Operating Manual

Lynx-2

Time Code Module

Manual No. 73A020-H

Assistance and Information

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Software Version

Serial Number

Technical Assistance is available ONLY if the Lynx-2 is registered. Mail in your Warranty Card immediately to register the Lynx-2.

Remember; when calling for technical support, you must provide the software version and Lynx-2 serial number. This will enable us to give you accurate and prompt assistance.

Copyright and Printing History

Each revision will cause the letter to the right of the manual part number to change. The purpose for each revision will be listed below. Events such as the addition of a feature or functional test will cause the revision number to change.

Internal Document Number: 73K023 Revision H

Revision Number	Approval Date	Serial No. Affected	Changes Made
B	12/1/92	N/A	Table of Contents added and Miscellaneous editing changes.
C	12/8/92	N/A	Rack Mount Instruction Change and Miscellaneous editing changes.
D	12/18/92	N/A	KCU Modifications to Installation, Getting Started and Appendix.
E	1/18/93	N/A	Single Rack Mount Instructions, Bulkhead Information and Miscellaneous additions and editing changes.
F	2/19/93	N/A	Revise Features and Controls section, add Film Module in Advanced Features section, and miscellaneous editing changes.
G	4/5/93	N/A	Add Circuit Board Interface to Appendix and miscellaneous additions and editing changes.
H	9/15/94		Complete rewrite with V700-10 software release

Limited Warranty

TimeLine Vista, Inc. (TimeLine), warrants this product against defects in material or workmanship as follows:

1. For a period of ninety (90) days from the date of purchase TimeLine will at its option, either perform necessary repairs at our expense or pay the labor charges of others it authorizes to repair the defective product. After the initial 90 day period labor charges are the responsibility of the purchaser.

2. In addition TimeLine will supply at no charge, new or rebuilt replacements for defective parts for a period of one (1) year from the date of purchase.

Labor and Parts

To obtain warranty service, the purchaser must notify TimeLine in writing during the initial ninety (90) day period. TimeLine will then authorize the purchaser to take or deliver, prepaid, the product to TimeLine or it's authorized Service Center.

Parts Only

During the remainder of the warranty period, any defective part will be replaced if the purchaser delivers/sends the product, prepaid to TimeLine. Labor incurred in the repair is at the purchaser's expense.

This Warranty does not cover any damage due to accident, misuse, abuse, or negligence.

We suggest that the purchaser retain the dated sales receipt as evidence of the original date of purchase.

This warranty is not transferable and applies only to the original, registered purchaser.

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Safety

To assist identification of potentially hazardous circumstances or procedures, warnings and cautions will be displayed with the appropriate text. Occasionally, information that provides an enhanced understanding of the text will be provided as a Note.

Note

A Note provides information about or an explanation of a topic related to the subject being discussed.

Warning

Warnings describe a procedure that if not followed as specified could potentially cause damage to the equipment, a loss of data, or create an error condition.

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

Manual Contents and Use

To those who have never owned a TimeLine Time Code Module: Every effort has been made to make this a concise and understandable reference. Sophisticated transport control is one of the more complicated technologies that audio/video engineers, technicians and operators have to deal with.

While maintaining power and flexibility, TimeLine has made the intricacies of the Lynx-2 module transparent to the user.

Lynx-2 will be of little value if you do not invest some time to familiarize yourself with the unit's interface and operational procedures. Do not hesitate to call us if you are confused about a particular feature, application or function. But first, **PLEASE READ THE MANUAL**!

Introduction — Provides a high level overview of the Lynx-2 system and a broad feature list.

Applications — Presents common applications and configurations for Lynx-2, audio, video and MIDI equipment.

Installation — Describes how to install and configure the Lynx-2 system for your specific application.

Getting Started — Presents initialization, start up procedures, and basic operating instructions.

Troubleshooting — Describes methods to verify that your system is correctly installed and troubleshooting procedures to isolate parts of the system which may be incorrectly configured or installed.

Features and Controls — Contains a description of the basic operational features of the Lynx-2. The descriptions are grouped by function.

Time Code Generator — Describes in detail how to set up and operate the SMPTE/EBU time code generator.

Time Code Reader — Provides detailed operating information for the SMPTE/EBU time code reader.

Sync & Resolver — Provides detailed operating information for the transport synchronizer or resolver.

Advanced Features — Provides detailed operating information for some advanced synchronization applications.

Appendix

Time Code Overview
A review of how and why the various SMPTE/EBU time code formats evolved, what they mean and how they impact the production process.

Quick Reference & Cable Reference Guide
Provides setup and cabling information to help configure and use the Lynx-2.

Keyboard Control Unit Modifications
Provides Service Bulletin (SB91-003) modification instructions for the KCU.

Glossary
An alphabetic list of common terms used throughout the manual and in the industry in general.

Technical Information
Provides various tables, schematics and other technical information that may be helpful.

Typography Conventions Used

This manual uses the following Typographical conventions.

Press Press a key, generally a movement key or function key such as [CLR].

Select Press or adjust the indicated key or knob to obtain a result or display

You see A key word, indicator, or number that you can see on the front or rear panel or display.

[CLR] This indicates a particular key on the front or back panel of the Lynx-2, such as the clear key in this example.

{BWL} This indicates a Lynx-2 front panel key shifted or menu function. For example, {BWL} is the [SHIFT] and [GEN REF] keys.

LED This is one of the lights on the front panel. LED means Light Emitting Diode.

Key Each of the buttons, switches or keys on the front panel that you press to cause something to happen.

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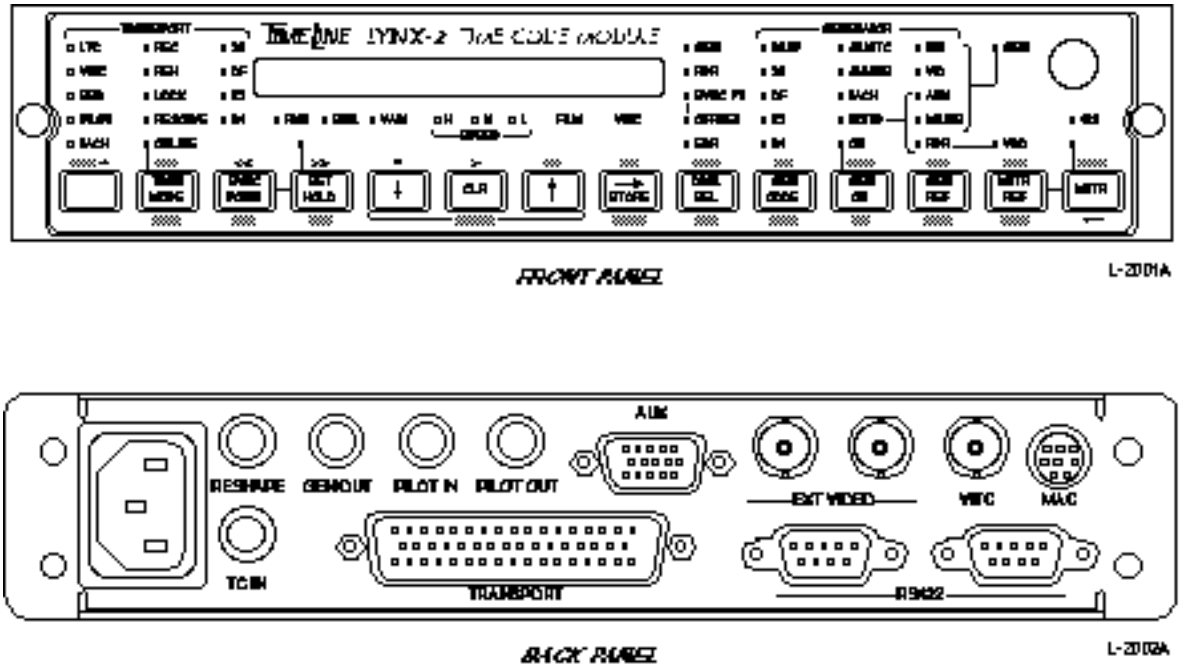


Figure Chapter 1 -1. Lynx-2 Front and Back Panels

What is the Lynx-2 Time Code Module?

The Lynx-2 Time Code Module is a high performance, time code synchronization interface for audio, video and film transports.

Representing the culmination of seven years of machine control experience, the Lynx-2 is specifically designed to handle the ever increasing machine control and synchronization applications required of professional production, post production and broadcast users.

Features

- A wideband, high speed, 1/10 to 60x play speed, bi-directional time code reader, and a multistandard time code generator. Each module can be designated as master or slave.
- Internal software parameter selections for over 125 different transport types, a Macintosh computer port, GPI and mute relays, and system status outputs.
- Setup menus provide convenient user access to configure the system for specific applications.
- One or more Lynx-2 modules can be used to form a system, and they can be used with or without an external controller.
- The front panel keys and indicators provide complete user access of all setup, functional and operational features.
- A multifeatured synchronization interface, providing control over a wide variety of audio and video machines.

Option Cards

An Optional Film card is available.

Each Lynx-2 Time Code Module contains four independent functional units.

- Time code generator
- Time code reader (wideband)
- Transport synchronizer/resolver
- Asynchronous Communications (RS422 serial port)

> Note
>
> Throughout this manual you'll find references to other sections, which will provide detailed information regarding a particular function, feature or application.

Time Code Generator

The time code generator provides convenient, local time code striping for each controlled transport. It can generate all world-wide standard time code types. Pilot rates (60, 59.94, 50, 48 Hz) are generated. Jam sync, Jam tach and Jam user-bit modes are also provided.

The time code generator can reference two standard, and three non-standard timing reference sources. The standard references are the module's internal crystal, and an external video sync input. The external sync input accepts black burst, color bars or composite video sync references. Time code generator details are covered in the Getting Started chapter.

MIDI Time Code

Lynx-2 will generate MIDI Time Code (MTC) on the Macintosh computer interface, allowing synchronization of MIDI systems to audio/video transports, external controllers and DAWs.

In addition, Lynx-2 can convert all worldwide time code standards to MTC. The MTC output is provided through the Macintosh, DIN-8 connector on the rear panel. More MIDI information is provided in the Applications and Advanced Features chapters.

Time Code Reader (Wideband)

The time code reader reads all SMPTE and EBU time code formats as well as 24-frame “film” code. The bi-directional, wideband reader automatically detects the time code type and displays the code-type on the front panel.

The time code reader accepts input levels from -15 dBm to +4 dBm. Play speeds from 1/10 to greater than 60x are supported. Reshaped time code output can also be derived from the reader. Time code reader details are covered in the Getting Started chapter.

Time Code Reader (Serial)

Serial Time Code can be read and used for synchronization. Serial time code is detected through the serial communication lines in the 50-pin transport connector, on the rear of the Lynx-2 Module when a serial video transport is connected. Serial time code reader details are covered in the Getting Started chapter.

Transport Synchronizer/Resolver

The internal software supports over 125 user-selected audio/video transports. A complete list is located in the Appendix.

The synchronizer provides rapid locate and sync-lock time, and supports parallel, serial and combined machine interfaces. “Code only master,” as a master reference source, is also supported.

The Lynx-2 is fitted with a gearbox processor. The gearbox processor permits the synchronizer to lock machines with dissimilar time codes. The gearbox also allows variable speed synchronization when used with a TimeLine Keyboard Control Unit (KCU).

An optional, plug-in FILM board permits the Lynx-2 synchronizer to control and lock biphase-driven devices such as film transports.

In a Lynx-2 system, each transport is controlled and locked to a system reference. This means that any module can be designated as master or slave, independent of machine cabling. This allows you to freely choose which transport is master and which are slaves. No internal adjustments are required.

If time code drops out or is lost, the synchronizer will automatically switch to Pilot Tone input (if available), for continued synchronization.

The Lynx-2 module can also be used as a speed only resolver. The speed of any tape with prerecorded pilot tone or time code can be resolved to the system master reference. Details are covered in the Sync & Resolver chapter.

Asynchronous Communications

The Lynx-2 module has an asynchronous communications port for connecting to other Lynx-2 modules or a controller, such as the TimeLine KCU. The communications port is RS422 running at 38.4 Kbaud, which permits modules to be located up to 1000 ft. away. The Lynx-2 module has two 9-pin "D", subminiature connectors to permit daisy chaining between controller and Lynx-2 modules.

Bulkhead Features

The removable Lynx-2 front panel provides access to a number of Lynx-2 features.

- Module software prom
- Module serial number
- Generator code output level adjustment
- Reader reshaped time code output adjustment
- Pilot output level adjustment
- Chassis ground isolate jumper
- System test points
- System operation confidence LEDs

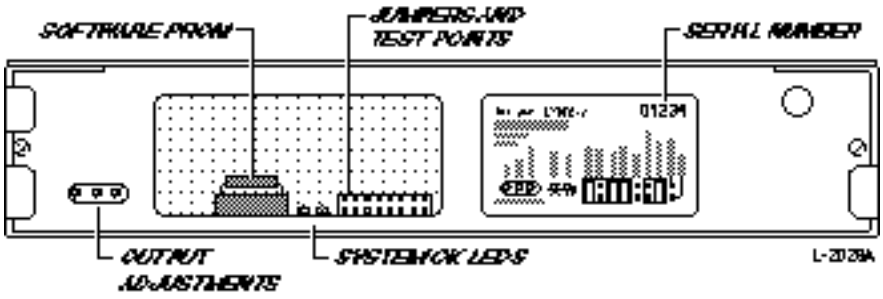


Figure Chapter 1 -2. Bulkhead Features

System Overview

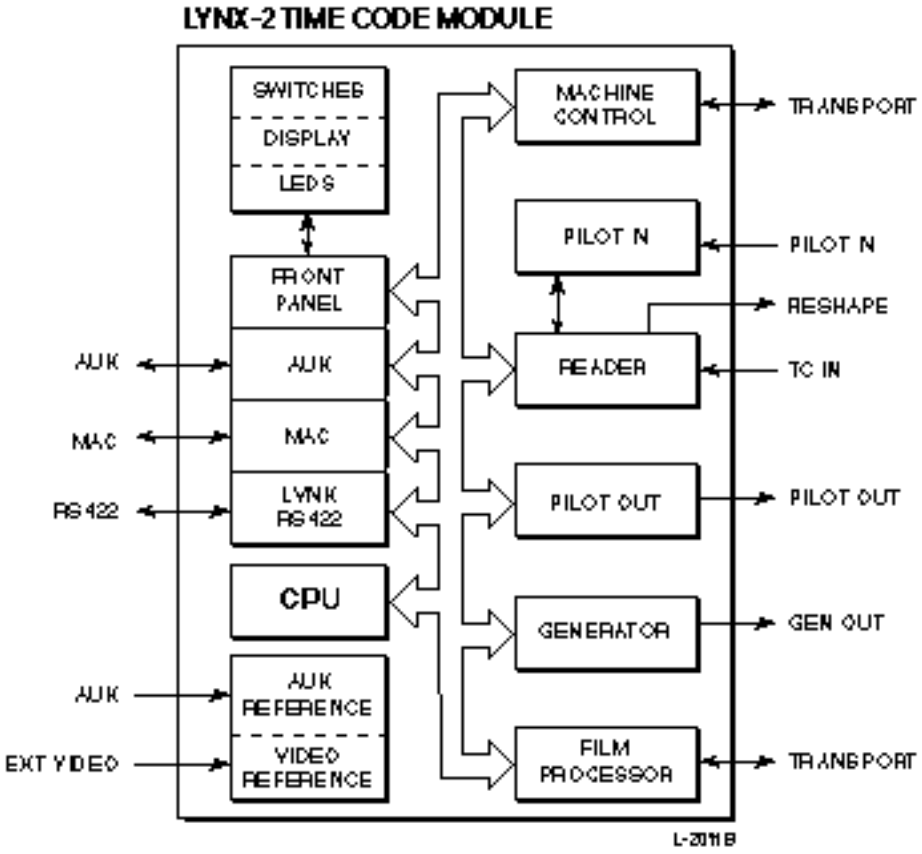


Figure Chapter 1 -3. System Overview

Each transport is assigned a Lynx-2 Time Code Module. They are generally daisy chained together through a standard, 9-pin RS422 cable, to form a system. The number of modules that may be connected is practically unlimited. Lynx and Lynx-2 modules can be mixed to form a system.

Lynx-2 modules may operate in one of two modes: as stand-alone units in a system, or as slaves in an externally controlled system.

A stand-alone system is typically defined as a group of two or more transports, each having their own designated Lynx-2 module. (A single time code module/transport package may also be considered as a stand-alone system.) Any one of these transports can be designated as master, all others become slaves in the system. Master status can be assigned to any module, at any time.

An externally controlled system has one or more transport(s), each with their own time code module, and an external

editor/controller. In an externally controlled system, the controller is used to designate the master and slave transports.

The master Lynx-2, resolves to the selected timing reference source. Slaves lock their *position* to the master, and their *speed*, to the reference source.

> Note
>
> Throughout the text of this manual we will often refer generically to the word transport(s). Unless otherwise specified, we are referring to all audio, video, DAT, DAW, MIDI and/or other virtual machine like devices.

System Configuration

Machine types and related operating parameters are stored in a lookup table in the Lynx-2. Simply select a transport by name from the list of over 125 transports, in the MENU software. The software allows Lynx-2 to be easily reconfigured at any time, to accommodate different transports.

Currently, Lynx-2 supports transports manufactured by: AEG, Akai, Alesis, Ampex, Denon, Fostex, JVC, 3M, Mitsubishi, Otari, Panasonic, Saturn, Sony, Stellavox, Studer, and Tascam.

When a transport type is selected from the menu, Lynx-2 automatically configures the correct:

- Logic input levels
- Logic input polarities
- Tach rates
- Analog outputs
- Frequency outputs
- Location toggle rates
- Ballistics information
- Record command timing
- Track selection logic
- Serial control protocol.

The first time a Lynx-2 module is powered up, an initialization procedure must be completed. Once initialized, the module defaults to the transport selection menu, ready for you to scroll through and select the manufacturer and model of machine you will be using.

Once the initialization process is complete, all necessary machine control parameters are automatically stored into non-volatile RAM. Subsequently, unless intentionally modified, the Lynx-2 will always recall this preset information upon power-up.

Once set, the module displays the following information on power-up:

- Software version number
- Machine type selected
- Editor or controller type
- Module address
- Video standard (if present)

No other set-up operations are necessary. Getting Started, covers all initialization instructions.

If you are experienced in using time code machine-control products, you may find the Features & Controls section helpful in giving you a summary of the Lynx-2.

If time code machine control is new to you, you may want to read the Appendix, before continuing.

Specifications

Time Code Generator

Operating Code	SMPTE (30 FPS NDF) SMPTE Drop Frame (30 FPS DF) EBU (25 FPS) Film Code (24 FPS)
Output	Electronically balanced
Signal Output Level	0-5 Vpp adjustable
Output Impedance	560 ohms
Signal Rise Time	4 microseconds
Time Code Stability	±2 microseconds max.
Reference Sources	
Internal Crystal	30, 29.97, 25, 24 Hz
Internal Timing	Crystal (±50 ppm)
External Video	30, 29.97 (NTSC Sync), 25 (PAL Sync)
Sources	Color bars, Black burst or Composite sync
Input Level	0.5-8 Vpp
Input Impedance	2 Kohms
Modes	Normal, Momentary JAM, Continuous JAM, Tach-to-time code, JAM User Bits

Pilot Output

Output	Electronically balanced
Pilot Rate	48-60 Hz Sinusoidal signal
Signal Output	0-2 Vpp adjustable
Output Impedance	560 Ohms
Reference	Selectable, generator or reader

Time Code Reader

Input	Differential Input
Input Sensitivity	-20 to +10 dBm
Input Impedance	>10 Kohms
Speed Range	1/20-80 x play speed

Reshape Output

Output	Electronically balanced
Signal Output	0-5 Vpp adjustable
Output Impedance	560 Ohms

Pilot Input

Input	Differential Input
Input Sensitivity	200 mV to 5 Vpp
Input Impedance	>10 KHz
Frequency Range	48-60 Hz ±15%

AUX Reference Input

Input	TTL
Input Impedance	100 K
Frequency Range	48-60 Hz ±15%

Synchronizer

Lock Stability	±50 microseconds, typical
Lock Time	2 to 3 seconds, nominal
Tach Frequency Range	1-10 KHz nominal play speed
User adjustment required	None
Parallel Interfaces	Use TimeLine parallel cables (listed in the Appendix) Auto-configures from transport menu.
Serial Interfaces	RS422: 38.4 Kbaud and RS232: 9600 baud. Auto configures from transport menu.

Front Panel

The removable front panel has the following characteristics:

Display	Alpha Numeric 16-character Dot Matrix
Selection keys	14 switches
LED status indicators	46 LEDs

Electrical

Mains Input	90-265 VAC at 50-60 Hz
Power Requirement	Approximately 10 W

Interconnections

The connectors mounted on the rear of the Lynx-2 are specified as follows:

EXT VID	BNC Female Connector (2) (internally looped to each other)
TC IN	1/4" Female stereo jack
RESHAPE	1/4" Female stereo jack
GEN OUT	1/4" Female stereo jack
PILOT IN	1/4" Female stereo jack
PILOT OUT	1/4" Female stereo jack
TRANSPORT	50-pin Female 'D' Connector
RS422	9-pin Female 'D' Connector (2) (internally looped to each other)
AUX	15-pin Female 'D' Connector
MAC	8-pin Mini Circular

Transports

Supports transports manufactured by:
AEG, Akai, Alesis, Ampex, Denon, Fostex, JVC, 3M, Mitsubishi, Otari, Panasonic, Saturn, Sony, Stellavox, Studer and Tascam.

Option Cards

Film Biphase reader/generator

Mechanical

Dimensions	8.5"W x 1.75"H x 12"D
Weight	4 lbs, 0 oz
Shipping Dimensions	14"W x 4"H x 16"D
Shipping Weight	11 lbs, 0 oz

TimeLine Vista, Inc. reserves the right to change the design and specification of equipment without notice.

Chapter 2 Applications

Introduction

Many different types of audio and video equipment are available. Before installing your Lynx-2, think about how your system will be set up and what functions you require. A helpful exercise is to sketch out your proposed system, on paper, including all audio and data cabling, so that you can develop a more defined plan of the hardware and interface materials you'll need to augment your existing system.

An efficient, high-performance system depends upon the quality and compatibility of the equipment being used. We have selected some of the more common configurations, used in the industry, to help you visualize how some systems can be configured. Please use Figures 2-3 through 2-6 as a guide for your specific application.

Any given Lynx-2 may be designated as Master, but even if it is the master time code module, it still has to have a speed reference. The Lynx-2 can reference itself, using its internal crystal, or it can be connected to some other external reference source, such as "house" sync.

The Lynx-2 Time Code Module incorporates all of the processing power and functions found in the previous Lynx and Lynx Film modules. In addition to supporting all worldwide SMPTE/EBU time code standards, the Lynx-2 has, fit as standard, a gearbox processor and an industry standard, serial machine control port. A plug-in option card, the Film Processor is available for the Lynx-2 module.

Film Processor

The Lynx-2 is ready for the film processor option card. Configuring a Lynx-2 to be a Biphase Slave, under external control, is frequently used when adding tape machines to a film chain. The Lynx-2 module is fed from the biphase source.

This method of synchronization is more effective than putting a time code-only reel of film on a film transport and feeding the time code to a Lynx system in a "Code-only Master" mode.

The Lynx-2 can also be used as the Biphase Master. In this mode, the Lynx-2 generates the biphase signal instead of slaving to it. The advantage of this setup is that in "play" it will properly resolve the film speed and position, relative to a video reference.

Resolving a Single Machine

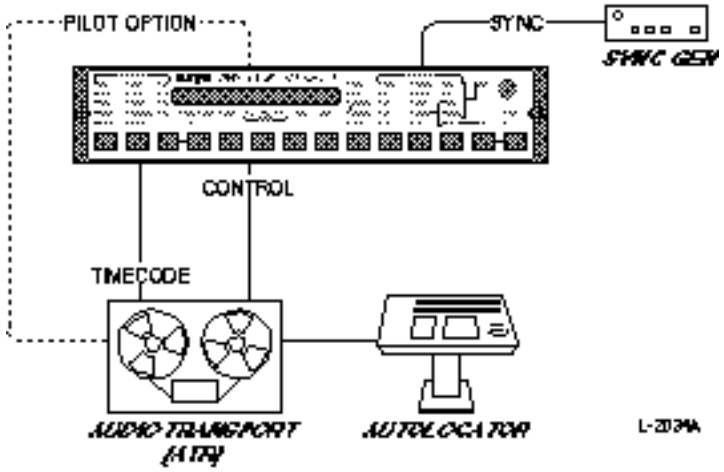


Figure Chapter 2 -1. Resolving a Single Machine

Typical Uses

This application is for systems that require a transport to be resolved to any speed reference other than its own internal speed reference. Example: Resolved analog audio transports would not use internally set capstan speeds such as 15/30 ips. Instead, the transport would run at the reference source selected on the Lynx-2 module.

Analog tape transports derive their capstan speed reference from a stable, internal frequency source. Since all machines have slightly different internal frequencies, they will play at fractionally different speeds. By resolving a machine, an exact capstan/tape speed can be established.

The Lynx-2 module will resolve the speed of a machine to either external video, mains or pilot tone. When Lynx-2 resolves the playback speed of an analog tape transport, it ignores the *position* or *address* of the time code. Instead, it locks the machine to the selected reference source by reading the time code on pilot tone or tape, and controlling the speed of the tape so that the "code" speed

from the tape matches the reference speed. (Resolver details are covered in the Sync & Resolver Section.)

Resolve and Lock

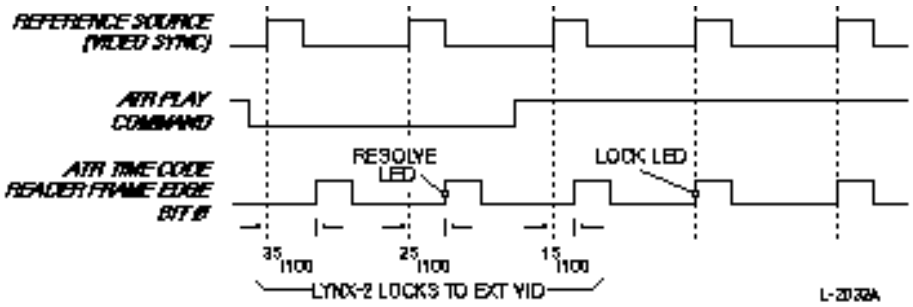


Figure Chapter 2 -2. Resolve and Lock

Typical Uses

The Resolve and Lock application is frequently used with Pilot. Pilot, Pilot Tone or phase-locked synchronization (all synonymous), is one of the original methods used to facilitate synchronous operation. It uses a resolver to maintain a constant speed between two or more transports.

Pilot synchronization is most commonly used in film applications. Pilot is generated from, and referenced to, a stable sine wave such as the AC power line frequency, or better yet, a crystal locked Pilot Tone Generator. (Not all AC power lines operate at a solid line frequency.)

In this application, the Slave time code modules will reference to the Master transport's pilot frequency. For example, the master might be an original production master recorded in the field on a Nagra. The resolver's output controls the Slave transport's capstan speed by generating an error calculation and updating the correction signal, until the machines are running at the same speed.

Again, this is a *speed only* application. Location to an exact Hours:Minutes:Seconds:Frames (HH:MM:SS:FF) address is not possible. Because of the cyclic or repetitive nature of the sine wave used for the sync signal, it is impossible to define a single pulse in a stream of sine wave oscillations.

An exception to using the Lynx-2 in this application is when video or digital machines are used. Control of these machines is normally released by the Lynx-2 module and the configuration will not work. In these instances, the reference source must come from the digital or video transports that you are using. This is done by selecting the master reference (MAST REF) to VSO. (Resolver details are covered in the Sync & Resolver Section.)

Chase Synchronization - Audio as Master

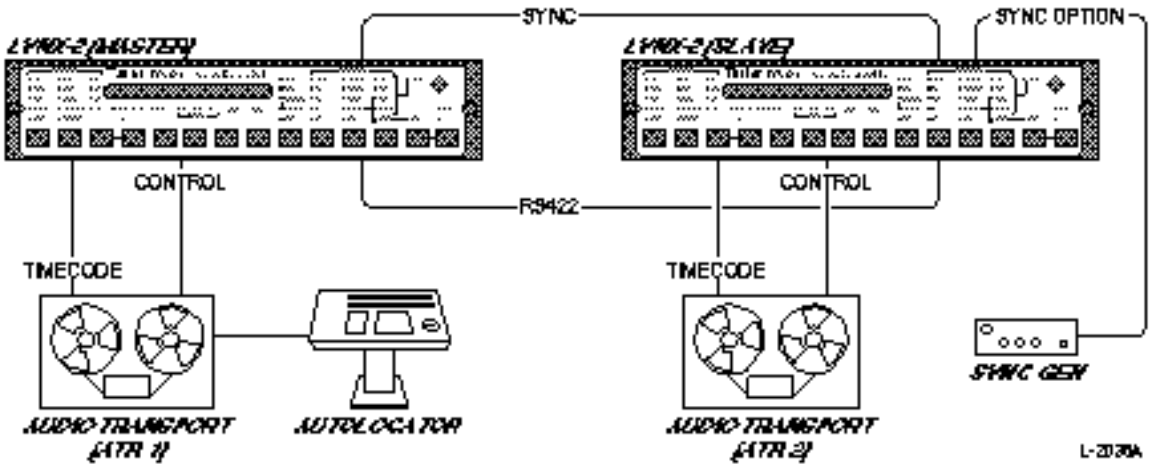


Figure Chapter 2 -3. Chase Synchronization - Audio as Master

Typical Uses

Use this setup when you are using an analog audio transport as Master and other analog audio machines as Slaves.

The transports may be locked to an internal or external reference, or run in VSO mode. In stand-alone (SAL) operation any number of Lynx-2s and transports can be online, simultaneously.

Remember, one time code module must be assigned to each transport. In this application, precise positional and speed synchronization is achieved for multiple machines. Example: Chase-locking together two or more multitrack machines for increased tracking capabilities.

As with resolving a single transport, multiple machines are resolved to the selected Lynx-2 reference source. Each machine, which can be either an internal or external source, then resolves independently to the reference. Any machine related disturbances that may have been recorded on the master tape are not passed on to the slave.

When necessary, the master reference can be set to VSO by using the machines internal Variable Speed Oscillator. This allows you to vary the speed of the Master transport being used as frequency reference. When the Lynx-2 is set to VSO, the system will follow the master time code rate and force the Slave(s) to operate at the same speed as the Master.

Chase Synchronization - Video

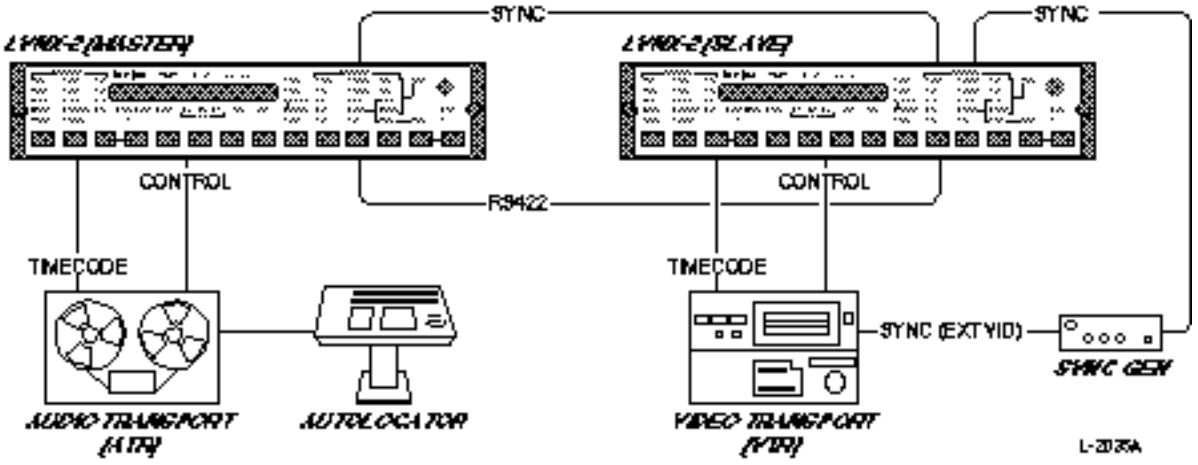


Figure Chapter 2 -4. Chase Synchronization - Video

Typical Uses

For chase sync applications, any audio or video transport may be designated as Master. The video transport may be the Slave as long as the Lynx-2 system reference source is set to external video and connected accordingly.

This setup will cause analog audio machines to run at the reference video speed. If an audio transport is Master, its Lynx-2 must be resolved or locked to the speed of the house sync reference.

If you do NOT have house sync and are using only one video machine, you can use the video machine as the Master reference by setting the reference source to VSO. The Slave(s) speed will then match the playback speed of the video tape transport.

The Lynx-2 can also be used in situations where the time code on a video tape is not referenced to its own picture (stranger things happen). If you run into this problem, please refer to the Advanced Features and Troubleshooting sections.

Post Production - Audio

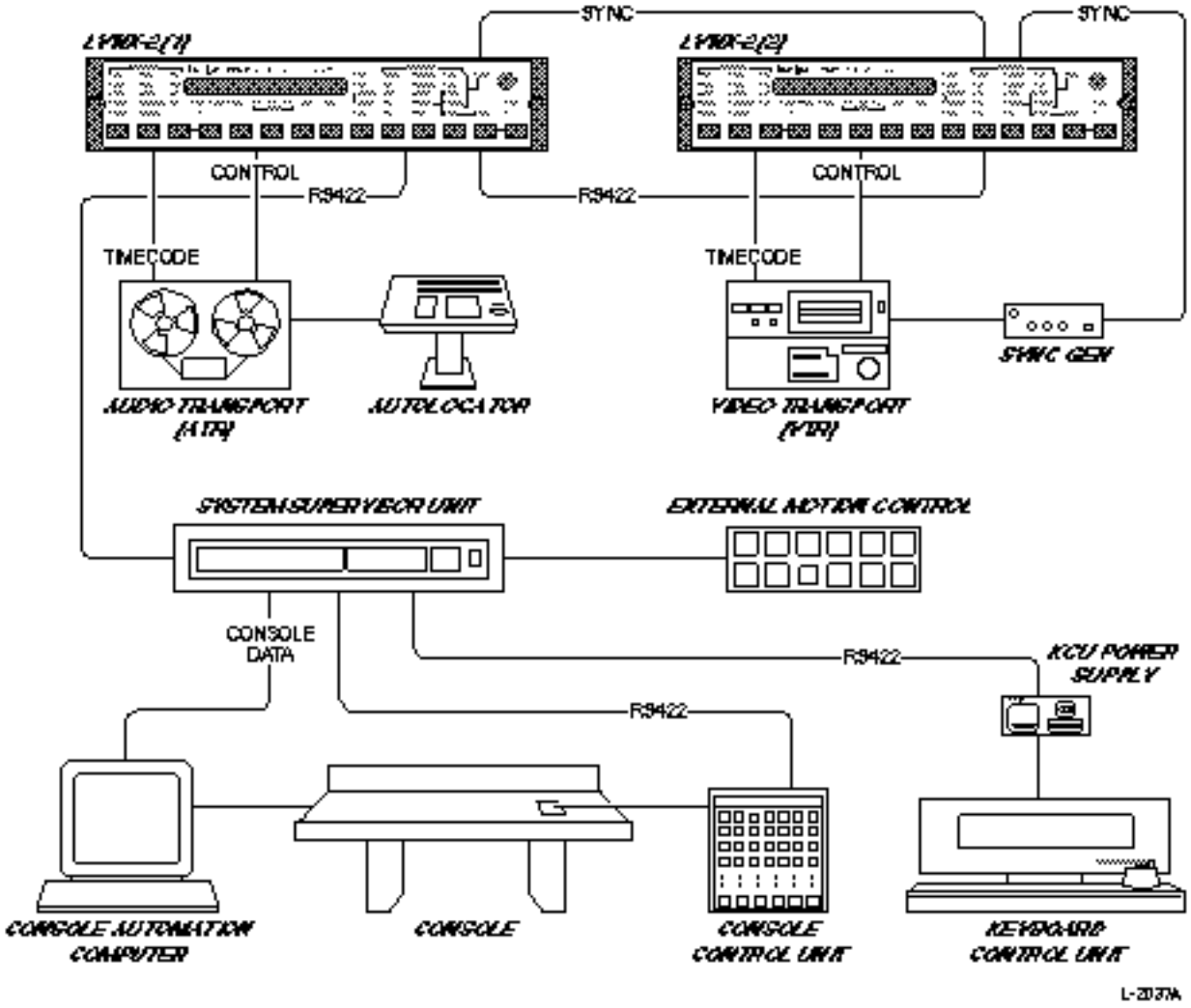


Figure Chapter 2 -5. Post Production - Audio

Typical Uses

Just like the raw video footage, all of the audio elements that go into a video production must be assembled. This procedure is generally known as audio post-production. There are several different branches of audio post, since there are many different types of sound sources that go into a typical production.

These include production audio such as: dialog and live production sound effects. Often, incidental noises on the film/video set and other uncontrollable aspects of the shoot, such as false starts, flubbed lines, makes the production audio unusable. This brings us to the four main areas of audio post.

ADR Automated Dialog Replacement (ADR) is a process whereby actors re-record production dialog in a sound studio. This replacement dialog is recorded onto audio tape that has been striped with time code and is locked to a video work print. The actors carefully watch the work print as they re-read their lines.

Foley Foley is the process whereby common "real life" sounds such as footsteps, door closures, dish noises, and telephone rings, are recorded by specialists called Foley walkers. They too make their recordings while watching a work print that's synced to an audio tape machine that records the sounds they make.

SFX Sound effects (also referred to as SFX), are the spectacular sounds such as explosions, crashes, gunshots, alien environments. Today, most SFX work, as well as some Foley, is created using CD's, digital audio samplers or DAWs (Digital Audio Workstations). Samplers and DAWs are devices that can be synchronized, using time code or MIDI Time Code (MTC).

Music Music is generally supplied by an arranger/composer who works with rough cuts (preliminary edits) of the finished show, and ultimately the finished film/video master. The composer may record real instruments onto audio tape, which is locked to picture using time code and Lynx-2 modules, or work with virtual MIDI tracks synced to the picture via MTC.

Often, there are many different audio tape sub-masters, each with their associated transports and time codes. The post-production audio may all reside on audio tape, or some or all of it may be transferred to film dubber transports.

Ultimately, the multiple audio sources are blended together in the final mixdown, resulting in a finished audio master. Because this can be quite an elaborate process, many modern post-production facilities use automated mixing consoles.

All video, audio and film transports and the console automation can be controlled by TimeLine modules and interfaces. As you can see, this process is only possible if accurate use of SMPTE/EBU time code and synchronization methods are employed.

Adding an ATR to a Video Editor

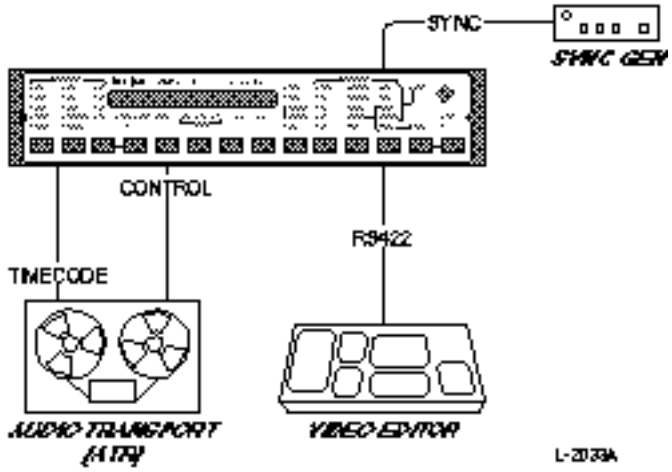


Figure Chapter 2 -6. Adding an ATR to a Video Editor

Typical Uses

The Lynx-2 can be used with video and audio editing control systems that have Ampex VPR-3 communications capability. This allows audio, video and film transports requiring parallel or biphase control, to be added to a video editor.

Applications include: Sound effects (prelay), complex audio operations to picture, simple video editing, audio transfer and auto conforming.

To use a Lynx-2 in this setup, the module must be correctly configured for your editor or controller. Many editors are supported by the Lynx-2 module.

