LYNX TIME CODE MODULE OWNER'S MANUAL

TIME LINE

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1 INTRODUCTION

1.1 OVERVIEW

TimeLine's Lynx is a high performance modular time code product which is actually four independent functional units contained in a single enclosure. Each module features the following:

- SMPTE / EBU time code generator.
- · SMPTE / EBU time code reader (wide band)
- · Transport synchronizer / resolver.
- · SMPTE / EBU RS-422 serial port .

The system architecture assigns one Lynx module to each transport to be controlled. When multiple modules are connected with standard 9 pin RS-422 cables, they form a time code system that can synchronize an unlimited number of transports online simultaneously.

The Lynx module is characterized by a lack of internal adjustments necessary to configure different transports. The selection and initialization of transport type is accomplished by menu selection from the front panel.

This action automatically reconfigures:

- · Logic input levels.
- · Logic input polarities.
- Tach rates
- Analog outputs
- Frequency outputs
- Toggle rates
- Ballistics information

Typically, the only "learned" information necessary for proper operation is the tape speed (i.e. 15/30 ips) which is determined by reading time code for 10 seconds before first use. Most of the information is contained within the system and is selected by

menu, therefore the Lynx module powers up with much of the information necessary to operate immediately.

Each module contains an independent time code generator allowing convenient local time code striping for each controlled transport.

There is also a wide band time code reader in every Lynx module. It will read all SMPTE and EBU code formats as well as 24 frame "film" code from 1/10 to 60x speed.

In addition, The Lynx can be used to resolve the speed of any audio transport using time code or pilot tone already recorded on the tape.

All system information is retained in non-volatile RAM, enabling the user to store the transport setup information for each particular machine being synchronised. On power-up the module will display the machine type stored in memory and load the necessary parameters to control the machine. No other operations are necessary for immediate use. See section 3.2 and section 3.4 for further information on setup and initialization of the Lynx module.

1.2 MENU ORGANIZATION

Due to the growing number of transports the Lynx can control, the menus have been re-organized in a heirarchial format.

You will use the FORW and BACK keys to step through an alphabetical listing of manufacturers, and then the and keys to select the particular transport desired.

Additionally there is an Option Menu for selecting specific conditions for operation under other than normal situations. Appendix III contains a complete listing of transports supported by TimeLine products.

2 FEATURES AND CONTROLS

2.1 FRONT PANEL DESCRIPTION

2.1.1 TRAN MODE KEY

This key selects whether or not the Lynx module is ONLINE or OFFLINE. When OFFLINE the Lynx module will relinquish remote control over the transport.

ON LINE LIGHT

Indicates that the Lynx module is responding to system commands and controlling the transport.

When not lit, the Lynx module will relinquish control over the transport, except that the SYNC POINT button can be used as a single point search-to-cue.

RESOLVE LIGHT

Indicates the transport is in 'play' and its time code is resolved to within 20 subframes (20/100 frame) of the master's reference source.

LOCK LIGHT

Indicates the transport is in 'play' and its time code is resolved to within 2 subframes (2/100 frame) of the master's reference source. This function is duplicated by the letter "L" which appears in the OFST ERR display.

In the special case when the Lynx is controlling a video or digital audio transport, the transport is brought into lock, and then 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.

See section 6.3 for a more complete description of video or digital audio slave operation.

The master transport, is resolved to the master reference source. In this fashion, wow,& flutter, and bad frames of code will not be passed down to the slaves under normal conditions. This is true unless the VSO mode is intentionally selected for the master, at which time the master capstan speed runs WILD, and the slaves follow the speed of its time code. This is the normal setup used when a source of time code ("CODE ONLY MASTER") is the master reference, or when it is desired to vari-speed the master machine for off-speed audio mixing, or to eliminate "wow" when the master first goes into "play".

(See section 6.1.2 for a description of VSO mode and the function of the master reference key.)

2.1.2 GEN MODE KEY

Selects GENERATOR MODE This key can be used to PRESET the generator mode by touching it when the generator is stopped, or can be used to momentarily change mode "on the fly" if touched when the generator is already running.

WHILE STOPPED:

JAM TC or JAM UB may be preselected as explained below.

WHILE RUNNING:

The GEN MODE key will cause the generator to immediately "jam sync" once to the reader input; that is to say, the generator will continue generating code but will instantaneously reproduce the time code number present in the reader at the moment the GEN MODE key is touched, and will then continue running sequentially, locked to the generator's reference source.

GENERATOR MODE LIGHTS

If no generator mode lights are on, the generator will generate continuous time code locked to house reference, while running, and can be started and stopped with the GEN ON key. This is the "normal mode".

JAM TC LIGHT

Indicates that generator will automatically jam sync to the reader input after three valid, consecutive reader frames are read. The transfer from reader to generator will re-occur if reader time code is discontinuous when three new valid, consecutive frames are received. Otherwise the generator will produce consecutive frames. This mode is used to regenerate code when making tape copies, or for reconstructing code that is poorly recorded or has dropouts. See section 4.5.

JAM UB LIGHT

Indicates that simultaneously while generating normal time code, the "user bits" (spare) portion of the time code is being filled with the present reader time. The user bits will faithfully follow the current reader time, whether the reader is stopped or moving. See section 8.6 for a description of user bits.

NOTE: The user-bits portion of the time code is permanently set to 00:00:00:00 unless intentionally entered by means of the front panel or during the jam sync process.

TACH'S TC LIGHT

To be implemented in a later version of software.

2.1.3 GEN ON KEY

This key toggles the generator on/off. The light directly above the key indicates that the generator is running. When the light is not lit it indicates that generator is off, ready to resume at the last frame transmitted. There is no output from the generator when it is off or in the set/hold mode.

2.1.4 SYNC POINT KEY

When touched and released, cues to the current sync point, and the GOTO light flashes. The key operates only when OFFLINE. The light will also flash when executing a cue command received from the master.

SETTING A SYNC POINT

When touching the \X(SYNC POINT) key and the \SET HOLD key simultaneously, the sync point is loaded from the current tape time, either while the tape is stationary or while it is moving.

When a sync point is set, the Lynx module automatically compares the time code number just loaded to that of the module previously assigned as the "master", and computes and stores the result in the Lynx offset memory, which can be displayed in the display OFST position.

At the moment a sync point is set, the display will switch to the SYNC PT position for approximately 2 seconds to show the number just loaded.