Please note that there are some specific limitations associated with using an external controller or editor. They are:

1. The Lynx-2 and the editor must be compatible;
2. Pin #5 of the video editor cable must NOT be connected or grounded;
3. Jog wheel performance is limited by the type of ATR. An ATR with voltage controlled search will jog more smoothly than those without;
4. Seamless insert editing capability is specific to each audio tape machine;
5. The minimum edit length is governed by the ATR (typically five frames);
6. If you wish to use an editor that is not supported, do not assume that it will work, even if it is VPR-3 compatible.

Lynx System Supervisor

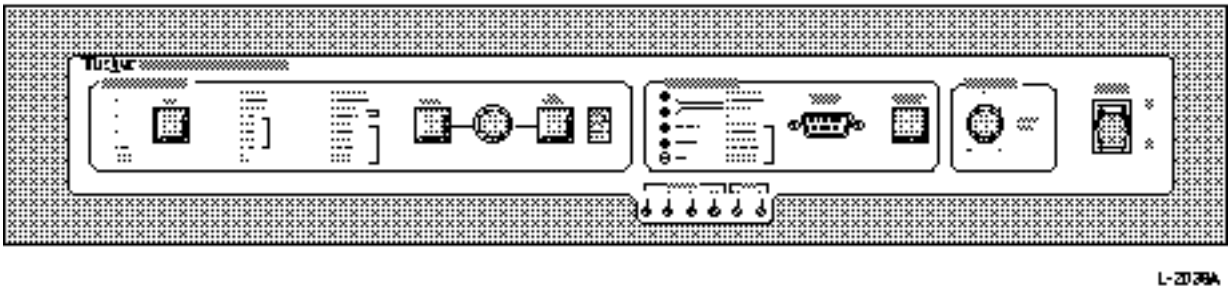


Figure Chapter 2 -7. Lynx System Supervisor

Typical Uses

When used with Lynx-2 Time Code Modules, the Lynx System Supervisor Unit (SSU) provides console automation and audio post-production, system integration. The SSU helps bring an integrated system online, with limited amount of time and expense. All high-speed data communications for the entire systems are handled with ease.

Lynx-2 is compatible with numerous transports and console automation systems, providing accurate synchronization of transports and mixing operations, from a single position within the studio.

The Lynx SSU allows connection of multiple TimeLine control units, as well as giving a direct software interface to many popular studio computer systems.

Keyboard Control Unit

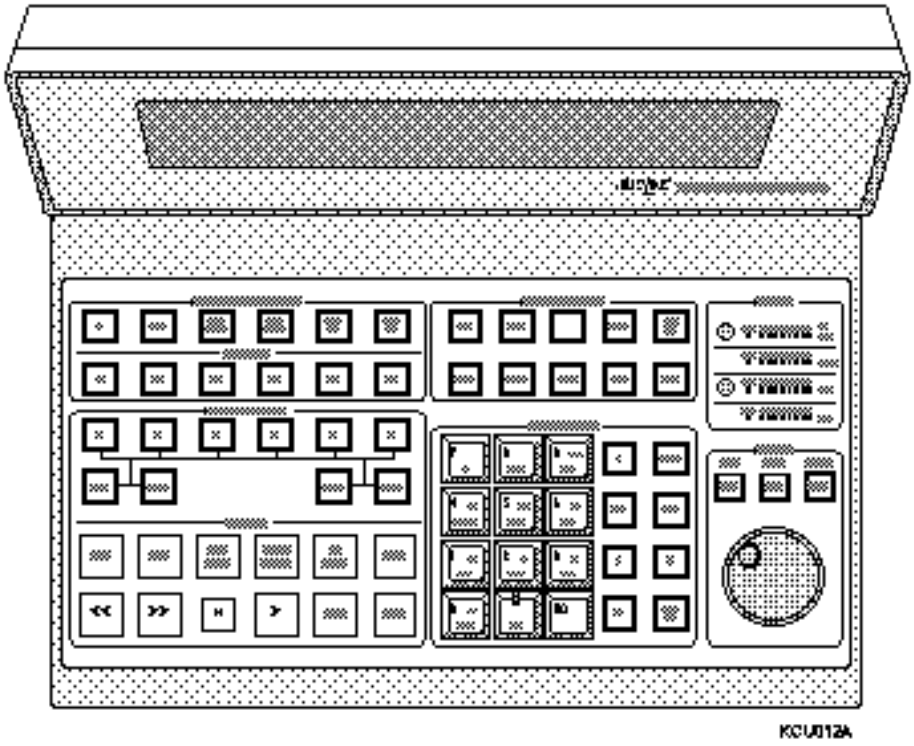


Figure Chapter 2 -8. Lynx Keyboard Control Unit

Typical Uses

The Lynx Keyboard Control Unit (KCU), is a powerful machine controller/editor. It can be used for a wide range of multiple machine synchronization and audio editing applications.

As a stand-alone time code module, the Lynx-2 is unsurpassed in its range of functions and applications. But, accessing these units is a little like operating a multitrack tape deck, without a remote control unit.

The TimeLine KCU provides a convenient, fast way to access Lynx-2 functions.

Frequently performed operations and activities are placed at your fingertips. Entering offsets, setting sync points and time code numbers, setting record in/out points, selecting Master machine and reference source, readying record tracks, and quickly establishing and moving to new tape positions are all time consuming activities, and a necessary part of production, post-production and editing sessions.

Without a KCU, the Lynx-2 modules and the master transport remote can perform most of these activities. However, many more keystrokes and some setup changes may be required. Complex, multimachine systems can be complicated to operate. Generally, anything that can streamline the process is welcome.

With the KCU, you can control up to six tape or film transports, and two programmable GPI relay closures. Each transport may be operated individually, or any combination of selected machines may be placed into a synchronized group; with any of the machines in that group designated as the Master.

Console Control Unit

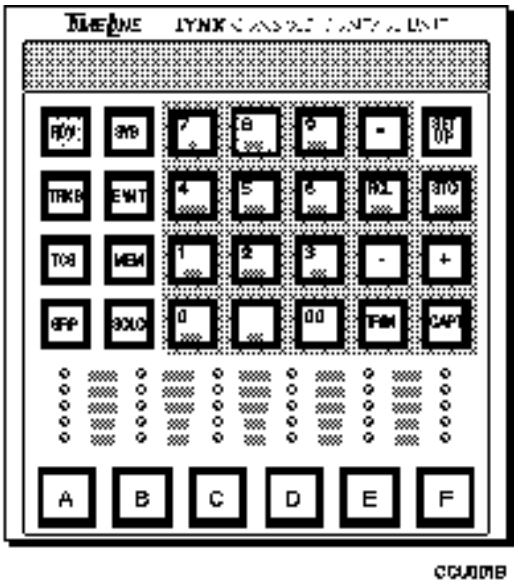


Figure Chapter 2 -9. Lynx Console Control Unit

Typical Uses

The Lynx Console Control Unit (CCU), is a compact, console-mounted machine control panel, capable of executing a wide range of multimachine synchronization and audio editing tasks. The CCU is designed to provide the maximum amount of control status, in a minimum amount of console top panel space. The CCU is an accessory to the SSU, and is ideal for the less intensive studio application.

The CCU provides a convenient, fast way to access Lynx-2 functions. Frequent operations and activities are placed at your fingertips. With the CCU, up to six tape or film transports and eight programmable GPI relay closures are under your control.

Each transport may be individually accessed from the CCU, or a selection of available machines may be operated as a synchronized group; with any transport designated as the Master.

Entering offsets, setting record in/out and sync points, selecting slew positions, selecting Master machines and reference source, readying record tracks, and quickly establishing and moving to new tape positions are all possible from the CCU.

Two CCUs or KCUs may be used simultaneously, in addition to the automatic control system and standard parallel transport control, in the more complex studio environment. A CCU and KCU may also be used simultaneously.

Remote Motion Controller

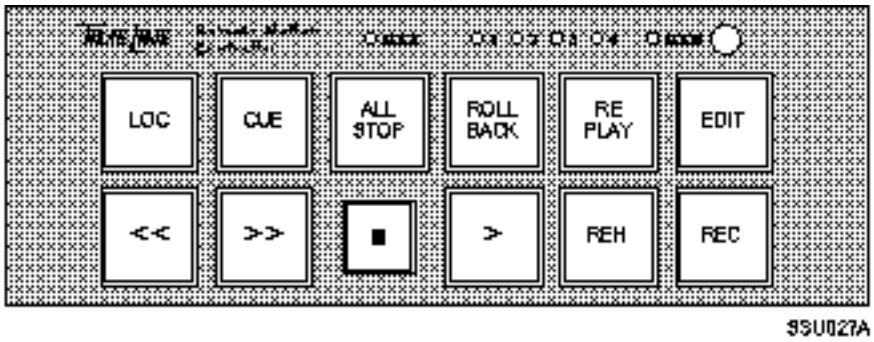


Figure Chapter 2 -10. Remote Motion Controller

The Remote Motion Controller (RMC) provides the same motion control switches as the KCU. The RMC may be added to the System Supervisor to provide an additional remote transport controller, or to provide machine control and editing features for a CCU/ SSU installation. When directly connected to the SSU, the RMC provides LED indications for ADR beep countdown and group lock. The RMC is available as a kit for mounting into a console or other remote location.

Jog/Shuttle Wheel

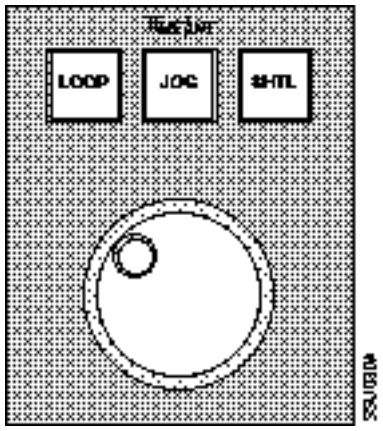


Figure Chapter 2 -11. Jog/Shuttle Wheel

A Jog/Shuttle Wheel assembly kit is available for customer installation into several System Supervisor applications. The jog/shuttle kit is designed to connect directly to the CCU or the SSU, SSL data interface option. The Jog/Shuttle Wheel assembly provides console top mounting, for CCU applications, and allows expansion of the Remote Motion Controller.

Chapter 3 Installation

Introduction

This chapter describes installation and interface procedures for the Lynx-2 Time Code Module. It also includes a quick software check, to verify that the Lynx-2 is operational.

Part I of this chapter describes the different hardware and logistical elements that must be considered when installing a Lynx-2 Time Code Module. Part II provides interface illustrations for a variety of applications. Part III is the module's Quick-Check software test procedure.

The procedures in Part I assume that you know the optimum system configuration for your facility, or that you have studied the Applications chapter of the manual. The interface diagrams in Part II of this chapter will also help you determine the appropriate configuration.

> Note
>
> Please save the original factory packaging. It is specially designed to protect your Lynx-2 module, should it require reshipment.

System Setup Planning

Before you install and configure your equipment, there are several fundamental issues to consider.

AC Power

At least one AC outlet is required for each Lynx-2 module. If there is more than one piece of equipment in the rack, use a surge-protected power distribution strip, fitted with an adequate extension cable.

Each Lynx-2 comes with a 3-wire, IEC power cable. The Lynx-2 is fitted with an internally fused switching power supply, which operates with out adjustment over a wide range of conditions: 90-265 VAC, 50-60 Hz.

Power On Initialization

Before installing the Lynx-2 module, we recommend that the unit is prepared for operation. The module is supplied from the factory, ready for initialization.

When first powered up, the display flashes indicating that there is no user setup, and the module is ready to store new parameters.

On power-up, the module initializes to the transport select menu. Scroll through to select the manufacturer and model of the machine you will be using. Step through the list of machine manufacturers using the keys marked {LAST} and {NEXT}. Once you've found the correct manufacturer, press the [↑] or [↓] keys to select the specific model.

When you find the correct machine, press the [STORE] key so that the operational parameters of the transport are saved in the module's battery-backed RAM.

There are other parameters to set up and store in the unit's RAM. However, they are not critical to the module's basic operation. For the moment, press the [STORE] key as each setup selection option is displayed, until the module switches out of the setup mode. Chapter 4, Getting Started, covers other setup options in detail.

The Lynx-2 module only has to be initialized the first time power is applied. All transport information is restored from RAM on subsequent power-up.

Part I - Installation

The Lynx-2 Time Code Module may be mounted in an equipment rack or used as a free-standing unit. The module is supplied with the necessary hardware for rack mounting.

Free-standing

Sometimes the best location for the Lynx-2 module(s) is free-standing, rather than in a rack. If this is the case, you will not need the rack ears, screws and nuts that come with each unit. You may want to save them for future rack mount installation.

Rack Mount Installation

Lynx-2 modules conform with industry standard dimensions, for 1/2-rack installation. Two modules are designed to fit side-by-side in a standard 1U, 19" rack space.

Each module is supplied with a single rack mount "ear". To install the rack mount "ears" to the Lynx-2 module, you will need a Phillips screwdriver.

Warning

The components inside the Lynx-2 chassis are static-sensitive. BEFORE attaching the rack mount hardware, be sure you and the Lynx-2 are properly grounded. This will eliminate potential damage to the equipment. Place the unit on an anti-static work area to ensure a trouble free installation.

Rack Mounting Two Side-by-Side Units

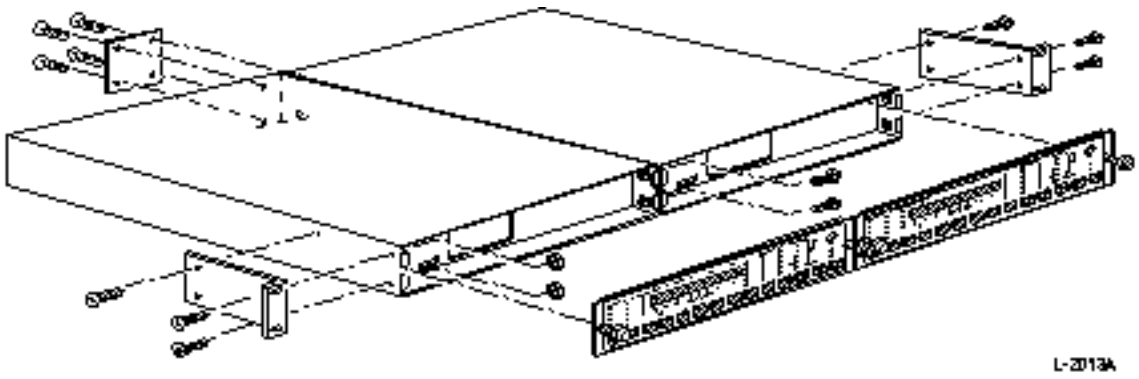


Figure Chapter 3 -1. Rack Mounting Two Side-by-Side Units

In the following instructions, when referring to the left and right side of a module, the reference perspective is the front of the unit.

The most common installation configuration incorporates two modules, mounted side-by-side. The following instructions are for a two-module installation.

1. Place the two modules side-by-side on an antistatic work area.
2. There are three threaded nuts on the right side of the right module. Use these nuts and three bolts to secure a rack ear to the module.
3. Line up the three holes in the side leg of the rack extension, with the three nuts on the right side of the chassis.
4. Put the bolts through the holes so that they thread into the nuts and tighten.

5. Check that all bolts are secure.
6. Next look at the right side of the left module. There are two threaded nuts near the front of the module. These two nuts line up with two holes on the left side of the right module.
7. Remove the two thumb screws securing the right front panel, and slide the panel out.
8. Slide the modules together so that the holes in the right module align with the nut positions in the left module.
9. Use two bolts to join the front of the two modules. Put the bolts through the holes so that they thread into the nuts and tighten.
10. Check that both bolts are secure.
11. Reinstall the front panel and tighten the thumb screws.
12. Next, locate and install the back-joining plate. This small plate has four holes. These holes line up with the four bolts that secure the rear panels to the chassis. The plate bridges the space between the two units.
13. Remove the center four bolts holding the two back panels in place.
14. Place the joining plate between the modules and reinstall the four bolts.
15. Check that the bolts are all secure.
16. On the left side of the left module, there are two holes and a threaded nut. Use these holes and the nuts and bolts supplied, to attach the left-side rack ear.
17. Line up the three holes in the left-side rack ear with the holes in the left side of the chassis. Put one screw through the rear mounting hole to secure the ear in place.
18. Remove the two thumb screws securing the left front panel and slide the panel out. Place the remaining two screws through the front rack ear holes and secure using the supplied nuts, and tighten.
19. Check that all bolts are secure.
20. Reinstall the front panel and tighten the thumb screws.

The two Lynx-2 modules are now ready to install in your equipment rack.

1. Slide the modules into position in the equipment rack.
2. Secure by inserting two, #8-32 rack screws through each ear and into the threaded rack rail, then tightening.
3. Attach a power cable to each Lynx-2.

Rack Mounting a Single Unit

When installing only one Lynx-2 module, it must be mounted on the left side of the equipment rack. An optional single unit rack mount kit is required to install a single module.

When referring to the left and right sides of a module, the reference perspective is the front of the unit.

1. There are two holes and a threaded nut on the left side of the module. Use these holes and the supplied nuts and bolts to attach the standard rack mount ear.
2. Line up the three holes in the left-side rack ear with the holes in the left side of the chassis. Put one screw through the rear mounting hole to secure the ear in place.
3. Remove the two thumb screws securing the front panel and slide the panel out. Place the remaining two screws through the front rack ear holes and secure using the supplied nuts. Tighten firmly
4. Reinstall the front panel and tighten the thumb screws.

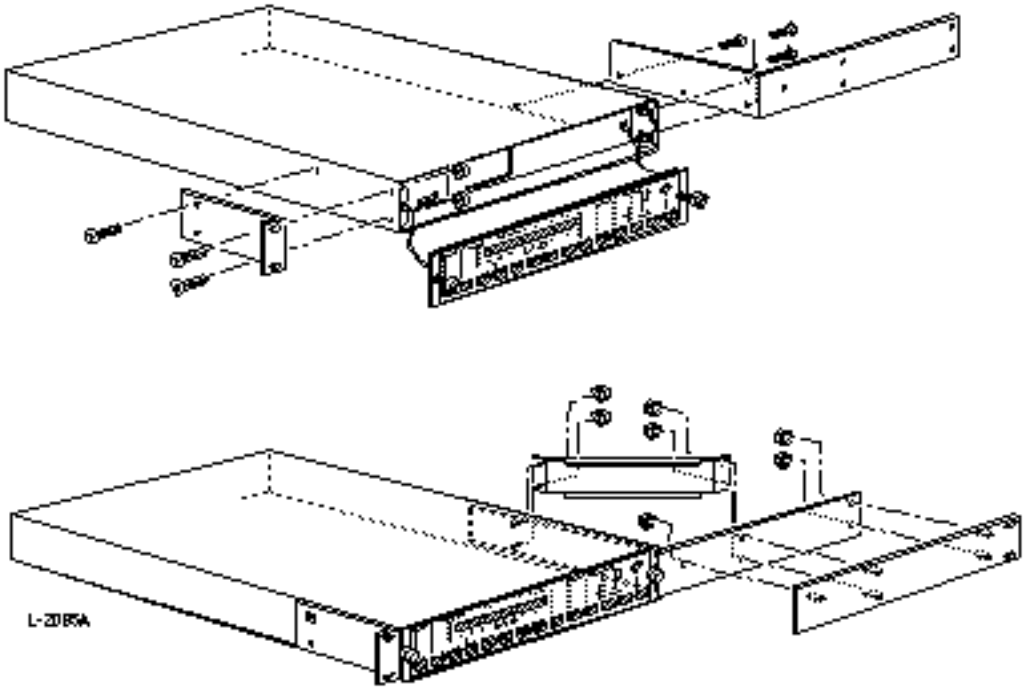


Figure Chapter 3 -2. Rack Mounting A Single Lynx-2

When a single module is rack mounted, the right-side rack ear is a half-rack blank panel.

1. There are three threaded nuts on the right side of the module. Use these nuts and three bolts to secure the rack extension kit to the module.

2. Line up the three holes in the side leg of the rack extension with the three nuts on the right side of the chassis.
3. Put the bolts through the holes so that they thread into the nuts. Tighten firmly.
4. Place the gusset on the studs, on the rack bracket, and loosely secure the gusset using two of the nuts supplies.
5. Place the blank front plate on the extension bracket with the center studs through the gusset. Secure the plate in place using the nuts supplied. Tighten firmly.
6. Tighten the nuts holding the gusset to the rack bracket firmly.

The single Lynx-2 module is now ready to install in your equipment rack.

1. Slide the Lynx-2 into position in the equipment rack.
2. Secure by inserting 2 - #8-32 rack screws through each ear and into the threaded rack rail, then tighten.

Cabling

Lynx-2 requires both machine specific and generic cabling.

Transport Cables

- Use a custom transport cable to connect each Lynx-2 to its local transport. Specific cables for all supported transports are available from an authorized TimeLine dealer. (See the Appendix, for a detailed list of transport cables.)
- The 15-pin "D", sub-connector is an auxiliary serial option port, which also provides mute relay and lock status outputs. The cable is application dependent, and must be custom made.

Generic Cables

- Use SMPTE standard, 9-pin RS422 cables (supplied with the module) to connect all Lynx-2 modules, forming the system BUS.
- Use 2-conductor shielded audio cable, with 1/4" TRS connectors for TC IN, Reshape, GEN out, and Pilot in/out jack connections. The inputs are all differential. The outputs are all balanced.

  Termination of the opposite end of each cable will be determined by the connector, on the associated machine.
- Use standard BNC cables to connect the Lynx-2 to external video and VITC sources. The EXT VID BNC jacks are wired in parallel and can be used to loop from one module to the next.
- Use a standard 8-pin DIN, Macintosh computer cable for access to the MAC interface port.
- Lynx-2 uses a standard, 3-wire IEC power cord.

Bulkhead Features

The removable Lynx-2 front panel provides access to a number of Lynx-2 features.

- Module software prom
- Module serial number
- Generator code output level adjustment
- Reader reshaped time code output adjustment
- Pilot output level adjustment
- Chassis ground isolate jumper
- System test points
- System operation confidence LEDs

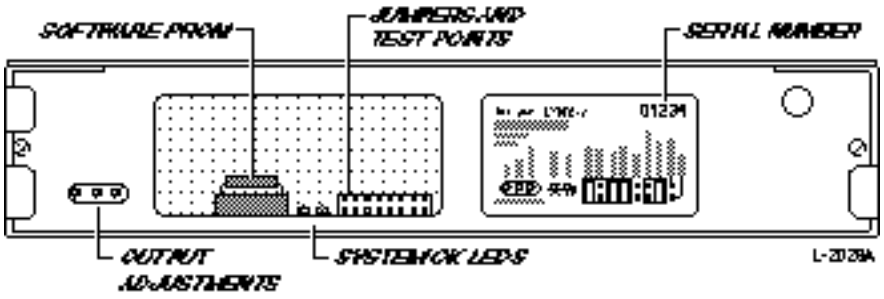


Figure Chapter 3 -3. Bulkhead Features

The nominal setting for the output level adjustments is -8 VU. The adjustment pots have a range of from zero to +10 dBm.

A chassis ground isolation jumper is provided. This jumper allows the user to choose between having the signal and chassis grounds connected or separated.

The video and communications grounds are always isolated. Other jumpers and test points include:

- Optional interface card jumpers
- Software program jumpers
- Test points.

The Lynx-2 system software can be updated by change the PROM (U50) immediately behind the front panel bulkhead cut out. Please refer to PROM Installation Guide (Part Number 73625) when installing new Lynx-2 software.

The Lynx-2 Serial Number is located on the bulkhead label. This number is required for all communications with the factory.

Two system "OK" confidence LEDs are provided. Both of these LED's should be on, in normal operation.

Setup Exceptions

When Lynx-2 is to be used as a Generator or Reader ONLY, any transport can be selected from the transport menu.

Basic Interface

Now that you have initialized the Lynx-2, you are ready to install it into your system. Specific cable installation is application dependent. If needed, refer to Part II of this chapter for help in determining your cabling requirements.

Each transport must have a local Lynx-2 module. Together, they comprise a synchronized unit. A synchronized unit consists of one machine and one Lynx-2 module.

Basic interface requires a minimum of four connections for each synchronized unit:

- Connect a video reference source
- Time Code Reader input from transport
- Connect RS422 communications cables
- Connect each transport with a 50-pin transport cable.

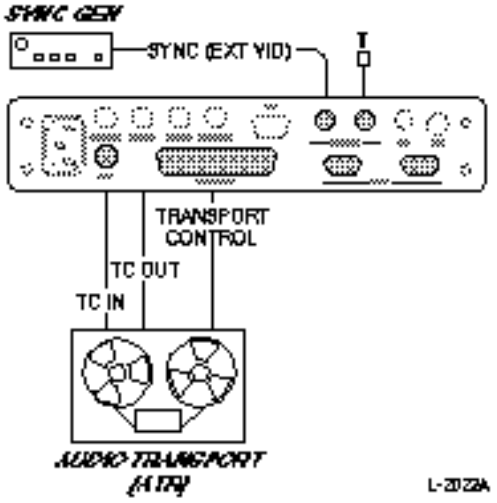


Figure Chapter 3 -4. Basic Interface

Video Reference Source

The video reference source should be either NTSC or PAL blackburst, color bars, or composite sync, and should come from a reliable reference sync generator or house sync generator. The reference source should be properly terminated.

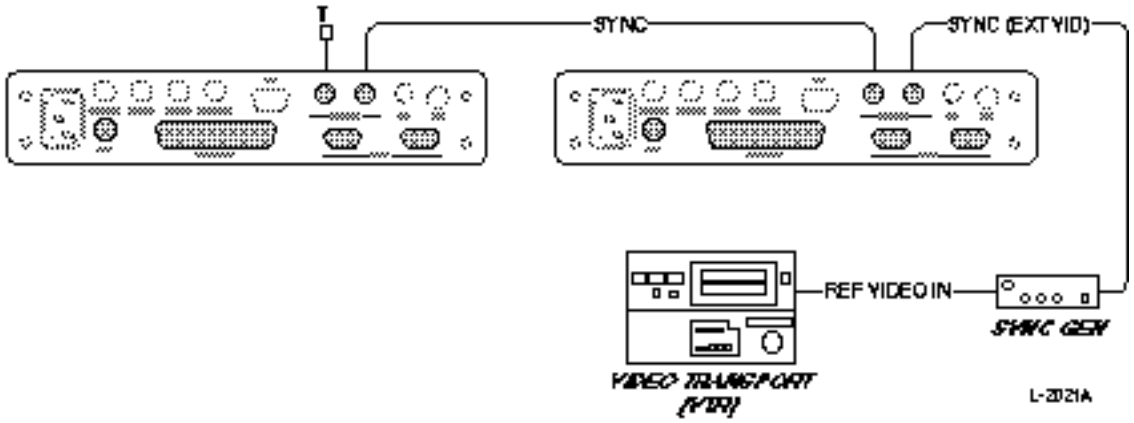


Figure Chapter 3 -5. Daisy Chaining Video Reference Source

Connect the video reference source to the EXT VID BNC connectors on the back of the Lynx-2. There are two, parallel BNC input jacks on each module. Connect all other modules requiring the video reference by looping from one module to the next. Terminate the last module with a 75Ω termination plug.

Reader Input

Connect a 1/4" TRS cable from the time code output of the transport to the TC IN jack on the back of the Lynx-2 module. This cable feeds Longitudinal Time Code from the machine, to the Reader input of the module.

Table Chapter 3 -1. Reader Time Code Connector Pin Description

Pin	Description
Tip	Time Code Reader +
Ring	Time Code Reader -
Sleeve	Ground

The Lynx-2 module uses the time code to synchronize the machine. This is typically a balanced connection. Wire the cable so that the "hot" pin (typically pin #2) on the transport output goes to the tip of the TRS plug.

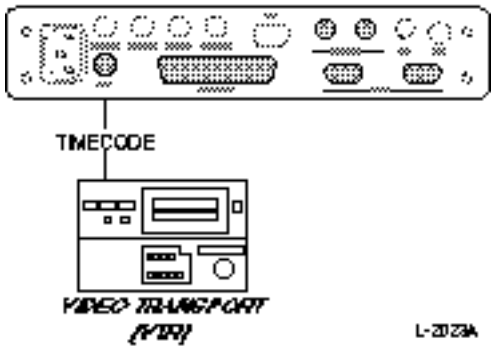


Figure Chapter 3 -6. Reader Input Connection

> Note:
>
> The Lynx-2 module can also use serial time code to synchronize a serial VTR. This type of installation does not require a separate LTC feed from the machine. Time code is detected serially through the VTR 9-pin connector.

Generator Output

Optionally, connect a 1/4" TRS cable from the GEN OUT jack on the back of the Lynx-2 module, to the time code input on the tape transport. This cable is used to stripe tape with longitudinal time code from the Lynx-2 time code generator.

Table Chapter 3 -2. Generator Output Connector Pin Description

Pin	Description
Tip	Time Code Reader +
Ring	Time Code Reader -
Sleeve	Ground

RS422 Communications

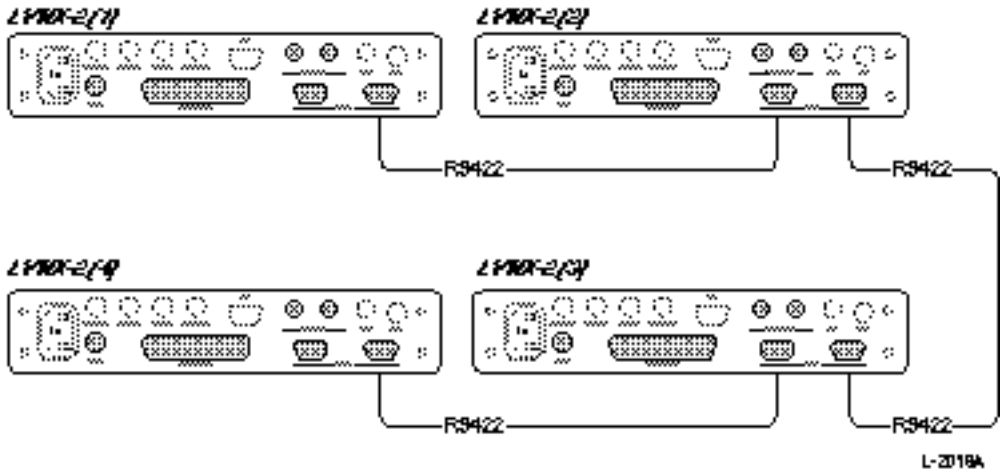


Figure Chapter 3 -7. Daisy-Chaining RS422 Communications

There are two, parallel RS422 I/O ports on each Lynx-2 module. These ports provide a communications path between all Lynx-2 modules in a system.

Each Lynx-2 module comes with a standard RS422 cable. These cables should be used to daisy chain all the additional modules that your system may require.

If it is necessary to mount the modules in separate locations, the RS422 cable may be extended up to 1000 feet. Use high quality, multipair cable that is made up of at least three individually shielded, twisted pairs. Lynx-2 uses the standard RS422 connections and pin no. 5 of the 9-pin connector. (See Table 3-2.)

Table Chapter 3 -3. RS422 Connector Pin-outs

PIN	MSTR	SLAVE
1	GND	GND
6	GND	GND
2	RX -	TX -
7	RX +	TX +
3	TX +	RX +
8	TX -	RX -
4	GND	GND
9	GND	GND
5	FRM CLK	FRM CLK

Serial Addresses

When Lynx-2 is used with a TimeLine Keyboard Control Unit (KCU) or with another controller, each module must have a unique serial address so that communications between multiple machines do not get confused.

> Note:
>
> To operate the KCU with the Lynx-2 module, the KCU processor board must be modified. See the Appendix for Service Bulletin (SB91-003) modification instructions. If your KCU operates with KCU080-14 software or higher, this modification has already been completed.

Press the [SHIFT] and [MSTR] keys simultaneously, then press the [GEN CODE] key. This accesses the ADDRess options. Press the [↑] key to advance the address of the module by one. The [↓] key will decrease the address in the display by one.

Make sure that no two modules in the system have the same address.

Transport Connection

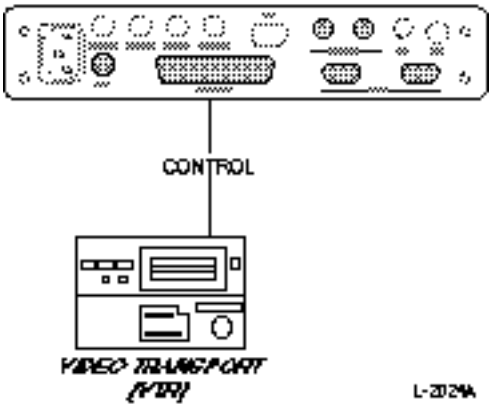


Figure Chapter 3 -8. Transport Connection

It is important that the appropriate 50-pin transport cable is used to connect the Lynx-2 to its local transport. Please refer to the Appendix for a list of Transport Cables that may be purchased from an authorized TimeLine dealer. Table 3-3 indicates the pin-out configuration of the transport cable.

When the Lynx-2 is used as a generator or reader only, or in Code-Only Master operation, a transport cable is not required.

Table Chapter 3 -4. Rear Panel, 50-Pin Transport Cable Connector

Pin	Signal	Pin	Signal
1	Ground	26	Tach direction sense
2	Transport ground sense	27	Channel 2 insert command
3	Stop (still) command	28	Video insert command or Ch 3
4	Capstan frequency output	29	Servo relay-A N/O
5	N/C	30	Servo relay A common
6	Lifter drop command	31	Servo relay-B N/C
7	Fast forward/direction command	32	RS422 TX (+)
8	Record tally	33	N/C
9	Auxiliary in 2	34	Ground
10	Lock Light or Ch 4 insert command	35	Record-off command emitter (-)
11	Channel 1 insert command	36	Search command emitter (-)
12	Rehearse command	37	Play command
13	Servo relay-A N/C	38	Search volts out
14	Servo relay-B common	39	Capstan volts out
15	Servo relay-B N/O	40	Record-on command
16	RS422 (-)/RS232 TX (-)	41	Auxiliary in 1
17	N/C	42	Tach pulse in
18	+5V (50 mA max)	43	AUX Out O/C
19	Record-off command collector (+)	44	-12V (50 mA max)
20	Search command collector (+)	45	+12V (50 mA max)
21	Adaptor Detect	46	Mute relay N/O
22	AUX Out Opto	47	Mute relay N/C
23	Transport command common	48	Mute relay common
24	Rewind command	49	RS422 RCV (-)/RS232 RCV (-)
25	Play tally	50	RS422 RCV (+)

> Note:
>
> Some of these pins have different designations when the Lynx-2 is fitted with a film option card. Please see separate table in Advanced Features, for these designations.

Code-Only Master

When setting up the Lynx-2 as a Code Only Master, you may select any audio transport from the transport menu. The MSTR REF SRC must be in VSO mode. (See Chapter 8, Synchronizer and Resolver, for detailed information.)

A Code Only Master normally supplies valid time code, even at wind speeds. Therefore, if time code is recorded on an audio track, the HF limitations of the audio channel's playback amplifier may need to be modified to accommodate the highest shuttle speeds/frequencies expected.

Most ATRs do not have this facility and the Slave transports will only chase the Master when valid code is present.

Modern VTRs that have a time code track, need no modification. These VTRs are manufactured with special wideband amps that can decode high speed signals.

A Transport cable is not required when operating in code-only mode.

Pilot Input

Optionally, connect a 1/4" TRS cable from a pilot tone output on the transport to the PILOT IN jack on the back of the Lynx-2 module. The Lynx-2 module can use the pilot tone input signal to resolve the speed of a transport, or to maintain synchronization, if time code is lost or not present.

Pilot Output

Optionally, connect a 1/4" TRS cable from the PILOT OUT jack on the back of the Lynx-2 module to an audio input on the transport. The Lynx-2 pilot output signal is a sinusoidal signal that can be software selected to follow the time code reader input or generator output.

Auxiliary Connection

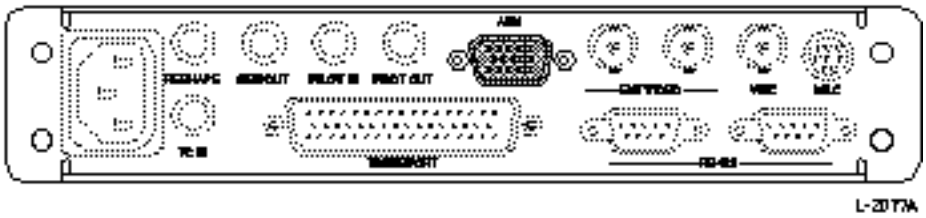


Figure Chapter 3 -9. Back Panel Auxiliary Connection

The 15-pin "D-type" Auxiliary connector on the rear panel of the Lynx-2 is used to connect the TimeLine Lynx-2 remote front panel mounting kit. To simplify installation when the module is being used with different transparent cables, the connector also has duplications of the transport connector module lock light, and mute relay connections. This connector is also used to connect the (50-60 Hz nominal) auxiliary input generator reference source timing signal.

Table Chapter 3 -5. Rear Panel 15-Pin Auxiliary Connector

Pin	Signal	Pin	Signal
1	+12 VDC	9	Ex Gnd
2	OPEX Rx D+	10	Ex Gnd
3	OPEX Tx D+	11	Mute Rly Com
4	Mute Rly N/C	12	Mute Rly N/O
5	Ex Gnd	13	Lock Light
6	+12 VDC	14	Aux Freq In
7	OPEX Rx D-	15	+5 VDC
8	OPEX Tx D-		

Part II - Interface Diagrams

This section presents a variety of interface diagrams. Refer to the diagram that most closely represents your system setup and application. Remember, slight differences in equipment may require small configuration modifications.