WARNING:

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

2.1.5 SET HOLD KEY

This key is used to preset the generator, reader, or other displays. When first touched, it holds (or "freezes") the display, and causes the set/hold light to flash. Now, the frames column will flash., allowing the frames value to be adjusted and set. When touched again, moves the flashing column to the left, allowing each succeeding column to be adjusted.

To release the display from hold mode, hold this key again until the set/hold light goes out. This will allow the display to resume counting.

NOTE:

The set/hold mode does not affect the generator or reader input or outputs while the columns are being adjusted, unless the value is actually "stored" as described below.

2.1.6 ADJUST KEYS ↑ & ↓

These keys are used while in the SET/HOLD mode.

1	Subtracts	one	from	the	number	in	the
flashing	column.						

1	Adds	one	to	the	number	in	the
flashing	column.						

CLR When held, will clear the display to 00:00:00:00.

When the \(\bullet\) or \(\bullet\) keys are touched numbers will increase or decrease one integer at a time. HOLDING these keys will cause the numbers to scroll automatically.

The CLR key can also be used to clear a permanent error message from the display, such as the "no uideo" message which appears if loss of video sync is encountered.

2.1.7 SUBF UBITS KEY

In the GEN and RDR modes, causes the display to show the user-bit of the time code. The UBITS light will flash when user bits are being displayed. To resume showing time code, touch this key again.

In the OFFSET and OFST ERR modes, this key allows access to subframe offsets and offset errors.

NOTE:

When there is a subframe offset in the system, the "SUBF" light will flash if you are displaying frame offsets as a reminder that there are also subframes loaded, which can be accessed with the SUBF UBITS key.

2.1.8 STORE KEY

Allows you to store a time code number when the SET/HOLD light is flashing. The displayed value is stored into the location shown by the DSPL SEL indicators, and the SET HOLD mode is released.

2.1.9 DSPL SEL KEY

Toggles through display to the various Lynx display registers.

This key also affects the CODE TYPE and REF SRC displays, as described elsewhere.

GEN LIGHT

Indicates that the generator time is being displayed. The CODE TYPE and REF SRC lights show the current generator status.

RDR LIGHT

Indicates that reader time is being displayed.

If actual time code is being read, the LTC light is on and the actual incoming time code value appears in the display. If time code is not present, the display is then continually updated by tach pulses.

SYNC PT LIGHT

AS A SLAVE:

Shows the point which is to be synchronized with a selected point on the master transport.

AS A MASTER:

Shows the position that all slave sync points are to be synchronized with.

NOTE:

See SYNC POINT key description for a full description of the sync point register.

OFFSET

Displays the intended number of frames difference between the slave transport relative to the master transport. Shows the full-frame offset, or the subframe offset if the SUBF light is lit. Whenever there is an offset programmed in the system, the "OFST" light stays constantly illuminated as a reminder, even if the display select is in another position.

OFST ERR

Indicates the actual number of frames difference between the intended offset and the current position. Shows the full-frame, or the subframe error if the SUBF light is lit.

When the transport is in `lock' these values go to zero.

2.1.10 CODE TYPE KEY

WHEN DISPLAYING THE GENERATOR.

This display shows the type of time code being generated.

NTSC LIGHT

This is a generator SPEED indicator, and can be on when generating 30 or 30-DF time code.

WHEN ON:

Indicates that the code being generated is running at a speed of 29.97 frames per second. This is normally referred to as NTSC color speed since this is the speed at which color video frames run, and is the speed at which most video time code is generated.

WHEN OFF:

Indicates that the code being generated is running at a speed of 30 frames per second.

This is the reference many times used when time code is to be used for purposes of syncing up with 35mm film.

NOTE:

The rest of the indicators in this row show the type of time code being generated.

30. LIGHT

Indicates that time code being generated is "non-drop frame" SMPTE time code. There are 30 frames for every second displayed.

When used with the NTSC light out (non color speed) this will produce 24 hours of time code for every 24 hours of elapsed time.

DF LIGHT

Indicates that time code being generated is "drop-frame" SMPTE time code. There are 30 frames for every displayed second, except for certain numbers which are 'dropped'. The total number of frames dropped is 108 per hour.

When used with the NTSC light on (color speed), this will produce 24 hours of time code for 24 hours of elapsed time.

(See appendix 8.6 for an explanation of dropframe time code.)

25. LIGHT

Indicates that time code being generated is 25 frames/second EBU (European Broadcast Union) time code. There are 25 frames for every displayed second.

24. LIGHT

Indicates that time code being generated is 24 frames/second film style time code. This is a non-standard time code used for special usage with film systems.

WHEN NOT DISPLAYING THE GENERATOR,

The display shows the type of time code being read by the time code reader, as follows:

30. LIGHT

Indicates that time code being read is 30 fps "non-drop frame" SMPTE time code.

DF LIGHT

Indicates that time code being read is 30 dropframe SMPTE time code.

25. LIGHT

Indicates that time code being read is 25 frames/second EBU time code.

24. LIGHT

Indicates that time code being read is 24 frames/second film style time code.

2.1.11 REF SRC KEY

Selects the reference speed of the generator, as well as the reference play speed of the transports. The particular function in use is determined by the DSPL SEL position. See below.

REF SRC LIGHTS

Shows the currently selected reference source of the generator and / or master machine, as follows.

WHEN DISPLAYING THE GENERATOR:

The lighted indicator shows the source of the generator speed.

INT XTL LIGHT

Indicates that the generator is locked to the internal crystal of the Lynx.

EXT VID LIGHT

Indicates that the generator is locked to the external video reference plugged into the EXT VID jack. If no signal is present this position is disallowed, and the message "no video" appears in the time code display.

WHEN NOT DISPLAYING THE GENERATOR:

The lighted indicator shows the selected play speed reference which all machines use when being synchronized. It will only be lit when the Lynx module is selected as the MASTER.

INT XTL LIGHT

Indicates the synchronizer is using the internal crystal of the Lynx as the system reference.

EXT VID LIGHT

Indicates that the synchronizer is using an external video signal as the system reference.

MAINS LIGHT

Indicates that the synchronizer is using the incoming power line frequency as the system reference.

VSO LIGHT (variable speed override)

Indicates that the master is allowed to run at its own play speed (commonly called "wild speed") and the speed of its time code will be passed down to the slaves as the play speed reference for synchronization.

This will allow the master transport's VSO control to be used to alter the play speed of the entire system for off-speed mixing, or can allow the use of "code only" as a master, without transport cables hooked up to the master machine.