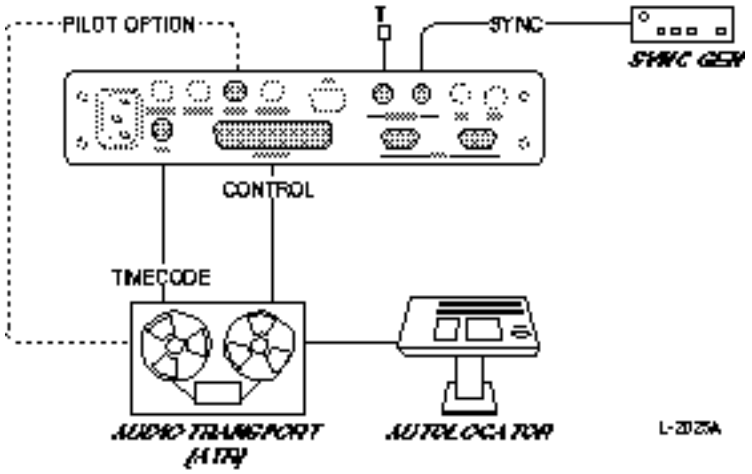


Figure Chapter 3 -10. Resolving a Single Machine

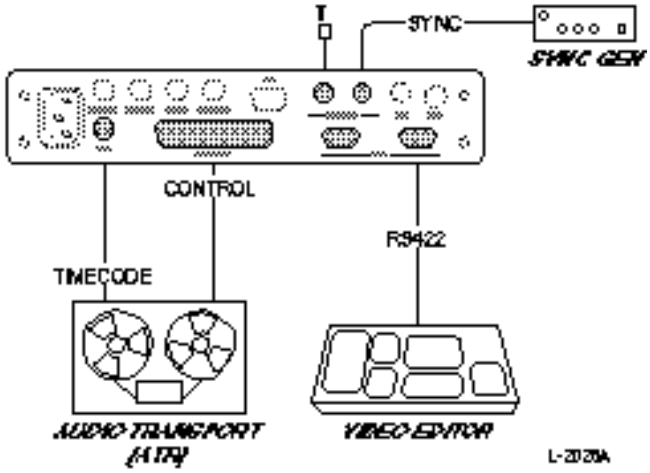


Figure Chapter 3 -11. Adding an ATR to a Video Editor

Chase Synchronizer - Audio

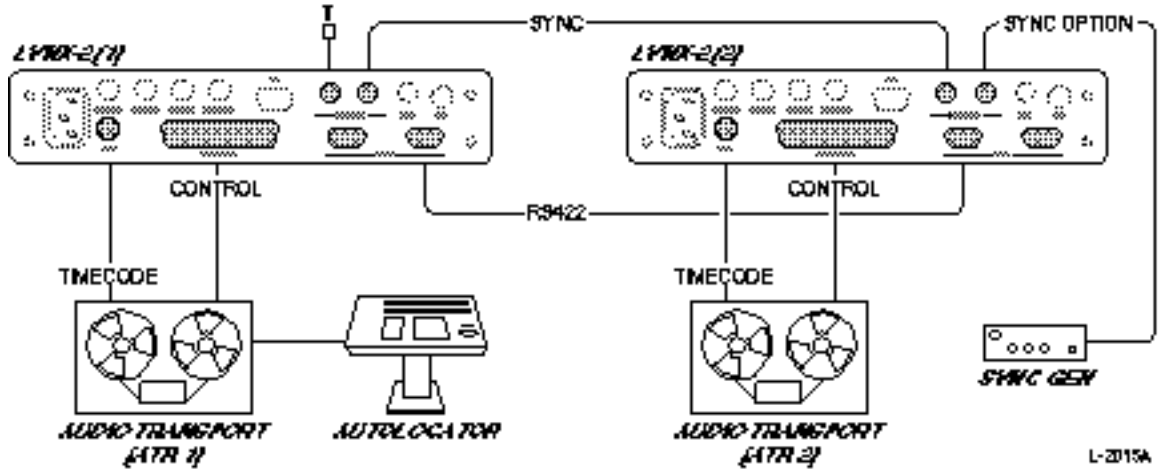


Figure Chapter 3 -12. Chase Synchronizer - Audio

Chase Synchronizer - Video

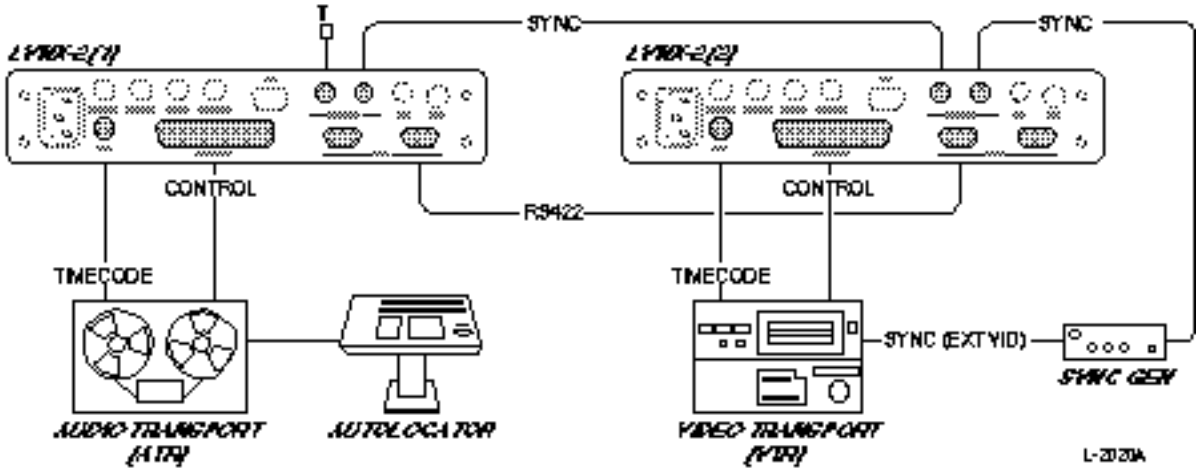


Figure Chapter 3 -13. Chase Synchronizer - Video

Biphase Slave Under External Control

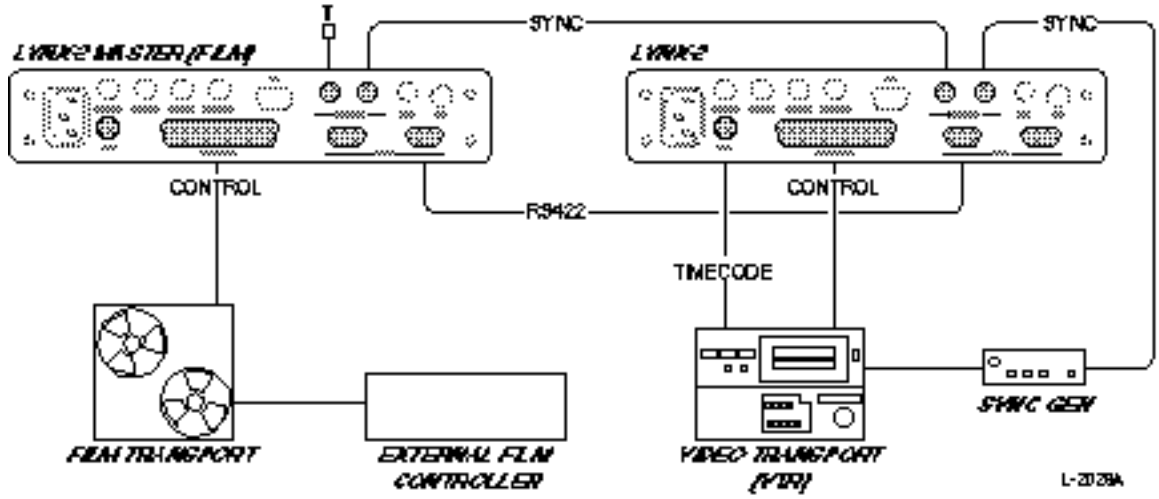


Figure Chapter 3 -14. Biphase Slave Under External Control

Biphase Master Under External Control

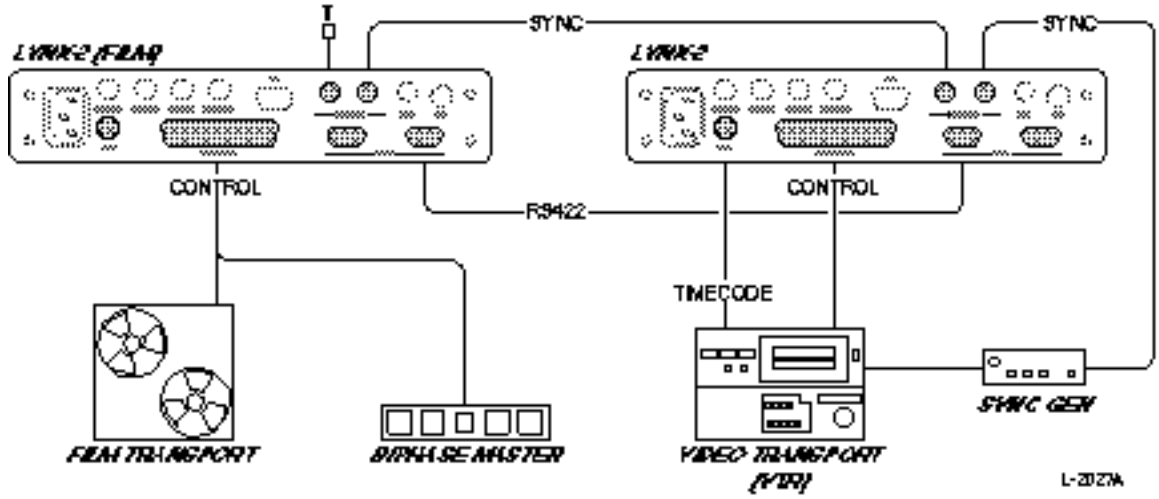


Figure Chapter 3 -15. Biphase Master Under External Control

KCU Stand-alone

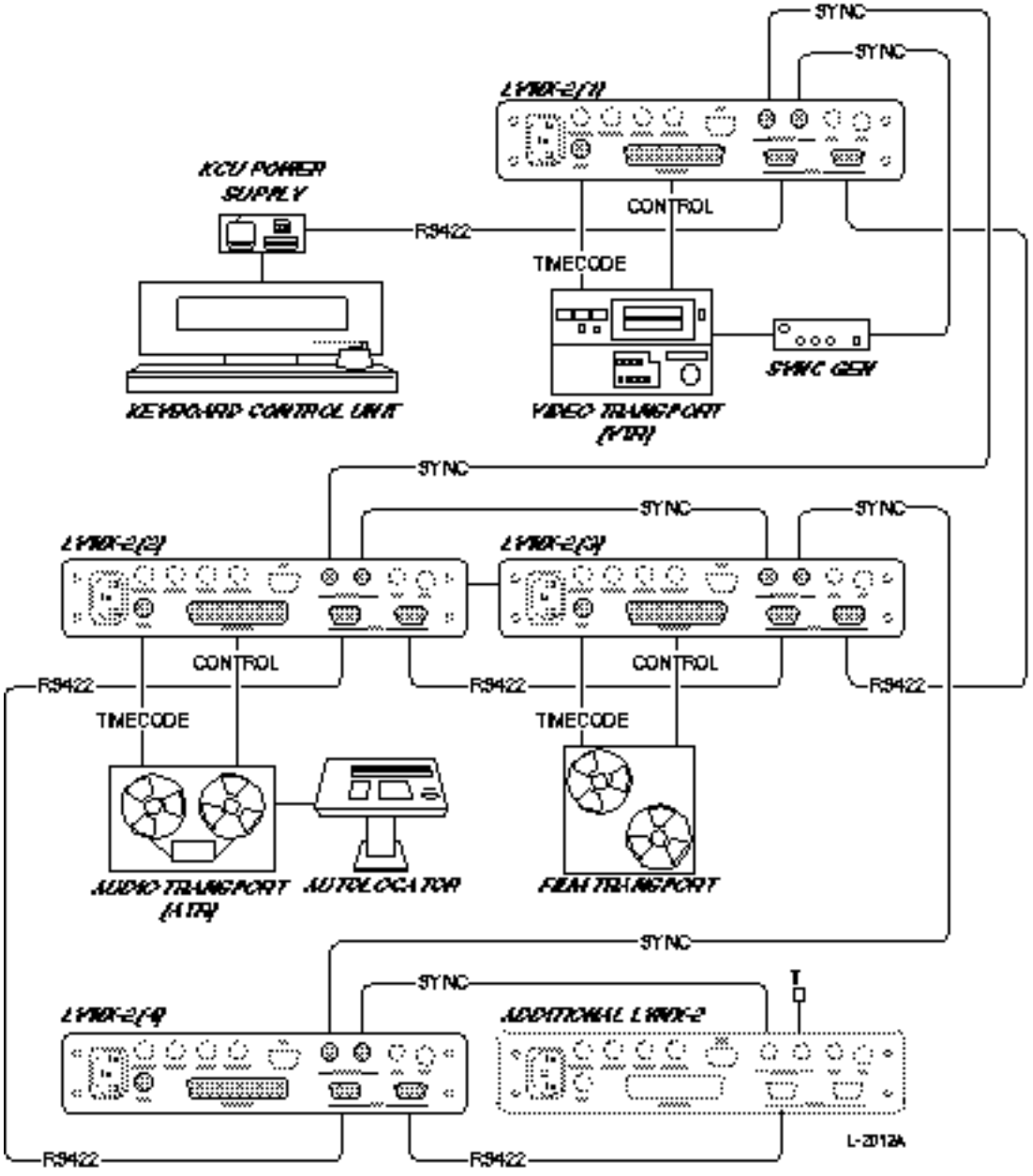


Figure Chapter 3 -16. KCU Stand-alone Production System

Post Production System - Audio

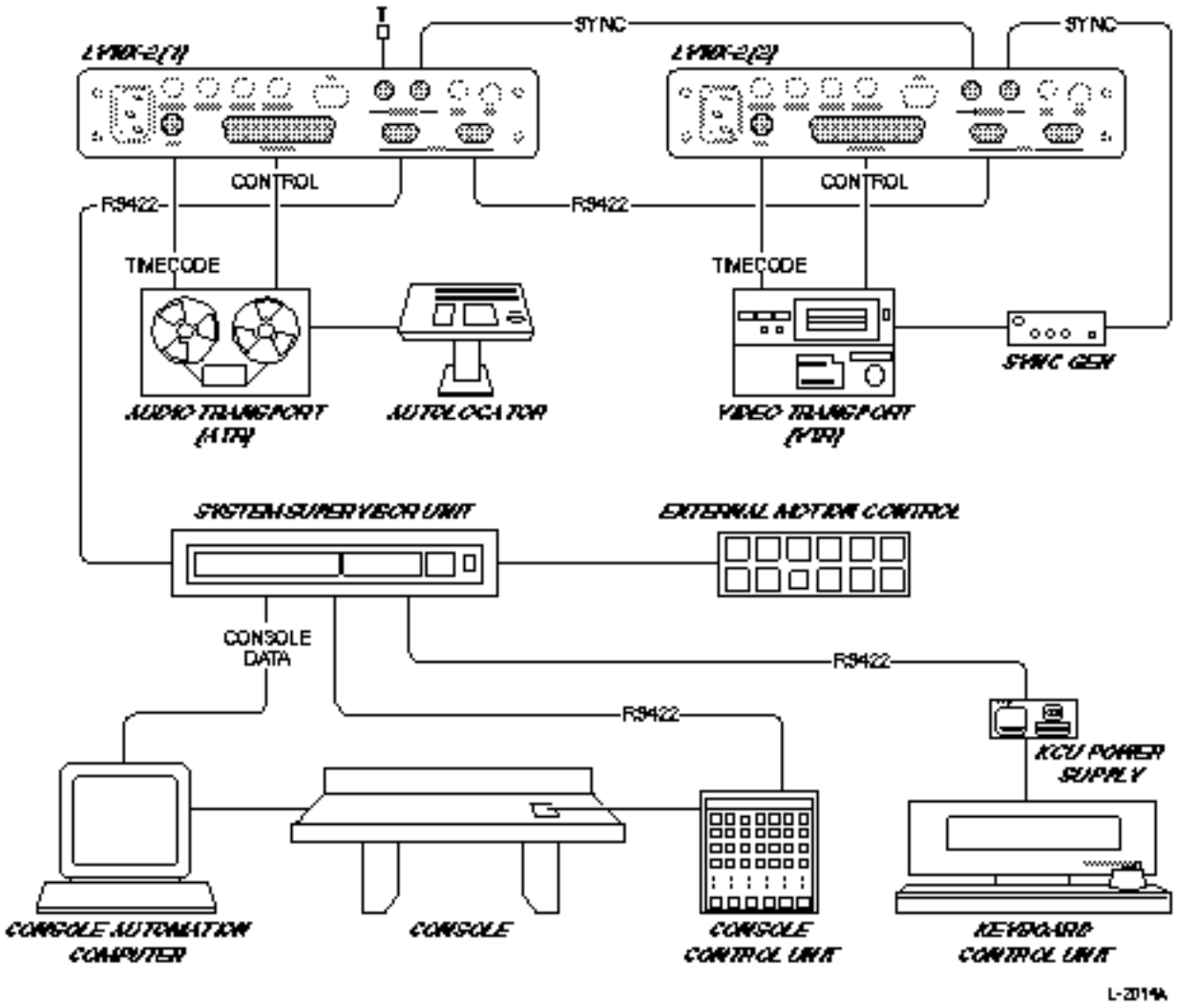


Figure Chapter 3 -17. Post Production System - Audio

Part III - Installation Quick Checkout Procedure

The primary function of the Lynx-2 module is to synchronize slave transports to a master. Before attempting to put a multimachine system online, verify that basic functions of each synchronized unit are working properly.

Transport Functions

The following steps will allow you to verify that the basic functions are working:

1. Follow the initialization and setup procedures outlined in Part I above. Be sure that the proper transport has been selected. The ability to synchronize a transport is absolutely dependent upon selecting the correct transport at power up.
2. Check to see that the correct transport cable has been connected between the transport and Lynx-2.
3. Check to see that a time code cable has been connected between the transport and Lynx-2 Reader input.
4. Load a pre-striped time code tape on the transport so that it is ready to play. If pre-striped tapes are not available, refer to Chapter 7, Time Code Generator, for instructions on how to generate and record time code.
5. If a machine has an "external capstan" switch, make sure it is in the EXTERNAL position.
6. Press the [TRAN MODE] key to put the machine online.

You are now ready to verify basic transport functions.

7. You may now press each of the transport function keys on the front of the module, to verify that the machine transport functions are responding properly.

   PLAY = [SHIFT] + [CLR]
   STOP = [SHIFT] + [↓]
   FAST FORWARD = [SHIFT] + [SET HOLD]
   REWIND = [SHIFT] + [SYNC POINT]
   RECORD = [SHIFT] + [STORE]
   REHEARSE = [SHIFT] + [↑]

Reader Test

Next, verify that the Reader is working properly.

1. If you haven't already done so, check to see that a time code cable has been connected between the output of the machine's time code track and the Lynx-2 Reader input.
2. Press the [DSPL SEL] key and toggle through the LEDs until RDR is selected. This puts the Reader register in the display.
3. Press Play on either the machine, or the Lynx-2. Allow the transport to run for at least 10 seconds to verify that time code is counting on the display, and that the green LTC LED is on.

Generator Test

Next, check that the Lynx-2 is generating and displaying time code.

1. If the transport is online, take it offline by pressing the [TRAN MODE] key. The module is offline when the online LED is not lit.
2. Press the [DSPL SEL] key and toggle through the LEDs until GEN is selected. This puts the generator register in the display.
3. Press the [GEN REF] key and toggle through the LEDs until INT is selected. This selects the module's internal crystal as the speed reference for the generator.
4. Press the [GEN CODE] key and select any code. Since this is a test, the code and code type are not yet critical.
5. Now press the [GEN ON] key. The generator LED should come on and time code addresses be displayed.

Providing all the basic tests have checked out OK, you are now ready to move on to more specific operations. (See Chapter 4, Getting Started.)

Chapter 4 Getting Started

Introduction

Once the Lynx-2 system is installed, turn it on. Use the basic operating procedures outlined in this chapter to demonstrate the modules features and controls. This chapter will help you become familiar with the operation and capabilities of the Lynx-2 Time Code Module.

This chapter covers:

1. Configuration of the Lynx-2.
3. Basic operating checks to use when setting up your system.
4. Selection of an operating mode to show what Lynx-2 can do.

Key Functions

The Lynx-2 front panel switches are used in one of three operational modes, directly, shifted and in setup. The shifted functions are indicated above the switches and are accessed by simultaneously pressing the blue shift key and the desired function key. The setup functions are indicated below the switches. Setup mode is accessed by simultaneously pressing the blue shift key and the [MSTR] key. Setup mode is "latched" and the setup menus and functions can be directly accessed. To exit setup mode, press shift and [MSTR] again.

Initialization and Configuration

The Lynx-2 module's non-volatile memory is completely cleared before leaving the factory and is ready for operational configuration.

When first turned on, the module will initialize and then flash the display to indicate that it is ready to store the configuration parameters. The module defaults to the transport selection menu, ready for you to scroll through and select the manufacturer and model of machine you will be using.

We recommend that the non-volatile RAM be cleared each time the module is connected to a new or different transport. To completely clear the RAM, press and hold the [CLR] key while you power-up.

The initialization process is as follows:

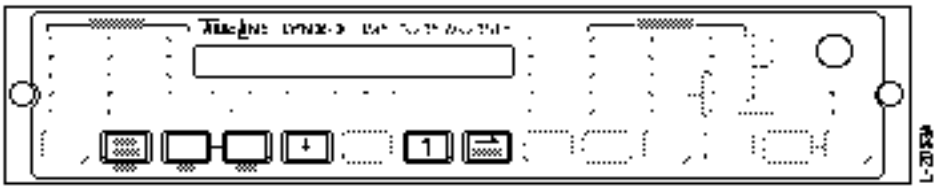


Figure Chapter 4 -1. Front Panel Initialization Keys

1. Power switch ON
   TimeLine is displayed and all LEDs light.
   A 2-second LED check is automatically performed.
   Note any LED's that do not function.

   Lynx-2 V700-XXX displayed
   V700 is the Lynx-2 master software program. Version XXX identifies the current revision that is installed in the module.

   AUTO Ser TRAN displayed
   This is the default choice in the transport menu. Because the unit has not been configured, it automatically powers up in SETUP mode. The Auto Serial Transport setting automatically detects the serial transport connected and loads the appropriate setting. For a complete list of VTR's supported, see the Cable Reference Guide in the Appendix. You may also step through the list of transport manufacturers using the {LAST} and {NEXT} keys. Once you've found the correct manufacturer, press the [↑] or [↓] keys to select a specific model.

2. Press [STORE]

   AUTO Ser TRAN (or any other transport on the menu) displayed
   Once you find the correct machine, press the [STORE] key so that the operational parameters of that specific transport are saved in the module's non-volatile RAM. The display stops flashing.

> Note:
>
> Each time you turn on the Lynx-2, the selected transport is displayed.

3. Press [TRAN Mode] {Menu}

   Editor KCU flashing in the display
   This is the default controller type (TimeLine KCU). If you are using a KCU with old software or a controller made by another manufacturer, store this parameter. (A list of editor types are in the Appendix.) If you are using the Lynx-2 in a stand-alone system, this parameter can be ignored.

   Press [STORE]

   Editor KCU displayed
   Saves your selection, the display stops flashing.

4. Press [TRAN Mode] {Menu}

   Address 1 displayed
   This is the default address. If the module is being used in a stand alone system, this parameter can be ignored. If you are using a controller and have more than one Lynx-2 in your system, each must have a unique serial address. Press [↑] or [↓] to select different addresses.

5. Press [STORE]

   Address 1 displayed
   Saves your selection, and the display stops flashing.

6. Press [TRAN Mode] {Menu}

   DONE displayed
   Transport and address selection are complete.

7. Press [STORE]
   To exit the Setup mode.

The Lynx-2 automatically stores your setup configuration in RAM, then reinitializes. The selections you have made will be displayed and the module will calibrate the capstan output and detect the video reference type.

Once set, all necessary machine control parameters are automatically stored into non-volatile RAM. The module displays the following information on power-up:

- Software version number
- Machine type selected
- Editor or controller type
- Module address
- Video standard (if present).

The Lynx-2 will always recall this preset information on power-up, or until intentionally modified. All stored parameters are immediately operational.

Sign On

Each time you turn on the Lynx-2, after its original configuration, the system will sign on by sequentially showing the following information on the front panel display.

If the displayed parameter is not correct, the setting can be modified as needed, by entering Setup mode. The display shows the following:

Display & LED Test. The numeric display will show the TimeLine name and turn on all the Front panel LEDs to indicate full functionality.

Software Version XXX. Lynx-2 V700-XXX is the current software revision installed in the module.

Transport. "AUTO Ser TRAN," is the name of the machine that has been selected as the local transport.

Editor Type. The editor type selected to control the system. Editor type only needs to be set in a controlled system. This setting does not affect operation in a stand-alone system (SAL).

Module Address. The address number of the module in a controlled system. Each Lynx-2 module must have a different address. When the Lynx-2 is operated as a stand-alone system (SAL) then the address setting does not affect operation.

Calibrating. The Lynx-2 automatically calibrates the selected transport's Capstan Control output for the three operating speeds.

Video Detect. The Lynx-2 measures the external video sync source if present. If there is no video connected, press [CLR] to bypass this test.

Video Type. The type of video reference detected is displayed.

00:00:00:00. The display is initialized to the time code reader and the module is ready for operation.

Operation Checks

Instead of an elaborate operator setup procedure for each transport, the Lynx-2 software has been designed to recognize and load the necessary operational parameters for each transport. The Lynx-2 automatically sets and detects:

- Tallies and transport commands
- Lifter controls
- Relative timing offsets between erase and record heads
- Center frequency or voltage for the capstan control output
- Tape speed

Time Code and Tach Pulse checks should be performed with each synchronized unit before putting Lynx-2 into full operation.

Time Code Check

To perform the basic operational checks, do not connect the Lynx-2 to a Keyboard Control Unit (KCU), editor, controller, or another Lynx-2.

Load a tape containing valid time code onto the transport. If manual switching to external control is required, select external capstan control on the transport.

Remember, the tape must be prestriped with time code. If not, use the following procedure, or refer to Chapter 7 for instruction on how to generate and stripe time code.

Generate Time Code

The following procedure is used to select the code type and generator reference rate for striping code on tape. Time code must be striped with the tape transport running at fixed speed. Take the Lynx-2 offline to ensure that the machine will run on internal. Connect a time code cable between the Lynx-2 GENOUT Jack and the machine's, time code track input.

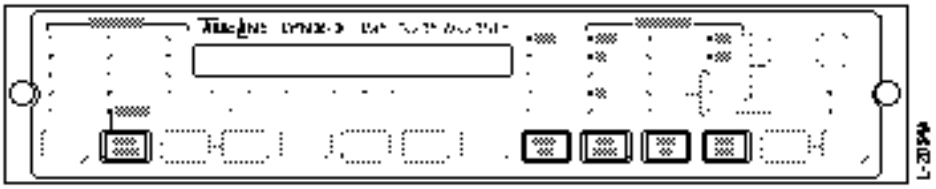


Figure Chapter 4 -2. Front Panel Time Code Selection Keys

1. Press [TRAN MODE]

   ONLINE LED off
   Press the [TRAN MODE] key to take the module offline so that the tape machine will run at fixed speed.

2. Press [DSPL SEL]

   GEN LED on
   Press [DSPL SEL] one or more times to select the generator to the display.

3. Press [GEN REF]

   INT or VID LED on
   Press the [GEN REF] key to select Internal crystal or External video, if connected, as the generator speed reference.

4. Press [GEN CODE]

   29.29 and 30 LED on (USA & Japan), *25 LED on* (Europe)
   Press the [GEN CODE] key one or more times to select the code type to be generated. The 29.97 and 30 LEDs indicate that non-drop frame code (30 frame) will be generated at the NTSC rate of 29.97 frames-per-second.

5. Press [GEN ON]

   Display updates
   Press the [GEN ON] key to select the generator. See Chapter 7, for presetting the generator to a different time code start value.

6. Press PLAY + REC (Transport)
   Puts the machine into record and strip time code.

Verify Time Code

Ensure the time code cable is connected between the time code track on the machine and the TC IN jack on the module. Use a 1/4" TRS cable.

Ensure the transport cable is connected between the machine and the 50-pin transport connector on the Lynx-2.

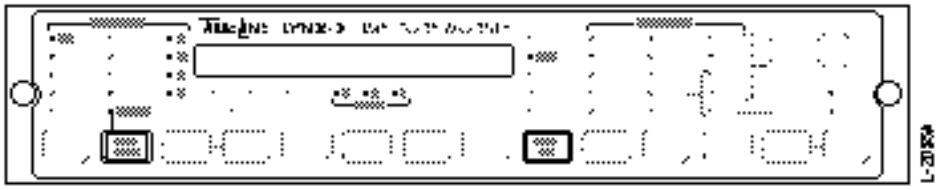


Figure Chapter 4 -3. Front Panel Time Code Reader Display Key and LED's

1. Press [TRAN MODE]

   Transport ONLINE LED off
   The module should be offline. Press [TRAN Mode] if it is online.

2. Press [DSPL SEL]

   RDR LED on
   Select the reader display for this test.

3. Press PLAY (transport)

   Display incrementing and LTC LED on
   Lynx-2 is now reading time code. Press the [DSPL SEL] key one or more times until RDR is selected.

4. Press STOP (transport)

   Display stops
   Stop the transport. The Lynx-2 display will also stop.

Check that the transport code type LED column is displaying the correct code type.

Check that the Lynx-2 machine speed indicator LEDs (H, M, L) are showing the correct speed.

Table Chapter 4 -1. Time Code Check Troubleshooting

Problem: Lynx-2 used for audio only; initialization stops at the Video detect prompt. *Solution*: Press [CLR] Lynx-2 will wait at the EXT VID detect prompt until either: 1. An external video cable reference source is detected. 2. [CLR] is pressed.
Problem: The LTC LED does not turn on when you put the transport into play. *Solutions*: • Check the time code cable. The time code cable must be correctly attached for Lynx-2 to read time code. • Check that the tape is striped with the time code. Listen to the time code output. The time code cable must be connected to the TC IN jack on the Lynx-2 and the time code output from the machine.
Problem: The LTC and TACH LEDs flash on and off. *Solutions*: • Check the time code cable. The time code cable must be correctly attached for Lynx-2 to read time code. • Check that the machine is set to run at the correct speed. The TACH LED indicates that you are reading tach pulses, not time code.

TACH and Direction Signals Check

Next, let's check the TACH (tachometer) pulse rate and duration signals. This test checks the rate of time code against the rate of TACH pulses.

Note
The time code and initialization procedures must have been successfully performed.

Make sure the connection between the transport's time code track and the module's TC IN (Reader input) is *disconnected* for this test. This forces the module to read the transport's TACH pulses.

Make the RDR display active. If it is not, press the [DSPL SEL] one or more times to step the display to RDR.

Press PLAY on the machine and verify that when the transport is moving, the TACH light is on and the display is counting correctly in the forward direction.

TACH Pulse Check Procedure

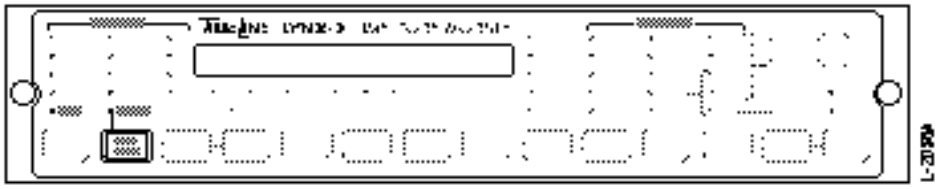


Figure Chapter 4 -4. Front Panel TACH Display LED

1. Disconnect the 1/4" TRS cable between the transport and the TC IN on the Lynx-2.
2. Press [TRAN MODE]

   ONLINE LED off
   Take the Lynx-2 offline if it is online.
3. Press PLAY (transport)

   TACH LED on
   Lynx-2 starts reading and displaying tach pulses in real time. If TACH LED not on, see Table 4-2.
4. Press STOP (transport)
   Display stops incrementing. Stop the transport.
5. Press REWIND (transport)
   Lynx-2 display reading with the display counting down.
6. Press FAST FORWARD (transport)
   Lynx-2 display reading with the display counting up.
7. Press STOP (transport)
   Display stops.

Set TACH Pulse Display to Match Transport Display

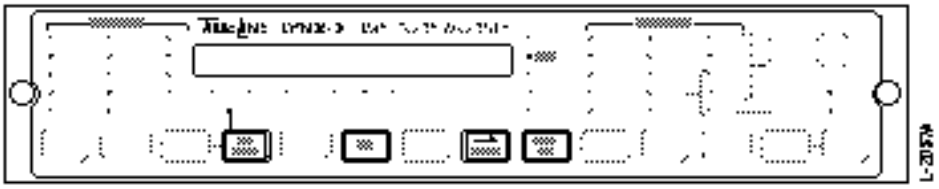


Figure Chapter 4 -5. Front Panel Set Display

1. Press [DSPL SEL]

   RDR LED on
   Press [DSPL SEL] one or more times to turn on the RDR LED.

2. Press [SET HOLD]

   Display flashes
   The reader register starts to flash indicating that it may be edited.

3. Press [CLR]

   00:00:00:00 is displayed
   Clears the reader register.

4. Press [STORE]

   00:00:00:00 is displayed
   Stores the value currently displayed in the reader register.

5. Press RESET (transport)
   Set the transport tape timer to 00:00.

6. Press PLAY (transport)

   Lynx-2 display reading
   Play transports for about 60 seconds. Verify that the "seconds" display is counting in real time. The transport's display should be the same as the Lynx-2's.

7. Press STOP (transport)

   Display stops incrementing
   When the transport is stopped, the TACH pulses on the Lynx-2 and transport stop.

8. Press RWD or FFD (transport)

   Display reading
   Spool the transport for two or three minutes, verify that the transport display closely matches the Lynx-2 display.

Table Chapter 4 -2. Tach Pulse Troubleshooting

Problem: Lynx-2 is not reading or displaying TACH pulses. *Solution*: Check the transport cable and connections. The transport cable must be securely connected for Lynx-2 to read TACH pulses.
Problem: The Lynx-2 display is not incrementing simultaneously with the transport TACH display. *Solutions*: • Check the transport cable and connections. • Check that the correct transport has been selected in the setup procedure. Some machines have selectable tach rates. • Check that the correct rate is selected.

TACH Pulse to Time Code Check

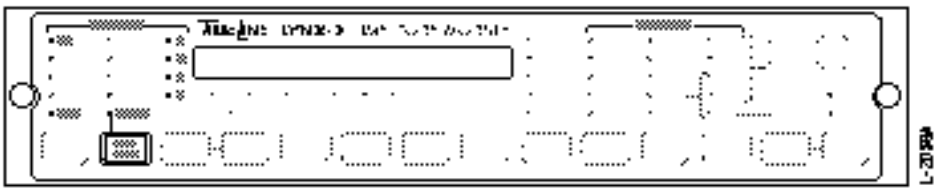


Figure Chapter 4 -6. Front Panel TACH and Time Code Display

This check tests the time code to tach pulse relationship

1. Press [TRAN MODE]

   ONLINE LED off

   To perform this test the module should be offline, press [TRAN MODE] if it is online.

2. Connect the time code output from the machine to the Lynx-2 TC IN jack.

3. Press PLAY (transport)

   > Display updates, LTC LED on, Code type LED on

   Put the transport in play and let the time code reader read time code. Check that the transport code type LED indicates the correct code type.

4. Remove the time code cable from the Lynx-2 reader input.

   LTC LED off, TACH LED on
   The Lynx-2 switches from LTC to TACH, to update the reader position.

5. Press FWD (Transport)

   Display updates
   Fast forward the transport a few minutes so that the Lynx-2 reader updates to a new value based on machine tach output.

6. Press STOP (Transport)
   Reconnect the time code reader input.

7. Press PLAY (Transport)

   Display updates smoothly, LTC LED on
   Watch the seconds column of the Lynx-2 display; the time code value should start counting smoothly, without jumping to a new value.

8. Repeat test Rewind direction.

Table Chapter 4 -3. Tach Pulse to Time Code Check Troubleshooting

Problem: Time code and tach positions do not correctly match. *Solutions*: • Check that the Lynx-2 is reading time code properly; In play, the LTC LED should be on solid when time code is connected. • Check that the Lynx-2 has correctly identified the code type that is striped on the reel. • Check that the correct transport type has been selected in the Lynx-2 setup menu. • Check that the correct tach rate frequency has been selected on the machine. Some transports have internally selectable tach rates.

Transport Control Check

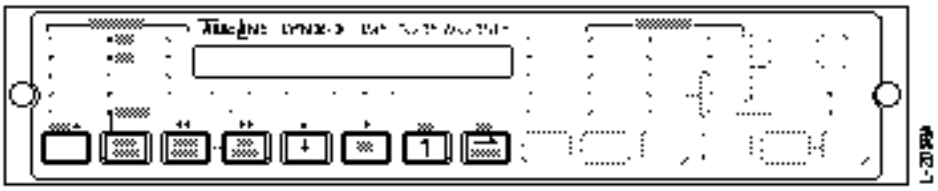


Figure Chapter 4 -7. Front Panel Transport Control

The Lynx-2 module key switches can be used to directly control the transport. Using the shifted function of the Lynx-2 front panel each of the transport control functions can be checked.

1. Press [TRAN MODE]

   ONLINE LED on
   To perform these tests, the module should be online. Press [TRAN MODE] if it is offline.

2. Press [SHIFT]+{>}

   > in display, display updates
   The transport should go into play.

3. Press [SHIFT]+{↑}

   > in display, display updates, REH LED on
   The transport should go into rehearse, if it allows that feature. At least one track may have to be in record ready on some machines.

4. Press [SHIFT]+{>}

   > in display, display updates, REH LED off
   Pressing PLAY cancels rehearse mode.

5. Press [SHIFT]+{REC}

   > in display, display updates, REC LED on
   The transport should go into record. Check that only tracks where it is safe to go into record are in record ready.

6. Press [SHIFT]+{<<}

   << in display, display updates
   The transport should go into rewind.

7. Press [SHIFT]+{>>}

   >> in display, display updates
   The transport should go into fast forward.

8. Press [SHIFT]+{■}

   ■ in display, display stops
   The transport should go into stop.

Setup Options

For basic module operation, it is not necessary to configure any other options. In some instances, the default transport Setup Options must be customized for a particular situation. The complete transport OPTions menu is as follows:

- Capst Wild = DC Capstan adjust
- Lifter mode = Lifter defeat control
- Phase mode = Phase mode on/off
- Pilot out mode = Generator or reader
- Relay mode = Mute relay control
- Serial TC inhibit = Serial Time Code ON/OFF
- Speed = Tape shuttle approach speed adjustment

Some of this operational data is unique to each transport and is stored separately, in RAM, for each machine. Once set, these optional parameters are recalled when the corresponding transport is selected.

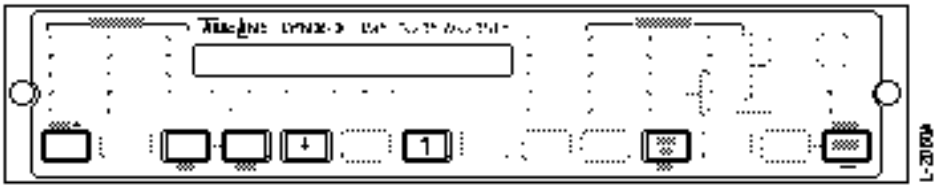


Figure Chapter 4 -8. Front Panel Setup Keys

1. Press [SHIFT] and [MSTR] simultaneously
   Enter setup.
2. Press [GEN ON]

   CAPST Wild is displayed
   It is the first item in the options menu.

To select other items in the OPTions Menu, use the {LAST} and {NEXT} keys to scroll left and right through the menu. Use the [↑] and [↓] arrows to select the option that corresponds with your operational requirements. See Appendix for more details.

3. Press [SHIFT] + [MSTR]
   Exit setup mode and save your changes.

> Note:
>
> Serial Time Code is only available from certain video transports. The user has the option to read the Serial Time Code coming from the machine. This option can be toggled on or off. The Lynx-2 will use Serial Time Code when searching and locating, or for synchronization if LTC is not present. Refer to Chapter 8, Time Code Reader for more detailed information.

Chapter 6, Feature & Controls, covers these Options in greater detail.

The setup option parameters are *not* erased when [TRAN MODE] and [CLR] are pushed simultaneously; this only resets the transport parameters to the factory default.

Initial Synchronization

Verify that the Lynx-2 system is operating properly by following the simplified synchronization procedures listed below.

By resolving and locking the tape machine to the system reference the Lynx-2 capstan control function can be checked. The first attempt at synchronization will be slightly slower as the Lynx-2 acquires the correct control frequency or DC conditions to lock the transport.

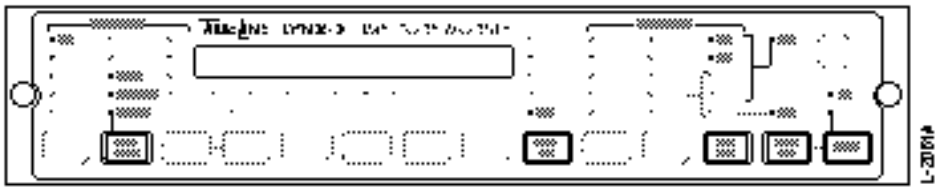


Figure Chapter 4 -9. Front Panel Synchronization Setup Keys

1. Press [TRAN MODE]

   ONLINE LED on

   To perform these tests, the module should be online press [TRAN MODE] if it is offline.

2. Press [GEN REF]

   INT LED, or VID LED on

   Press the generator reference key to select either INT (internal crystal) or VID (external video) if a video sync source is connected as the system speed reference.

3. Press [MSTR]

   Master LED on, 422 LED on

   Press the [MSTR] key to enable the Lynx-2 module synchronizer.

4. Press [MSTR REF]

   GEN LED on

   Press the [MSTR REF] key if the VSO LED is on, to select GEN, as the master transport, speed reference.

5. Press PLAY (transport)

   LTC, RESOLVE & LOCK LEDs on

   The Lynx-2 module controls the tape machines' capstan speed so that the time code runs at the same rate as the system reference.

6. Press [DSPL SEL]

   ERR LED on, display shows >L 0.00

   Press the [DSPL SEL] key one or more times to select the offset error display. The display is showing subframes. You should see 0.00 subframe error, which indicates that the machine is locked to the system reference.

7. Press STOP & PLAY (transport)

   ERR LED on, Display shows >L 0.00

   Stop the machine and then put it back into play, the machine should lock much faster than the previous time. The subframe error display should rapidly count down to 0.00 error.

Table Chapter 4 -4. Initial Synchronization Troubleshooting

Problem: The machine will not lock at all. *Solutions*: • Check that the correct transport type is selected in the Lynx-2 setup menu. • Check that there is time code on the tape and that the module LTC LED is on in play. • Check that the machine is switched to external capstan control.
Problem: The offset error display never stabilizes at 0.00. *Solutions*: • Check that the correct transport type is selected in the Lynx-2 setup menu. • Check that the machine is switched to external capstan control.

If the transport capstan is DC controlled it may be necessary to adjust the capstan wild speed trim so that the Lynx-2 default control speed and the normal play speed of the transport are similar. See the Features and Controls Section, for a more detailed explanation.

Synchronizing Two Transports

These instructions assume that the two transports to be synchronized have tapes with similar time codes and that there is no time code offset. (In a system, each transport/Lynx-2 package is considered a synchronized unit.)