The disadvantage of using this mode is that wow and flutter may be passed down from master to slaves, although this effect is minimized by digital filtering in the Lynx module.

NOTE: Springer ment beviseen lest

At any time, only THREE positions are available as the master system reference.

The first position is the current selection of the generator reference, and the remaining two positions are MAINS and VSO.

2.1.12 MASTER KEY

Selects the Lynx module as the system master. The unit must be previously have been put ON LINE for this function to operate. Once a master is selected, the MASTER keys on all other system Lynx modules are deactivated.

A new master can be chosen at any time by first deselecting the current master .

MSTR LIGHT

Indicates the Lynx module has been designated as the system master.

2.1.13 POWER SWITCH

Controls AC power to the Lynx module. It is highly recommended that power not be turned on or off while tape is threaded and the attached transport is in 'ready' mode.

2.1.14 RMT LIGHT

Not used.

2.1.15 422 LIGHT

Indicates that the Lynx is either transmitting or receiving RS 422 to/from the system.

2.1.16 NUMERIC DISPLAY

Time Code/Message Display. normally displays time code and user bits in hours, minutes, seconds and frames.

Displays all menus and error messages.

2.1.17 READER SOURCE INDICATOR LIGHTS

These indicators are active regardless of other information being displayed on the panel.

When all lights are out, it indicates that the source of the time code showing in the RDR display was last received from incoming time code, rather than tach or pilot.

LTC LIGHT

Indicates that valid time code is present at the reader input.

VITC LIGHT

Not used.

PILOT LIGHT

Indicates that the synchronizer is locking to a PILOT signal on the PILOT IN jack.

TACH LIGHT

Indicates that transport tach pulses are being used to drive the reader display.

2.2 REAR PANEL DESCRIPTION

2.2.1 POWER AND FUSE

Accepts factory supplied power cord. The switch to the right of male power socket selects voltage on which the Lynx will safely operate. This switch has two positions, 115 and 230.

Contains fuse drawer which holds the AC power fuse. The drawer is accessed by inserting the blade of a small screwdriver into the slot at the lower front of the power cord receptacle opening and twisting the blade. The fuse drawer will slide out. There are two positions in the drawer. The one furthest in is the active position, the one nearest to the back panel is for a spare.

WARNING:

The Lynx is supplied with the proper fuse for operation on the voltage for which it is set at the factory. If you wish to change the setting you MUST also change the fuse.

115 volt AC mains	1/4 Amp GMA
230 volt AC mains	1/8 Amp GMA

WARNING:

Operation of Lynx with mains switch in the wrong position can cause irreparable damage to the unit. This damage is not covered by the factory warranty. Be very sure this switch is in the correct position and the proper fuse is installed before applying power to the unit.

2.2.2 SERIAL NO.

Individual Lynx serial number. Always refer to this number when consulting your dealer about your Lynx. These numbers are recorded at the factory to determine the software, hardware, and other engineering changes.

2.2.3 VITC CONNECTOR

Not used.

2.2.4 EXTERNAL VIDEO REFERENCE INPUT

Either one of the two identical female BNC type connectors must be used to receive a reference signal for the generator and synchronizer. They are hard-wired together so that the unused plug becomes an extension, used either to loop the video through the Lynx or terminate the video by attaching a 75 ohm terminating plug.

2.2.5 READER TIME CODE INPUT CONNECTOR

Electrically balanced, standard female 1/4" phone jack, tip-ring-sleeve type, used as the input for the reader time code. Time code output of transport is connected to this input. An UNBALANCED input is recommended, with the RING tied to ground.

2.2.6 READER RESHAPE OUTPUT (CODE OR PILOT)

Electrically balanced, standard female 1/4" phone jack, tip-ring-sleeve type, provides reshaped reader time code for dubbing. This can alternately supply a reshaped pilot signal derived from the incoming time code. See section 3.5.

2.2.7 GENERATOR CODE OUTPUT CONNECTOR

Electrically balanced, standard female 1/4" phone jack, tip-ring-sleeve type. Provides output of generator time code when the generator is on.

2.2.8 READER PILOT INPUT CONNECTOR

Electrically balanced, standard female 1/4" phone jack, tip-ring-sleeve type. Accepts pilot tone input used by the synchronizer to resolve transport speed to a prerecorded tone which is twice the system frame rate.

2.2.9 GENERATOR PILOT OUT CONNECTOR

Electrically balanced, standard female 1/4" phone jack, tip-ring-sleeve type. Provides a 48/50/60 Hz square wave locked to the generator clock. The

frequency of this signal is always twice the frame rate of the time code being generated. It is always present, whether or not the generator is on or off.

2.2.10 TRANSPORT CONNECTOR

50 pin D style connector which accepts factory supplied transport interface cables.

2.2.11 GEN LVL. ADJUSTMENT

Adjusts the output level of the generator from -10 to +6 dBm.

2.2.12 RS 422 CONNECTORS

Standard 9-pin female RS 422 connectors used to connect the Lynx module to other Lynx modules or to an external controller or editor. All Lynx modules in a system must be joined together using a standard RS422 cable.

Both connectors labelled RS422 are parallel wired.

2.2.13 GND/ISO SWITCH

This toggle switch determines whether the chassis is grounded to the transport.

In the GND position, the transport is grounded to the chassis.

In the ISO position, the chassis is electrically isolated from the transport to preserve system grounding.

WARNING:

The EXT VID and RS422 connectors share the same ground, and are always ground isolated from both transport AND chassis ground. This means there may be a ground potential between the video BNC and the transport cables.

2.2.4 EXTERNAL VIDEO REFERENCE IMPUR

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Electrically balanced, standard female 1/4" phone jack, tip-ring-sleeve type. Provides output of generator time code when the generator is on.

2.2.8 READER PILOT NIPUT CORNIECTOR

Electrically balanced, chandard female 1/4" phone jack, tip-ring-sleeve type. Accepts pilot tone input used by the synchronizer to resolve transport speed to a prerecorded tone which is fwice the system frame rate.

2.2.9 GENERATOR PLUGT OUT COMMECTOR

Electrically balanced, standard female 1/4" phone jack, tip-ring-sleeve type. Provides a 48/50/80 Hz square wave locked to the generator clock. The

frequency of this signal is always twice the frame rate of the time code being generated. It is always present, whether or not the generator is on or off.

1.2.19 THANSPORT CONNECTOR

50 pin D style connector which accepts factors supplied transport interface cables.

22.11 GEN LVL ADJUSTMENT

Adjusts the output level of the generator from -10 to +6 dBm.

22.12 RS 422 COMMECTORS

Standard '9-pin female RS 422 connectors used to connect the Lynx modules or to an external controller or editor. All Lynx modules in a system must be joined tegether using a standard RS422 cable.

Both connectors labelled RS422 are parallel wired.

12.13 GND/ISO SWITCH

This toggle switch determines whether the chassis is grounded to the transport.

in the GND position, the transport is grounded to the charsis.

In the ISO position, the chassis is electrically isolated from the transport to preserve system orounding.

WARNINGS

The EXT VID and RS422 connectors share the same ground, and are always ground isolated from both transport AND chassis ground. This means there may be a ground potential between the video BNG and the transport oables.

3 INSTALLATION AND SIMPLIFIED OPERATION

NOTE:

It is strongly suggested that you save the factory supplied shipping carton as it is specially designed to protect your Lynx module if it ever requires re-shipment.

3.1 RACK MOUNTING INSTRUCTIONS

Lynx modules are designed to rack mounted side by side, if desired. Each module comes with a single rack "ear". To assemble two units for rack mounting:

Remove the top covers of the two units.

Install the rack "ear" on right hand side of one Lynx and the left hand side of its associated pair. Use the 8-32 flat head hex screws provided, and the #8 self locking nuts, required only on the left unit.

To join two Lynx modules together at the center, temporarily lift up the small circuit card on the right unit by removing its four mounting screws.

Using the the front and back mounting holes in the left side of the Lynx chassis, screw the right unit to the left unit using the two 8-32 pan head Phillips screws, and two split ring lock washers provided.

Replace the reader card on the right unit.

Replace the top covers on both units. The pair is now ready for mounting in a standard 19" rack.

3.2 FIRST INITIALIZATION

The blue labels on the front panel refer to the setup functions of the controls. They are referred to here in (parentheses).

3.2.1 ERASING BATTERY RAM

When the Lynx is powered on for the first time, or it is desired to erase information already stored in the battery memory, this is done by holding the 'X(*SET UP*) key WHILE the power switch is being turned on. At this time a transport name will start flashing in the display.

At all other times the battery memory will restore all transport information in memory when power is applied.

3.2.2 MENU 1: TRANSPORT

Use the FORW and BACK keys to step through the transport menu to find the transport name that corresponds to the transport which the Lynx will control. The transport menu is explained in APPENDIX Section 8.1.

When the desired transport name appears in the display touch the STORE key The display will stop flashing.

Verify that the correct transport name appears in the display.

Touch the MENU key to step to the next menu selection.

3.2.3 MENU 2: "DONE"

menu.)

If there are no setup mistakes, hit the STORE key once more, and the system will be fully initialized.

(If it is desired to go through the procedure again, hitting the MENU key will return you to the first

The transport parameters are now automatically stored in the Lynx memory. The display will now read 00:00:00:00, initialize to the RDR display, and the unit is now ready for operation.

3.2.4 MENU 3: OPTIONS

This menu is accessed by holding the *SET UP* key for approximately 5 seconds. As explained above you will use the *FORW* and *BACK* keys to step through the available options and the † and ↓ keys to set the value for the selected option. By toggling the DSPL SEL key you may select either the Transport or Option Menus.

The following page explains the options available and their application within the Lynx system. Although the Lynx contains defaults for each of these options, the user may alter these values to suit the situation.

Phase: This item allows control of the 'lock mode'.

000 = Phase OFF

A new feature which allows automatic resynchronization if a frame error is detected. This is done in a 'slow lock' mode to prevent audible pitch change.

001 = Phase On

The normal resolve after lock option. The module reverts to a phase-lock and maintains resolved play speed while ignoring actual frame numbers. This will prevent loss of lock during dis-continuities in time code. To indicate this type of operation the Resolve light will flash if a frame error occurs.

LiFt: This option controls lifter defeat routines.

000 = Lifters are never defeated by Lynx This mode prevents lifter defeat during locates, thereby causing slower lockup times by denying the Lynx access to time code at the park point.

00 I = Normal operation. The Lynx will close its mute relay and issue a Lifter Defeat command as it approaches the park point to determine the precise position of the machine within a 9 frame window.

002 = Lifter Defeat Mode. In this mode the Lynx defeats the lifters and energizes the mute relay during all wind, cue, or locate functions allowing high-speed time code to be read. This mode should be used when there is discontinuous or spliced time code to allow accurate locate and cue functions.

r Ly: This option controls the mute relay action.

000 = Normal mode. The mute relay is energized in wind modes while lifters are defeated.

00 I = Mute until Resolve. This provides normal operation with additional muting in PLAY mode until RESOLVE light comes on indicating an error of less than 20 sub-frames.

002 = Mute until Lock. The same as mode 001 except muting remains active until LOCK light comes on indicating an error of less than 2 subframes.

003 = Mute unless STOPPED or LOCKED.

5Pd: This option controls the dynamic approach speed during wind mode.

In unusual situations such as lightly loaded or oversize reels this parameter may be adjusted to prevent overshoot when approaching the park point. The value is display in arbitrary units which range in value from 050 to 255.

3.2.5 SIGNON

On power-up the system will sign on by showing the following information, in sequence, on the front panel display:

L410-38 (Version number)

Atr-100 (transport type)

This information is loaded from the battery powered RAM, and should always contain the setup chosen before powering down previously.

3.2.6 INITIALIZATION AS A GENERATOR OR READER ONLY

When the Lynx is to be used as a generator or reader only, where no transport cable is connected, you may select any transport from the transport menu.

3.2.7 INITIALIZATION FOR CODE-ONLY MASTER USE

When the Lynx is to be used as a code-only master, select any AUDIO transport from the transport menu. REF SRC must be in VSO mode. A "code only master" must supply valid time code all the time, even at wind speeds. This will require a wideband time code playback amplifier and a defeat of tape lifter operations. See See section 6.2 for further information

When the Lynx is powered on for the first time.

transport information in memory when power is

3.3 INITIAL SETUP

The primary function of the Lynx module is to synchronize slave transports to a master, which can be a transport or a source of incoming time code. The synchronizer is totally dependent on the time code reader as its source of transport position information, so time code must be present from the controlled machine to the reader input.

Be sure the RDR IN connection is made from the Lynx module to the transport before attempting any synchronization operations.

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.

The ability to properly synchronize a transport is dependent upon selecting the correct transport at power up.

3.3.1 INTERCONNECTIONS

Connect all of the Lynx units together using a standard 9-pin RS 422 cable.