Make sure that both modules are connected together as indicated in the Installation Section and are configured as described earlier in this chapter. Put both modules online by pressing the [TRAN MODE] key.

Press PLAY on each transport so that the Lynx-2 reads the time code positions from each tape.

Choose one of the Lynx-2 modules as Master and press the [MSTR] key, the Master LED will light. The other module is the Slave. The 422 LED on both modules will also light indicating that the modules are communicating via the Lynx-2 system BUS.

Press PLAY on the Master transport, followed by STOP. The Slave transport will now search to the Master position and slightly ahead of the Master. When the Slave transport has stopped, press PLAY on the Master, the Slave machine will go into play and both machines will lock.

Verify that both transports are "locked" by checking the Lock LED on each module.

> Note
>
> The very first attempt at "lock" may take up to 10 seconds.

The Slave transport will now chase and lock to the Master transport no matter how the Master transport is shuttled.

You can now reassign the Master status to the Slave sync unit. This is done by pressing the [MSTR] key on the current Master, the LED will go off. Next press the [MSTR] key on the module that was the Slave to make it the new Master, the Master LED will light.

You can reassign the Master at any time and all positional relationships will be maintained. Any previous offsets will be transferred to the new Slave machines.

Master Setup Procedures

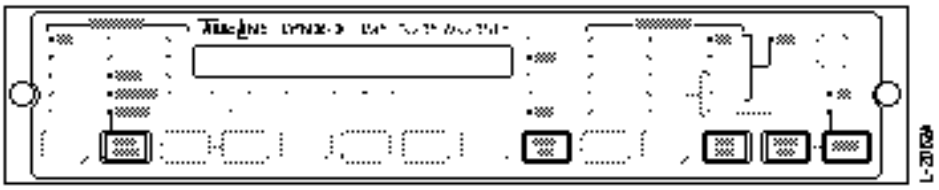


Figure Chapter 4 -10. Front Panel Master Select

1. Press [DSPL SEL]

   RDR LED on
   Press the [DSPL SEL] key one or more times to turn on RDR LED.

2. Press [TRAN MODE]

   ONLINE LED on
   Put the Master Lynx-2 online.

3. Press PLAY (transport)

   LTC LED on, Display updates
   Allow the module to read time code for at least 10 seconds.

4. Press STOP (transport)

   Display stops
   Stop the transport. The Lynx-2 display will also stop.

5. Press [GEN REF]

   INT LED on
   Press the [GEN REF] key one or more times, to select the Lynx-2 internal speed reference as the generator reference.

6. Press [MSTR]

   MSTR LED on, 422 LED on
   Defines the Master Lynx-2 and turns on RS422 communications to Slave Lynx-2 modules.

7. Press [MSTR REF]

   GEN LED on
   Select the GEN reference as the Master transport speed.

Slave Setup Procedure

8. Press [DSPL SEL]

   RDR LED on
   Press the [DSPL SEL] key one or more times to turn on RDR LED.

9. Press PLAY (transport)

   LTC LED on, Display updates
   Allow the module to read time code for at least 10 seconds.

10. Press STOP (transport)

    Display stops
    Stop the transport. The Lynx-2 display will also stop.

11. Press [TRAN MODE]

    ONLINE LED on
    Put the Slave Lynx-2 online.

Synchronization Procedure

12. Press PLAY and STOP (Master transport)
    Play the Master transport, the Slave will chase and park slightly ahead of the Master machine.

13. Press PLAY (Master transport)
    Play the Master transport, the slave will go into play.

14. *RESOLVE LED on*
    Lynx-2 has resolved the speed of the Master machine to the reference, and the Slave transport to the Master transport. It is within 1/4 frame of being locked.

15. *LOCK LEDs on*
    When both Lynx-2 LOCK LEDs turn on, the transports are synchronized and playing at the speed of the reference source.

16. Press [DSPL SEL] *slave*

    ERR LED on
    Press the [DSPL SEL] key one or more times to turn on the offset ERR LED. The display is showing subframes. You should see >L 0.00. This means the Slave is locked to the Master and the number indicates the accuracy of the lock, to 1/100 of a frame.

17. Press STOP (Master transport)
    The Master and Slave transports stop. Next, reverse the Master/Slave relationship; make module #2 the Master and #1 the Slave.

Reverse Master/Slave Relationship

18. Press [MSTR]

    MSTR LED off
    Press the [MSTR] key on module #1 and deselect it as Master.

19. Press [MSTR]

    MSTR LED on
    Press the [MSTR] key on module #2. Check that the generator and master reference selections on module #2 are correctly set.

20. Repeat above steps 12-17.

Synchronization with an OFFSET

Offset synchronization is used when two or more tapes have time codes that do not match. For example, tape "A" may start at 00:00:00:00 and tape "B" at 02:00:00:00.

You can set the module controlling tape "B" so that there is a two hour difference or offset. The Lynx-2 will automatically adjust tape "B's" time code position to include the offset.

In a Lynx-2 system, Slave offsets are always displayed in the time code type of the Master machine. In stand-alone operation, the offset of the Master machine is always 0. In a TimeLine, post production system, it is possible for the Master to have an offset.

> Note:
>
> An offset value cannot be entered into a Stand-alone Master module. Any attempt to do so will produce the error message "NO MSTR OFST".

Example: Slave time code, minus Master time code, equals offset between machines.

```
  02:00:00:00 (Slave)
- 00:00:00:00 (Master)
= 02:00:00:00 Offset
```

Setting Up an OFFSET

For this example, it is necessary to have two reels of tape with different time codes or two reels of tape with at least 10 minutes of striped code.

Verify that the modules are correctly connected and have been configured. Turn on the modules and wait for the initialization sequence to finish.

For an example, we will use a Master tape striped with one hour code and a Slave with three hour code and will enter an offset of 2 hours (02:00:00:00). The example can however, be performed using any time code values.

Example:

```
  03:00:00:00 (Slave tape time code)
- 01:00:00:00 (Master tape time code)
= 02:00:00:00 Offset
```

On the Slave, press [DSPL SEL] one or more times until the OFFSET LED lights. This accesses the OFFSET register. Next press [SET HOLD]. The Frames value starts to flash. Press the [↓] or [↑] keys to change the Frames offset value. Each time you press the [SET HOLD] key, the display cursor moves to the next column in the display.

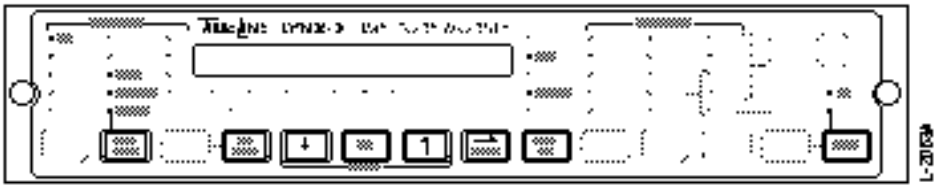


Figure Chapter 4 -11. Front Panel Offset Set and Store Keys

1. Press [DSPL SEL] (Slave)

   OFFSET LED on

   Press the display select key one or more times until the OFFSET LED turns on.

2. Press [SET HOLD]

   Frames display flashes

   Press [↑] or [↓] to change the number of frames to be offset. In this case the value should be :00. If there is a number in the offset register, press [CLR] to enter 00:00:00:00.

3. Press [SET HOLD]

   Seconds display flashes

   Press [↑] or [↓] to change the number of Seconds to be offset. In this case the value should be :00.

4. Press [SET HOLD]

   Minutes display flashes

   Press [↑] or [↓] to change the number of Minutes to be offset. In this case the value should be :00.

5. Press [SET HOLD]

   Hours display flashes

   Press [↑] or [↓] to change the number of Hours to be offset. In this case the value should be :02.

6. Press [STORE]

   This stores the offset 02:00:00:00 in the offset register.

7. Press [DSPL SEL] (Slave)

   RDR LED on

   Press the [DSPL SEL] key one or more times until the Slave RDR LED turns on.

8. Press [DSPL SEL] (Master)

   RDR LED on
   Press the [DSPL SEL] key one or more times until the Master RDR LED turns on.

9. Press [TRAN MODE] (Master and Slave)

   ONLINE LEDs on
   Put both modules online.

10. Press [MSTR] (Master)

    MSTR LED on master module and MSTR and 422 LEDs on slave modules
    Select Lynx-2 #1 as the Master, and initiate 422 communications with the Slave modules. The Slave module 422 LED goes on, verifying communications between the Master and Slave.

11. Press PLAY (Master transport)
    Play the Master machine. The Slave transport goes into PLAY.

12. *LTC, RESOLVE and LOCK LEDs on*
    Both machines lock and the resolve displays will increment on both Slave and Master Lynx-2's. Notice that the Slave's display is exactly 2 hours ahead of the Master.

Calculating an OFFSET

There are two ways to compute and enter offsets between Master and Slave machines.

1. You calculate or have a known offset that is entered manually, as described above.
2. You automatically capture (determine) and enter the offset by using the sync point procedure described below.

For systems without an external controller, the following procedure is performed on both Slave and Master modules. If you are using an external controller, please refer to Synchronizing Lynx-2 with the TimeLine Keyboard Control Unit (KCU).

The Lynx-2 will automatically calculate offset between time code points numbered on each tape. These time code points are known as sync points. Each Lynx-2 module has a sync point register that can be captive or manually entered and trimmed.

Before automatically capturing an offset, the modules should already be configured and have successfully completed their individual time code checks, as described earlier in this chapter.

Sync point/captive procedure can be performed with the modules on or offline. If the modules are online it is not necessary to select a Master, since the calculated offset will be correctly transferred to the Slave module.

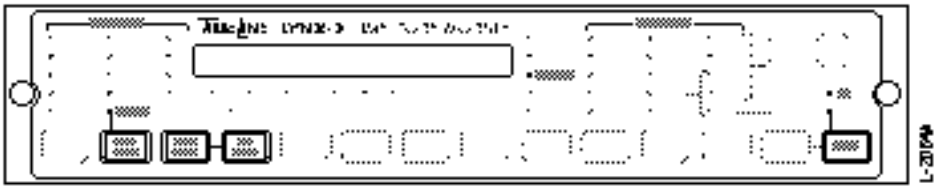


Figure Chapter 4 -12. Front Panel Sync Point/Set Hold Keys

1. Press PLAY (transport #1)
   Move the tape to a position that you would like to define as a Sync Point and STOP the transport.

2. Press [SYNC POINT + SET HOLD]

   SYNC PT LED flashes (two seconds) then remains solid
   Pressing the [SYNC POINT + SET HOLD] keys simultaneously, captures the current time code reader value in the Sync Point register. The SYNC PT LED comes on to indicate an active sync point register.

3. Press PLAY (transport #2)
   Move the second machine to the point that you wish to match the sync point marked on the first machine.

4. Press [SYNC POINT + SET HOLD]

   SYNC PT LED flashes (two seconds) then remains solid
   Pressing the [SYNC POINT + SET HOLD] keys simultaneously, captures the current time code reader value in the Sync Point register. The Sync point LED comes on to indicate an active sync point register.

5. Press [TRAN MODE]

   ONLINE LED on
   Puts all modules online.

6. Press [MSTR]

   MSTR LED on, 422 LED on (all modules)
   The Slave modules will automatically compute their offsets relative to the Master.

> Note:
> Storing a sync point value of '0', or trimming an offset calculated using sync points, will cancel the sync point and turn off the sync point LED.

Trim an OFFSET

Sometimes an OFFSET must be trimmed. The offset value can be increased or decreased in subframe increments (1/100 frame). For information on how to trim an offset value from the KCU, refer to the Keyboard Controller manual.

Offsets may be trimmed dynamically, while the tape is moving; by pressing [DSPL SEL] one or more times until the OFFSET LED comes on. Then press [SET HOLD] and use the [↓] or [↑] keys to modify the offset, while simultaneously monitoring the Master and Slave tapes. The Lynx-2 module will adjust the slave position so that the new offset is correct. In this way, it is possible to adjust two tape machines until the audio phases and they are in perfect synchronization.

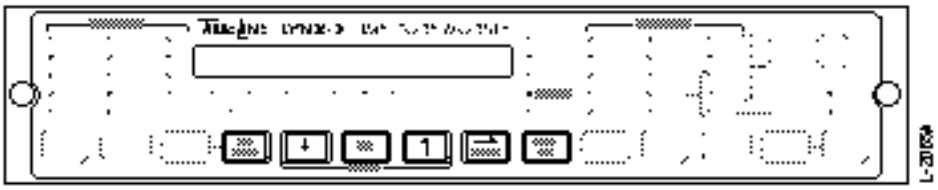


Figure Chapter 4 -13. Front Panel Offset Set and Trim Keys

1. Press [DSPL SEL]

   OFFSET LED on

   Press [DSPL SEL] one or more times until only the OFFSET LED is on. The offset value will be displayed.

2. Press [SET HOLD]

   Display flashes

   The offset may now be adjusted using the [↓] or [↑] keys, press [CLR] to set the offset to 00:00:00:00 and make the register inactive. Press [SET HOLD] one or more times to advance to the display column to be adjusted. An offset value may be adjusted in subframe (1/100th frame) increments. Press the [SET HOLD] key to step to the subframe column. Adjusting the offset may be done while the tapes are moving.

3. Press [STORE]

   Display stops flashing

   Stores the value currently displayed in the offset register. To exit offset adjust without storing the current value, press and hold [SET HOLD] until the display stops flashing.

Manually Set or Trim a Sync Point

In some instances, it is preferable to adjust or store a new master sync point and thereby cause all Slave machines to simultaneously recalculate their offsets rather than individually adjusting each offset.

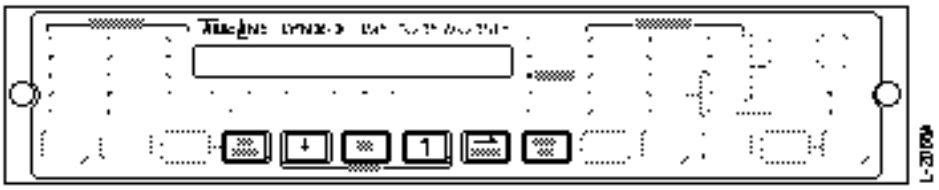


Figure Chapter 4 -14. Front Panel Sync Point Trim and Set Keys

1. Press [DSPL SEL]

   SYNC PT LED on
   Press [DSPL SEL] one or more times until only the SYNC PT LED is on. The sync point value is displayed.

2. Press [SET HOLD]

   Display flashes
   The sync point may now be adjusted using the [↓] and [↑] keys. Press [CLR] to set the sync point to 00:00:00:00 and make the register inactive. Press [SET HOLD] one or more times to advance to the display column to be adjusted.

3. Press [STORE]

   00:00:00:00
   Stores the value currently displayed in the SYNC PT register.

Locating to a Sync Point

When a Lynx-2 module is offline, the sync point register can be used as a single point autolocator.

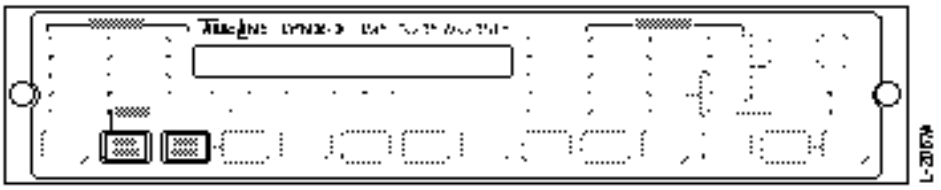


Figure Chapter 4 -15. Front Panel Sync Point Key

1. Press [TRAN MODE]

   ONLINE LED off
   Take the Lynx-2 module offline.

2. Press [SYNC POINT]
   Press the [SYNC POINT] key at any time to return to and park the machines at the sync point.

Synchronizing Lynx-2s with a KCU Controller

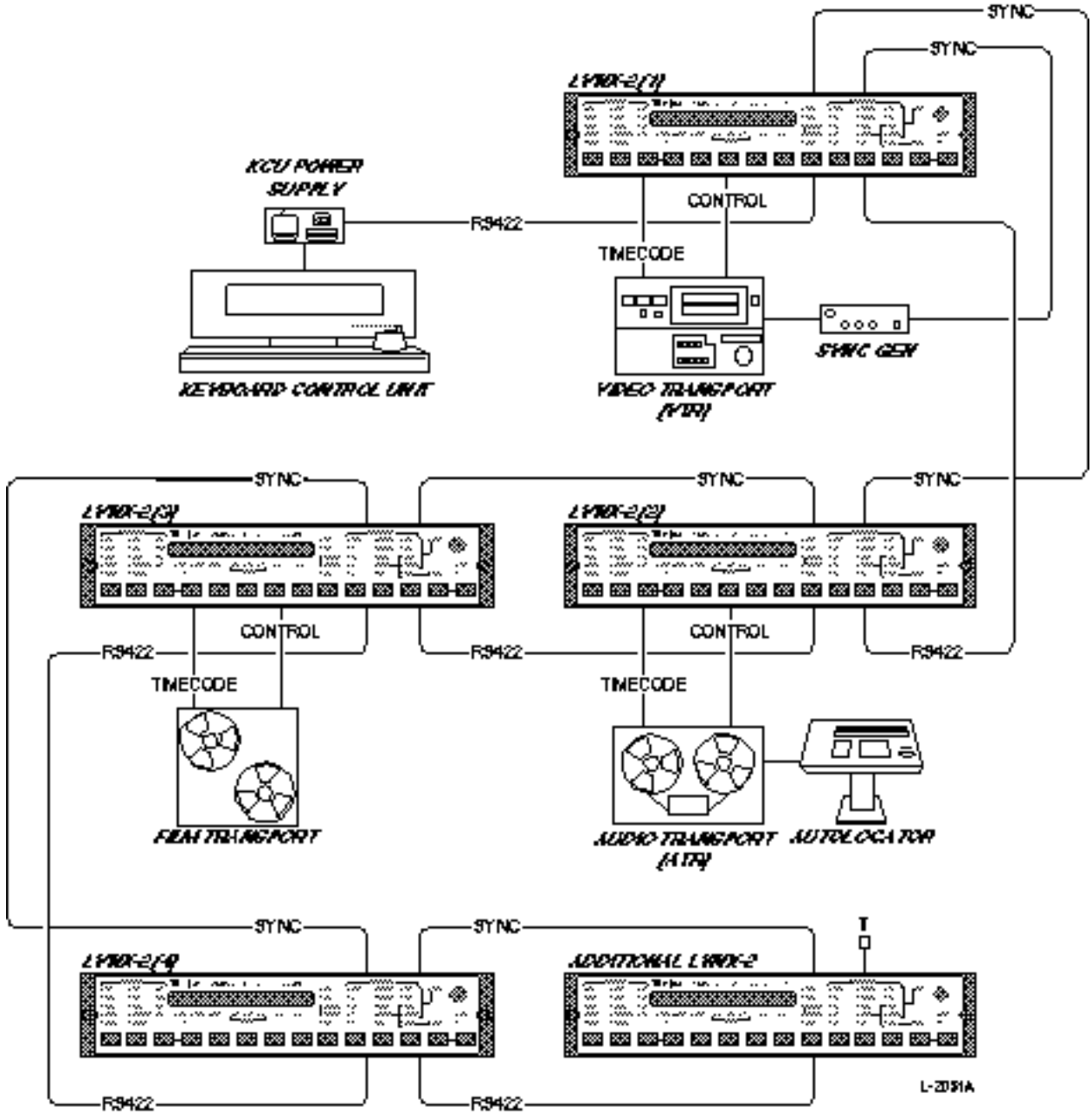


Figure Chapter 4 -16. Synchronizing Lynx-2s with a KCU Controller

Multiple video (or video and audio) transports may be synchronized with a controller or editor such as TimeLine's Keyboard Control Unit (KCU). The controller will simplify operations in situations where offsets change frequently.

To verify that the system is correctly connected, refer to Figure 4-2.

The following connections must be made for a KCU machine control system.

- EXT VIDEO: Connect a video sync cable between the external video reference and each Lynx-2 module. This can be done by looping from one module to the next. (Only required if video or digital audio machines are used.)
- RS422: Connect an RS422 cable between the KCU and each Lynx-2 module. This can be done by looping from one module to the next.
- TRANSPORT: Connect a transport cable between each machine and its controlling Lynx-2 module.
- TC IN: Connect a time code cable between each machine and its controlling Lynx-2 module.

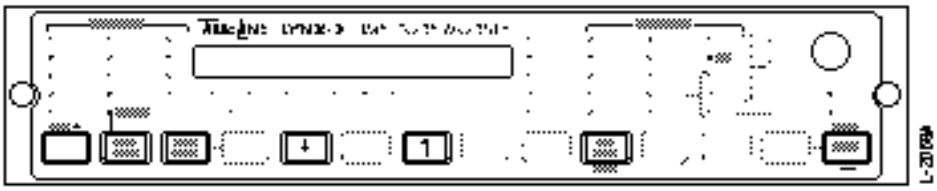


Figure Chapter 4 -17. Front Panel Setup for KCU Operation

1. Press [Power switch]

   Module turns on
   Turn on both Lynx-2 units. Confirm the setup parameters of each Lynx-2 as described at the beginning of this chapter.

2. Press [TRAN MODE]

   ONLINE LED on
   Put both modules online.

Remember: Give each module a unique address. If the KCU detects that the modules have the same address, the KCU will not poll correctly and the message: "Press the 'Poll' key to establish communications," will be displayed on the KCU.

The Lynx-2 power-on sequence displays the serial address of each module. If you need to review or change the address of a module, press [SHIFT] + [MSTR] simultaneously, then [GEN CODE] to access the address menu. Use the [↓] and [↑] keys to make changes. Press [SHIFT] + [MSTR] to exit setup

3. Press PLAY (transport)

   Display incrementing, VID LED on
   Let the Lynx-2 modules read time code for 10 seconds.

4. Press STOP (transport)

   Display stops
   The Lynx-2s are ready to be controlled by the KCU, an editor or other external controller.

Setup The KCU

> Note:
> To operate the KCU with the Lynx-2 module, the KCU processor board must be modified. See the Appendix for Service Bulletin (SB91-003) modification instructions. If your KCU operates with KCU080-14 software or higher, this modification has already been completed.

1. Turn on the keyboard control power supply unit. The KCU will automatically poll the Lynx-2, RS422 Control BUS to establish communications with the module. The LEDs corresponding to the addresses previously set on the modules will light. The 422 LEDs on each module will come on. The number of lit LEDs should match the number of connected modules. If not, see Table 4-3.
2. Press [SETUP] than [SYS] (KCU)

   Enter setup mode to select a system speed reference source.

   Press [0] (KCU keypad)

   SYSTEM OPTIONS displayed

   Use the KCU [+] and [-] keys to select Ext Vid or Int-Xtl as the system reference source.
3. Press [SETUP] (KCU)

   GRP Message displayed

   Press [SETUP] to exit setup mode. The KCU will display the following message: "Hold the 'GRP' key, and add the groups in order of priority."
4. Press [GRP] + [A] (KCU)

   "A" turns on

   Assign the transports to the machine group by simultaneously pressing [GRP] and the letter corresponding with each Lynx-2 address.

   The first machine selected is designated as the Master/reference transport and is indicated with a capitol letter/asterisk.

   Repeat step 4, for each transport. Notice if there is a dash under the machine's letter, this indicates that the machine assigned to this particular address is offline.

   Remember: [A] is assigned to the Lynx-2 with address #1, [B] to #2, and so on for the rest of the modules.

5. Press [TRAN MODE]

   ONLINE LED on
   If any modules are offline, put them online. The dash under the letter on the KCU display changes to a dot, this confirms that the assigned Lynx-2 is online.

Check the KCU System

The following procedure will help verify that all of the Lynx-2 modules and transports will operate correctly with the KCU in both solo and group mode. Any offsets previously entered on a Lynx-2 unit will be overwritten by the KCU.

1. Press [SOLO] then [A] (KCU)

   SOLO:A displayed
   This 'solos' the transport assigned to the [A] key.

2. Press [PLAY] (KCU)

   SOLO:A>L displayed on the KCU
   Play the transport for 10 seconds to allow the Lynx-2 to read the time code and lock. If you don't get a lock indication, refer to Chapter 5.

3. Press STOP (KCU)
   Repeat steps 1 and 2 for each transport.

4. Press [GRP] (KCU)

   A B C D E F displayed on the KCU
   The online status of all assigned Lynx-2s is displayed.

5. Press [STOP] (KCU)

   Selected machine CH displayed on the KCU
   Press [STOP] on the KCU, the Slave transports will chase and park to the current position of the Master transport.

6. Press [PLAY] (KCU)
   You should see all transports play and show lock.

Table Chapter 4 -5. KCU Troubleshooting With an External Controller.

Problem: Communication errors at KCU, or communications are established and then drop. *Solution*: • Check the Lynx-2 addresses, each Lynx-2 must have a unique address. If two modules have the same address, a communications conflict occurs. Note: To operate the KCU with the Lynx-2 module, the KCU processor board must be modified. See the Appendix for Service Bulletin (SB91-003) modification instructions. If your KCU operates with KCU080-14 software or higher, this modification has already been completed.
Problem: Press POLL on KCU but nothing happens. All the KCU address LEDs come on. *Solutions*: • Check the cabling. • Check the video reference. • Check the KCU software version. If old KCU software version is being used, then Lynx-2 module Editor setting needs to be set to "Old KCU". (See Features and Controls.)
Problem: When using the KCU, the display shows No Code (NC). *Solutions*: • Check the time code cable to the module. • Check the LTC LED on the Lynx-2 module. • Check the audio output level of the time code track on the transport.

Chapter 5 Troubleshooting

Error Messages

Introduction

The Lynx-2 module provides several levels of user information: system error messages, messages and warnings.

System error messages are displayed when the Lynx-2 is unable to perform due to a system failure or communications discontinuity.

Warnings are displayed if an illegal combination of commands is entered, or a condition exists that the operator may need to be aware of.

Messages are displayed to provide the user with system information, when a command sequence is entered incorrectly or a precondition is required for a command to operate.

System Error Messages

System error messages are automatically displayed. When an error occurs, normal operation can continue provided that communications between each piece of the system have not been completely lost.

BIPHASE Err

Cause: The film processor option board lost communications with the Lynx-2 main board.

Solution: Press [CLR] and/or cycle power. If this does not correct the problem, contact the factory.

Buffer Ovfl

Cause: Too many deferred messages have been received from an external controller for the Lynx-2 RS422 serial receive buffers.

Solution: Press [CLR] to cancel the error message. If this does not correct the problem, contact the factory.

Checksum Err

Cause: The front panel has received corrupted data, an unrecognizable message, or invalid token from the main board. Incompatible main board and front panel S/W version

Comm Timeout

Cause: Communications failure between the main board and the front panel or remote front panel. The front panel software has a 25 second time out and will display this message if communications are dropped. This would normally only be caused by connecting a front panel after the module has been powered up. It is possible for the LEDs and display to be functioning, but the key switches to be dead.

Solution: Check the front panel to main board or remote panel to AUX connector connections and repower the Lynx-2.

DEFER Error

Cause: An unknown deferred message was received on the Lynx RS422 communications bus.

Solution: Press [CLR] to cancel the error message. If this does not correct the problem, contact the factory.

Error C00

Cause: A transport capstan table error has occurred. The Lynx-2 module was unable to find a value.

Solution: Power cycle the module. If this does not correct the problem, contact the factory.

Error TA00

Cause: A transport tach table error has occurred. The Lynx-2 module was unable to find a value.

Solution: Power cycle the module. If this does not correct the problem, contact the factory.

Error TXT00

Cause: Lynx-2 communications bus, pin 5 frame timing has failed.

Solution: Power cycle the module. If this does not correct the problem, contact the factory.

Error PT00

Cause: Pilot tone output generation has failed.

Solution: Power cycle the module. If this does not correct the problem, contact the factory.

INIT Error

Cause: The film processor board was unable to establish communications on power up.

Solution: Power cycle the module. If this does not correct the problem, contact the factory.

MSG Ovfl Err

Cause: A deferred message that is too long was received on the Lynx RS422 communications bus.

Solution: Press [CLR] to cancel the error message. If this does not correct the problem, contact the factory.

MSTR REF Err

Cause: If the generator reference [GEN REF] is selected to reader the master reference {MSTR REF] can not be GEN but must be selected to VSO.

Solution: Select VSO as the master reference.

PCB Error

Cause: Incorrect software is fitted for the hardware configuration.

Solution: Contact your local dealer or the factory for assistance.

RS422 Error

Cause: An unknown message was received on the Lynx RS422 communications bus.

Solution: Press [CLR] to cancel the error message. If this does not correct the problem, contact the factory.

Warnings

CALIBR''N Err

Cause: The Lynx-2 was unable to calibrate the capstan outputs on power up.

Solution: Press [CLR] to cancel the error message.

CAPSTAN Err

Cause: The transport capstan servo is not responding to synchronization control.

Solution: Make sure that the correct transport is selected and that the transport is set for external control.

GEN LOCK Err

Cause: The generator servo has lost lock because the generator reference is not present.

Solution: Restore or change the generator reference source. Press [CLR] to cancel the error message.

GEN REF Err

Cause: An attempt to change the generator reference source was made when the module is selected as Master. A change to the reference source would cause an interruption to the Lynx-2 frame bus signal.

Solution: Deselect the Lynx-2 master and then change the reference source.

LYNX OFFLINE

Cause: An attempt to put the Lynx-2 module online has been made at a remote panel when the local panel has not been enabled.

Solution: Put the module on line locally first.

SERIAL Error

Cause: The transport is not responding to serial control and the serial line communications have timed out.

Solution: Make sure that the cable is properly connected to the transport. Check that the correct transport type has been selected in the transport setup menu.

Sony NAK Err

Cause: A Sony serially controlled transport has responded with a negative acknowledge (NAK) to a Lynx-2 command.

Solution: Power cycle the module. Check the correct transport type has been selected in the transport setup menu. If this does not correct the problem, contact the factory.

Ampex CHKSUM

Cause: An Ampex serially controlled transport has responded with unrecognized message header, NAK or checksum error to a Lynx-2 command.

Solution: Make sure that the cable is properly connected to the transport. Check that the correct transport type has been selected in the transport setup menu.

Sony CHKSUM

Cause: A serial checksum error has occurred with the selected Sony transport.

Solution: Make sure that the cable is properly connected to the transport. Check that the correct transport type has been selected in the transport setup menu.

- UNREF'D JAM -

Cause: The reader input can not be confirmed as resolved to the generator reference. It is likely that the generator and reader are running at different rates.

Solution: Resolve the transport to the generator reference.

VARI REF Err

Cause: A cross lock or varispeed master can not have a master reference set to VSO or if the master reference is selected to GEN the generator reference can not be RDR.

Solution: Select a valid master reference.

Messages

Calibrating

Cause: The Lynx-2 module as part of its power up initialization sequence is calibrating the capstan servo output for all three tape speeds.

DONE

Cause: The initial Lynx-2 configuration process has been completed. Press [STORE] to save your selections and complete configuration.

Generator ON

Cause: An attempt to change the Generator reference source or code type has been made while the generator is running.

Solution: Turn the generator off before making a change.

-- GEN PRESET --

Cause: The generator start time has been set to the time code value in the preset register by pressing the [SHIFT] and [GEN CODE] keys simultaneously.

Ignored

Cause: An external video reference source has been detected, but because VID is not selected as the generator reference it has been ignored.

---- JAM ----

Cause: Either an automatic or manual generator time code jam operation has occurred. The time code output will jump to the current reader value and continue to generate time code.

Master ON

Cause: A Lynx-2 front panel transport command has been attempted when the module is a master.

-- NO CODE --

Cause: The Lynx-2 module is online, in play and there is no time code or pilot tone input.

Solution: Check that there is time code on tape and a time code cable connected to the TC IN jack.

-- Play 30 --

Cause: Confirmation of change of transport tape speed. The Tach to time code frame relationship indicates a play speed of 30 ips.

-- Play 15 --

Cause: Confirmation of change of transport tape speed. The Tach to time code frame relationship indicates a play speed of 15 ips.

-- Play 7.5 --

Cause: Confirmation of change of transport tape speed. The Tach to time code frame relationship indicates a play speed of 7.5 ips.

TAPE OUT

Cause: The specified transport is not responding to a Lynx-2 motion command. The most common cause for this message is that the tape has spooled off the machine.

Solution: Check that there is tape threaded on the machine.

TRAN CLR

Cause: A [CLR] + [TRAN MODE] command has been issued to the module. The Lynx-2 will reset the synchronizer transport parameters to the factory default values.

TimeLine

Cause: TimeLine corporate logo, displayed each time that the module powers up.

Video = NTSC

Cause: The Lynx-2 external video detect routine has detected an NTSC video sync signal.

Video = PAL

Cause: The Lynx-2 external video detect routine has detected a PAL video sync signal.

NO MSTR OFST

Cause: An attempt has been made to enter an offset into a Lynx-2 Stand-alone Master module.

Solution: Re-enter the offset into a slave module.

NO FILM JMPR

Cause: Lynx Film Interface software version .001 or higher requires a jumper modification to the film processor board.

Solution: Refer to Service Bulletin SB94-004 for update specifications

Self Test Messages

The Lynx-2 front panel has a Self Test procedure, that is entered by pressing [SHIFT] + [↓] + [MAST REF]. There are three sections to the self test procedure, LED tests, key test and display test. Once in self test press [SHIFT] + [↑] or [↓] to step to the next test section. The following messages and information are displayed during the self test process. To exit self test the module must be powered down.

LED Tests # 10-15

There are six LED tests in the self test procedure. Press the [↑] and [↓] keys to step through each test.

10 Left side LED brightness matching.

11 Right side brightness matching.

12 All LEDs on test.

13 Red LEDs on only test.

14 Yellow LEDs on only test.

15 Green LEDs on only test.

Display Tests

Press [SHIFT] + [↑] or.[↓] to step to the display tests. Use the [↑] and [↓] to select one of the three display tests.

Horizontally scrolling ASCII character set.

All display pixels on.

Vertically scrolling ASCII character set.

Key Test

Press [SHIFT] + [↑] or [↓] to step to the key test. The display will indicate the key number of the key that is being pressed.

No keys pressed

Cause: The front panel key test routine is entered. Press keys to confirm that they are being correctly scanned. Press [SHIFT] + [↑] or [↓] to exit the key test routine and step to one of the other tests or power cycle the module to leave self test.

Chapter 6 Features and Controls

Introduction

The Lynx-2 Time Code Module contains four independent, functional units.

- Time code generator
- Time code reader
- Transport synchronizer/resolver
- Asynchronous communications interface

The Lynx-2 can also be fitted with either a film processor (biphase reader, generator) or a VITC reader option board.

The front panel controls provide the user with access to, and visual feedback for all of the Lynx-2 functions. It is important to understand that the front panel keys, LEDs and display are multi-functional.

The front panel indicators and display have been designed to provide the maximum level of user information. The LED layout is grouped by function: the left side of the front panel indicating the transport and synchronizer status and the right side of the panel indicating generator and system reference status.

Features - Front Panel

- 16-character, alpha-numeric, dot matrix, time code display.
- Comprehensive LED status indicators.
- Front panel transport remote control mode, with single point search to cue.
- Record, rehearse and tape speed LED status indicators.
- Designed to be remotely located from the module chassis. (An optional, remote mounting kit with blank front panel is available).
- Removable front panel permits access to the system software PROM, generator, reshape and pilot output adjustment pots, the module's ground isolation jumpers, and the module's Serial Number.

Generator

- Generates all worldwide time code standards: SMPTE (DF and NDF), EBU, Film.
- MIDI time code.
- Selection of internal, video, pilot, mains or reader as generator ref.
- External video sync input accepts NTSC or PAL, black burst, composite video or composite sync.
- Access to time code User Bits.
- Automatic or manual jam sync modes.
- Pilot field rate output (60, 59.94, 50, 48 Hz), locked to generator.

Reader

- Wideband, bi-directional operation, 1/10 to 60x play speed.
- Automatic detection of time code type, over a wide range of input levels.
- Selectable time code reader input bandwidth filter.
- Code-type LED indicators.
- LED indicators showing valid LTC, VITC or serial time code.
- User bits display.
- Automatic display of subframe offset errors in the ERR mode.
- Reader display “hold” function.
- Reshaped time code and Pilot Tone output locked to Reader.

Synchronizer

- Rapid locate and sync lock-up time.
- Subframe offsets supported.
- Supports wide-band LTC, VITC, serial time code or TACH for location.
- Automatic switch over to Pilot Tone input for continued synchronization if time code is lost.
- Speed-only resolver from either time code or Pilot Tone input.

Communications

- Industry standard RS422 serial data at 38.4 kilobaud.
- Serial data communication via 9-pin, “D” subminiature connectors, as per SMPTE standard. Communications “Daisy chained” between Lynx-2 modules and controller.
- Serial data cable length up to 1000 ft. (300 meters) maximum.
- 8-pin Din Macintosh computer interface port.
- 15-pin “Sub-D” connector AUX communications serial port.

Additional Features

- Compatible with all existing Lynx systems.
- Built-in serial transport control interface.
- User selectable Serial Time Code synchronization.
- Masterless system; any machine may be selected as master. All machines (including master) resolve to the selected reference speed.
- Built-in Gearbox processor function permits X-Frame synchronization. And, with the TimeLine KCU, variable speed synchronization.
- Built-in support for Sony 5800 series VCRs.

Serial Number

Always refer to the serial number and software version when consulting with your dealer or the factory. The number is located behind the removable front panel.

The serial number is recorded at the factory to track software, hardware, and other engineering changes.

Option Cards

Film Processor: A special plug-in interface card allows seamless integration of sprocketed film transports into a Lynx-2 machine control system.

Machine Interfaces

The Lynx-2 provides direct selection of transports from the following manufacturers:

AEG, Akai, Alesis, Ampex, Denon, Fostex, JVC, 3M, Mitsubishi, Otari, Panasonic, Saturn, Sony, Stellavox, Studer, Tascam

Editor Interfaces

The Lynx-2 supports direct connection to an editor machine port, using Ampex VPR-3 serial communications. It will also connect directly to digital audio workstations with VPR-3 machine control capability.

Complete emulation of video tape transport; locks audio transport to video sync reference. Accepts video editor commands. Reports transport status to editor.

Front Panel Controls and Indicators

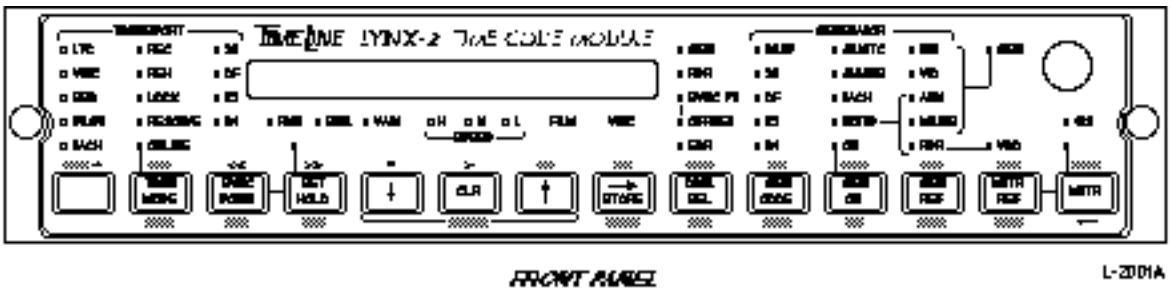


Figure Chapter 6 -1. Lynx-2 Front Panel

This section identifies each functional block on the front panel of the Lynx-2 Time Code Module. The function of each key and LED indicator is described in detail.

The Lynx-2 front panel switches are used in one of three operational modes, directly, shifted and in setup. The shifted functions are indicated above the switches and are accessed by simultaneously pressing the blue shift key and the desired function key. The setup functions are indicated below the switches. Setup mode is accessed by simultaneously pressing the blue shift key and the [MSTR] key. Setup mode is “latched” and the setup menus and functions can be directly accessed. To exit setup mode, press shift and [MSTR] again.

SHIFT Key

All front panel keys except for the [SHIFT] key, permit access to multiple functions. The [SHIFT] key is a single function key used in conjunction with other keys, to access the second- and third-level functions of each key.

The [SHIFT] key must be pressed and held when a shifted function is selected. The shifted function is indicated above each key. For example, when the [SHIFT] and [GEN REF] keys are pressed simultaneously, the time code reader BWL (bandwidth limit) filter is activated.

Pressing the [SHIFT] and [MSTR] keys together permits access to the Lynx-2 module setup menus.

The setup menu function of each key is indicated beneath each key. For example, when the [SHIFT] and [MSTR] keys are pressed simultaneously, followed by the [GEN REF] key, the AUX-1 menu is activated.

In this section, the shifted and setup functions are indicated by { }. For example, {MODE}.

Display

The Lynx-2 has a bright, 16-character, high resolution dot matrix time code display. The display provides the user with time code status for all of the necessary time code registers and also an easy method of entering and modifying time code data, by using the set hold and store keys. In Setup, the display is used to provide a clear and simple method of configuring the Lynx-2 menu options. In normal operation, the characters at the left and right sides of the display are used to convey additional system information.

Left side of display, irrespective of time code source selected:

> Machine is in play

G Machine is in search

>> Machine is in fast forward

<< Machine is rewind

Left side of display, when ERR display is selected:

>L Machine is in play and locked to the system reference

>XL Machine is in play and cross frame locked to the system reference

>VL Machine is in play and varispeed lock. The module may also be cross framed to the system reference.

Right side of time code display

.00 Subframe (1/100 frame) offset error displayed

UB Time code user bits displayed

TC Time code position displayed. TC is only shown when the Lynx-2 is fitted with an option card that permits the display to be updated from a second source (i.e., biphase).

Bi Biphase position displayed

Pr Preset displayed

Master Reference Controls and Indicators

The [MSTR REF] key is used to select the synchronizer Master machine reference. It toggles between GEN and VSO.

- When GEN is selected, the generator reference is used as the master reference source.

  When VSO (Variable Speed Override) is selected, the master machine play speed is used as the master reference source.
- Pressing the [SHIFT] and [MSTR REF] keys simultaneously, displays the software version installed in the Lynx-2 module.
- In setup, the [MSTR REF] key access the AUX 2 menu, this menu is not currently used.

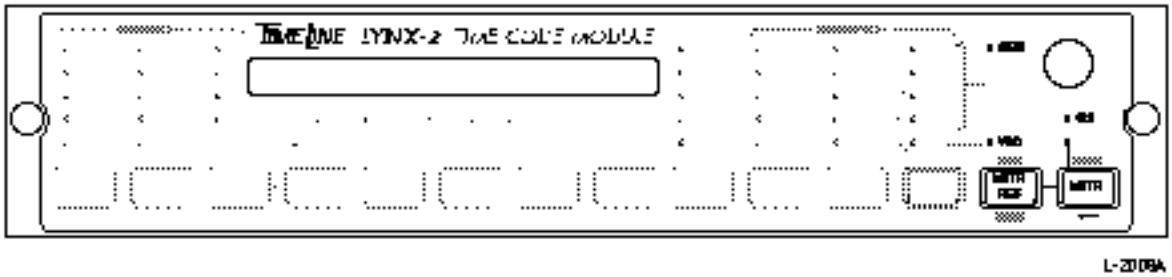


Figure Chapter 6 -2. Master Reference Controls and Indicators

GEN LED

There are two choices of Master reference: Gen or VSO. When Gen is selected, the generator reference source is used as the system speed reference. When VSO is selected, the speed of the Master transport is used as the system speed reference.

Press the [MSTR REF] key to select either Gen or VSO. As indicated by the brackets on the front panel when Gen is selected, the Master reference is the same as the generator reference.

INT - The module's internal crystal
VID - An external video source
AUX - An external auxiliary source
MAINS - The module's AC power line frequency,

which have all previously been described.

VSO LED

When the VSO (Variable Speed Override) LED is lit, it indicates that the Lynx-2 is not controlling the Master machine and that is running at its own play speed.

In VSO, the incoming speed of the Master machine time code is used as the Master reference and passed down to the slaves as the play speed reference for synchronization.

The master transport's VSO control can be altered, thus affecting the play-speed of the entire system. Using VSO as the MSTR REF also provides a "code only" master environment, so that the system can lock to a "wild" time code.

When in VSO mode, the Lynx-2 module will track the speed of the master transport up to ±15% of numerical play speed. A disadvantage of using VSO as the MSTR REF is that wow and flutter may be passed down from the master to slaves. This effect is minimized by digital filtering in the Lynx-2 module.

Remember, AUX, MAINS and RDR/VSO are non-standard speed reference sources.

MSTR Key

The [MSTR] key is used, to designate a Lynx-2 module as the system Master. The module must be ONLINE to be selected as master. The MSTR LED and the 422 LED will light. Once a master is selected, the [MSTR] keys on all other modules in the system are deactivated.

A new Master can be selected at any time by:

1. Pressing the [MSTR] key on the current master so that the MSTR LED turns off.
2. Pressing the [MSTR] key on the module that you would like to be the new master.

   Remember, any module can be master.

The [MSTR] key is only active if you are *not* using an editor or controller. When a controller is used, the master selection is done by the controller.

Pressing the [SHIFT] and [MSTR] keys simultaneously, puts the module into setup mode. The setup mode is used for Lynx-2 setup, initialization and option menu selections. Access to each option menu is either by pressing the [TRAN MODE] key one or more times or directly. The keys used for direct menu access are indicated under each key. The arrow under the [MSTR] key indicates that the setup functions are active. See the Appendix for a complete transport setup menu.

RS422 LED

When on, the 422 LED indicates that the Lynx-2 is either transmitting or receiving RS422 serial data. All 422 LEDs should be on in a KCU system or SAL system when the Master is selected.

Time Code Generator: Controls and Indicators

The LEDs below the generator heading indicate generator status information. The keys below the LEDs are used to select generator code type, generator mode and reference source, and turn the generator on/off. For further information on the Lynx-2 generator functions see the Time Code Generator Section.

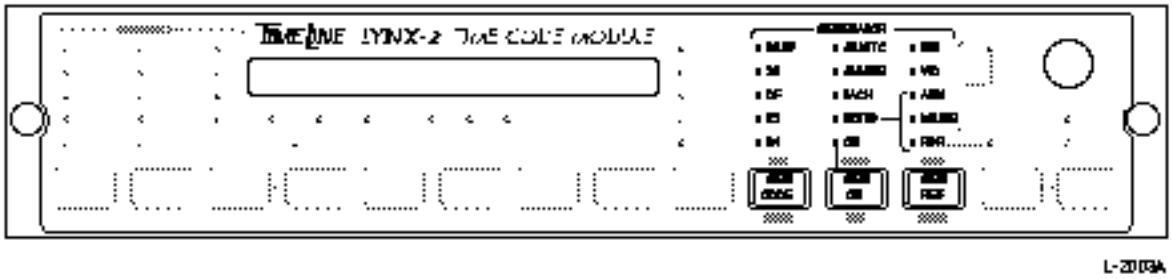


Figure Chapter 6 -3. Generator Controls and Indicators

GEN CODE Key

The [GEN CODE] key is used to toggle through the various combinations of speed and code type. Each time you press the key, the next time code type is selected. The LEDs light up in the following sequence:

1. 29.97 and 30: SMPTE non-drop at 29.97 fps
2. 30: SMPTE non-drop at 30.00 fps
3. 29.97 and DF: SMPTE drop frame at 29.97 fps
4. DF: SMPTE drop frame at 30.00 fps
5. 25: EBU Code
6. 24: Film Code

Jam

Pressing the [SHIFT] and [GEN CODE] keys simultaneously, has two functions. When the generator is off, this presets the generator start time to the value stored in the generator preset register. The default generator preset value is 00:59:45:00. Any value can be stored in the generator preset register by pressing [DSPL SEL] to select the generator, and [SHIFT] and [DSPL SEL] to toggle the display to the preset register. The generator preset is indicated by a “Pr” in the right of the display; use the set hold and store method of entry to update the value. A “Gen Preset” message is displayed each time the generator start time is updated.

Pressing the [SHIFT] and [GEN CODE] keys simultaneously when the generator is on, allows you to manually jam the reader value into the generator register. It is only possible to manually jam time code when the generator is in normal mode (i.e., no other jam function has been selected).

ADDR

In setup, the [GEN CODE] key, accesses the module's address, editor type and master transmission type menu.

The module address is used when a Lynx-2 module is part of a system that is managed by an edit controller. Within such a system, each module must have a unique address for the controller to correctly communicate. Addresses are assigned between '0' and '127'. The default address is '1'.

> Note
> No two modules in a system can have the same address.

Table Chapter 6 -1. ADDR Setup Menu

KEY	MENU	SUB-MENU	RANGE	
GEN CODE	ADDR	Address	0 - 127	
		Editor	KCU Old KCU CMX GVG ACE	VRC2 BOSS CASS POGOL TLC
		Mstr type	V500 V7/600	

- When the Lynx-2 module is used as part of a system managed by an edit controller, the edit controller type must be defined. Once you've entered the ADDRess setup menu, press [NEXT] to step to the editor select table.
- Use the [↑] and [↓] keys to move through the list of controllers. Select the controller that you are using from this list and press [SHIFT] and [MSTR] to exit and save this selection as part of the module's default setup. Once selected, the Lynx-2 will initialize to this editor type each time the module is powered up.
- When the Lynx-2 module is used in SAL mode, the Master RS422 message transmission type must be defined. Setup menu option, "Master", in the Lynx-2 module is used to determine SAL X-frame rate operation. To enter setup, press the module [SHIFT] and [MSTR] keys together. Press the {ADDR} key, the "Editor and Address" column is displayed, then use the FORW and BACK keys until "Master" is displayed. The Master option defaults to V600, which should only be used if all the modules in the system are Lynx-2's or are Lynx modules fitted with V600 software.

- When this option is set to V600, the “time line” rate and code type information is transmitted over the serial port, so that more than one Lynx-2 or V600 module can be cross frame synchronized, simultaneously in SAL operation. If there are any modules with V500-26 or earlier software in the system, use the [↑] and [↓] keys to set the Master option to V500.

GEN CODE LEDs

The Lynx-2 module can generate all worldwide standard time codes. When the generator reference is set to internal crystal (INT), the user can define the speed and code type as needed. If INT is **not** selected, code type selection is restricted by the choice of reference source. The LEDs above the [GEN CODE] key indicate the speed and code type that has been selected.

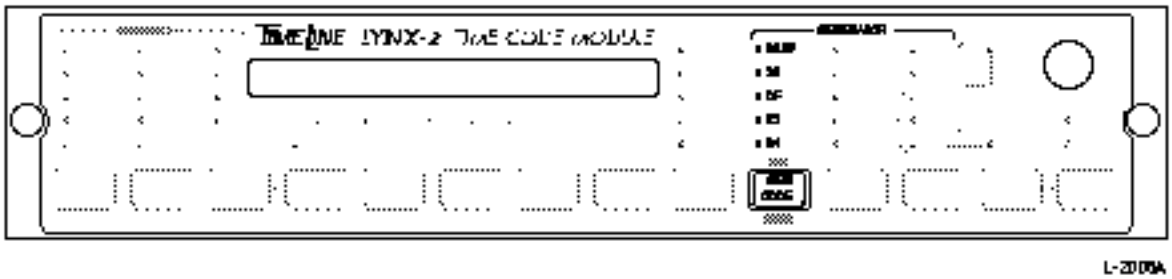


Figure Chapter 6 -4. Code Type Control

29.97 LED

When the 29.97 LED is illuminated, it indicates that time code is being generated at a speed of 29.97 fps. This is the NTSC color speed reference and the NTSC color standard.

The 29.97 LED can be lit in combination with the DF LED and 30 LED. If the DF and 29.97 LEDs are lit, this indicates that the generator's speed is 29.97 fps *and* the code type is DF. This is the common broadcast configuration.

If the 30 and 29.97 LEDs are lit, this indicates that the speed is 29.97 and the code type is NDF. This is the standard music recording format.

When the Lynx-2 generator reference is NTSC video, the 29.97 LED will automatically light, to indicate the incoming reference source rate.

If the 29.97 LED flashes in combination with the 25 or 24 LED's, it indicates that the generator is X-frame locked to an NTSC reference source. 25-frame code will be generated at 24.975 fps and 24-frame code will be generated at 23.976 fps.

30 LED

The 30 LED indicates that the time code being generated is SMPTE 30 frame code (non-drop). This LED does not indicate whether the frame rate is 30 or 29.97 fps. That indication is provided by the 29.97 LED.

DF LED

The DF LED indicates that the time code being generated is the SMPTE "drop frame" code type. This LED does *not* indicate whether the frame rate is 30 fps or 29.97 fps. That indication is provided by the 29.97 LED.

DF, is a non-linear counting system that "drops" certain numbers every hour so that the time code module's display and the elapsed time, when running at a frame rate of 29.97, will match. A total of 108 frames are dropped during each hour of program time, allowing the time code display to catch up to the actual elapsed time.

The Lynx-2 will generate DF code at 29.97 and 30 fps rates. Drop frame code running at 30 fps is a non-standard code.

25 LED

The 25 LED indicates that the time code being generated is 25-frame EBU code, running at a speed of 25 fps. When the Lynx-2 reference source is PAL video or 50 cycle AC MAINS, this code type is automatically selected.

24 LED

The 24 LED indicates that the time code being generated is 24-frame film code, running at a speed of 24 fps. This is the standard film rate.

GEN ON Key

The [GEN ON] key is used to:

- Turn the generator on and off. The LED directly above the [GEN ON] key lights when the generator is running
- Pressing the [SHIFT] and [GEN ON] keys simultaneously, allows generator mode selections to be made.
- In setup, the [GEN ON] key accesses the OPTions menu. The options are described in more detail below.

Generator Mode

[SHIFT] and [GEN ON] allows you to select a generator mode. The mode may only be changed when the generator is stopped.

To select a generator mode, press and hold the [SHIFT] key then press [GEN ON] to toggle through each of the choices in the generator mode section. When no LEDs are lit, the Lynx-2 is in the Normal or default mode.

In normal mode, when the generator is running, you may press [SHIFT] and [GEN CODE] simultaneously, to momentarily "jam" (or insert) the current reader time code value into the generator register. The generator continues to generate sequential time code from the jam time code value.

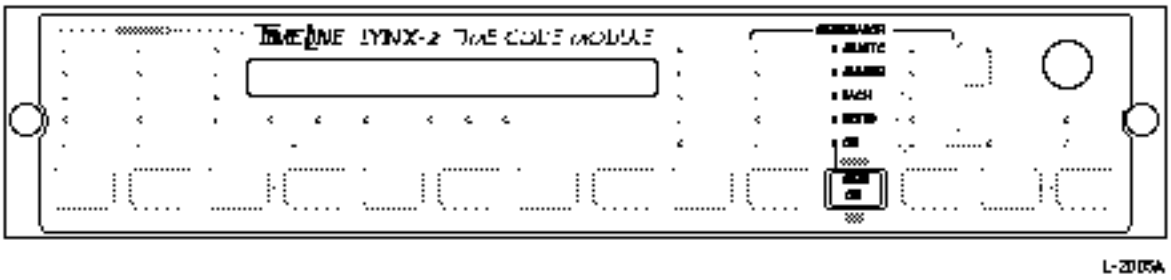


Figure Chapter 6 -5. Generator Modes

Care should be taken when jamming and restriping time code that the source transport is resolved to the generator reference. A "Gen Ref ERR" display message will be displayed if the incoming code is a different code type, or not referenced to the generator.

Options Setup Menu

To access the OPTions menu, press [SHIFT] and [MSTR] simultaneously, then press [GEN ON]. The OPTions menu provides access to the following module options:

- Capstan Wild Speed
- Generator Message Hold
- Lifter Defeat
- Locate Speed
- Lock Delay
- Lock Window
- Mute Relay
- Park Ahead
- Phase Lock
- Pilot Out
- Sample Rate
- Serial Initialization
- Serial Tape E/E
- Serial Time Code
- Serial Time Code Lock
- Video Park Window
- X-frame Generator

To select items in the OPTions Menu, use the [NEXT] and [LAST] keys to scroll left and right through the menu. Use the [↑] and [↓] arrows to set the option that corresponds with your operational requirements.

Table Chapter 6 -2. OPT Setup Menu

KEY	MENU	SUB-MENU	RANGE
GEN ON	OPT	Capst wild	-128 - +127
		Gen msg hold	OFF ON
		Lift dft	OFF AUTO WIND ALWAYS
		Locate speed	20 - 255
		Lock delay	0-50 frames
		Lock window	0-75 subframes
		Mute	NORMAL UNTIL RSLV UNTIL LOCK NOT LCK/STP IF NOT LOCK
		Park ahead	0 - 30
		Phase lock	ON OFF
		Pilot out	GEN RDR
		Sample rate	48 44.1
		Ser init	ON OFF
		Ser tape/ee	TAPE LCL AUTO
		Ser TC	OFF[TT1] LTC/VITC LTC VITC
		Ser TC lock	ON OFF
		Vid park win	0-10 frames
		X-frame gen	ON OFF

Press [SHIFT] and [MSTR] to exit and save these selections as part of the module's default setup. Once selected, the Lynx-2 will initialize to these settings each time the module is powered-up.

The transport related setup options are sorted in the transport table. If a new transport is selected, the default values are loaded for the transport. The previous changes will be retained with the old transport and restored when that transport is re-selected.

Capstan Wild Speed

It allows the "wild speed" of a machine to be adjusted when a voltage-controlled machine does not run at the right speed before synchronizing, or a tape has been recorded off pitch. This is an advanced feature, which should generally not be used, except by an experienced user. Please note this information is held separately for each transport, and is restored when the transport is re-selected. It is NOT erased when [TRAN + CLR] is pressed. It is only erased if a complete memory clear is performed by holding the [CLR] key on power up. This is to allow the information to be retained when selecting another machine.

Generator Message Hold

This allows the Lynx-2 to momentarily display generator error messages or hold the messages until cleared by the user. The error message will be displayed until the [CLR] key is pressed. This is useful when the module cannot be monitored during time code striping.

Lifters

This option allows the user to select the conditions under which the Lynx-2 issues a Lifter Defeat command, to the local transport.

- Off - Lifters never defeated by Lynx-2. This mode prevents the module from defeating the lifters, as it approaches the park or cue point. This mode prevents precise tape location. Use of the off mode usually causes slower lock-up times.
- Auto - Normal lifter operation. While in normal locate or cue operations, the Lynx-2 will close its mute relay and issue a Lifter Defeat command as the tape approaches its destination. This helps the module determine a precise position, and allows the transport to park within a 9-frame park.
- Wind - Lifter defeat mode. In this mode the Lynx-2 defeats the lifters and engages the Mute relay during all fast-wind, cue, locate and high-speed shuttle operations, allowing high-speed time code to be read. To allow accurate transport location, this mode should be used whenever the tape has discontinuous or spliced time code.
- Always - Full-time Lifter Defeat mode. In this mode the Lifter Defeat command is active whenever the Lynx-2 is online. This mode should be used as little as possible as the tape is always on the head and should not be used with tape machines that use a shared logic line to control lifter defeat and other functions.

Locate Speed

SPD - This option allows the user to adjust the dynamic approach speed on a given transport. This is done to accommodate unusual conditions relating to tape pack and reel size, etc.

The default value of the Approach Speed parameter is set for normal conditions, and is part of the pre-programmed setup information that is loaded into the synchronizer when a transport is selected from the Transport Selection Menu. In unusual circumstances, such as very lightly loaded reels or full 14" reels, it may be desirable to adjust the Approach Speed parameter to eliminate any tendency to undershoot or overshoot a locate point. The Approach Speed is displayed in arbitrary units, ranging in value from 050 to 255.

Lock Delay

The time in frames (0-50 fr) that the machine has to be continuously in the lock window, before it is considered that the transport is locked, and the module will show lock status. It should be noted that very short lock delays could result in the machine locking in the wrong place.

Lock Window

The time code window or threshold in subframes (0-75 sfr), which the machine has to be within before the lock delay starts running. The lock window setting can be adjusted when time-to-lock may be more critical than lock accuracy. This can be used to fix problems with unstable machines, bad or misframed time code or to cause a Digital or Video tape transport to release with a looser lock tolerance. The setting is used in conjunction with the Lock Delay setting.

Mute

This option selects the operating mode for the module's Mute relay:

- Normal - Normal Mute relay mode. The Mute relay follows the Lifter Defeat logic (see above). When the lifters are defeated by the module, and tape comes into contact with the heads, the relay will be energized.
- Until RSLV - Mute until Resolved. This mode is the same as Normal, except that additionally the relay will stay muted in Play, until the Resolve LED lights. The mute relay opens only when the machine is within 25 subframes of Lock. This ensures that the audio will stay muted while the machine is slewing into a lock condition.

- Until Lock - Mute until Locked. This mode is the same as Until RSLV, except that the module's mute relay remains closed until the LOCK LED comes on. This occurs at about ±2 subframes of offset error.
- Not Lock/Stp - In this mode, the mute relay is only energized during tape wind modes. The relay is not energized during jog or when stopped.
- If not locked - In this mode, the mute relay will energize whenever the module is not locked, in stop or jog or shuttle modes.

Park Ahead

The amount of frames a transport will park ahead of a locate point. Some machines benefit from a longer, or shorter park ahead time. Also, sometimes it may be necessary to have video transports park exactly to the locate, or park point. In this case, a park ahead value of '0' would be selected. Except when set to '0' the park ahead value is dynamically learned by the Lynx-2 to optimize lock time.

Phase Lock

This allows control over the lock mode of the module. Phase mode ON is the normal "resolve after lock" mode, used by the Lynx-2 module. Phase mode OFF provides for automatic resynchronization, in the event that a frame number difference of frame offset error develops (due to a tape splice, for example). The Phase modes are:

- Phase Mode OFF. After initial synchronization, the module continues to observe frame number, and corrects for frame number errors if they occur. If a frame number error (or Offset Error) occurs, the module will resynchronize at a constant, slow rate that should be audibly undetectable.
- Phase Mode ON (default mode). After initial synchronization, the module reverts to a phase-lock mode and maintains resolved speed, while ignoring the actual frame numbers. This allows the module to "free-wheel" over any discontinuities or jumps in the time code, at the resolved speed. The Resolve LED on the module will flash and the offset error (ERR) will display any jump or discontinuity between the master and slave time codes.

Pilot Out

This option selects the reference for the pilot output. It can be set to GEN or RDR. When set to GEN the pilot output is locked to the generator reference, when set to reader the pilot output will lock to the time code reader input.

Sample Rate

Sample rate selection for reel-to-reel digital audio transports. This option replaces dual 48 and 44.1 sample rate selections in the transport setup menu. This setting is used to automatically compensate for the tach rate frequencies at the different sample rates.

Serial Initialization

This option will inhibit the initialization sequence normally transmitted to a serial transport when a Lynx-2 is switched ONLINE or when the transport itself is switched from LOCAL to REMOTE. This means that operating parameters associated with the color framer, tape E/E selection, servo reference, anticlog timer, and tape timer mode will not be overridden by the Lynx-2.

Serial Tape E/E

This options menu provides three TAPE E/E modes for serial transports using Sony protocol.

- TAPE. Always tape playback (default)
- LOCAL. Tape E/E as selected locally at the transport
- AUTO. Automatic tape E/E switching provided by the transport.

> Note:
>
> To support Local and Auto modes, the Lynx-2 will, at the appropriate times, issue STOP commands instead of still commands; since only a STOP command will allow the transport to switch to E/E.

Serial TC

The serial time code option defines how machines using Sony serial protocol will lock to serial time code. If supported by the transport, the Lynx-2 module will request either LTC, VITC or Tape Timer information to use as serial time code.

- OFF[TT1]. The Lynx-2 requests only tape timer information from the serial transport. It is used as follows:

  Lock to serial time code enabled: Synchronization is performed using control track alone. The tape timer time code defines tape position absolutely, and may be reset or preset from a KCU.

Lock to serial time code disabled: Longitudinal time code via the time code reader is used for synchronization, and the tape timer is used for tach updating only. In this mode, the tape timer is used in a relative sense and does not define absolute tape position.

- LTC/VITC. The Lynx-2 requests either longitudinal or VITC time code. Arbitration between the two is performed by the transport itself. This is the normal selection for most transports.
- LTC. The Lynx-2 requests longitudinal time code only.
- VITC. The Lynx-2 requests VITC only.

A complete description of Serial Time Code features is in Chapter 10, Advanced Features.

Serial Time Code Lock

This selection enables or disables the serial time code lock function.

Video Park Window

The park window in frames (0-10 fr), for video and film transports only. This is used to accurately cue a video transport to a specific location. If the park window is set to zero, the transport will respond to a ±1 frame locate. The video park window setting is set for all VTRs and is not reset when a different video machine is selected.

X-frame Generator

In normal operation, the Lynx-2 time code generator generates time code at the selected system reference rate. The X-frame Gen option can be used to allow the Lynx-2 generator to X-frame generate code types. Set this option to on, if it is desired to generate a code type that is not the same as the selected Video reference or mains frequency (i.e., to generate 25-frame code when locked to NTSC video).

GEN Mode LEDs

Normal Mode

When none of the LEDs are lit, the generator is in *normal* mode. In the normal mode, the generator begins generating continuous time code, starting with the value entered in the generator register. The generator is locked to one of the selected generator reference sources.

Jam TC LED

When on, the Jam TC LED indicates that the generator will automatically jam sync to the reader input after three consecutive, valid time code frames are read. The time code read from the rear panel TC IN jack is transferred to the generator register and becomes the current generator time code value.

If intermittent or bad time code is read while in the Jam time code mode, the module will continue to generate continuous code until three consecutive, valid frames of code are received. At this point, it will re-jam.

This mode is used to regenerate code when making tape copies, or for reconstructing code that is poorly recorded or has dropouts.

JAM UB LED

When on, the Jam UB LED indicates that the generator is generating time code, with the “user bits” portion of each time code word being filled with the incoming time code reader value.

This mode is used when it is desired to transfer, for informational purposes, the original time code value from a source reel onto a new production reel.

To display the User Bits register, press the [SHIFT] and [DSPL SEL] keys simultaneously. The letters UB are shown in the display to indicate that the user bits are being displayed. Press [SHIFT] and [DSPL SEL] to return to the normal time code display.

Remember, in a normal operation, the generator will set the user-bits portion of the time code to 00:00:00:00, unless another value is intentionally entered by means of the front panel or during a Jam UB sync operation.

TACH LED

When on, the TACH LED indicates that the generator will generate time code based on the TACH information from the machine. The Lynx-2 will convert tach pulses into a SMPTE time code value. Note that the actual time code value is arbitrary and can be preset using the Lynx-2 [SET HOLD] key.

N/STD LED

There are three non-standard reference sources. These are considered non-standard because the Lynx-2 has no control over the code speed and therefore, it may not meet time code specifications. This LED lights if the generator reference selected deviates by more than ±0.2% of the numerical rate.

GEN REF Key

The [GEN REF] key is used:

- When pressed it toggles through the module's choices of available generator reference sources.
- Pressing the [SHIFT] and [GEN REF] keys simultaneously, toggle-activates a BandWidth Limit (BWL) filter on the reader input.
- In setup, the [GEN REF] key accesses the AUX 1 menu. This menu is used for setting the film processor option parameters.

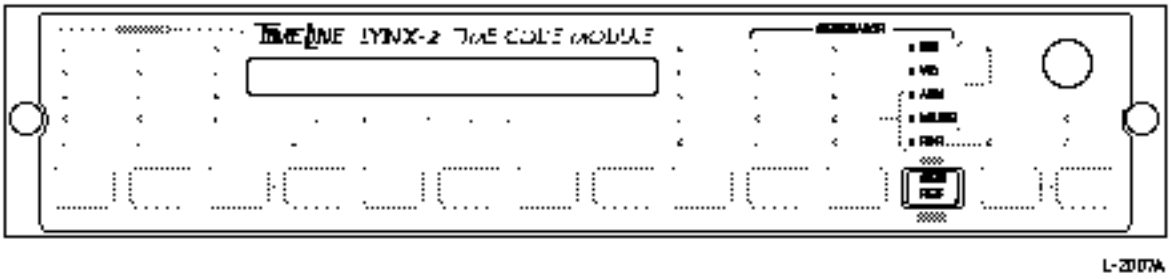


Figure Chapter 6 -6. Reference Source Controls and Indicators

BWL

Press [SHIFT] + [GEN REF] to select the bandwidth limit filter. The BWL LED will come on to indicate that a 50 kHz bandpass filter has been inserted in the time code Reader circuit. This filter helps eliminate spurious noise that might otherwise pollute incoming time code.

AUX 1 Setup Menu

In setup mode, the GEN REF key accesses the AUX-1 menu. To access the AUX-1 menu, press [SHIFT] and [MSTR] simultaneously, followed by {AUX 1}. The AUX-1 menu is available only when a film interface option board is fitted in the Lynx-2 module. It provides access to the following film options:

- Film frame rate
- Film acceleration
- Film fast speed
- Film input
- Film time code

To select items in the AUX-1 menu, use the {NEXT} and {LAST} keys to scroll left and right through the menu. Use the [↑] and [↓] arrows to set the option that corresponds with your operational requirements.

Press [SHIFT] and [MSTR] to exit and save these selections as part of the module's default setup. Once selected, the Lynx-2 will initialize to these settings each time the module is powered-up.

Table Chapter 6 -3. AUX-1 Setup Menu

KEY	MENU	SUB-MENU	RANGE
GEN REF	AUX-1	Film FRMS/SEC	24 25 30
		Film accel	4-32
		Film fast spd	1-20 (limited by selected pulse rate)
		Film in	BI-PHASE TACH/DIR
		Film TC	FILM GEN SYSTEM

Film Frame Rate

This option selects the nominal film frame rate at sync speed. It can be set to 24, 25, or 30 frames-per-second. The selected frame rate is indicated by the 24, 25 and 30 transport code type LED's.

NOTE:
If NTSC video is selected as the system reference, the biphase generator will run 0.1% slow.

Film Acceleration

This option sets the ramp or acceleration rate of the biphase generator. The acceleration values are normalized to play speed. An acceleration value of '1' means the biphase output accelerates at 1x play speed per second, with a value of '5', the output will accelerate at '5' times play speed per second.

Film Fast Speed

This option sets the maximum fast wind speed of the biphase generator. The fast speed value is expressed as a multiple of play speed; a value of '6' would limit the wind speed to 6x play speed. The maximum fast speed that can be set, is also limited by the selected biphase pulse rate.

Film Input

The film follower or biphase reader input can be set to read either biphase or tach and direction signal inputs.

Film Time Code

This menu item allows the operator to set the time code format used by the Lynx-2 reader, thus controlling the film cross-framing method.

- FILM - The reader will operate and display the biphase frame rate, as in the previous version of the Lynx-2 software (this is the default mode). The biphase frame rate is set by the Film FMRS/SEC Lynx-2 menu.
- GEN - The reader will use the time code format of the LTC generator. This corresponds to the original Lynx method, and requires the operator to preset the generator code type.
- SYSTEM - If the Lynx-2 is a slave, then the reader will automatically follow the time code type of the master deck. If the Lynx-2 is a master, then:
  a. In a KCU system, if the Lynx-2 is also the reference transport, then the reader time code type will be determined by the KCU FILM menu "Ref Code Type". Otherwise, the reader code type will be that of the actual reference transport.
  b. In a stand-alone system, the reader will use the same time code format as the LTC generator.

GEN REF Key LEDs

The [GEN REF] key selects the Lynx-2 generator reference source. The generator reference source determines the speed that the generator will run at, and is used by the Master module as the system speed reference.

INT LED

When generating time code, the INT LED indicates that the generator is referencing the module's INTernal crystal.

VID LED

When generating time code, the VID LED indicates that the generator is referencing an external controller, or video source, that is plugged into one of the two EXT VID jacks on the rear panel.

If VID is selected as the GEN REF, but no video signal is present, the VID LED will flash and a "Gen ref Err" message appears in the display.

AUX LED

When generating time code, the AUX LED indicates that the generator is referencing a 50-60 Hz signal that is connected to the AUX jack on the rear panel of the module. Remember, this is a non-standard REF SRC.

MAINS LED

When generating time code, the MAINS LED indicates that the generator is referencing the module's AC power line as a reference frequency. Remember, this is a non-standard REF SRC.

RDR LED

When generating time code, the RDR LED (above the [GEN REF] key) indicates that the generator is referencing time code that is connected to the TC IN jack on the rear panel of the module. Remember, this is a non-standard REF SRC.

Display Controls and Indicators

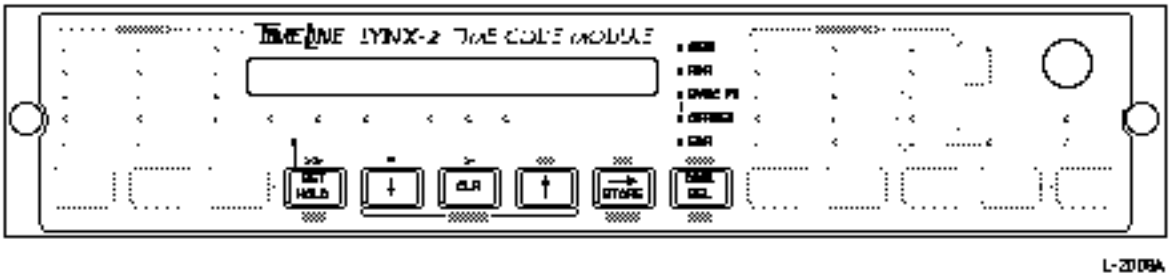


Figure Chapter 6 -7. Display Controls and Indicators

DSPL SEL Key

The [DSPL SEL] key is used:

- When pressed, it toggles the main display so that the GEN, RDR, SYNC PT, OFFSET and ERR values can be read.
- When [SHIFT] and [DSPL SEL] are pressed simultaneously, the code user bit values are displayed.
- In setup, the [DSPL SEL] key is used to access the TRANsport select menu.

UBITS

Press [SHIFT] and [DSPL SEL] simultaneously to display the user-bits portion of the time code value in the display. The following are the codes shown in the display:

UB Time code user bits displayed

TC Time code position displayed. TC is only shown when the Lynx-2 is fitted with an option card that permits the display to be updated from a second source (i.e., biphase).

Bi Biphase position displayed

Pr Preset displayed

TRAN Setup Menu

TRAN refers to the transport menu in the Lynx-2 setup configuration. In setup, press the [DSPL SEL] key for access to the TRANsport menu.

Use the [NEXT] and [LAST] keys to scroll through the alphabetic list of transport manufacturers. Use the [↑] and [↓] arrows to move through the supported machines. Select the machine that you are using from this list. Press [SHIFT] and [MSTR] to exit setup and to save this selection as part of the module's default setup. Once selected, it will become part of the global setup that is loaded each time the module is powered-on.

Table Chapter 6 -4. TRAN Setup Menu

KEY	MENU	MANUFACTURER	TRANSPORT
DISPL SEL	TRAN	AEG	M-20
		Akai	DR-1200
		Ampex	ATR-100 ATR-124 MM1200 VPR-3 VPR-6 VPR-80 VPR-300
This is a small example of the Transport menu. The complete Transport menu can be found in the Appendix (Cable Reference Guide).			

DSPL SEL Key LEDs

There are five LEDs above the [DSPL SEL] key. These LEDs indicate which register is accessed, for the alpha-numeric display.

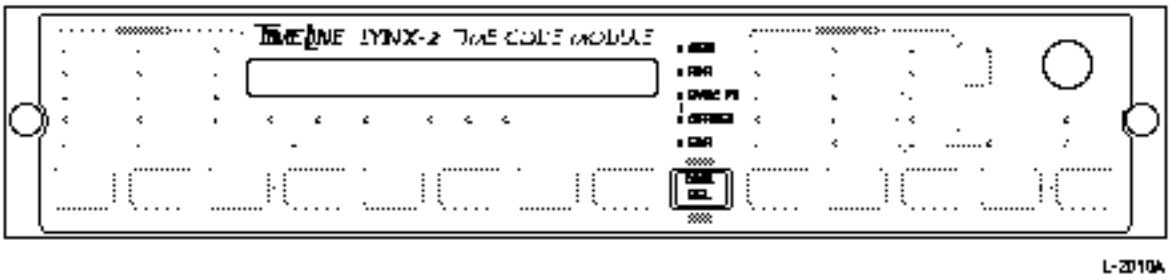


Figure Chapter 6 -8. Display Control and Indicator LEDs

GEN LED

When on, the GEN LED (above the [DSPL SEL] key) indicates that the main display is showing the value in the generator register. The code type (above the [GEN CODE] key) and generator reference LEDs indicate the reference source and code type being generated.

RDR LED

When on, the RDR LED (above the [DSPL SEL] key) indicates the tape transport position. The reader position can be updated by one of several transport signal sources. When time code is being read, the LTC LED turns on and the actual incoming time code value appears in the display. When LTC is not present, one of four other sources is sequentially selected to update the display. The lowest priority is transport tach pulses, if the TACH LED turns on, it indicates that tach pulses are being counted and used to update the display.

SYNC PT LED

When turned on, the SYNC PT LED indicates the sync point register value.

The sync point register value is used to automatically calculate offsets between machines. If the sync point register is active, the sync point LED will remain on. The [DSPL SEL] key is stepped through the options.

OFFSET LED

When turned on, the OFFSET LED indicates the offset, if any, between the master and slave machines.

Offset is a numerical value representing the time difference between the master and slave transport positions. It is always applied to the slave modules. The offset is subframe accurate.

Offset is determined as follows:

Slave time code	03:20:40:15
- Master time code	02:10:20:15
= Offset number	01:10:20:00
or	1hr 10min 20sec 0frames

If the slave module has an offset, the offset LED will remain on. The [DSPL SEL] key is stepped through the display options.

ERR LED

The ERR LED (also called offset error), indicates that the display is showing the actual position of the local machine in relation to the master. The offset error value will count down to zero as the slave machine synchronization. Once the slave machine is in lock, the error value should read >L0.00.

In “search” mode, the display shows the distance to the search point. Subframe values are not displayed in search mode.

> Note
> With video machines, a small subframe error may be displayed even after the machines are locked. This is the phase error between the time code and control track. This is not a problem if the value is constant. If the value drifts, the machines are not locked and it is likely that the time code generator reference source was not video when the tape was striped.

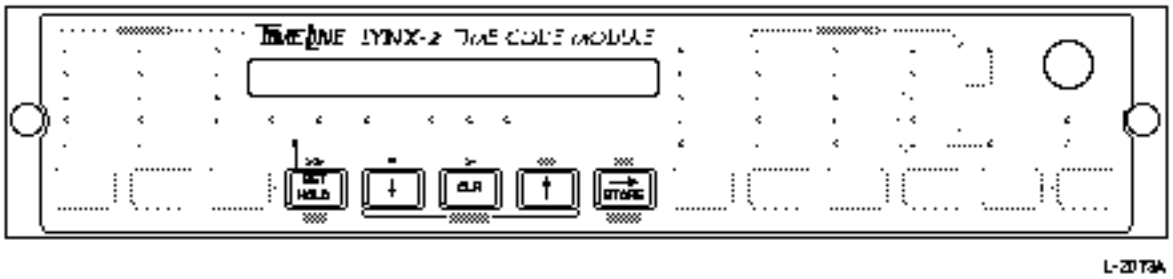


Figure Chapter 6 -9. Display Control Keys

SET HOLD Key

The [SET HOLD] key is used to:

- If the [SET HOLD] key is pressed and held, it will hold or momentarily “freeze” the display for two seconds. ADJUST keys may then be used to enter offsets, sync points, generator or reader values.
- If the [SET HOLD] key is pressed and released, the display will hold and the SET HOLD LED will flash. The [↑], [CLR] and
  [↓] keys can then be used to enter or adjust offsets, sync points, and generator or reader values.
- When [SET HOLD] is pressed, the “frames” column (far right on the main display) will flash. Adjust and set the frames value as needed. Press [SET HOLD] again and the “seconds” column flashes. Enter the desired “seconds” value. Each successive press of the [SET HOLD] key moves the flashing display column to the left, allowing data entry.

  Once you’ve entered your values, press the [STORE] key to save the new value to a register of your choice. To transfer a time code value, press the [DSPL SEL] key one or more times to select the display register you want to store in. By this method, the Lynx-2 allows time code values to be captured and transferred to another register. For example, a sync point value can be transferred to the time code generator.

To release the display, *without* saving the changes, press and hold the [SET HOLD] key until the SET/HOLD LED turns off (approx. 2 seconds). The display will resume counting.

Fast Forward

Pressing the [SHIFT] and [SET HOLD] keys simultaneously, will put the local machine in “fast forward” mode.

Next

In setup mode, the [SET HOLD] key is used as the NEXT key. This key allows you to step to the next item in a setup menu.

Key

The [↓] (down arrow) key is used to adjust values while in the SET HOLD mode. It subtracts ‘1’ from the number in the flashing display column. Hold the key down for continuous scrolling.