Connect appropriate transport control cables from each Lynx to its associated transport.

3.3.2 TACH AND CABLE CHECKOUT

Load time coded tapes on the transports. If no time coded tapes are available, see Section 4 for instructions on how to generate and record time code.

Make sure that the TCIN (reader input) is DISCONNECTED at this time.

Make sure the RDR display is active. If it is not, touch the DSPL SEL key until the RDR light is lit.

Operate each machine manually to verify that when the transport is moving that the TACH light is on and the display is counting. The the display must count correctly in both forward and reverse.

If the transport is running at 30ips, the display will count in 'clock time'. At 15ips, it will count 1/2 'clock time' (i.e. 1/2 real time).

3.3.3 READING TIME CODE

Connect an audio cable from the code output channel of each transport to the TCIN of each associated Lynx.

Play each transport for 10 seconds and verify that time code is counting on the display and that the green LTC light is lit.

3.4 INITIAL SYNCHRONIZATION

To verify that the Lynx synchronizing system is operating, the following simplified operating procedure will serve as a simplified guide to synchronizing.

Once the system is operating, you can become more familiar with the advanced functions of the system by reading the complete operating instructions. The following instructions assume that two transports are to be synchronized with no time code offset.

3.4.1 CHASE OPERATION

Make sure that both modules are initialized as described above.

Touch the TRAN MODE key on both Lynx modules.
The ON LINE lights will now be on.

Select one Lynx as master by touching the MASTER KEY. Its MSTR light will now go on. The 422 light on BOTH panels will now be on.

Put the master transport in the play mode. The slave transport will now search, play, and lock to the master.

Verify both transports are "locked" by checking the LOCK light on all Lynx modules.

The slave transport should now 'chase' and lock to the master transport no matter how the master transport is moved. You can now exchange which transport is the master by touching the illuminated MASTER key, causing it to go out, and touching the other MASTER key, causing it to light.

NOTE:

The very first attempt at lock may take up to 10 seconds. Subsequently, lock up time averages 1-3 seconds.

3.5 ADJUSTMENTS AND JUMPERS

3.5.1 OUTPUT LEVEL ADJUSTMENTS

There are three output level adjustments:

- Generator code output level (on rear panel).
 - Reshaped code output level (under top cover).
 - Reshaped pilot output level (under top cover).

A normal setting for any of these output levels would be approximately -1 dBm.(-5VU) The actual range of these outputs is -10 to +6 dBm.

3.5.2 RESHAPED TIME CODE / RESHAPED_PILOT OPTION

The module provides an internal option to select either reshaped time code or reshaped pilot output from the rear panel RESHAPE jack. This selection is a small jumper plug, on the reader circuit card, labelled P5.

The two positions of this jumper are marked as follows:

RESHAP = Reshaped code output

PILOT = Reshaped pilot output

This jumper is factory installed in the "reshaped code" position.

The reshaped time code is a squared-up version of the reader input signal. No re-clocking, or other changes to the incoming code are made, and this signal can be used for direct time code dubbing when desired.

The reshaped pilot output is extracted from the time code coming into the reader input, and is equal to twice the incoming frame rate. The following nominal frequencies result:

INCOMING CODE	PILOT OUT
SMPTE non-color speed	60 Hz
SMPTE color speed	59.94 Hz
EBU	50 Hz

3.5.3 RESHAPE OUTPUT LEVEL POTS

The individual level pots for reshaped time code and reshaped pilot outputs are located on the reader card, and are designated R22 and R23.

3.6 KEY SENSITIVITY: TOUCH/HOLD EXPLAINED

Because certain keys, namely, SET HOLD, CLR, and STORE, may cause an unwanted effect if bumped accidentally, they are programmed with a slight delay. When referring to these keys, the following terms will be used:

TOUCH = Depress for less than 1/4 second. HOLD = Depress for at least one second.

3.7 DISPLAY ENTRIES

The ability to enter time code numbers into the eight digit display is a necessary part of many Lynx operations. This will normally be used to enter generator starting times, tach times, and offset and sync point values.

3.7.1 SET HOLD MODE

Touching the SET HOLD button will freeze the display. A flashing digit (cursor) will appear in the HR column, and the set/hold light will also flash.

3.7.2 CLEARING AND MODIFYING THE DISPLAY

The display can be cleared to 00:00:00:00, if desired, by holding CLR.

Touch ↓ to subtract one from the column, or

touch 1 to add one to the column..

Touching SET HOLD again will move the flashing cursor to the next column to the right.

Repeating the above procedure will allow you to enter numbers into all the columns.

3.7.3 STORING A NUMBER

When the desired time code number appears in the display it can be stored by holding the STORE key. The register to which the number will be stored is indicated by current position of DSPL SEL

The set/hold light will go out, and the display will now resume normal counting.

3.7.4 NEGATIVE NUMBERS

In the OFST and OFST ERR positions, values can be either positive or negative since these positions indicate a relationship between the master and slave transport positions, not an actual time code value.

A positive number in the slave's offset register indicates the slave is ahead of the master the

indicated amount, and a negative number indicates it is behind the master. Negative numbers appear with a flashing - (minus) sign once you have stored the value by touching the STORE key.

To enter a negative number clear the display and use the \downarrow key to subtract from 00:00:00:00.

4 TIME CODE GENERATOR

Each Lynx module contains an independent Jam Sync time code generator. SMPTE drop and non-drop code, EBU 25 frame code and 24 frame film style codes are available from the Lynx. The Lynx provides a generator pilot tone output signal.

4.1 GENERATOR REFERENCE

Before generating time code, it is important to know how the speed of the generator is derived, since speed control is an inherent part of using time code.

In the Lynx module the REF SRC key selects either the internal crystal or external video sync as the reference for the generator. These are the two reference sources for the Lynx generator.

The generator must be stopped to change the generator reference. This helps to prevent the reference from being changed inadvertently.

4.1.1 SETTING THE GENERATOR REFERENCE

To set or change the generator reference:

If generator is running, touch the GEN ON key to stop the generator.

Touch the REF SRC key until the light next to desired setting is lit.

Press the GEN ON key. The generator will begin to run locked to the appropriate reference.

NOTE:

Since it is impossible to lock to external video unless that video signal is supplied, the "no video" error message will appear on the display if that is attempted. The Lynx will then automatically revert to its internal crystal reference. To clear the displayed error message, touch CLR.