Stop

Pressing the [SHIFT] and [↓] keys simultaneously, allows you to “stop” the local machine.

Menu

In setup mode, the [↓] is used to change option menu items.

CLR Key

The [CLR] key is used to clear the display in SET HOLD mode, and set a value of 00:00:00:00 to clear error messages or prompts from the display.

Play

Pressing the [SHIFT] and [CLR] keys simultaneously, will put the local machine into “play”.

Key

The [↑] (up arrow) key is used to adjust values while in the SET HOLD mode. It adds ‘1’ to the number in the flashing display column. Hold the key down for continuous scrolling.

Rehearse

Pressing the [SHIFT] and [↑] keys simultaneously, will put the local machine into rehearse. The REH LED above the [TRAN MODE] key will light when the transport is in rehearse.

STORE Key

The [STORE] key is used:

- To store a time code value in SET HOLD mode.
- For time code and OFFSET values, one of the LEDs in the DSPL SEL column will be lit, indicating which register the value will be stored in. When STORE is pressed, the value in the display is stored into the selected register, and SET HOLD mode is canceled.

Record

Pressing the [SHIFT] and [STORE] keys simultaneously, puts the local transport into RECord. The REC LED above the [TRAN MODE] key will light when the local transport is in record.

Timing Setup Menu

In setup mode, the [STORE] key accesses the timing option menu.

The Timing menu is used to adjust the default Record command advance timing. TimeLine has calculated this for each machine, at each speed, when the Lynx-2 is under external editor control. The record timing compensation is used when a machine is put into record in an edit sequence. The Record command is issued, fractionally, in advance of the edit In point, so that the machine is fully in record at the In point. The Record advance value for each machine is automatically set when a machine is selected from the transport table. When the Lynx-2 is operated in SAL mode, the record timing menu values are not used. The Timing menu also contains the Rehearse command In and Out method, these are also automatically set when a machine is selected from the transport table.

Table Chapter 6 -5. Timing Setup Menu

KEY	MENU	SUB-MENU	RANGE
STORE	TIMING	IN ADV High OUT ADV High IN ADV Med OUT ADV Med IN ADV Low OUT ADV Low	0 - 255 ms 0 - 255 ms 0 - 255 ms 0 - 255 ms 0 - 255 ms 0 - 255 ms
		Rehearse IN	0 - Latch REH 1 - Pulse REH 2 - Pulse REH + PLAY 3 - Pulse REH + REC IN 4 - Latch REH + REC IN 5 - Pulse REC 6 - Long Latch REH + REC IN
		Rehearse OUT	0 - Unlatch REH 1 - Pulse PLAY 2 - Pulse REH 3 - Pulse PLAY + REC OUT 4 - Pulse REC 5 - Pulse REH then PLAY

The Lynx-2 module transport, record advance timing, can be checked or adjusted by running a test edit with the selected machine. Once the test edit procedure has been performed, the settings are saved in battery backed ram. If another machine is selected, the settings will be reset to the factory defaults.

Record timing adjustments are made in setup mode. Press the [SHIFT] and [MSTR] keys simultaneously followed by the {TIMING} key to enter the timing setup menu. Use the {LAST} and {NEXT} keys to step to the transport speed setting that you want to adjust. The values indicated in the display correspond to the delay in milliseconds, between the Lynx-2 module record command being issued and the transport actually going into record. In an ATR, this delay is composed of a number of components, which include erase/record head spacing, record bias ramp timing and transport control microprocessor command scanning rate.

There are separate settings for record in and record out at each transport speed. If the delay is known, use the [↑] and [↓] keys to adjust the timing at the selected speed. The Lynx-2 module will then issue the Record In and Out commands this amount ahead of real time so that the resultant on tape edit will be correct.

If the record delays are not known, use the following procedure to adjust the In and Out timing. While performing the test edits, make sure the ATR is set to “Sync-Repro” or “Sel-Sync”.

The procedure uses a video tape transport as an accurate edit timing source to make comparative edits on the ATR. Set up the VTR as the record deck, load a scratch tape with prerecorded time code and audio material, or record time code and a 1 kHz tone on tape. Set up a 20 second duration edit with an in point at an even numbered time, for example 2:00:00. Perform the edit to black: this will leave the VTR audio track signal ending at 2:00:00 and restarting at 2:20:00 precisely.

Make the ATR the record deck and the VTR a source deck. To adjust the record in timing, perform an edit with a 10 second duration and the same in point for both machines as used in the previous edit. Replay the audio machine and listen for the VTR audio. Adjust the Lynx-2 record in timing value until the VTR audio is just heard in the ATR edit. Start by making coarse adjustments (25 ms steps) to bring the test edit point into the proper timing range and then fine tune the value until it is satisfactory. Repeat for each tape speed.

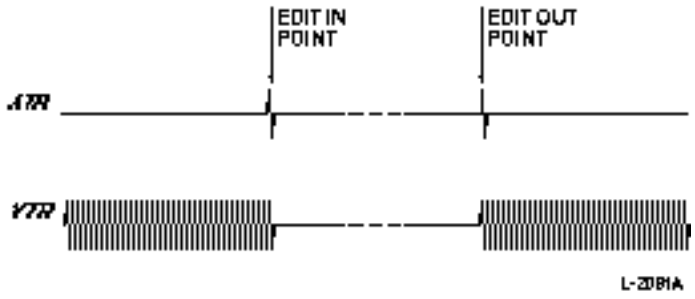


Figure Chapter 6 -10. Record In/Out Timing

To adjust the record out timing, set up a 10 second edit with the edit out point for both machines at 2:20:00. Perform the edit and replay the audio machine, and listen for the VTR audio. Adjust the Lynx-2 record out timing value until the VTR audio is just heard in the ATR edit. Repeat for each tape speed.

After each trial ATR edit, it is recommended that the audio on the ATR machine is manually erased, so that each test edit is performed on blank audio tape. Consideration should be given, to the fact that the ATR's microprocessor command scan times may vary, and there could be a slight variance in record timing from one edit to the next.

Transport Controls and Indicators

TRAN Mode Key

The [TRAN MODE] key is used to put the module on and offline. When online, the transport is under Lynx-2 control. When offline, the transport is released from Lynx-2 control.

Resolve

Press [SHIFT] and [TRAN MODE] simultaneously to select resolve mode. This mode is reserved for future implementation.

Menu

In setup, the [TRAN MODE] key is used as the menu key. Pressing the menu key sequentially steps through the setup option menus. The menu key is useful to quickly scan the menu structure if you can't remember which menu you need.

Reader Source LEDs

The LEDs on the left of the module, under the Transport heading, are "Reader" indicators. The Reader status LEDs are active regardless of other information being displayed on the front panel.

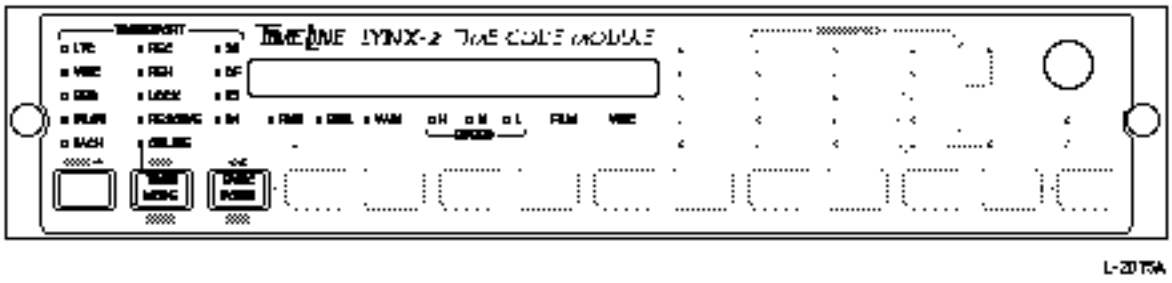


Figure Chapter 6 -11. Transport Controls and Indicators

LTC LED

When lit, the LTC LED indicates that either valid Longitudinal Time Code (LTC) is present a the modules TC IN jack, or Interpolated Serial Longitudinal Time Code is being updated from the machine's serial port. In this case, the SER LED will also light indicating valid Serial LTC.

VITC LED

The VITC LED will light when Serial Vertical Interval Time Code is being updated from the machine's serial port. The SER LED will also light indicating valid Serial VITC.

SER LED

When lit, the SER LED indicates that valid serial time code is being read from the machine's serial port. Either the LTC or VITC LED will also light, indicating the type of serial time code detecred. This feature is only available with serial VTRs that are fitted with an address track time code reader.

PILOT LED

When lit, the Pilot LED indicates that Pilot Tone is present at the module's PILOT IN jack, and that the synchronizer is using the pilot signal to lock or resolve the transport. If the transport feeds both time code and Pilot Tone to the module, the module will automatically switch to reading the Pilot if valid time code is lost.

TACH LED

When lit, the TACH LED (above the [SHIFT] key) indicates that transport tach pulses are being used to update the reader position. This LED will also light under two other circumstances: If a Lynx-2 Film Module detects valid biphase and when the module is using serial control tach pulses alone to synchronize the transport.

The transport reader LED display can be summarize by the following table.

Table Chapter 6 -6. LED Status

	LED's				
Time Code Source	**LTC**	**VITC**	**SER**	**PILOT**	**TACH**
LTC via reader	X	--	--	--	--
Pilot Tone	--	--	--	X	--
Tach Update	--	--	--	--	X
Biphase	--	--	--	--	X
Serial LTC	X	--	X	--	--
Serial VITC	--	X	X	--	--
Serial Tape Timer 1	--	--	X	--	X
Interpolated Serial LTC	X	--	X	--	X
Interpolated Serial VITC	--	X	X	--	X

Note: "Interpolated" indicates that the time code is being updated from control track pulses by the transport itself.

X indicates that the LED is "On".

Transport Status LEDs

Above the [TRAN MODE] key there are five LEDs that provide transport status information.

ONLINE LED

When the ONLINE LED is lit, the Lynx-2 module will respond to system commands and take control of the transport's capstan servo to synchronize the machine.

When the ONLINE LED is not lit, the Lynx-2 module relinquishes control of the transport's capstan speed. The SYNC POINT key and shifted function transport control keys can still be used to locate and control the machine.

REC LED

The RECord LED is a tally indicator. When the REC LED is on, the local transport is in record.

REH LED

The REHearsal LED is a tally indicator. When the REH LED is on, the local transport is in rehearse. Rehearse is used in editing when an edit sequence is checked prior to going into record.

LOCK LED

When the LOCK LED is on, the transport is in "play" and its time code is synchronized with the master reference. The machine is locked and in sync.

The LOCK condition is also displayed by the letter "L", in the offset err (ERR) display. The LOCK LED has an approximately one second delay, while the system determines the stability of the lock status.

When the Lynx-2 is controlling a VTR or DAT machine, the transport is brought into lock by the synchronizer, then released to its own internal servo reference. When the transport is released to its own servo reference, it may reframe. The LOCK and RESOLVE LEDs will stay lit as long as the machine does not lose LOCK, and stays within 25 subframes of the correct position.

RESOLVE LED

When lit, the RESOLVE LED indicates that the transport is in "play" and that its' time code is resolved to within 25 subframes (25/100 frame) of the master's reference source.

SYNC POINT Key

The [SYNC POINT] key is used to:

- Cue a transport to the current sync point. This feature only operates when the local transport is offline (ONLINE LED is off).
- Pressing the [SHIFT] and [SYNC POINT] keys simultaneously, will put the transport into “rewind”.
- In setup, the [SYNC POINT] key is used as the LAST key. The LAST key allows you to step back to the previous item in a setup menu.

Transport Code Type LEDs (30, DF, 25, 24)

The four LEDs under the Transport heading indicate the code type connected to the reader input. These are simply Reader status lights. One LED will always be on solid to indicate the off-tape code type. If this code type is not the same as the Master reference, then a code type LED will flash to indicate the type of the Master. The Lynx-2 will synchronize the dissimilar code types. See Advanced Features for information on X-frame synchronization.

Miscellaneous LEDs

There are several LEDs on the Lynx-2 module that are simple status lights. The user has little or no control over these LEDs. They are:

- When on, the RMT LED indicates the Remote/Local select status on serially controlled machines that support this feature. If this LED flashes, it indicates that the machine is set to local control.
- When on, the BWL LED indicates that the bandwidth limit function has been selected.
- When on, the VARI LED indicates that the transport is in varispeed synchronization mode. A KCU fitted with K600 series software must be used for varispeed operation.
- When on, the H,M,L SPEED LEDs indicate the nominal tape speed of the local transport (i.e., 30/15/7 1/2 ips).
- When on, the FILM and VITC LEDs indicate the presence of either the FILM or VITC option cards.

Bulkhead Features

The removable Lynx-2 front panel provides access to a number of Lynx-2 features.

- Module software prom
- Module serial number
- Generator code output level adjustment
- Reader reshaped time code output adjustment
- Pilot output level adjustment
- Chassis ground isolate jumper
- System test points
- System operation confidence LEDs

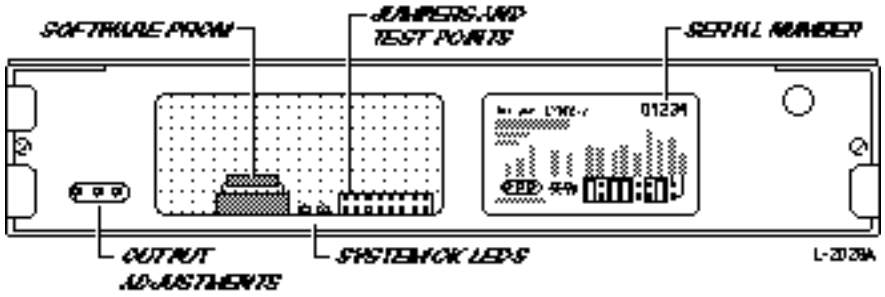


Figure Chapter 6 -12. Bulkhead Features

The nominal setting for the output level adjustments is -8 VU. The adjustment pots have a range of from zero to +10 dBm.

A chassis ground isolation jumper is provided. This jumper allows the user to choose between having the signal and chassis grounds connected or separated.

The video and communications grounds are always isolated. Other jumpers and test points include:

- Optional interface card jumpers
- Software program jumpers
- Test points.

The Lynx-2 system software can be updated by change the PROM (U50) immediately behind the front panel bulkhead cut out. Please refer to PROM Installation Guide (Part Number 73625) when installing new Lynx-2 software.

The Lynx-2 Serial Number is located on the bulkhead label. This number is required for all communications with the factory.

Two system “OK” confidence LEDs are provided. Both of these LED's should be on, in normal operation.

Rear Panel

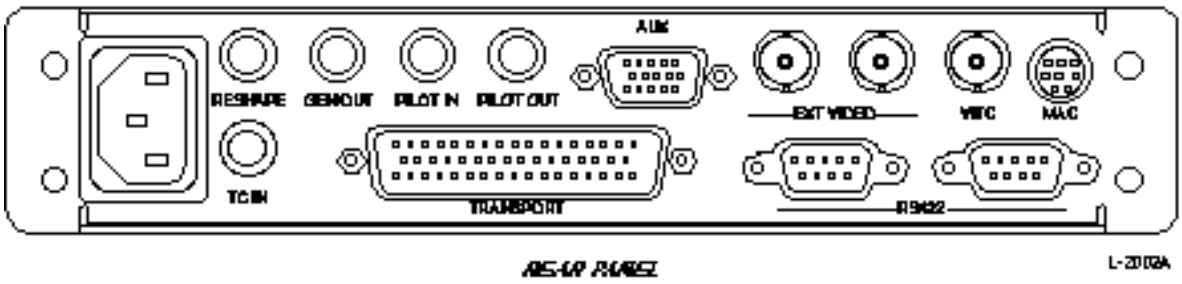


Figure Chapter 6 -13. Rear Panel

This section identifies each connector and jack on the rear panel of the Lynx-2 Time Code Module, and describes its function in detail.

AC Power Cord Connector

The AC power cord connector is a molded socket that accepts an international standard 3-pin IEC cord.

The power cord connector accepts the factory-supplied IEC power cord.

The Lynx-2 power supply has an internal fuse that is at a correct ratio for the module. Should this fuse fail, it is likely that the power supply unit will have to be replaced. Please refer all servicing to qualified service personnel.

RESHAPE

RESHAPE is a squared-up output of the Reader input. This is an electronically balanced, female 1/4" TRS phone jack.

A RESHAPE level potentiometer is located behind the removable front panel. Use this pot to adjust the output level of the reshaped time code, as needed.

GEN OUT

GEN OUT is the time code generator output jack. This is an electronically balanced, female, 1/4" TRS phone jack. It provides generator time code when the generator is on.

A GEN OUT level potentiometer is located behind the removable front panel. Use this pot to adjust the output level of the generator, as needed.

PILOT IN

PILOT IN accepts Pilot Tone input. This is a differential input, female, 1/4" TRS phone jack. Pilot Tone is used by the synchronizer to resolve transport speed to the generator reference speed source.

PILOT OUT

PILOT OUT is a dedicated Pilot output. This is an electronically balanced, female, 1/4" TRS phone jack. The pilot output is software selectable to follow either generator reference or reader input.

It provides a 60, 59.94, 50 or 48 Hz sinusoidal wave that is locked to the generator reference or time code input. The frequency of this signal is always twice the frame rate of the reference. Pilot Tone output is always present, provided that the generator reference or reader signals are present.

A Pilot out level potentiometer is located behind the removable front panel. Use this pot to adjust the output level of the Pilot Tone as needed.

AUX

The AUX port uses a standard 15-pin, "D" connector. It can be used to access the external "lock-status" output, or as the mute relay. It is also used as an expansion serial port for connecting a remote front panel to the Lynx-2. See the Installation Section for the connector pin-out description.

EXT VIDEO

Two EXT VIDEO, female BNC connectors are provided. Either may be used to provide a reference signal for the generator and synchronizer. The BNCs are hard-wired together in parallel, so that the unused plug becomes an extension. Use the second connector to loop video through the Lynx-2, or terminate the video input by attaching a 75 ohm terminating plug.

VITC

A VITC jack is provided so that the Lynx-2 module can read VITC. To read VITC, the VITC option card must be installed.

MAC

This is a standard Macintosh computer DIN-8, mini-circular connector, configured for direct connection to an Apple MACintosh computer printer or modem port. The serial port is RS422 and is available for future development. This port is currently used to output MTC (MIDI time code), which can be used to interface to other MIDI applications.

TC IN

TC IN is the Time Code Input Connector. This is a differential input, female, 1/4" TRS phone jack. This jack is used as the input for the time code reader. Attach the output of the machines time code track to this jack.

TRANSPORT

TRANSPORT is a 50-pin, "D" style connector used to interface to each transport with factory-supplied transport interface cables. See the Installation Section, for the connector pin-out.

RS422

Two, standard 9-pin, female, RS422 connectors are provided. These are used to connect a Lynx-2 module to other Lynx-2 modules, or to an external controller or editor. All Lynx-2 modules in a system must be joined together using standard RS422 cables. The RS422 connectors are wired in parallel. Use the second connector to loop through or daisy-chain to the next module.

Ground Isolation

There are two Ground/ISO jumpers behind the removable front panel. These allow you to isolate the signal and chassis grounds as needed.

- In the GND position, the signal and chassis grounds are tied together.
- In the ISO position the signal and chassis grounds are electrically isolated.

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. See the Troubleshooting Section, for further information on correcting ground loop problems.

Chapter 7 Time Code Generator

Introduction

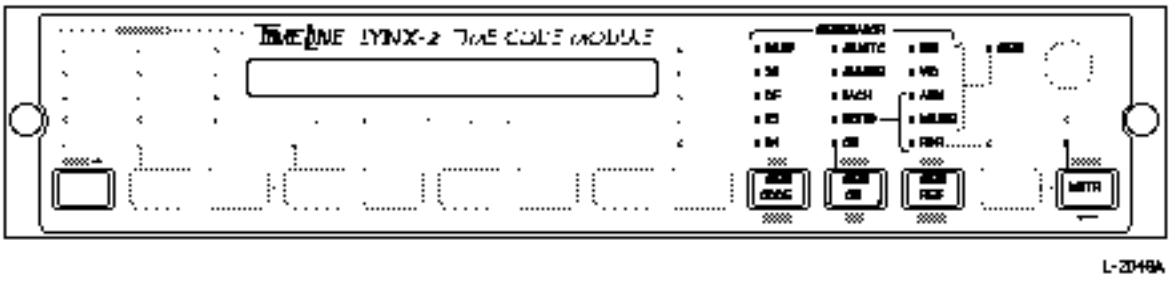


Figure Chapter 7 -1. Lynx-2 as a Generator

The Lynx-2 generates all worldwide standard SMPTE/EBU time codes. MIDI Time Code (MTC), Pilot Tone and 24-frame film code can also be generated.

SMPTE/EBU, MTC, and the 24-frame rate contain both address and speed information. Pilot Tone provides speed information only.

It is important to understand how the speed of the time code generator is derived, since the user always has to select and use a specific generator speed and time code type; it is a significant part of using the Lynx-2 module.

> NOTE
>
> Understanding the subtleties of time code terminology can make a significant difference in a clear and accurate understanding of the Lynx-2 Time Code Module. Before continuing, you may wish to refer to the Appendix. There you will find a glossary of time code terminology.

Time Code Generators produce a digitally coded signal, governed by a stable reference source. The Lynx-2 generator outputs code that is locked to one of five generator speed reference sources. These GEN REFS are mutually exclusive, meaning that only one may be selected at a time. The five sources are:

INT - Internal crystal

VID - External video sync

AUX - External Pilot Tone

MAINS - AC line supply

RDR - Time code reader input

On the front panel of the Lynx-2, the [GEN REF] key is used to access the five source references. INT and MAINS are internally derived and VID, AUX and RDR are all from external sources.

INT

When the modules generator reference is selected to internal, the time code generator is referencing the modules internal crystal. The generator can generate any code selected in the generator code type column.

VID

When the module's generator reference is selected to video, the time code generator is referencing an EXTernal video sync signal, which has been connected to the EXT VID connector on the rear panel of the module.

If the video source connected is NTSC, the time code generator will run at 29.97 fps. The code selected in the code type column can be either non-drop (30 frame) or drop frame only. If the video source connected is PAL, the time code generator will run at 25 fps and the code type is preset to 25 frame. The Gen Ref VID LED will flash and a "GEN LOCK ERR" message is displayed, if the module loses video. The error message is maintained in the display as a warning, until [CLR] is pressed.

AUX

When the module's generator reference is selected to AUX, the time code generator is referencing an AUXiliary or PILOT signal, which has been connected to the AUX connector on the rear panel of the module.

> Note
>
> This is a non-standard reference source. Lynx-2 has no control over the code speed and therefore, the code may not meet time code specifications. The generator N/STD (non-standard) LED will light as a warning if the reference rate deviates by greater than ±0.2% of nominal speed.

The AUX input speed tracking range is limited between 50 Hz -15% and 60 Hz +15%. The generator non-standard LED will light if the reference rate deviates by more than ±0.2% of nominal speed. The generator can generate any code selected in the generator code type column. The Gen Ref AUX LED will flash if the AUX reference is not present, loses lock or is out of range.

MAINS

When the module's generator reference is selected to MAINS, the time code generator is referencing the module's internal MAINS AC power line frequency.

If the AC power line is 60 cycles, the code selected in the code type column can be either non-drop (30 frame) or drop frame only. If the AC power line is 50 cycles, the code type is automatically preset to 25 frame.

RDR

When the module's generator reference is selected to reader, the time code generator is referencing incoming time code from an external machine.

The generator will reference and track the incoming time code rate. If the incoming code type is 30 frame (non-drop), the generator can generate either 30 frame or drop frame code. If the incoming code is DF, the generator can generate either 30 frame (non-drop) or drop frame. This can be used to convert between drop and non-drop code types. The Gen Ref RDR LED will flash if the reader reference is not present.

Setting the Generator Reference

The [GEN REF] key allows you to select a generator reference source. The generator must be off, to select or change the reference source. If the [GEN REF] key is pressed while the generator is running a "Generator ON" message will be displayed.

To set or change the generator reference:

1. If the generator is running, press the [GEN ON] key to turn the generator off. This key toggles ON and OFF.
2. Press the [GEN REF] key until the LED next to the desired generator reference comes on.
3. Press the [GEN ON] key to start the generator. It will generate code locked to the reference source.

Once the reference source has been selected, the speed or rate of the time code is automatically defined by the reference source (REF SRC). The nominal speeds are 30, 29.97, 25 and 24. When the reference source selected is either AUX or RDR, the Lynx-2 modules have a varispeed range of ± 15%, relative to each of the four nominal speeds.

Selecting the Generator Code Type

The next step is to select the "code type" to be generated. Selecting the correct code type is possibly the most critical decision that is made when operating any time code module. (More complete information on SMPTE time code can be found in the Appendix. Please read this section if you have any doubts about time code in general, reference speed, frame rates, or time code types.)

If you have selected INT as the reference source, then you may choose any code type, i.e., 30, DF, 25 or 24.

When SMPTE is selected you can also choose the reference rate to be 29.97 or 30 fps. If your reference source is VID, your choices are 30 and DF for NTSC, and 25 for PAL.

If your reference source is AUX, you may choose any code type, i.e., 30, DF, 25 or 24. But please remember, AUX is a non-standard reference source.

If your reference source is MAINS, the code type is determined by the line frequency.

If your reference source is RDR, the code type can be mixed DF and non-DF for SMPTE, but can only be the same as the incoming time code for 25 and 24.

29.97 LED

When the 29.97 LED is on, it indicates that the time code being generated is running at a speed of 29.97 fps. This is the NTSC color speed reference and the NTSC color standard.

At the same time that the 29.97 LED is lit, either the DF LED or 30 LED will be lit. If the DF LED is lit, this indicates that the generator's speed is 29.97 and the code type is DF. This is the common broadcast format, and will cause the Lynx-2's display and a stopwatch to match over a given elapsed time.

If the 30 LED is lit, this indicates that the generator's speed is 29.97 and the code type is 30 frame or non-drop frame. This is the standard configuration for music recording. In this format, the Lynx-2 time code display will run 0.1% slower than real time.

When the module is referenced to NTSC video, and the generator selected to 24- or 25-frame code, the 29.97 LED will flash to indicate that the 24 or 25 cross frame code being generated is running 0.1% slow.

30 LED

When the 30 LED alone is on, it indicates that the time code being generated is running at a speed of 30 fps. This is the old B&W TV standard.

This indicates that the code type is 30 frame or non-drop frame. This configuration will cause the Lynx-2's display and a stopwatch to match elapsed times.

DF LED

When the DF LED is on, it indicates that the generator's speed is 30 and the code type is DF. This is a non-standard format, and the Lynx-2 time code display will run 0.1% faster than real time.

The DF LED indicates that the time code being generated is a SMPTE "drop frame" code type.

Both 30 and 29.97 fps speeds can operate with the DF code type. DF is a non-linear counting system that "drops" certain numbers every hour, so that the time code module's display and the actual elapsed time when running at 29.97 fps will match. A total of 108 frames are dropped during each hour of program time, allowing the time code display to catch up to the actual elapsed time.

This LED does not indicate whether the time code rate is 30 fps or 29.97 fps. That indication is provided by the 29.97 LEDs.

25 LED

When the 25 LED is on, it indicates that the time code being generated is running at a speed of 25 fps and the code type is 25. (Remember, the European reference is 50 Hz.) This is the EBU color and B&W television standard, also know as the PAL format.

The DF LED can never be lit when time code is generated at this speed. This speed and code type will produce 24 hours of time code over 24 hours of elapsed time.

24 LED

When the 24 LED is lit, it indicates that the time code being generated is running at a speed of 24 fps and the code type is 24. This is the standard film/frame rate.

The DF LED can never be lit when time code is generated at this speed. This speed and code type will produce 24 hours of time code over 24 hours of elapsed time.

Generator Modes

Lynx-2 has four generator modes. One normal mode and three alternate modes. The indicators for the alternate modes are aligned in a column above the [GEN ON] key. They are Jam time code, Jam UB, and TACH. There is also a non-standard indicator that is lit when the generator reference is not running at nominal speed.

The [GEN ON] key, in conjunction with the [SHIFT] key, is used to select the various generator modes. In normal operation, no LEDs are lit in the [GEN ON] column. If you press and hold the [SHIFT] key while pressing the [GEN ON] key, you can toggle through the alternate modes. The generator must be off before the generator mode can be changed.

Normal

In the Normal mode, none of the LEDs above the [GEN ON] key are lit.

The Normal mode is automatically selected at power on. In this mode, the generator runs sequentially from the starting value stored in the generator register. The generator register is the module's memory buffer that holds the generator time code value.

This value can be preset by using the Lynx-2's capture or set hold entry procedure. The Lynx-2 also has a generator preset register. The generator can be repeatedly preset to this known value, by pressing the [SHIFT] and [GEN CODE] keys when the generator is off. The generator preset can be entered using the Lynx-2 Set/Hold procedure.

Press the [DISP SEL] key until the generator LED is lit, then press [SHIFT] and [DSPL SEL] until the preset "Pr" is displayed. Use the Set/Hold/Store procedure to alter the time code value. To view the generator time code number, press [DSPL SEL] one or more times until the display GEN LED is lit.

The most common applications use the normal mode. A typical application will be laying down or striping fresh time code onto tape.

Jam Time Code

The Lynx-2 generator will automatically Jam to the longitudinal or serial time code reader when the Jam time code mode is selected. All code types, including MTC (MIDI time code) can be generated in the Jam time code mode.

Jam Sync is primarily used for:

- Reshaping or restriping existing code
- Inserting information into the user bits
- Assigning multiple generators to the same starting address
- In editing.

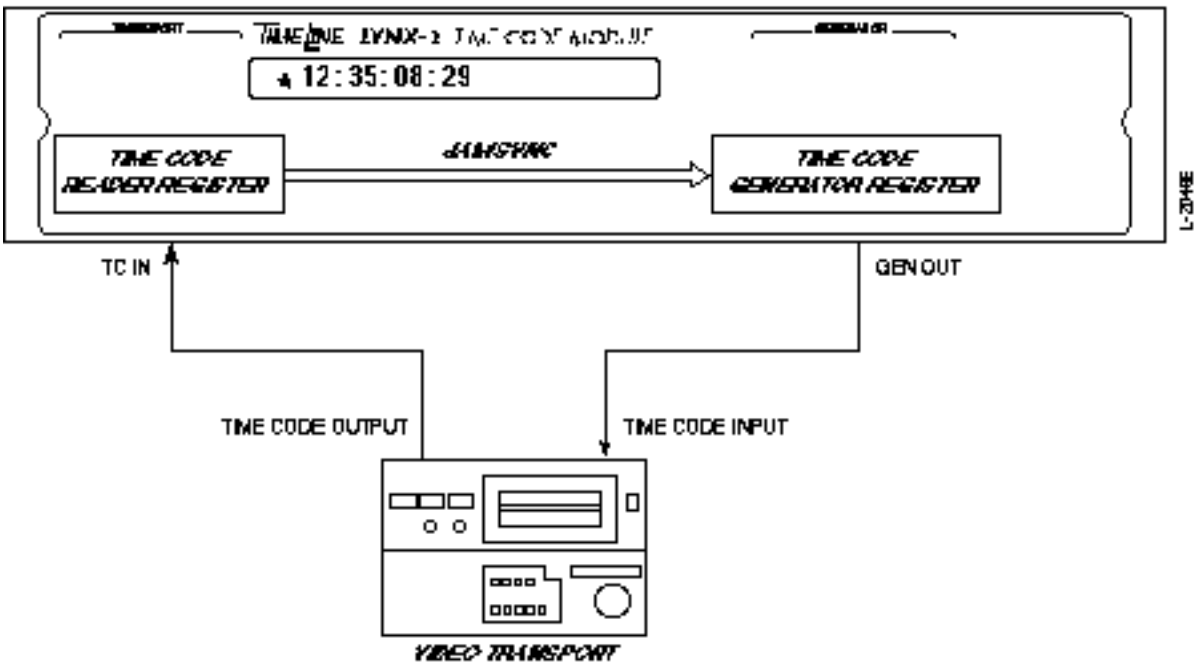


Figure Chapter 7 -2. Jam Sync Time Code

Jam time code or Jam sync is a generator function that is an alternative to reshaping. It is used to create a new time code that is phase related to an existing time code on tape. It is extremely useful for repairing problems in an existing time code track or creating a continuous time code track from an edited time code track.

The output of the generator operates as in the 'normal' generator mode. However, the reader time code input is transferred or jammed to the generator, which starts generating from this point forward. Any deterioration's or discontinuities in the source time code are ignored, and the generator will continue to output uninterrupted code. At the point that the reader time code is transferred to the generator, the Lynx-2 displays a --Jam-- message.

JAM UB (Automatic)

The Jam UB LED is lit when Jam User Bit mode is selected. Jam UB is used to jam time code data into the user bits, without altering normal time code generator operations. It is identical to the Jam time code mode, except that the reader value is made to load automatically into the generator user bits register.

In the Jam UB mode, if the time code input stops, the generator will continue to output continuous code as described in the Jam time code mode.

> Note
>
> We do not recommend using the automatic jam mode with video machines as a reference source. If the incoming time code was not correctly recorded, or if it is not framed correctly, it is possible to generate faulty code.

Jam TACH

When lit, indicates the module's time code generator is in Tach-to-time code jam mode.

To select generator jam to Tach-mode press [SHIFT] and the [GEN MODE] key until the generator TACH LED comes on. Enable the generator by pressing the [GEN ON] key, the generator output will follow the transport motion:

When the generator is enabled in the Tach-Jam mode, the machine's motion automatically initiates time code generation. When the machine stops, the generator repeats the last frame number in the stopped position for one second, then automatically switches off. The generator ON LED will flash to indicate the generator is on but is not currently generating code. When motion restarts the generator will automatically restart and jam to the incoming tach signal.

In the Tach-to-Time code mode, the default frame rate for the module's generator is determined by the system frame rate. This default may, of course, be overridden by the operator at any time as long as the generator is not running.

The Tach-to-Time code mode always generates time code words at the same bit rate as normal sync speed time code (e.g., 30 frames-per-second X 80 bits-per-frame = 2400 bits-per-second), regardless of the actual running speed of the machine, to allow reading by devices that cannot read high speed time code.

Whenever the machine is moving, but not running in lock, the module's generator performs a "flying jam" to the current position on a frame-by-frame basis so that each time code frame number generated corresponds to the instantaneous position of the machine at the start of the time code word. As a consequence, time code numbers will not be sequential when the machine is not in play speed lock. Frame numbers will be skipped if the machine is running faster than play speed, and will be repeated when the machine is running slower than play speed.

When the transport achieves lock, the generator performs a single Jam Sync operation and then continues to generate normal, sequential time code that is locked to the reader input.

The individual time code words generated by the Lynx-2 Module are always generated in the normal, forward sequence (bit #1 to bit #80) regardless of the tape direction. If the machine is moving in the reverse direction, the module generates normal time code words, which are in reverse numerical order.

Striping Time Code

For most applications, it is preferable to stripe time code onto tape, before recording. When time code is prestriped, you can sync the master tape to other equipment, facilitating the recording process.

For time code generation, first select a reference source. The reference source is the generator time base signal that the time code, synchronizer, generator, and tape machines will all sync to.

If INT (internal crystal) is selected, next select the time code type (30, DF, 25, 24), which will depend on the application. Remember that 30 and DF codes can run at 29.97 or 30 fps.

Enter and store an initial time code number into the generator register. When the [GEN ON] key is pressed, Lynx-2 automatically starts with the value in the register and continues generating time code from that point on.

Procedure to Stripe Time Code

When striping time code, the Lynx-2 should always be offline, so the machine that the code is being recorded on, will run at its own internal fixed speed.

This setup prevents the Lynx-2 and the record transport from getting into a capstan-control feedback loop. In other words, the record transport will not try to synchronize to itself while striping new time code.

The following steps should be taken when striping time code:

1. The capstan speed reference of the record transport should be set to internal. The transport mode [TRAN MODE] of the Lynx-2 must be set offline. If the ONLINE LED is lit, press the [TRAN MODE] key to take the machine off line.
2. Connect the GENOUT jack on the back panel of the Lynx-2 to the input of one of the edge tracks of the record transport. Typically the TC IN and transport cables should be connected also.
3. Select a generator reference by pressing the [GEN REF] key one or more times to select the desired reference source.
4. Select the code type that you want to generate by pressing the [GEN CODE] key until the desired code type LED(s) is lit.
5. Press the [GEN ON] key to start the generator. Check to see that the transport input is receiving a proper level. Master tapes are generally printed at -6VU. The range of Lynx-2 output levels is -20 dBm to +6 dBm. The Lynx-2 generator output level can be adjusted by removing the front panel and adjusting the generator trim pot.

6. Press the [DSPL SEL] key one or more times to select the generator to the display. Press [GEN ON] to stop the generator.
7. Press the [SET HOLD] key. The LED should now be flashing. If desired, preload a starting time code value. The [↑] or [↓] arrows increment or decrement the values in the generator register. Pressing the [SET HOLD] key again will allow you to move cursor-style through the HH:MM:SS:FF display. Preloading a starting value larger than 00:00:00:00 will help prevent rewinding the tape off the reel. 01:00:00:00 (one hour) is a common starting value. Press [STORE] to store the value in the generator.
8. If all the above steps have been followed, you are now ready to record time code on tape. Press record and play on the transport.
9. Press the [GEN ON] key to start normal time code generation. The selected time code will be output at the GENOUT jack and recorded onto the tape.

Restriping Time Code

The Lynx-2 module has both manual and automatic Jam Sync modes. The process of Jam sync takes the time code value in the reader register and transfers it to the generator register, which can then be recorded onto tape. The Lynx-2 continues to generate time code from the initialization point that is in-sync with the source time code.

Pilot

The Pilot output signal is a sinusoidally-shaped output, which is two times the frame rate of the time code that is being generated.

This signal appears at the PILOT OUT connector on the rear panel of the Lynx-2 and is available whenever a valid generator reference is present. If you need a Pilot Tone reference on tape, it can be recorded on a separate track at the same time that time code is being recorded.

When Lynx-2 is reading time code, and the time code track has a dropout, is damaged or unusable, a Pilot track provides a way for the time code module to maintain synchronization. When this occurs, the Lynx-2 uses the Pilot signal as a synchronizing reference.

The pilot output is normally derived from the generator reference, if required, the pilot signal can be derived from the Reader input. Use the pilot out option menu to select generator or reader as the pilot reference source.

To use Pilot signal, simply connect a TRS jack cable between the PILOT OUT jack on the Lynx-2 and an audio input on the transport.

A Pilot-level potentiometer is located behind the removable front panel. Use this pot to adjust the output level of the Pilot Tone as needed.

Chapter 8 Time Code Reader

Introduction

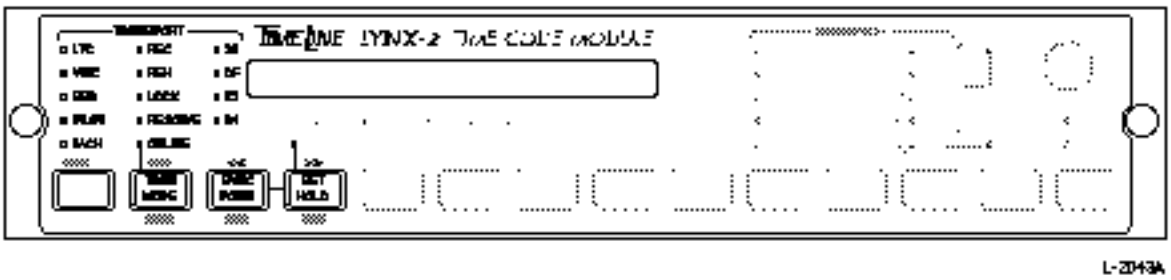


Figure Chapter 8 -1. Time Code Reader: Controls and Indicators

This chapter contains information on the longitudinal and serial time code readers of the Lynx-2. Part one describes the operations of the longitudinal reader of the Lynx-2. Part 2 describes the serial time code reader features of the Lynx-2.

Each Lynx-2 module contains a wideband Time Code Reader. The Reader input (TC IN) is differential and will read all SMPTE/EBU code formats as well as 24-frame "film" code, running at 1/10 to 60x play speeds. The Reader is an integral part of the Lynx-2 synchronizer.

The Reader accepts time code from an external tape source and sends code information to the synchronizer through an internal data bus; so that the machine's speed and position are constantly updated. (Synchronizer details are covered in the Sync & Resolver Section.)

The Lynx-2 Reader accepts incoming information from one of five sources:

- LTC (Longitudinal Time Code)
- VITC (Vertical Interval Time Code)
- SER (Serial Time Code)
- Pilot (Pilot Tone)
- TACH (Machine Tach Pulses)

Time code is read from the first valid source that the Lynx-2 finds. The Reader looks first to LTC, then VITC and so on, through to TACH. This sequence is based on a priority detection scheme, which is resident in the module's system software. For example, if a machine is connected to both LTC and Pilot, and valid signals for both are present, the Reader will automatically choose LTC as the preferred code.

Longitudinal Time Code Reader

Reader Features

- Wideband, bi-directional operation, with 1/10 to 60x play speed.
- Automatic detection of code-type, over a wide range of input levels.
- Code-type LED indicators.
- LED indicators showing valid LTC, VITC and SERial time code, as well as Pilot Tone and TACH pulses.
- User bits display.
- Automatic display of subframe offset errors in the ERR mode.
- Selectable bandwidth filter for the Reader.
- Reader display "hold" function.
- Reshaped time code and Pilot Tone output derived from the Reader.

Numeric Reader Display

The Time Code Reader decodes information continuously, and updates the display at the end of each 80-bit time code word. The code frame has to be transmitted fully, before the Reader is able to display the address it is reading. The Lynx-2 Reader automatically adds one frame-count to each address, so the display indicates the current address.

To access the Reader's numeric display, press the [DSPL SEL] key until the RDR LED comes on. When lit, the RDR LED indicates that the Lynx-2 is reading and displaying time code, Pilot Tone or TACH pulses.

Display User Bits

Time code user bits can be displayed by pressing the [SHIFT] and [DSPL SEL] keys simultaneously. This switches the numeric display to show the user bit data. The two left hand display characters show [UB], indicating that user bits are being displayed. To switch back to normal time code display, press [SHIFT] and [DSPL SEL] again.

Reader Source and Code-Type Indicators

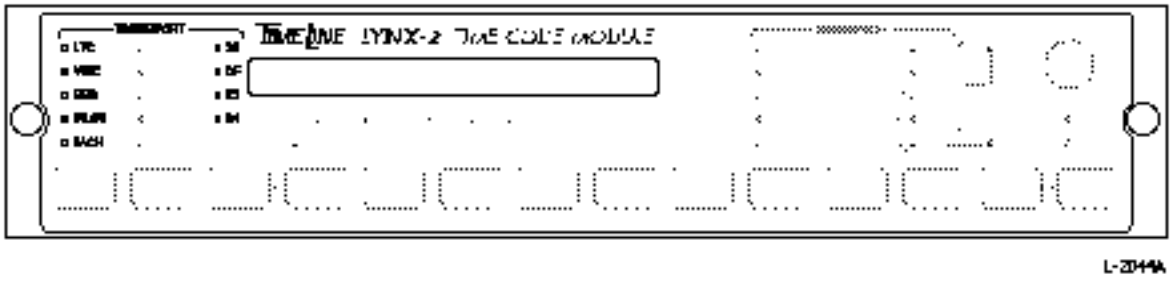


Figure Chapter 8 -2. Reader Source and Code-Type Indicators

The column of LEDs above the [SHIFT] key indicate the source of the information that is being used to update the Reader. The two columns of LEDs on the left of the module, under the Transport heading, are Reader indicators. The Reader status LEDs are always active, regardless of other information being displayed on the front panel.

When time code is read, the Reader automatically determines the code type and turns on one of the code-type LEDs (30, DF, 25, 24), on the left side of the main display. The actual incoming time code value appears in the display.

When the module is used as a synchronizer, the code/time in the RDR display always comes from the modules local transport.

Code Type Indicator Combinations

If a Lynx-2 module is operated in cross frame (X-frame) lock, then two of the Reader code type LEDs will illuminate. The solid LED always indicates the code type that is being displayed in the numeric display. If the code type displayed is different from the reference machine code type, a second transport code type LED flashes indicating that the synchronizer is X-frame locking to the system. (See the Advanced Features Section.)

LTC LED

When lit, the LTC LED indicates that valid Longitudinal Time Code (LTC) is present at the module's TC IN jack.

LTC time code information is typically recorded as an analog audio signal on a designated ATR or VTR track.

VITC LED

SMPTE/EBU code is difficult to read at slow tape speeds, and impossible to read in "still-" or "freeze-frame". As video technology developed, it became necessary to develop an alternative to LTC that could be used in slow motion and freeze-frame applications.

VITC (Vertical Interval Time Code) was developed as an alternative to LTC, when slow speed applications are required.

VITC is recorded on a pair of horizontal lines, in the vertical blanking interval, of the video field scan. Unlike SMPTE, VITC is reproduced in the "forward" direction only, even during reverse tape motions. The VITC LED above the [SHIFT] key indicates that VITC is present at the module's transport connector and is being used to update the Reader position. This is typically at speeds below 1/3 play speed for jog, shuttle and freeze frame operations.

SER LED

When a Lynx-2 is plugged into a serially controlled video machine that can supply time code information through the serial port, the module can use this information directly in slow motion and freeze frame modes. The module reads serial time code from the machine's control port, which is used to update the Reader tape position.

When lit, the SER LED indicates that valid time code is present at the module's transport connector and is being used to update the Reader position.

PILOT LED

Pilot is a sinusoidally-shaped signal with a frequency of two times the frame rate of its corresponding time code reference.

When lit, the Pilot LED indicates that Pilot Tone is present at the module's rear panel PILOT IN jack, and that the Reader has switched over to this signal as its source. The Reader did not find valid LTC, VITC or serial time code.

Pilot is typically used as a backup for LTC. Thus, if the SMPTE/EBU code is invalid, and pilot tone is present, synchronization will be maintained.

Pilot Tone can also be used as a speed reference when generating fresh time code. Pilot can be used as a generator reference when generating fresh code because of its direct 2x relationship with SMPTE/EBU time code. For every two complete cycles of Pilot Tone, the frame number is advanced by one.

Remember, the frequency of the Pilot Tone is always twice that of the frame rate.

TACH LED

When lit, the TACH LED indicates that the Reader is being updated by transport tach pulses. Tach pulses are normally directly generated from one of the rollers in a machine's tape path, and is therefore a measure of the amount of tape that has passed the heads. The pulses generated, and the machine's direction tally signal, can be used to indicate any movement in the position of the tape. The Lynx-2 module receives this information from the machine's transport connection and uses it to update the Reader position, in the absence of any other signal.

If the time code on a tape becomes unreadable, Lynx-2 automatically looks for the next best time code source. The module will search for the next best source in the following sequence:

1. LTC
2. VITC
3. SER
4. PILOT
5. TACH

As you can see, TACH is the lowest source recognized by Lynx-2. When reading TACH, the Lynx-2 uses a value stored in the machine lock-up table to calculate the number of tach pulses that relate to each frame of time code, and increments the display accordingly.

Set/Hold (Freeze) the Reader Display

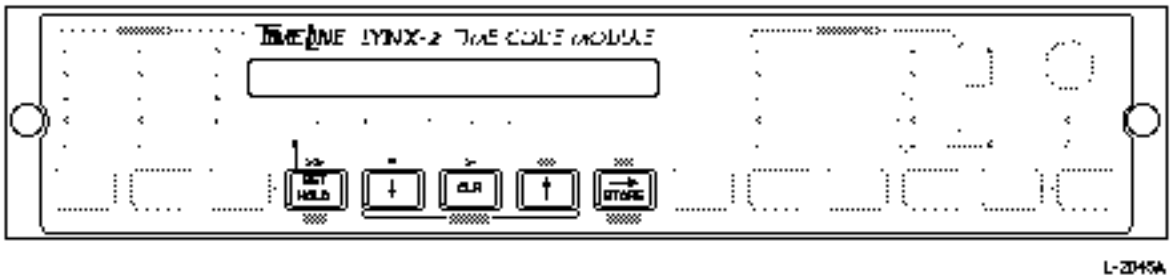


Figure Chapter 8 -3. Set/Hold Reader Display

When reading time code, there are times you will want to temporarily freeze or hold the time code display, but not stop the tape machine. Press and hold the [SET HOLD] key and the display will freeze for one second, then continue to run.

Press and release the [SET HOLD] key and the display will freeze. The frames' digits and SET HOLD LED will flash to indicate that you are in set mode. This mode can be used to set a Reader value, if there is no code on tape and the Reader position is being updated by tach only.

Store Time Code

If you want to adjust the time code that has been captured, use the CLR, up and down arrows, and set hold to enter a new value, and press the [STORE] key. The time code value will be stored in the RDR register.

To release (unfreeze) the display without altering the time code value, press and hold the [SET HOLD] key for one second. Because the tape machine was not stopped, the display will update to the current time code address.

Reshaped Code

The Lynx-2 has a time code Reader reshape output. Reshaping restores deteriorated code into good shape. The time code at the Reader input is cleaned up or reshaped and output through the RESHAPE output jack. The reshaped code can then be fed to other equipment.

A RESHAPE output level, adjustment potentiometer is located behind the removable front panel. Use this pot to adjust the output level of the reshaped time code as needed.

The reshaped output will not restore dropouts or convert discontinuous code to continuous code; it is only a "clean" copy of the Reader input. To restore dropouts or repair bad or discontinuous time code, the code must be regenerated. (See the Time Code Generator Section.)

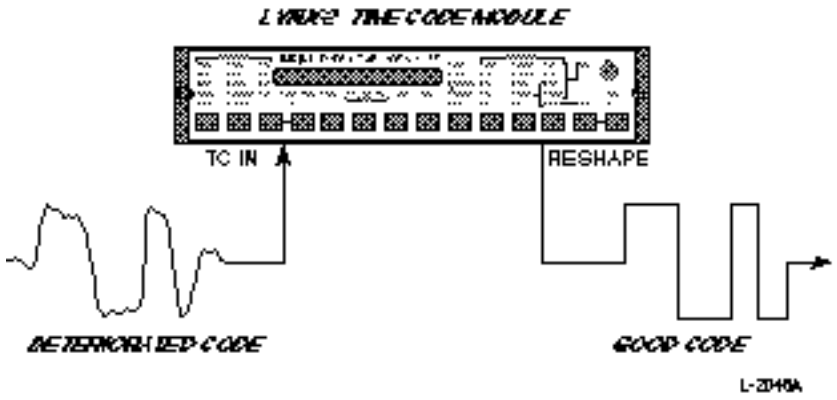


Figure Chapter 8 -4. Reshaped Code

Pilot

A Pilot signal, derived from the incoming time code, is available at the rear panel PILOT OUT jack. The pilot output can be software selected to lock to either the module generator reference, or the Reader input.

A Pilot-level potentiometer is located behind the removable front panel. Use this pot to adjust the output level of the Pilot Tone as needed.

BWL

The BWL (BandWidth Limit) LED indicates that a 50 kHz bandpass filter has been inserted in the Reader input circuit. This filter helps eliminate spurious noise that might otherwise corrupt incoming time code. It's usually only necessary to use BWL with video machines. To switch the bandwidth limit filter in and out, press [SHIFT and GEN REF].

Serial Time Code Reader

Introduction

Each Lynx-2 module has the option of reading Serial Time Code for synchronizing serially controlled VTR's. Serial time code is input via the 50-pin transport connector on the rear of the module, through the serial data communication lines. A separate longitudinal input is not necessary if serial time code is present.

Serial time code is a function of the video tape recorder itself. Either LTC, VITC or Tape Timer information can be encoded by the VTR through the 9-pin RS422 port to the synchronizer/ controller connected. Its most common use is with video editing systems.

It is essential that a video reference source be connected to the Lynx-2 if Serial Time Code Lock is to be used, as time code requests to the transport must be synchronous with this signal. If no video is present, then the Lynx-2 will display [* NO VIDEO *]. When serial time code lock is active, the longitudinal reader is completely disabled. All numeric information in the reader display is obtained from the serial port. Serial time code can be read in still, jog and shuttle modes.

Reader Features

- Automatic detection of LTC, Tape Timer or VITC input over the serial port.
- Time code read in still and at jog and shuttle speeds.
- Tape timer time code defines tape position and may be reset or set from a KCU.
- LED indicators showing valid LTC, VITC SERial time code.

Reader Source and Serial Code-type Indicators

The column of LEDs above the [SHIFT] key indicate the source of serial time code used to update the reader. In some cases, two or more LEDs will light to represent the specific reader update mode. The following LED configurations may be expected when reading serial time code.

Table Chapter 8 -1. LED Configurations

Time Code Source	LTC	VITC	SER	PILOT	TACH
Serial LTC	X		X		
Serial VITC		X	X		
Serial Tape Timer 1			X		X
Interpolated Serial LTC	X		X		X
Interpolated Serial VITC		X	X		X
Note: “Interpolated” indicates that the time code is being updated from control track pulses by the transport itself.					

Difficulties Reading Longitudinal Time Code: Level, Tape Speed and Frequency Response

Level

SMPTE/EBU Time Code is recorded as an analog, square wave signal. Bit periods are derived using zero crossing detection, the basis of biphase modulation. Time Code is demodulated by timing individual bit periods and making comparisons to locate or identify the 50% bit periods, which indicate an encoded binary one.

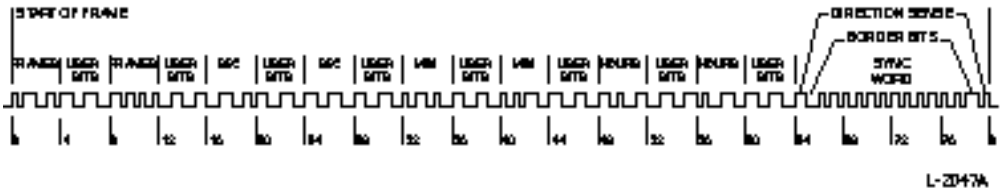


Figure Chapter 8 -5. Time Code Word

Amplitude distortion during playback will not effect the Time Code Reader, as long as the level of the code is above the minimum required Reader input (-20 dBm). The nominal range is -20 to +8 dBm.

When the code input is above the nominal level for the Reader, difficulties in reading it are generally a function of tape speed. The ability to reliably read time code off tape, under all conditions and applications, is limited by the electro/mechanical limitations of a specific machine, and the record/playback process in general.

Tape Speed

SMPTE Time Code is a longitudinal data signal that requires a minimum tape speed in order to be reliably detected. SMPTE/ EBU Time Code cannot be read at zero tape speed (still-frame). (See VITC above.)

Lynx-2 is designed to decode biphase signals from 1/10th to a minimum of 60x play speed. At very slow speeds, typically less than 1/10th play speed on 3/4" VCRs and 1/20th on 1" VTRs, you may see amplitude distortions that can occasionally cause extraneous transitions from one time code value to another unrelated value.

Frequency Response

The high-frequency (HF) limitations of a Lynx-2 system are primarily related to the HF characteristics of the machines in the system.

When time code is recorded on an audio track, the upper limit of the audio channel playback amplifier must be modified to accommodate the highest expected shuttle speeds or frequencies. At the highest practical speed, such as 60x fast-wind, the nominal frequency of the binary Zeros is 72 kHz; binary Ones are 144 kHz.

Also, signal amplitude is directly proportional to play speed. As you can see, at these frequencies, care must be taken when distributing and/or monitoring time code signals. (See Lifters and Relays under Setup Options in the Features & Controls Section.)

Wideband Reader

When is a wideband Reader necessary?

The wideband Reader is designed to accommodate the HF data associated with fast-wind transport functions. A wideband Reader can read high-speed code and provide continuous, accurate location information.

If a tape does not have contiguous time code, then tach pulses cannot be used for accurate location. Since TACH uses the measure or linear length of the tape to determine position in this situation, reading code at high speeds is essential. The Lynx-2 Reader and software operate effectively in fast wind searches to overcome this problem.

Mute Lifter Control

The Lynx-2 has comprehensive mute relay and machine lifter control functions so that optimum performance can be obtained from the synchronizer.

- Tape machines are frequently, internally set up to mute audio channels during fast-wind tape shuttle.
- When locating to a position on tape, Lynx-2 will intelligently send lifter defeat commands to the transport to read the time code, confirming that the tape is in the correct position.

The two setup commands mentioned above are an example of mutually exclusive functions. They have a canceling effect, each overriding the benefit of the other.

If you wish to read time code while in a fast-wind mode, then the machine cannot mute itself. Conversely, if you don't want to hear the "monkey chatter" in fast wind modes and wish to save your ears and monitors, then the machine should be muted.

Some transports have a specific feature that leaves the audio tracks muted, and unmutes the time code cue track. Unless your machine has this feature, we recommend disabling the machine's internal mute function when connecting it to the Lynx-2. Instead, choose lifter defeat and mute relay commands, under Lynx-2 software control, that are suited to your application. (See Lifters and Relays under Setup Options in the Features & Controls Section.)

If you experience long lock-up times and the tape machine frequently speeds up or slows down when synchronizing, check the machine's mute status. If mute is enabled, disable it.

The Lynx-2 will park a slave tape machine approximately 30 frames ahead of the master. If the code mute on the slave machine is enabled, it will park ahead of the master at a point that only approximates the 30-frame park ahead. Then when play starts, the Lynx-2 will read time code from the tape machine, determine that the tape is in the wrong position, and have to move it to the correct position. This causes the lock time to be longer.

Non-contiguous Time Code and Error Checking

Non-contiguous time code frames can potentially cause "lock" to occur at the wrong time code address.

The Lynx-2 Reader automatically ignores random or spurious non-contiguous frame numbers, which may be caused by tape dropouts or invalid data in the time code bit stream.

Lynx-2 has internal error correction algorithms in the Reader decoding circuitry, which prevent false transitions from being detected as valid code addresses.

Error checking the incoming time code ensures very high reliability of tape position. One or two randomly bad time code words will be rejected and the module will continue to update the Reader display, based on the last known valid time code.

Conversely, a legitimate jump in the time code is recognized by the Lynx-2 Reader and will be accepted. The time code Reader will display the new time code value and if in lock, will update the time code error display to reflect the time code jump. Let's consider an example of a legitimate time code jump.

A master reel has been assembled by editing together a number of concert performances, from separate days, that were recorded on prestriped tapes. The time code will jump to a new value at each edit. In this situation, it is normally preferable to jam sync a time code generator and generate a new continuous time code.

Chapter 9 Sync & Resolver

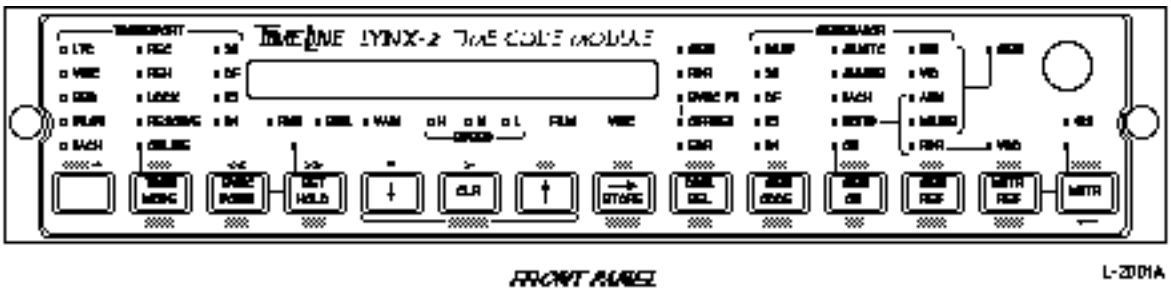


Figure Chapter 9 -1. Lynx-2 as Synchronizer

Introduction

Synchronization is an integral part of modern-day audio, video and film production.

This chapter provides detailed information for using Lynx-2 as a Synchronizer/Resolver. Since synchronization can be a complicated process, we begin by reviewing synchronization principles.

A synchronizer provides the interface between, and control of, two or more machines. This is accomplished by using time code, machine commands and tallies to locate and control position and speed information that has been recorded on a tape.

The synchronizer is supplied with a master speed reference and reads Master time code, which is used to control the speed and location of slave transports. By monitoring the master time code, the Lynx-2 modules will control the Slave transports, locate to specific time code addresses relative to the Master transport and then go into play and synchronize. Synchronizing multiple machines allows a variety of production elements to be produced independently, then brought together in a post production environment for final mixing, editing and assembly.

A Resolver uses a speed reference as a means of controlling one or more machines. Resolving corrects speed differences between a reference source and a Slave transport, but offers no means of accurate location.

Based on an output from the synchronizer, the resolver electronically controls the slave machine's capstan servo by sending a DC voltage or FM (frequency modulated) signal to the capstan motor, causing it to speed up or slow down to match the speed of the reference source.

Resolving a machine allows production elements that were recorded with pilot tone or time code to be replayed at a known speed. Resolving is mainly used in the transfer process when material is moved from one medium to another.

Most synchronization activities use SMPTE/EBU Time Code as a standard for identifying specific location and speed criteria for a tape.

Time code is a continuous stream of digital data blocks. Each time code data block is comprised of an 80-bit word with a unique address. This address is updated each frame. The time code word also contains sync bits, which are used to determine speed.

When recorded on tape, Longitudinal Time Code (LTC) provides an exact indication of speed and position.

As with any other music or data that is recorded on tape, the time code cannot slip. It will always retain its original physical position and relationship to the program material on the tape.

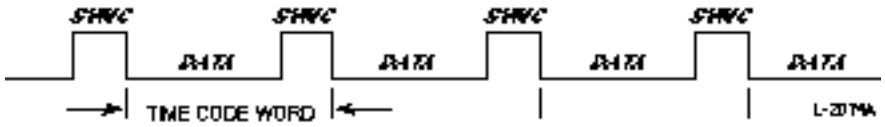


Figure Chapter 9 -2. Time Code Data Stream

Generally an audio channel (on ATRs and VTRs) or address track (on DTRs and VTRs) is striped with LTC. This can be read directly from the prerecorded track, either forward or backward, at a wide range of play speeds.

If you are ready to stripe time code onto tape, please refer to the Getting Started and Time Code Generator Sections.

Synchronizer Features

- Rapid locate and sync lock time.
- Subframe offsets supported.
- Supports wideband LTC, VITC, serial time code or TACH for location.
- Automatic switchover to Pilot Tone input for continued synchronization if time code is lost.
- Speed-only resolver from either time code or pilot tone input.

Synchronization

When machines are synchronized, any number of events on different machines can be made to occur at precisely the same point in time. To do this, a synchronization signal such as time code must be recorded on each machines tape.

To synchronize two or more machines, one machine must be designated as Master and the other(s) become Slave(s). Lynx-2 monitors both the Master and Slave machines for speed, position and direction. Any change of status or variance in the Master is followed or compensated for by adjusting the speed and direction of the Slave machine.

In play, each Lynx-2 reads the time code output of the local machine and controls the speed of its capstan motor to adjust the tape speed, relative to the selected Master reference speed.

In other transport modes, such as rewind or fast-forward, a signal is sent to the Slaves indicating a change in Master status and the Slaves respond and "chase" the Master. This type of chase synchronization is the basic configuration used with video-to-audio and audio-to-audio systems.

Synchronization provides many enhancements and creative possibilities for audio and post production systems:

1. The number of tracks or audio sources used in a project can be increased as required.
2. Setting offsets between machines allows a tape to be put or slipped out of sync by a controlled amount. Offsets, down to 1/100th of a frame are allowed.
3. Accurate record in and out points can be pre-programmed, rehearsed and then automatically executed.
4. Synchronization of dissimilar formats or machines is possible. For example; film, audio and video machines with MIDI sequencers or digital audio workstations.

Transport Control: Commands and Tallies

Synchronizer interface signals can be divided into two categories: Commands and Tallies. Commands are signals generated by the synchronizer to control the transport (i.e., Play, Stop and Record). The Tallies are the responses from the transport to the synchronizer (i.e., Tach and direction).

Transport movement signals are derived from SMPTE/EBU Time Code, Pilot Tone or TACH pulses. One of these is required for the synchronizer to determine the position, and maintain control of, the transport during play, fast forward and rewind.

To control the transport, the synchronizer "overrides" the capstan servo. This override signal is typically an FM (frequency) signal or variable DC voltage depending on the transport. The transport's play speed must be capable of varying, within an appropriate range, in response to this signal.

The Lynx-2 synchronizer compares the speed of the incoming time code with the Master reference speed, and sends the appropriate frequency or voltage to the Slave's capstan motor, causing it to speed up or slow down to the correct speed.

Time Code Word

As SMPTE/EBU Time Code was developed by the broadcast/video industry, the timing basis of the code is electronically synchronized to the beginning of each video frame. Each video frame is tagged with a unique identifying number called a Time Code Address (TCA). This address has eight digits representing Hours:Minutes:Seconds: and Frames.

The total of all time code information recorded for each video frame is called a time code "word". Each time code word is divided into 80 bits.

Time code information is made up of binary ones and zeros, which are specially encoded using a method called biphase encoding for recording on to tape.

Biphase encoding reverses the signal polarity halfway through a bit to represent a '1' and leaves the bit polarity unchanged to represent a '0'.

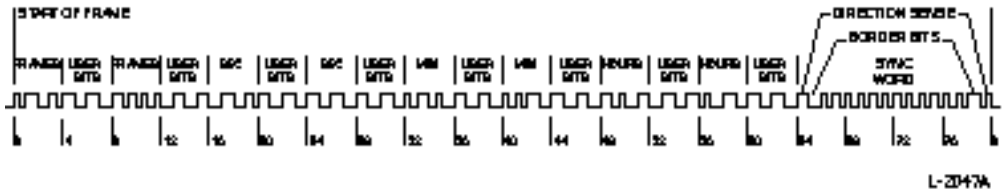


Figure Chapter 9 -3. Time Code Word

Each time code word is divided into groups of 4-bit segments, written in binary-coded decimal (BCD) notation.

- Eight 4-bit groups represent the time code address in Hours, Minutes, Seconds, and Frames.
- Eight 4-bit groups are reserved as User Bits. Here the user may enter custom ID information, such as reel numbers, session information, time of day, or another time code altogether.
- 16-bits at the end of the word contain the 12-bit "Sync Word", and two bits that identify the tape direction. The Sync Word is a sub-unit of the 80-bit time code word.

The time code address is detected by the module's reader circuitry and provides exact HH:MM:SS:FF to the synchronizer for positional accuracy. The Sync Word provides direction and Phase-lock speed information, and marks the end of the each time code word.

Bits 64 and 79 provide the module with the information it needs to detect the direction of the tape. These are the first and last bits of the Sync Word that are clocked into the phase detector. A '00' after the 12 sync bits, indicates that the code or tape is moving forward. A '01' indicates that the code is running backwards.

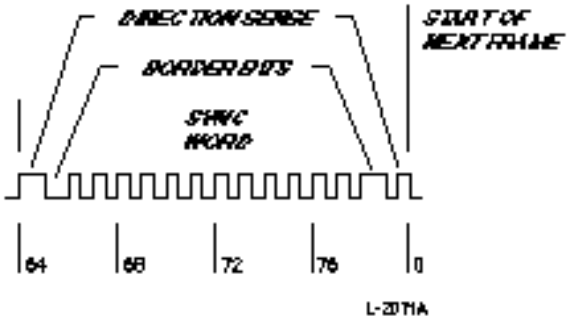


Figure Chapter 9 -4. Sync Word

The phase change between the last bit (bit 79) and the first bit (bit 0) of the next time code word provides the module the information it needs to resolve the capstan speed.

> NOTE
>
> Because bits can be defined with positive or negative transitions, the resulting code is immune to phase reversals. Cables can be routed with no regard for polarity.
> However, maintaining consistent cabling polarity is good studio practice, and will ultimately give you one less thing to worry about, or question, in the heat of production.

Ultimately, the time code end-of-frame (EOF) from the code track on tape, is compared with the system master reference source pulses. The difference, if any, is automatically calculated by the Lynx-2 module, and a capstan servo speed adjustment made to correct the capstan speed error.

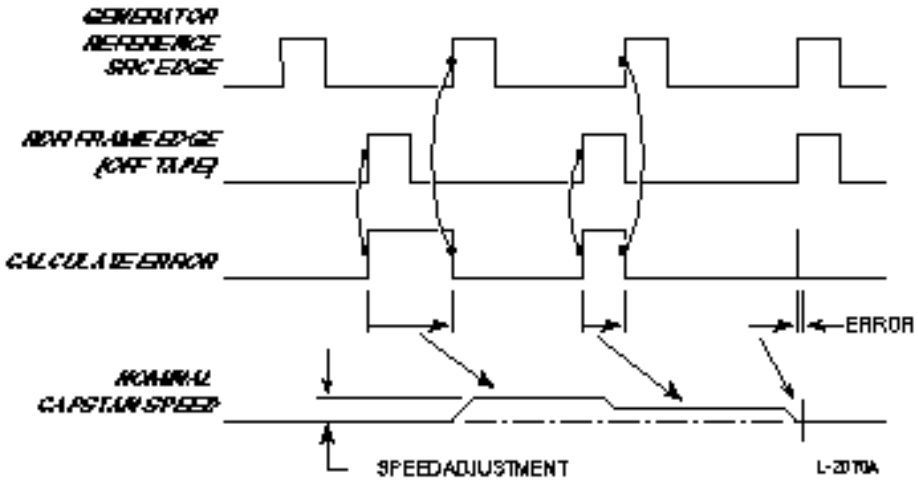


Figure Chapter 9 -5. Capstan Phase Detect & Servo.

Reference Source

The Lynx-2 module synchronizes to a common speed reference. This speed reference is detected on the Master module and distributed to each of the slave modules, to control the speed of all the machines. Press the [GEN REF] key to step through the five reference selections:

- INT - The module's internal crystal
- VID - An external video source
- AUX - An external auxiliary source
- MAINS - The module's AC power line frequency
- VSO - The modules reader speed, either fixed or varispeed.

INT

When lit, the INT LED, above the [GEN REF] key, indicates that the synchronizer's generator reference source is the Lynx-2 module's own INTernal crystal. When the module is selected as Master and the master reference is set to GEN, then the internal crystal will be used as the system speed reference.

If there is no video reference, INTernal crystal is generally selected as the generator reference source. The Slave modules/machines receive the speed reference via the RS422 cables that connect the system modules.

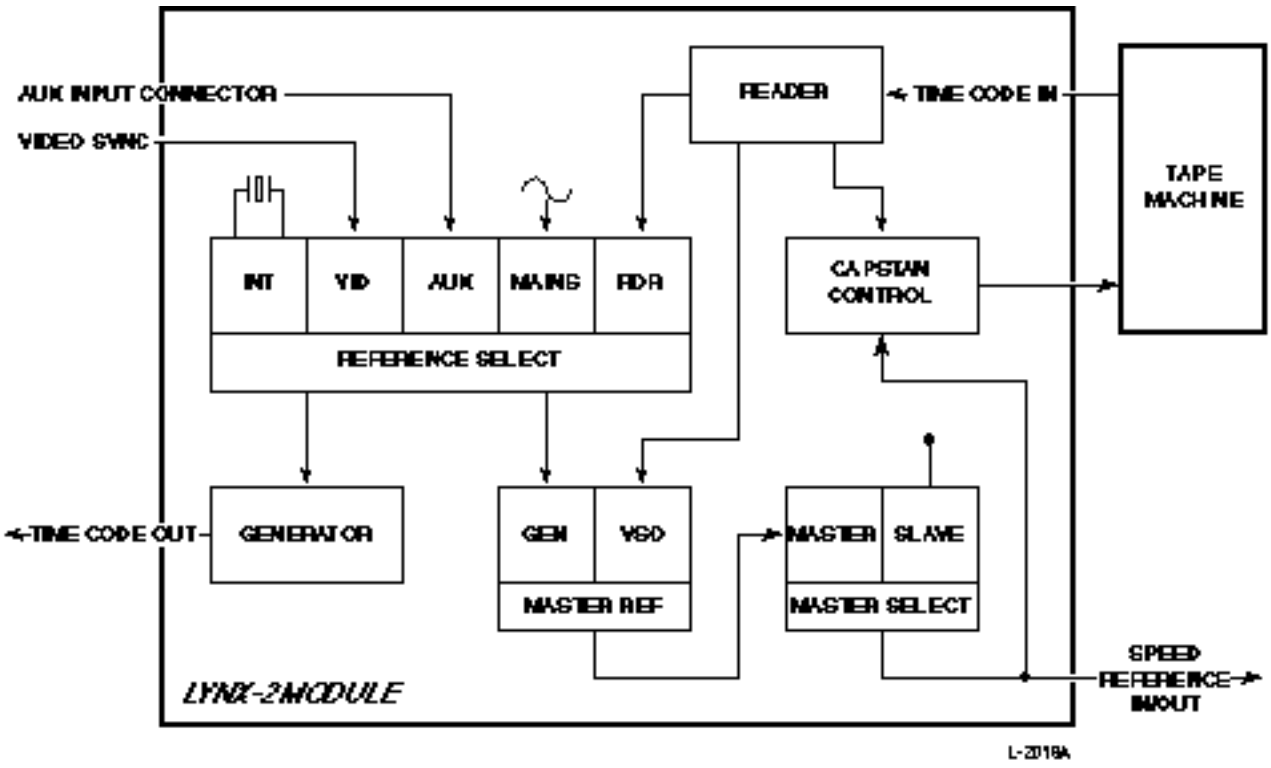


Figure Chapter 9 -6. Reference Source Selection

VID

When lit, the VID LED, above the [GEN REF] key, indicates that the synchronizer's generator reference is a signal coming from an external video source.

This reference, which can be black burst, color burst, color bars, or composite sync, is often generically called house sync. It comes from an external video sync pulse generator that is referenced by all machines in the system. Video should always be selected as the generator reference when there are video or digital audio transports being synchronized in the system.

If external video is the master reference source, each module in the system should be connected to the external video reference. This is easily accomplished by looping from one module to the next, using the two, parallel, EXT VIDEO BNC connectors.

AUX Input

When lit, the AUX LED, above the [GEN REF] key, indicates that the synchronizer's generator reference is a signal coming from an external auxiliary source that is connected to the modules auxiliary connector. The auxiliary input can be either a 50 Hz or 60 Hz signal.

The AUX master reference will typically only be connected to one module. The Slave modules/machines receive their speed reference via the RS422 cables that connect the system modules.

When the module is selected as Master and the Master reference is set to GEN, the AUX input will be used as the system speed reference.

MAINS

When lit, the MAINS LED, above the [GEN REF] key, indicates that the synchronizer's generator reference is the module's AC power line frequency. MAINS as a reference is normally only used when it is necessary to synchronize with older equipment fitted with AC motors, which run directly from the AC power line.

When the module is selected as Master and the master reference is set to GEN, the AC MAINS will be used as the system speed reference. The Slave modules/machines receive their speed reference via the RS422 cables that connect the system modules.

RDR/VSO

When lit, the RDR LED (above the [GEN REF] key) indicates that the synchronizer's generator reference is coming from the time code reader. When the module is selected as a Master, the master reference is automatically set to VSO. When the master reference is VSO, it indicates that the master machine is being allowed to run at its own play speed (commonly called "wild" speed). In wild mode, the capstan speed of the master transport is governed by its own internal crystal, and is not regulated by the Lynx-2 synchronizer.

The master transport's varispeed control can then be used to effect the play speed of the entire system. This is useful for off-speed mixing.

When in VSO mode, the Lynx-2 module will follow the speed of the master transport over a ±15% range.

A disadvantage of using VSO mode as the system reference, is that wow and flutter is passed down from the master to the slaves. Fortunately, this effect is minimized by digital filtering in the Lynx-2 module.

Using VSO as the MSTR REF also provides for "code only" master operation when transport cables are not available for a machine or the Master code does not come from tape. More on Code Only Master mode below.

When the module is selected as Master and the master reference is set to VSO, the Master transport reader speed is used as the system speed reference.

The Slave modules/machines receive their speed reference via the RS422 cables that connect the system modules.

Remember, that AUX, MAINS and RDR are non-standard capstan reference sources. These are considered non-standard because there is no control over the reference speed and therefore if used for time code generation, may not meet time code specifications. The generator N/STD LED will flash as a warning, if the reference rate deviates by greater than ±0.2% of nominal speed.

Time Code Frames

Once the generator reference source has been set, the frame rate is automatically determined for the VID system and RDR selections. If INT or AUX is selected, the generator frame rate and code type need to be set. By pressing the [GEN CODE] key one or more times, the module will step through the code types: 30, 29.97, 25 and 24.

The time code Reader will automatically indicate the code type (30, DF, 25, 24) that has been striped to tape on the local transport. The speed and code type on the local tape normally should be the same as the generator reference source.

Gearbox Processor

The built-in Lynx-2 Gearbox Processor enhances the Lynx-2 machine control system capabilities by permitting the module to synchronize mixed time code types, at both fixed and fractional rates. Accessing varispeed functions must be done from the TimeLine KCU.

In stand-alone operation, the Lynx-2 can be used to cross-lock different time code types. The Gearbox does not alter the nominal speed of each tape, but synchronizes each machine so that the hours, minutes and seconds of each time code word correctly match. This process is absolutely accurate and is identical to synchronizing similar time code types.

Details of the Gearbox Processor, cross frame and fractional rate synchronization, are covered in Advanced Features.

Transport Communications

Each Lynx-2 module uses three cables to connect to its local transport:

- Machine time code input, connects between the module's Generator [GEN OUT] and an audio or time code track input on the local transport.
- Machine time code output, connects between the transport's audio or time code track output and the module's Reader (TC IN).
- Transport control cable, connects between the machine's remote or synchronizer connector and the module's transport connector. This cable sends transport control data to the machine, and receives tallies back from the transport.

In addition, when two or more machines are used to form a system, RS422 cables must be used to daisy chain the modules together.

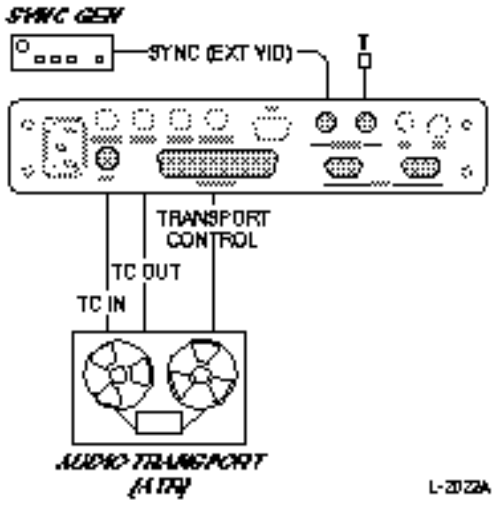


Figure Chapter 9 -7. Transport Communications

When PLAY is pressed on a transport, three activities are initiated:

1. The master time code is read by the master module, and transmitted via the RS422 serial port, to the slave modules.
2. The master module resolves and locks to the master reference.
3. The slave adjusts its position to equal the master time code and locks to the master reference.

Servo Control

Transport capstan servos are normally externally controlled by either a DC voltage or frequency modulated (FM) signal. Most modern parallel controlled machines use a nominal control frequency of 9600 Hz. All manufacturers use one of these methods. When a transport is selected from the Lynx-2 transport table, the method of capstan control is automatically set.

Voltage Control

The Lynx-2 is preprogrammed to provide each machine's play speed nominal DC voltage, and based on any error calculations, increases or decreases the voltage to the capstan servo motor as needed to adjust the capstan speed and maintain sync.

The Lynx-2 setup option, capstan wild speed, allows the nominal (or center) voltage to be user adjusted to allow for any irregularities in older transports.

Frequency Modulation

The Lynx-2 is preprogrammed to provide each machine's nominal play speed frequency.

Speed control is obtained when the Lynx-2 increases or decreases the frequency, based on the synchronizer error calculation, which in turn varies the speed of the capstan motor.

Frame and Phase Locking Modes

Lynx-2 has two modes of synchronization: Phase lock and Frame lock. Phase and Frame lock are terms common to the industry. In the Lynx-2 module, The default method of synchronization is phase lock on. To change to frame lock, set the phase option in the setup options menu to off.

Phase Off

Use the {LAST} and {NEXT} keys to step to the Phase option. Enter the OPTions menu by pressing [SHIFT] + [MSTR] then {OPT}. Set Phase = OFF, sets the module to the Frame lock mode.

Frame lock mode precisely synchronizes and slave(s) to the master. When locked, all of the information available in the time code word is used to maintain synchronization. If a time code discontinuity greater than one frame occurs, the synchronizer will very slowly resynchronize the slave machine so that the master and slave time codes match.

Phase On

Use the {LAST} and {NEXT} keys to step tot he Phase option. Enter the OPTions menu by pressing [SHIFT] + [MSTR] then {OPT}. Set Phase = ON. The Phase ON option sets the module in the Phase or Sync lock mode. This mode precisely synchronizes the Slave(s) to the Master. Once locked, the synchronizer ignores the absolute time code address values and maintains synchronization using the phase information from the time code sync data bits.