4.2 GENERATOR CODE TYPE

The time code frame rate is selected using the CODE TYPE key. The generator must be stopped to change this setting. This prevents accidental change of the frame rate by a single inadvertent key stroke.

Under normal conditions, it is suggested that 30 be selected as the standard frame rate, since this type of code can normally be read by almost all other time code readers. In Europe, 25 (EBU) is the code standard.

If the generator is running, touch GEN ON to stop the generator.

Touch the CODE TYPE key until the light adjacent the desired position is lit.

4.3 GENERATOR ON/OFF (HOLD)

Once the generator reference and frame rate have been set:

Touch the GEN ON key. The generator will begin generating time code from 00:00:00:00 or will continue generating from the last number displayed prior to stopping the generator. The ON Light above the GEN ON key will light.

4.4 SETTING THE GENERATOR

Press the DSPL SEL key until the light adjacent to GEN is lit.

Touch the SET HOLD key. This will freeze the display and the cursor will flash.

Enter the TIME CODE Point at which you want the generator to begin counting. See section 3.7 for an explanation of accessing the display if you are unfamiliar with the numeric entry procedure.

Press the STORE key. The generator will now begin generating from that point. The display automatically leaves the SET/HOLD mode.

4.5 GENERATOR MODE

The GEN MODE key selects the four generator modes in which the generator locks to an external code or tachometer pulse source.

4.5.1 NORMAL GENERATOR MODE

When the Lynx is powered on, it automatically selects the normal generate mode. In this mode, when the generator is started, it runs sequentially from the starting number visible in the GEN display.

4.5.2 JAM SYNC MODE (MANUAL)

The generator can be loaded momentarily from the reader time code input by touching the GEN MODE key while the generator is running.

This mode can be used to generate brand new time code to replace already existing, poorly recorded code. This is done by causing the incoming time code number to be transferred to the generator, at which time the generator will revert back to "normal mode" and generate sequential numbers.

The light adjacent JAM TC will momentarily light. At this point, the generator "looks" at the reader input and loads that time code value. It then continues to generate code counting from that reset value. It does not reload the reader code again unless the GEN MODE key is touched again.

The generator runs in normal generator mode after it has loaded the reader value, so it is necessary to make the new code and the old code are run at the same speed from that point on. This is done by making sure that source machine is resolved to the generator speed reference. See section 7.1.

4.5.3 JAM SYNC MODE (AUTOMATIC)

The automatic jam sync mode can be selected by depressing the GEN MODE key when the generator is stopped.

This is identical to the manual jam sync mode, except that the reader value is made to load automatically if the time code goes out of sequence for more than three frames.

This mode can be used to create new code from a reel which has varying ("discontinuous") time codes because the reel was spliced, or i composed of various material recorded at different times.

If the time code input stops, the generator will continue to free run as described above. It only does an "automatic" jam when continuous new code is present, for more than three frames.

Again, the code speed must be resolved to the generator speed in order to operate correctly.

4.5.4 JAM SYNC TO GENERATOR USER BITS

This mode is normally only used by remote editing systems.

In this mode, the reader number is recorded into the spare "user bits" portion of the time code waveform.

Normal generator operation is not affected while in this mode.

If reader code stops, the last time code value will be repeated in the generator user bits.

The Jam > UB mode can be selected by touching the GEN ON key when the generator is stopped.

4.5.5 JAM SYNC PRINCIPLES

The Lynx generator always emits time code a normal play speed. In order for the reader and generator frames to be counting at the same rate during jam-sync operation, it is necessary for the incoming time code coming into the reader be resolved to the generator reference.

This is accomplished by making the transport a MASTER during the jam sync operation. See section 7.0 on using the Lynx module as a resolver.

WARNING:

We do not recommend using the automatic jam mode with video machines as a source, because if the incoming time code was not correctly recorded, or if it is not framed correctly it is possible to generate faulty code. In software release 4.10, a warning message will be displayed to avoid this condition.

4.6 RECORDING TIME CODE

The output signal from the generator appears at the GEN OUT connector on the rear panel. To record time code, connect an audio cable from the GEN OUT connector to the appropriate audio input of the recorder.

WARNING:

As with any synchronizer, when recording original time code, make ABSOLUTELY certain that the recorder has its capstan switch on "internal" position and that the Lynx module is OFFLINE, so that the time code is recorded at an accurate tape speed. If possible, double check this with the transport tape speed display, if present.

4.6.1 GENERATOR OUTPUT LEVEL

The generator output level is adjustable with a rear panel trimpot. A typical level would be -5 Vu.

4.6.2 PILOT OUTPUT

The pilot output is a shaped square wave output which is always 2 times the frame rate of the code being generated. This signal appears at the PILOT OUT connector on the rear panel, and can be recorded on a separate track along with the generator time code.

This signal can then later be used to allow the Lynx module to maintain synchronization, if for some reason the time code track becomes damaged or unusable. Under these conditions the Lynx module will use the pilot signal as a synchronizing reference during time code dropouts.

CODE TYPE	PILOT FREQ.
4.6.2.1.	60Hz
30-DF	60Hz
4.6.2.2. NTSC	59.94Hz
30-DF NTSC	59.94Hz
4.6.2.3.	50Hz
4.6.2.4.	48Hz * non-std.

NOTE:

The PILOT OUT signal is continuously present at its output jack, even when the generator is off.

5 TIME CODE 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.

5.1 READER DISPLAY

To access the reader display, press the DSPL SEL key until the RDR light is illuminated. 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 pilot tone or tach pulse time.

When the Lynx is used as a synchronizer this code/time will 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 2.1.17 for a complete explanation of these indicator lights.)

5.3 RATE OF CODE INDICATORS

When displaying the RDR, the bank of lights immediately above the Code Type key indicate the type of time code being read.

5.4 RESHAPED CODE / PILOT

Reshaped Code is used for dubbing (copying) time code 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.

Any inconsistencies in the code such as wow and flutter will be passed down from the original to the copy, and in some cases the reshaped copy cannot be used. It is advised to use the generator jam sync feature to copy code.

6 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 pilot tone 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 operations.

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 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 TWO OR MORE TRANSPORTS WITH TIME CODE

6.1.1 MASTER SELECTION

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 MASTER key. See section 2.1.12.

6.1.2 MASTER REFERENCE

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

- The internal crystal of the Lynx selected as master.
- External video sync.
- The power line frequency.
- 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 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 time codes on multiple reels are identical. See section 3.4.

MANUAL OFFSET ENTRY

The offset between two transports can be manually entered using the display entry key pad. Select the OFST position of the display.

An "offset" is always defined as:

Slave time code

- Master time code
- Offset number of frames

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 time codes at the point they are to be synchronized. In the Lynx module, this is always displayed as a non-drop-frame time code number. The offset of the master machine is, by definition, always 0.

AUTOMATIC OFFSET ENTRY

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 2.1.4 for information on how to set a sync point.

Stop the master transport.

SLAVE TRANSPORT

Find the sync point on the slave transport.

See section 2.1.4 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, for its sync point to be set, and for it then to be stopped prior to assigning slave sync points.

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 time code 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 time code in high speed wind because they are not available.

For this reason, a "code only master" must supply time code at all times, even at wind speeds. This requires a wideband time code 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 time code 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" time code available and the tape lifters are not defeated, the slave machines will stop as soon as time code 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 time code from their standard playback electronics. Consult the machine instruction manual for details. Other machines, such as the Studer A800 comes supplied with a wideband time code amplifier dedicated to track 24 operation.

6.2.3 CODE ONLY MASTER SET-UP

See section 6.2.

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 synchronize to master time code.

6.3 SYNCHRONIZING 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 synchronized.

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 synchronizing 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.

6.4 ADVANCED FEATURES

6.4.1 AUTOMATIC PILOT RESOLVE

If both LTC and PILOT signals are being supplied from the tape transport, the Lynx module will perform a sophisticated automatic switch-over from LTC to PILOT which will keep a slave transport in "lock" if its time code is interrupted. This is achieved by causing the Lynx module to automatically go into "resolve" mode to the pilot signal, and then restore to LTC synchronization automatically when the LTC reappears.

Because the "phase" of the pilot signal may not match the LTC, the Lynx module keeps continuous track of the phase angle between the two signals, and will maintain this phase angle when it switches to pilot resolve.

This will result in a disturbance-free switch-over.

6.4.2 SETTING AND SHOWING SUBFRAME OFFSETS

Select "OFST" with the DSPL SEL key .

Touch the SUBF UBITS key.

The SUBF light will go on, and the frames display will now show subframes. If the unit is just initialized, this will be preset to 0.

Set/Hold mode will now allow you to scroll subframes. Use the \(\begin{array}{c} \text{ and } \begin{array}{c} \text{ arrow keys, or } \end{arrow} \)

CLR, to adjust the subframe value. (You can go back and forth between frames and subframes as you like).

When adjusting subframes, the CLR button clears the subframes only. When adjusting frames, the CLR key will clear frames and subframes to zero.

NOTE:

When scrolling backwards, through zero, the subframes value becomes negative. This will be indicated by a minus sign when exiting the Set/Hold mode.

6.4.3 SHOWING SUBFRAME ERRORS

With the display selected to OFST ERR, touching the SUBF UBITS button will show the subframe errors.

.Hours, minutes, and seconds will still display, so you can see the machine position error when it is searching.

.When the error is under one frame, the subframe display will come on as soon as the machine is into play and going into lock.

6.4.4 NOTES ON PILOT CAPABILITIES

An extremely sophisticated pilot resolve system has been implemented in the Lynx module, which can be used to resolve pilot signals without time code, or allow the use of a pilot track as a time code "backup" to maintain synchronization in case of code loss.

To use this feature, the time code and pilot signals must be recorded on two separate tape tracks at the same time.

The following are the unique capabilities:

and forth between frames and subframes as

Supports SUBFRAME OFFSETS between the pilot source and the selected reference, if entered.

AUTOMATICALLY will switch the system from longitudinal time code to pilot input, if the time code disappears and pilot is present.

.AUTOMATICALLY will adjust the lock point of the pilot lock so that the pilot can have any phase relationship to the time code at the point of code disappearance without any improper re-sync occurring. In this way the pilot input may be recorded out of phase, or with phase shift, and still always be used with confidence as a "control track".

Continues to count tach while locking to pilot, so that the reader display stays updated with machine position.

OFST ERR shows subframe pilot lock, if in the subframe position.

NOTE: and as prof as ancilibroo sand

Be sure to initialize the machine tape speed with time code first, before using pilot lock.

6.4.5 AUTOMATIC RE-SYNC

Follow the same procedure as for synchronizing

If "SET/HOLD" is used to change an offset, and the slave ATR is already synchronized in "play" mode, the machine will slew in real-time, automatically storing the new offset and re-syncing automatically.

This will occur at maximum capstan speed, in audio machines. It thus allows adjusting the time code offset audibly by "ear" while synchronizing. This features works frame by frame, or will re-sync subframe-by-subframe.

7 USING THE LYNX AS RESOLVER

The Lynx can be used to resolve the speed of any audio transport using time code or pilot tone 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 2.1.11 for an explanation of the available reference source selections.

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

CODE TYPE	FRAME FREQ.	PILOT FREQ.
7.1	30Hz	60Hz
30-DF	30Hz	60Hz
7.2 NTSC	29.97Hz	59.94Hz
30-DF NTSC	29.97Hz	59.94Hz
7.3	25Hz	50Hz
7.4	24 Hz	48Hz* non-std

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.

7.5 RESOLVING TO TIME CODE

Make the transport a MASTER as described in section 2.1.12.

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

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

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 if you want the transport to run at its calibrated speed.

7.6 RESOLVING TO PILOT TONE

The Lynx module will perform the same resolver function to a pilot signal feeding the PILOT IN jack, as long as time code is not present at the RDR IN jack. The Lynx module will always give LTC a higher priority than Pilot.

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8 TROUBLESHOOTING

8.1 SYSTEM RESTRICTIONS

8.1.1 USE OF MIXED TIME CODES

It is not possible to synchronize 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 dissimilar 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.

8.1.2 48HZ PILOT OUTPUT

The Lynx module generates standard pilot tone frequencies for 30, 30-DF, and EBU 25 frame time codes. It generates a non-standard 48hz frequency when generating 24fps film time code, which is 2x the frame rate.

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

8.1.3 24-HOUR BOUNDARIES

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

8.2 GOOD OPERATING PRACTICES

8.2.1 RECORDING SPEED

As with any synchronizer, when recording original time code, make ABSOLUTELY CERTAIN that the recorder has its capstan switch on "internal" position and that the Lynx module is OFFLINE, so that the time code is recorded at an accurate tape speed. If possible, double check this with the transport tape speed display, if present. If this rule is not observed, it is possible to record the original time code at a non-standard speed.

8.2.2 RECORDING LEVEL

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 audio tapes, it is the industry standard practice to use track 24.

8.2.3 SYNCHRONIZATION PROBLEMS

- The system will not synchronize without a master selected.
- The synchronizer will not lock codes with dissimilar 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 8.3 System Restrictions for an explanation about mixed codes.
- A slave transport will not synchronize without a working transport cable.

8.3 PROBLEM SOLVING

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

- Bad tach source, caused by a bad transport cable.
- 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:

- Remove the reader input signal (TC In) and run the machine in PLAY at 30ips. The tach should cause the display to count in real time, in. the right direction.
- Try rewinding, making sure the direction count reverses in the display.

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

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, after reading five seconds of code.

8.4 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. This error is self-reset, and clears when valid code is present.

B no no tape solo sh 00 s no eseso

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.

SEr Err

Occurs if the BVH-2000 transport is selected and the Lynx serial interface option is not present, or not functioning.

8.5 TIME CODE/USER BITS EXPLAINED

8.5.1 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 are 2400 / 4800 Hz. for 30 frame code.

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 time code 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).

8.5.2 TIME CODE TYPES

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

30. frame SMPTE code (also known as "non-drop" time code) 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.

SMPTE 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 8.3.1.

APPENDIX 1: TRANSPORT MENU

DISPLAY	TRANSPORT DESCRIPTION
AEG	
AE9-50	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-1500	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-420	D20 (R-DAT)
FoS-d20A*	D20 (R-DAT) (future)
FoS-4204*	D20 (R-DAT) (future)
JAC	
J-810	JVC BR-S610 (S-VHS)
7-810	JVC BR-S810 (S-VHS)
J-850	JVC CR-850, CR-600
J-8520	JVC CR-8250, CR-6650
J-8600	JVC BR-8600, BR-7700U (US)
J-8600E	JVC BR-8600E, BR-770E (Euro)
3 M	
79	3M M-79
MITSUBISHI	
850-A *	Mitsubishi X-850
850-d *	Mitsubishi X-50
880	Mitsubishi X-880 (future)
OTARI	
Otr 10-1	Otari MTR10 series 1
0fc10-5	Otari MTR10 series 2
0fc15-1	Otari MTR12 series 1
0FL15-5	Otari MTR12 series 2
0fr50	Otari MTR20
Otr-SS	Otari MX-55
0tr-10	Otari MX-70

DISPLAY	TRANSPORT DESCRIPTION
OTARI cont.	
0tr30-1	Otari MTR90 series 1
0tr90-2	Otari MTR90 series 2
5050-3	Otari MX 5050 MARK 3
SONY	
3324	Sony 3324 Digital Audio
3324-B *	Sony 3324 Digital Audio
3324-9 *	Sony 3324 Digital Audio
3348	Sony 3348 Digital Audio
3348-A *	Sony 3348 Digital Audio
3348-8 *	Sony 3348 Digital Audio
3402-A *	Sony 3402,3202
3405-9 *	Sony 3402, 3202
5850	Sony VO-5850, VO-5800
APr-24	Sony APR-24
APr-5000	Sony APR-5000, 5003
80U 800-P	Sony BVU 800 VTR (parallel)
600 800-F	Sony BVU 800 VTR (parallel)
600800-S	Sony BVU-950 VTR Ser. IF
BNH-5000	Sony BVH-2000 1", Ser. IF
J4000-5	Sony dmr-4000 Ser. IF
	Sony JH24, JH110
JH24	Sony JH114
STELLAVOX	Solly 3H114
StEL-td9	Stellavox TD-9
STUDER	Stellavox 1D-9
	Chadas AGO AGUS took
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")
A8 10	Studer A 812
8815	Studer A 820 (small format)
0588	Studer A-820 (small format)
H-0288	Studer A-820 MCH (512Hz tach)
1-0588	Studer A-820 MCH (32Hz tach)
TASCAM	T 0 10 (40 44 40)
tASc-40	Tascam Series 40 (42,44,48)
tASc-SO	Tascam Series 50 (52,58)
tASc-60	Tascam Series 60 (MS-16)

^{*} 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.



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

TRANSPORT CONNECTOR PIN -OUT



- 1 GROUND
- 3 STOP [STILL] CMND
- 5 CAPST. FREQ EMITTER
- 7 FORWARD [DIR] CMND
- 9 AUXIN2
- 11 INSERT A1 CMND.
- 13 SERVO RELAY-A N/C
- 15 SERVO RELAY-B N/O
- 17 RESERVED
- 19 REC-OUT CMND +
- 21 1K PULLUP TO +5V
- 23 TRAN CMND COMMON
- 25 PLAY TALLY
- 27 INSERT A2 CMND.
- 29 SERVO RELAY-A N/O
- 31 SERVO RELAY-B N/C
- 33 RESERVED
- 35 REC-OUT CMND -
- 37 PLAY CMND.
- 39 CAPST. VOLTS OUT
- 41 RESERVED
- 43 RESERVED
- 45 +12V (5 MA MAX)
- 47 MUTE RELAY N/C
- 49 RCV+ (SERIAL DATA)

- 2 TRAN. GND. SENSE
- 4 CAPST. FREQ COLLECTOR
- 6 LIFTER DROP CMND
- 8 RECORD TALLY
- 10 REMOTE LOCK INDICATOR
- 12 REHEARSE
- 14 SERVO RELAY-B COM
- 16 XMT+ (SERIAL DATA)
- 18 +5V (5 MA MAX)
- 20 SEARCH CMND +
- 22 RESERVED
- 24 REWIND CMND
- 26 DIRECTION SENSE
- 28 INSERT VIDEO CMND.
- 30 SERVO RELAY-A COM
- 32 XMT- (SERIAL DATA)
- 34 GROUND
- 36 SEARCH CMND -
- 38 SEARCH VOLTS OUT
- 40 REC-IN CMND.
- 42 TACH PULSE IN
- 44 -12V (5 MA MAX)
- 46 MUTE RELAY N/O
- 48 MUTE RELAY COM
- 50 RCV- (SERIAL DATA)

8.8 CIRCUIT BOARD INTERFACE

COMPONENTS BY FUNCTION

OPTOISOLATORS

STOP	U27	H11-G2
PLAY	U28	00000
REWIND	U9	
FAST FWD	U10	
LIFTER DEF.	U18	
SEARCH	U26	
REC. IN	U19	IAHI S
REC. OUT	U35	4 CAP

RELAYS

MUTE	K1	Aromat DS2
SERVO ENA	K2	Aromat DS2

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	S CAPS