This is the most commonly used mode, and should always be used when tapes are striped with discontinuous code.

Sync Principals

A synchronizer uses time code signals to facilitate a frame-for-frame synchronous lock between multiple audio, video, and film transports. A synchronizer controls one or more tape or film transports (slaves) whose starting position and tape speed copy those of one specific (master) transport.

There are three levels of system operation available when using the Lynx-2 module:

- Play speed only or Resolve
- Chase lock
- System Controller

Resolve

Resolve is a control mode that synchronizes only to the speed of the machines. There is no address information accessed or exchanged. One or more machines can be resolved to run at the exact same speed without regard to tape position.

Chase Lock

In chase lock, the slave machines follow the master transport position and speed. The master transport can be shuttled or located, and the slaves will follow. When chasing the master, the slave(s) automatically switch from play to chase, and resync when the master is put back into play.

System Controller

Synchronization via a system controller provides flexible control of, multiple transports. A central control keyboard, such as TimeLine's KCU (Keyboard Control Unit) provides options such as, machine group selection, solo transport control, locate, looping, offset, event points, and record in/out. The KCU is also used to access the Gearbox Processor fractional frame rate synchronization functions. (See the Advanced Applications section for more information on the controller applications.)

Code Only Master

The Lynx-2 module can be used in a code only master mode. This is done when the module does not support a tape machine that you wish to use, or it is necessary to chase to a generator or "wild" code speed. The slave machines will chase and lock to the master code in the normal way.

Connect the time code feed or transport output to the TC IN jack on the Master Lynx-2.

The slave modules are connected to their local transports with the normal transport cables.

When in Code Only Master mode, the master reference must be set to VSO, since it is not possible to resolve the speed of the Master transport. The Lynx-2 module will then use the transports speed as the system speed reference.

1. Connect the RS422 cable between the Master and Slave modules.

MASTER

2. Press [TRAN MODE]
   Puts the Master online.
3. Press [MSTR]

   MSTR LED on
   Select the code only machine to be Master
4. Press [MSTR REF]

   VSO LED on
   This releases the master transport from Lynx-2 control, and permits code only operation. Lynx-2 is ready to read time code off the master machine's time code track. The time code position and rate is communicated to the slave(s) via the system BUS.

NOTE: It is not important which transport setting is selected on the code only master module.

SLAVE

5. Press [TRAN MODE]

   ONLINE LED on
   Puts the slave online.

6. Play the master transport, the slaves will chase and lock.

Synchronization Setup Procedure

This synchronization procedure assumes that you have loaded each machine with prestriped tape, that all appropriate setup options are selected and that the appropriate cabling is connected.

Master Setup

1. Press [DSPL SEL]

   RDR LED on
   Press [DSPL SEL] one or more times to turn on RDR LED.

2. Press [TRAN MODE]

   Transport ONLINE LED on
   Put the designated master Lynx-2 online.

3. Press Play (Master Transport)

   Time code updates
   Play the transport for 10 seconds so that the Lynx-2 reads time code.

4. Press [MSTR]

   MSTR LED on
   Define the system master.

5. Press [MSTR REF]

   GEN or VSO LED on
   Press [MSTR REF] one or more times to set Lynx-2 to the desired master reference source.

Slave Setup

1. Press [DSPL SEL]

   RDR LED on
   Press DSPL SEL one or more times to turn on RDR LED.

2. Press [TRAN MODE]

   ONLINE LED on
   Put slave Lynx-2 into online mode.

3. Press Play (Slave transport)

   Time code display updates
   Play the transport for 10 seconds so that the Lynx-2 reads time code.

Synchronization Procedure

1. Press [PLAY] (Master transport)
   Puts the master transport into PLAY.
2. The slave transport will chase to the master position.
3. *RESOLVE LED on*
   Lynx-2 has resolved the speed of the slave transport to the Master transport, it is within 25 subframes of lock.
4. *LOCK LED on*
   When the LOCK LED lights up on both the Master and Slave(s) transports, the transports are locked.
5. Press [DSPL SEL]

   OFFSET ERR LED on
   Press DSPL SEL one or more times until the offset LED is lit. You can verify LOCK by checking the subframes. You should see >L0.00. The "L" means that the Slave is locked to the Master and the number indicates the accuracy of the lock in 100ths of a frame.

Lynx-2 as a Resolver

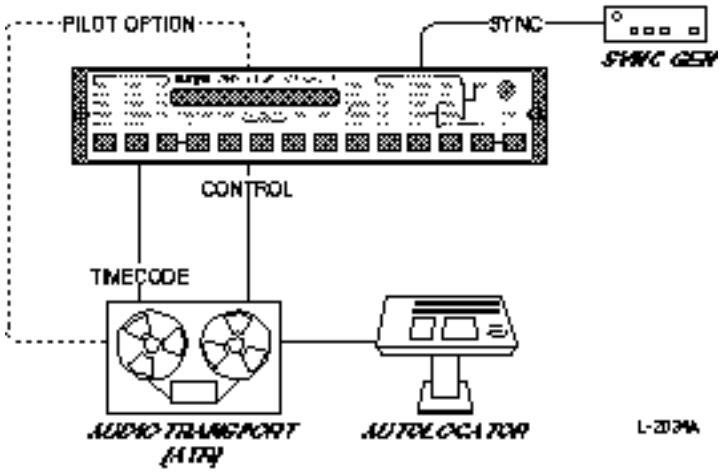


Figure Chapter 9 -8. Lynx-2 as Resolver

Pilot is one of the original methods used to facilitate synchronous operation. It uses a resolver to maintain a constant transport speed. Field production audio has traditionally used Pilot Tone as a speed reference so that when the production masters are brought back into the studio, a known speed can be established.

Pilot is generated from, and referenced to, a stable sine wave such as the AC power line frequency. The synchronizer compares the pilot frequency on tape with the master reference source. Any speed differences will cause phase shifts between the code frequencies. The phase shifts are detected and fed to the resolver.

The output of the resolver controls the rotation speed of the transport capstan by generating an error calculation and correction signal. This increases or decreases the voltage or frequency sent to the slave's capstan, until the machines are phase locked.

You could think of the resolver as a comparator, which compares the speed of a transport against a standard reference and then corrects for any deviation.

When Pilot Tone is used as a speed reference, the Pilot frequency is always twice the desired time code rate. The four most common pilot frequencies are:

- 60 Hz for 30 fr/s (B&W TV, NAB, USA)
- 59.94 Hz for 29.97 fps (Color TV, USA, Japan)
- 50 Hz for 25 fr/s (TV, cinema, Europe, IEC)
- 48 Hz for 24 fr/s (cinema, USA, NAB)

How Does a Resolver Operate?

A spare audio track is designated as the sync or control track. A suitable sinusoidal signal from a crystal oscillator, a movie camera or the high voltage AC line (stepped down through a suitable transformer), is recorded as the speed reference signal.

On playback, the pilot tone on tape is compared to the system reference, and the speed of the machine adjusted to achieve phase lock.

Warning

DO NOT plug AC line voltages directly into an audio input. Smoke, fire, major equipment damage and death can occur.

Pilot is also used to resolve master/slave systems. The master control track becomes the reference source, to which the slave control track is compared. The resolver corrects speed variations on the slave transport.

This type of phase-locked synchronization is a relative locking system. Its' success depends on putting the transports into play at precisely the same time and location. Corrections must be made manually.

Resolver Setup Procedures

This resolving procedure assumes that you have loaded the machine with a tape, with prerecorded pilot tone or time code, and that all appropriate setup options are selected and the appropriate cabling is connected.

Master Setup Procedure: Resolver

1. Press [DSPL SEL]

   RDR LED on
   Press DSPL SEL one or more times to turn on RDR LED.

2. Press [TRAN MODE]

   ONLINE LED on
   Puts the Lynx-2 online.

3. Press [MSTR]

   MSTR LED on
   Select the Lynx-2 as a Master, so that it will resolve the tape.

4. Press [MSTR REF]

   GEN LED on
   Press one or more times to select the master reference source. When GEN is selected, the generator reference speed will be used to resolve the speed of the machine also.

Resolve Procedure

5. Press [PLAY] (transport)

   RS422 LED on
   Put the transport into PLAY.

6. Press [DSPL SEL]

   ERR LED on
   Press [DSPL SEL] one or more times to select the ERR display. This will show >L0.00 and the module resolve and lock LEDs will come on, indicating that the tape speed has been resolved to the reference.

Chapter 10 Gearbox Processor

Introduction

The Lynx-2 module's synchronizer has a gearbox feature, which permits the module to synchronize mixed time code types, at both fixed and variable rates. The module contains the necessary hardware to perform the high resolution calculations required for Cross Frame (X-Frame) and Varispeed synchronization.

In Stand-alone (SAL) operation, the gearbox function will automatically X-Frame synchronize, mixed time code types. When used with a TimeLine Keyboard Control Unit (KCU), the gearbox processors will synchronize at both X-Frame and variable speed.

Special KCU varispeed software has preset, standard varispeed rates, or can automatically calculate the correct varispeed rate from reference and slave sync points.

This section includes detailed information on the principles and operation for both Lynx-2 and KCU Varispeed operation.

Features

- Can be used with existing V500 Lynx modules.
- Supports all time code types and rates.
- 30, DF, 25, and 24 time codes can run concurrently.
- With KCU, ±15% Varispeed synchronization range.
- Multiple methods for calculating Varispeed rate.
- Preset standard Varispeed, NTSC Pull-ups and Pull-downs.
- Machines can run X-Frame and Varispeed simultaneously.
- Clear, concise KCU status display.
- KCU software is quick and easy to use.

Software

Lynx-2 Time Code and Film Module

Lynx-2, V700 software contains full feature gearbox functions designed to operate with other Lynx-2 modules. When used in a system with older Lynx modules, the Lynx-2 gearbox functions will only operate if the modules are fit with V500 or V600 software. We recommend that all Lynx modules used in a system, with the gearbox processor, are upgraded to the latest version of V500 software.

It is not possible to operate a Lynx-2 module with Lynx modules that are running TimeLine SAL "L" or "FL" Series software.

Keyboard Control Unit

Varispeed control software, K600, is supplied on two PROMs. Both PROMs must be installed in the KCU for correct operation. Read the Keyboard PROM Installation Guide, included in the K600 software kit, for instructions on how to fit the software.

If you are replacing software earlier than KCU080-14, a simple hardware modification is required to the KCU processor board. Service Bulletin SB 91-003, which details this modification, is included in the K600 software kit.

Operation

X-Frame Lock

The Lynx-2 gearbox feature will lock or synchronize mixed time code types. Supporting 30, DF, 25 and 24-frame time code types, the gearbox can, if required, synchronize all four codes simultaneously. The nominal speed of each tape is not altered, but each machine is synchronized so that the hours, minutes and seconds of each time code correctly match, as shown in Figure 10-1. This process is absolutely accurate and is identical to synchronizing similar time code types.

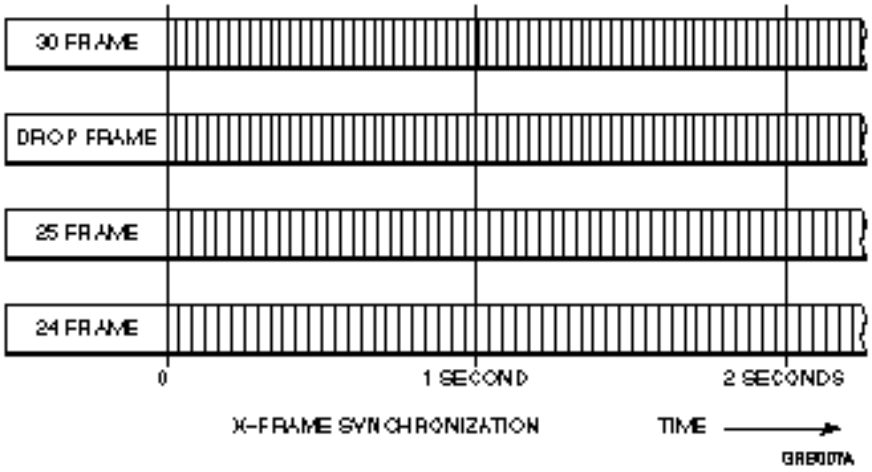


Figure Chapter 10 -1. X-Frame Timing

Any machine can be selected as the reference machine and all slave machines will automatically X-Frame lock. All machines synchronize at the rate of the Reference Source (Ref Src). For normal SMPTE time code operation, the rate is 29.97 fps, which is automatically selected when NTSC video is used as the system Ref Src. When NTSC (29.97 fps) is selected, 24-frame code will run slowly at 23.976 fps and 25-frame code at 24.975 fps. For EBU time code operation, the rate is 25.00 fps, which is automatically selected when PAL video is used as the Ref Src. When PAL is selected, 30 and drop frame tapes will run at 30.00 fps.

If the master reference source is Internal Crystal (Int), and the time code type selected is 30 or DF, the system can run at either 29.97 fps (NTSC) or 30.00 fps. If 30.00 fps is selected, 24-frame code will run at 24.00 fps and 25-frame code at 25.00 fps. See Table 10-1.

When the reference machine, code type is 24 or 25-frame time code, then X-Frame 30 and DF codes will run at 30.00 fps. To correctly run 30 or DF time codes at the NTSC rate, 29.97 fps, with a 24 or 25 fps reference, a KCU fitted with K600 software is required to enter a -0.1% varispeed in the slaves.

Table Chapter 10 -1. X-Frame Rates

Ref Src Rate	Slave Rate 30	DF	25	24
30.00	30	30	25	24
29.97	29.97	29.97	24.975	23.976
25.00	30	30	25	24
24.00	30	30	25	24

In X-Frame lock, the Lynx-2 module operates in the same way as a standard module. Sync points and offsets are calculated by the normal method and the processor takes care of the X-frame rate conversion, see Figure 2. The reader sync point and offset error time codes are displayed in off-tape time code type, but offsets are calculated and displayed in the reference code type.

For example, if a 25-frame tape is being synchronized to a 30-frame master tape, then the slave Lynx-2 module will display 25-frame time code numbers, except for the offset, which will be a 30-frame time code number.

On the Lynx-2 module, a Transport Code Type LED will flash if the synchronizer is in X-Frame, indicating the reference machine code type, if it is different from the off-tape time code type. When the module's Display Select [DSPL SEL] key is stepped through the display options, the Solid Transport Code Type LED indicates the type of code displayed.

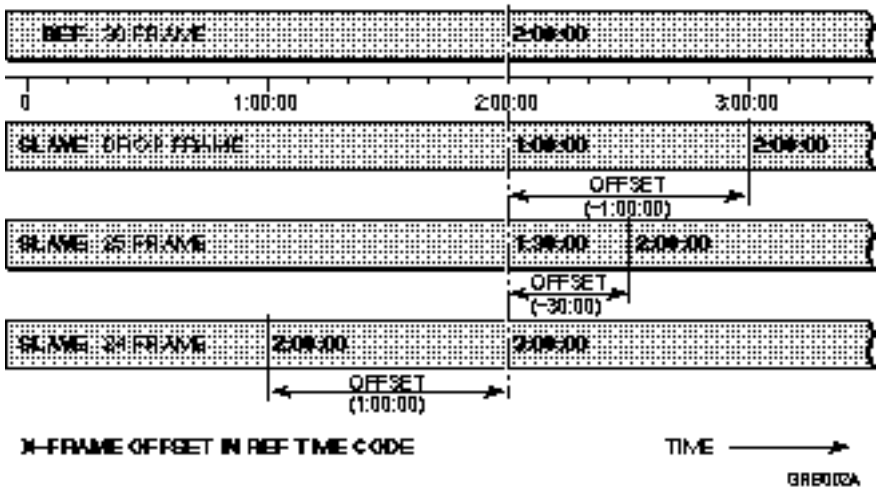


Figure Chapter 10 -2. Offsets in X-Frame

Varispeed Lock

With the KCU, the Lynx-2 module will operate both X-Frame rate and varispeed synchronization. Varispeed synchronization permits machines to run, locked together, at different speeds so that time compression or expansion occurs.

Varispeed synchronization allows many new operational features: tapes that have different running times can be fitted together; program material with non-synchronous time code can be locked; NTSC 0.1% pull ups and pull downs, and standards conversion between 24 and 25-frame codes requiring 4% speed compensation, can be performed.

The way that slave machines lock in varispeed is internally, extremely complex. A machine in varispeed can be thought of as having a constantly moving offset. At any point, the actual offset (the real difference between the tape time codes), is made up of two parts; the entered offset (time in the offset register) plus a varispeed offset adjustment. These two components are used to determine the positional relationship between machines.

So what is the offset and where is it defined? When machines are in varispeed mode there is only one point, somewhere in the "24-hour clock," where the actual offset is completely independent of the varispeed adjustment. At this point, no matter what varispeed rate is selected, the machines positional relationship does not change.

This point is called the "varispeed pivot point" and it is at this point, on the slave tape, that the offset is defined. Looked at another way, the pivot point is the place where the difference between the off-tape time codes is exactly the same as the time in the slave offset register. In the example below, the varispeed pivot point is at 00:00:00.

Consider two tapes with a zero offset. The master machine is running at fixed speed and the slave with a +10% varispeed. If these tapes are played from 00:00:00, then at 10 minutes the master time will be 10:00:00 and the slave time 11:00:00. Even though the tapes started with a zero offset, at 10 minutes the tapes have an actual offset of one minute.

In the example, if the master tape is at 10:00:00 and the slave varispeed percentage is changed from +10% to 0%, the slaves actual offset will be recalculated, and the tape would move back one minute to establish its proper, positional relationship at the new zero varispeed rate.

However, if the slave tape had been at 00:00:00 (the varispeed pivot point), altering the varispeed would not have moved the tape, as it is already in the correct place. From this it can be seen that there is only one place where the varispeed percentage does not affect the tape position.

In practice, the slave varispeed pivot point is not set at 00:00:00, but at the start of the program material, or at some other relevant point (i.e., the beginning of a sound effect). Then, if the varispeed rate needs to be altered, the start time is locked in place and the "sync" does not move.

With the KCU, the varispeed pivot point for each machine is set by entering slave Source Sync (SRC SYNC) points. Figure 10-3, shows the relationship between the reference and slave machine with different source sync points, at varispeed percentages of ± 15%. If a source sync point is not entered, as in our previous example, then the default time of 00:00:00 hours will be used as the varispeed pivot point, as shown in Figure 10-3, Example A.

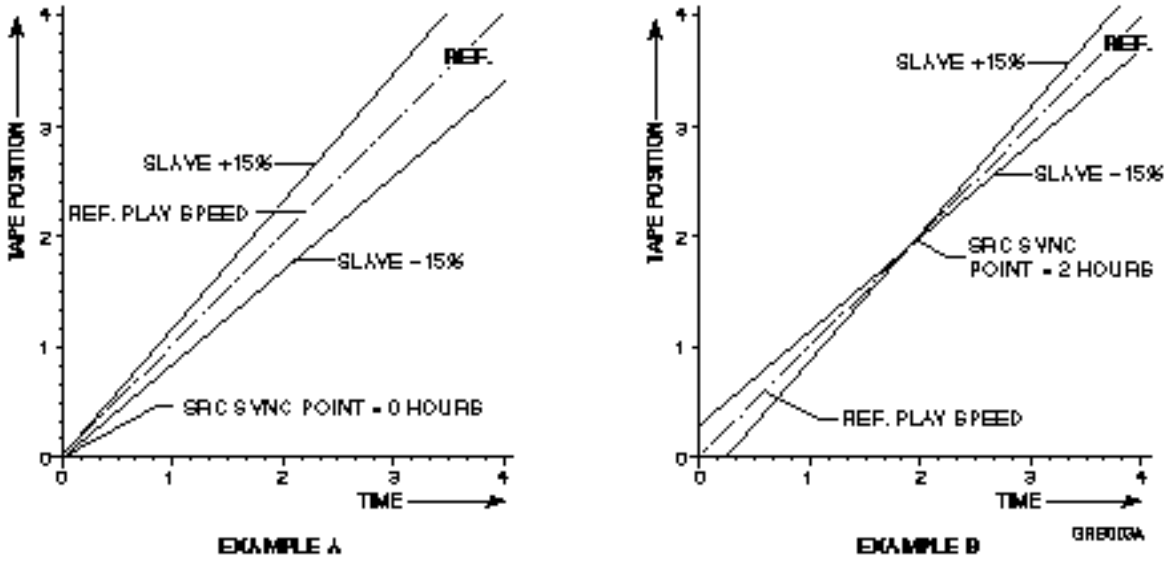


Figure Chapter 10 -3. Varispeed Synchronization

Machines running in varispeed can be offset by all the normal methods. The offset can be manually entered, captured or calculated from sync points. Offsets can be recalled and trimmed dynamically, if required, using the **+** and **-** keys or the Jog/Shuttle wheel. When offsets are calculated for X-Frame machines, the time codes are converted in the offset calculation to the reference machine, code type.

Manually entered offsets are applied at the slave source, sync point (varispeed pivot point). Some care must be taken when manually entering or adjusting offsets. If the slave tape is not located at or close to the source sync point, the machine will relocate to maintain the correct varispeed positional relationship.

Offsets can be captured by soloing the slave machine and pressing capture followed by the calculator (5) OFST key. The offset is calculated by subtracting the current master position from the current slave position. If either of the machines are operating in X-Frame rate mode, then the time code will be converted in the offset calculation to reference code type.

In normal operation, each time an offset is captured and the source sync point register is inactive (src sync key LED off), the register is automatically updated to the current time code value. The source sync point register remains inactive, but the new value will be used as the slave varispeed pivot point.

If the source sync point is active when the offset is captured, the register will not be overwritten and the captured offset will be compensated by the varispeed adjustment; making the offset value correct at the varispeed pivot point (source sync point). In both cases the current position of the machine does not move.

The normal offset calculation functions of the reference sync (Ref Sync) and source sync (Src Sync) keys and registers have not been changed. If Ref and Src Sync points are set for varispeed machines, the offset will be calculated in the normal way and applied at the source sync point. If no reference sync point is set, the system uses the record edit in point to calculate the offset. Figure 10-4, shows two examples of how offsets affect the relationship between the reference and slave machines at a -15% varispeed.

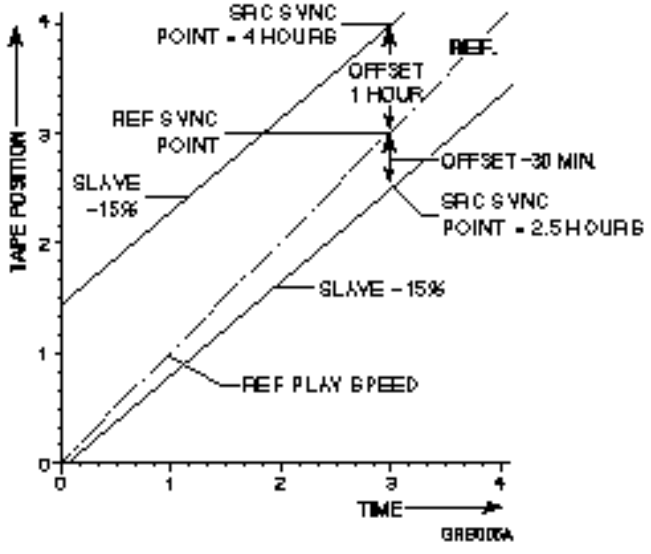


Figure Chapter 10 -4. Offsets in Varispeed

When the reference sync or edit in points are changed, ALL machines with active source sync point registers will have their offsets recalculated and reposition. The source sync point is active if the SRC SYNC LED is on in solo or status modes. If you do not want a particular slave machine offset to recalculate, the source sync point for that machine should be made inactive, by holding CLR and pressing the SRC SYNC key, before changing the reference sync or edit in points.

Making the source sync point inactive does not affect the varispeed pivot point. The system will still use the value in the source sync point register for the varispeed calculation.

From an operational standpoint, offset entry and calculation, as outlined, are quite straight forward. There is however, one special feature that has been added to the KCU sync point software, to further simplify operation. This allows slave varispeed pivot points to be moved without changing the actual offset relationship with the master machine.

In normal operation, if a slave varispeed pivot point is moved and the offset is not changed, the slave machine will recalculate its position and relocate. For example, consider our earlier varispeed example (Figure 10-4), with the master at 10:00:00 and the slave at 11:00:00. If the slave source sync point (varispeed pivot point) is now moved from 00:00:00 to the current tape position, 11:00:00 and the offset remains at zero, the slave tape would have to move back 1:06:00 to be correctly in sync with the master.

If the reference sync and edit in points are inactive, the KCU does a special calculation to prevent the slave from moving when a new source sync point is entered. The KCU automatically updates the slave machine offset to take into account the varispeed offset adjustment between the old and new source sync points. By updating the offset, the positional relationship defined by the previous source sync point and offset is maintained. In our example, when a new source sync point is set at 11:00:00, the offset register will be updated from zero to 1:00:00 and the tapes will not move.

Remember, it is possible to clear the ref sync or edit in points, temporarily, by pressing CLR and the REF SYNC and IN special function keys simultaneously. The register values are not cleared, but made inactive and can be recalled and restored if needed, after the slave machine sync point has been moved.

Table 10-2, summarizes the conditions and changes to the pivot point and offset, for each of the possible methods of calculating offsets. Blank cells in the table are not used by the KCU, and the status of these registers does not affect the offset computation.

Table Chapter 10 -2. Offset Calculation, Key Combinations

	Ref sync or edit in point	Source sync point	Pivot point	Offset
Capt offset		Inactive	Slave time	Slave - Mast
		Active	No Change	Comp*
Store/Capt		Inactive	No Change	No Change
Ref		Active	No Change	Src - Ref
Store/Capt	Inactive		Slave time	Comp**
Src	Active		Slave time	Src - Ref

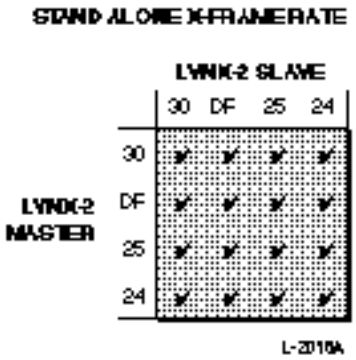
* Offset is slave - master time, varispeed compensated so that it is correct at the pivot point.

** Offset is old offset, varispeed compensated at the new source sync point.

SAL Operation

Lynx-2 modules can be used to X-Frame synchronize mixed code types in Lynx Stand-alone (SAL) mode. All possible code type combinations are permitted, as shown in Table 10-3.

Table Chapter 10 -3. Stand-alone X-Frame Combinations



In SAL mode, the master module time code generator is used to determine the system reference, code type and rate. The Lynx-2 module, generator reference source (Ref Src) can be selected to Ext Vid, Int Xtl, Mains AUX or VSO. VSO cannot be selected when the Lynx-2 is used in a system with V500 Lynx modules, or if the master is to be X-frame locked.

To X-Frame lock with V500 Lynx modules, a Lynx-2 module has to be the master. Set the Lynx-2 generator to the V500 slave tape code type and select as the generator Ref Src. Remember, when setting the generator for 30 or DF codes with Int selected, the generator rate can be either 29.97 fps (NTSC) or 30.00 fps. See Table 10-1, X-Frame Rates, to check that the correct rate has been selected.

The V500 modules will synchronize with the Lynx-2 generator and the master module will X-Frame lock against its own generator. The generator information is only used internally and it is not necessary to run the master generator for the system to lock.

To indicate when a Lynx-2 module is X-framing, one of the module Transport Code Type LEDs will flash to indicate the master module generator code type; if it is different from the machine's tape time code type.

If there are modules with V500-26, FV500-26 or earlier software in the system then only the master Lynx-2 module can be X-Frame locked.

SAL Setup Option

Setup menu option, "Master," in the Lynx-2 module is used to determine SAL X-frame rate operation. To enter setup, press the module SHIFT and SETUP keys together. Press the ADDR key, the "Editor and Address" column is displayed, then use the FORW and BACK keys until "Master" is displayed. The Master option defaults to V600, which should only be used if all the modules in the system are Lynx-2's or are Lynx modules fitted with V600 software.

When this option is set to V600, the "time line" rate and code type information is transmitted over the serial port so that more than one Lynx-2 or V600 module can be cross frame synchronized, simultaneously in SAL operation. If there are any modules with V500-26 or earlier software in the system, use the [↑] and [↓] keys to set the Master option to V500.

KCU Operation

Several improvements have been made to the standard Keyboard Control Unit. Information covering the KCU general operational changes are covered in the KCU manual supplement, enclosed in the gearbox option kit. These notes cover the specific differences between K600 software and the previous KCU080-16d software. A brief KCU080 software history is also included for those installations where the K600 upgrade is from an earlier software version.

The KCU detects Lynx-2 modules and Lynx modules fitted with V600 on the Lynx Bus and automatically switches for X-Frame and varispeed operation. All of the normal KCU operational functions have been maintained with only minor changes to accommodate varispeed operation. Of significant difference, is the introduction of a reference machine. The reference machine is the first transport added to the group after the Lynx bus is polled and is marked with an asterisk (*) in the display.

The reference machine defines the system time code type, and the system-wide time code numbers (i.e., edit in and out, duration and offsets). The reference machine does not have to be the master machine and does not even have to be in the group. A different master machine can be selected by pressing a machine key (A-F) and the SETUP key simultaneously.

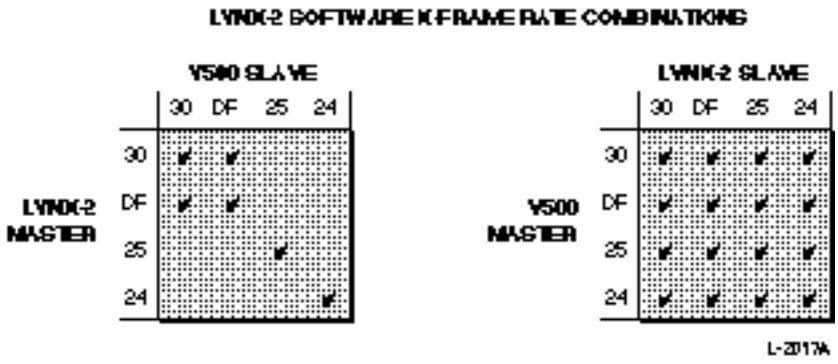
As the master machine can be any machine in the group, the time code in the reference sync point register will not necessarily be from the master machine. The Ref Sync register always stores the reference machine sync point. If the master machine is not the reference machine, the master machine can have an offset. The master will also have a source sync point, instead of a ref sync point, which can be used to calculate an offset from the reference machine in the normal way.

The KCU varispeed software has been designed to be easy to operate. In its simplest form, to varispeed a tape, all that is required is that varispeed is turned on and a varispeed source sync point marked. Comprehensive explanations of the KCU setup options, and the varispeed rate calculator operation, is covered in the following sections.

Any combination of Lynx-2 and Lynx modules fitted with gearbox processor cards and V500 modules can be used with the KCU. X-Frame synchronization of mixed code type is only possible with Lynx-2 and V600 slave modules. V500 modules can be used as slave modules, but only with the code type combinations that are shown in Table 10-4.

When a combination of Lynx modules are used in a system, the most flexible configuration can be obtained by selecting a V500 module as the master machine. The permitted combinations are as shown in Table 10-4.

Table Chapter 10 -4. KCU X-Frame Combinations



KCU Setup Options

Two new setup options have been added to the Transport setup menu and one new option to the System setup menu to control varispeed setup and operation.

Press SETUP followed by the TRAN key to enter the transport options menu. There are two new entries in the list, Number 3, Varispeed and Number 4, Varispeed Percentage. The entries can be accessed directly by pressing calculator keys 3 and 4 or by stepping through the list using the LAST and NEXT keys.

The Varispeed menu has four options, Off, +0.1%, -0.1% and Variable. The ± 0.1% settings are highly accurate preset calculations used for pulling up or down the NTSC 29.97 fps to 30.00 fps frame rate difference. The pull up and down settings are used to run machines at the correct speed when synchronizing with NTSC tapes. Select -0.1% when using a PAL reference to run a slave at 29.97 fps. Select +0.1% when using a NTSC reference to run slave tapes at 25 or 24 fps. X-Frame rate code combinations, where the preset NTSC varispeed corrections are required, are shown in Table 10-5.

The Variable option is used with the Varispeed Percentage, for setting varispeed rates to synchronize program material with different running times, or where standards conversion is required.

The variable percentage is adjustable by ±15%. The Jog/Shuttle wheel or the + and - keys are used to increment and decrement the varispeed amount. The Jog/Shuttle wheel increments the value in 10ths, and the + and - keys in 100ths of a percentage. The CLR key can be used to reset the varispeed back to 100%, the default.

The varispeed percentage will be automatically updated if varispeed sync, "In and Out points," are entered in the Tran varispeed calculation entry mode to calculate a varispeed rate.

Table Chapter 10 -5. NTSC Varispeed Corrections.

Ref Src Rate	Slave Code 30	DF	25	24
30.00*	-0.1%	-0.1%	0	0
29.97	0	0	+0.1%	+0.1%
25.00	-0.1%	-0.1%	0	0
24.00	-0.1%	-0.1%	0	0

* This case is unusual, because 29.97 fps would normally be selected for NTSC operation.

Press SETUP followed by the SYS key to enter the system options menu. There is one new entry in the list, Number 4, NTSC Default. This entry can be accessed by pressing calculator key 4, or by stepping through the list using the LAST and NEXT keys.

The NTSC default menu has 2 options, 29.97 fps and 30.00 fps. This menu is used to set the master module, frame rate for X-Frame synchronization, if the time code type is 30 or DF, and the reference source is not Ext Vid or VSO. This should normally be set to 29.97 fps, see Table 1, X-Frame Rates.

Varispeed Calculation

In most applications, unless the varispeed is a standard value, the simplest method of determining the correct varispeed rate is to use the KCU varispeed calculator. The calculator will calculate the rate from four points on tape (ref start and end, slave start and end) or as a ratio of two durations.

The KCU software has a special tran mode for varispeed percentage calculation. This mode is independent from normal KCU operation and is only used for marking points on each tape or for entering known program durations for varispeed calculation. In tran mode, the calculator automatically recalculates the rate, each time a point is marked, and enters the new varispeed value for that machine.

The varispeed calculator is entered by pressing the TRAN key twice. The first press of the TRAN key enters tran status mode, the TRAN key LED flashes, and information relating to the selected machine is displayed. Press the TRAN key again to access the varispeed calculator. The TRAN key stops flashing and the KCU displays, TRAN: followed by the current machine letter and a flashing "Varispeed" message to indicate that the KCU is in tran mode.

The current varispeed percentage is shown if the selected machine will varispeed. If the varispeed percentage flashes, this indicates that the rate, computed from the current varispeed calculator register values, does not match the actual varispeed percentage. A varispeed percentage will not be shown for the reference machine and V500 modules.

Tran mode is a special case of solo mode. The KCU transport functions can be used in the normal way to control a machine and locate specific points on tape. In tran mode there are start and end point registers for each machine, which can be captured, stored, recalled and trimmed in the normal way.

The varispeed calculator uses the IN (7) and OUT (8) calculator keys to store each machines' start and end times. The calculator then compares the slave times with the reference machine times and calculates the slave varispeed percentage. As each machine has independent in and out registers, it is possible to enter different points on the reference machine to calculate individual varispeed rates for each slave machine.

> NOTE
> The tran mode in and out varispeed calculation registers are not the same as the edit in and out registers.

The varispeed rate can also be calculated by entering two program durations. If the existing running time is stored in the reference machine, duration register, calculator key DUR (9) and the new running time in the slave duration register, then the calculator will compare the two durations and calculate a varispeed percentage.

Tran mode can be exited at any time by pressing the TRAN, GRP, SOLO or ALLSTOP keys.

Display

The KCU and the Lynx-2 module have status displays to clearly indicate the X-Frame and Varispeed status of each of the machines.

The Lynx-2 module front panel has an LED marked VARI and will show "VL00" in the offset error display to indicate that a machine is in varispeed. In X-Frame, a Lynx module Code Type LED will flash to indicate the reference machine code type, if it is different from the off-tape time code type.

The KCU will display XL for machines in X-Frame lock and VL for machines in varispeed lock in both group and solo modes. If a machine is in X-Frame and varispeed lock, only the VL will be displayed.

The double letter group lock indicators to the extreme right of the group time code have not been changed, and still indicate the system speed, reference source; for example, LL for external video and II for internal crystal. When VV is displayed, it indicates that the system reference source is VSO, and the system speed will be derived from the master machine, time code input. The VV is not an indication of varispeed lock status.

The tran status display now shows the code type and varispeed percentage for a machine if varispeed has been selected. Press the TRAN key and a machine key (A-F) to enter tran status mode. The bottom line of the display will show the varispeed percentage in place of the capstan wild or resolved message if varispeed is active. To exit tran status, press the GRP, SOLO or ALLSTOP keys.

Error Messages

A varispeed limits error message has been added to warn the user that out of range varispeed calculation information has been entered. The KCU software recalculates the speed every time the reference or slave in, out or dur varispeed calculation registers are altered.

If a number is entered that causes the varispeed to exceed the ±15% range, the varispeed percentage for that machine is reset to 100%, and the following message displayed; "Varispeed reset, limits exceeded!" The actual values in each register are retained, because the speed calculation may only have been exceeded temporarily, while new points are being entered.

Why set a pivot point?

In normal KCU operation, setting a source sync point is optional and only used as a method of calculating offsets. Machines in varispeed, by default, must have a pivot point for the varispeed synchronization calculation. If a sync point (varispeed pivot point) is not set, the KCU will use zero for the varispeed calculations. The varispeed pivot point is the place at which the machines will not move, if the varispeed rate is altered. It is very important that a source sync point is entered, that is related to the program material, otherwise the "sync" relationship will significantly move when the varispeed is changed.

The significant difference from normal operation when machines are in varispeed, is that a source sync point must be set, even if there is no offset required between the machines. Remember, capturing an offset or using sync points to calculate an offset, automatically enters the varispeed pivot point at a suitable time code.

Sub Frames

In some instances, when using the KCU, sub frame amounts will appear in the time code registers. This is normal and is a side effect of either the X-Frame time code conversion or varispeed adjustment process. For example, 30:15 in 30 frame code will become 30:12.50 if it is converted to 25 frame code. The internal calculations performed by the KCU are all high precision and always

take into account the sub frame contents of the time code registers.

Restrictions

SAL Operation

The Lynx-2 module will operate in X-Frame lock mode only. If the master machine is X-Frame to the reference code type, the reference source can not be VSO (master machine, time code reader speed). This is because the master module generator is being used as the "system reference machine."

If there are any V500-26 or earlier modules in the system, only the master V600 module can be X-Frame locked.

KCU Operation

Lynx modules fitted with V500 software will not X-Frame or varispeed against the reference code type. Check Table 10-3, X-Frame Combinations, for valid operating conditions.

X-Frame or Varispeed operation can not be selected for the reference code machine.

When the reference code machine is the master machine, the reference source can be VSO.

If the master machine is not the reference machine and is X-Frame or varispeeding against the reference machine, the reference source can not be set to VSO. If VSO is selected as the system speed reference, then the reference source will automatically switch to internal crystal, the system default.

Conversely, if the reference source is VSO and varispeed or X-Frame rate operation is selected for the master transport, then the reference source will be automatically switched to internal crystal.

Lynx-2 Film Option

Introduction

The Lynx-2 Film option card is a compact, and modular machine control device designed for use with pulse-interlock film transports such as dubbers, projectors, and telecines. The film option card plugs inside a standard Lynx-2 Module, allowing the module to be used with film transports. Using the Lynx-2 Film Module, a film transport or interlocked film chain controlled via a pulse-interlock bus may be operated from an external controller such as a TimeLine Keyboard Control Unit, a video editor or an audio editing computer.

On the transport control side, the Lynx-2 Film Module operates the same as the standard Lynx-2 Module, controlling the motion of the film transport by means of a pulse interlock signal generated by the module.

On the controller side, the Lynx-2 Module will operate stand alone with other Lynx-2 Modules or as part of a controlled system. The module can also be used with a video or computer editing system using Ampex VPR-3 serial communications protocol. This protocol emulation allows editing systems that are capable of serially controlling a VPR-3 to actually operate a film transport or interlocked film chain instead.

Installing the Option Card

Procedure

Disassembly

1. Remove the power cord and all other cables from the back panel.
2. Place the unit on a static safe workstation.
3. Remove the six phillips screws from the top cover, and remove. (See Figure 10-5)
4. Remove the phillips screw securing the center of the main board to the chassis. Save this screw. (See Figure 10-6.)

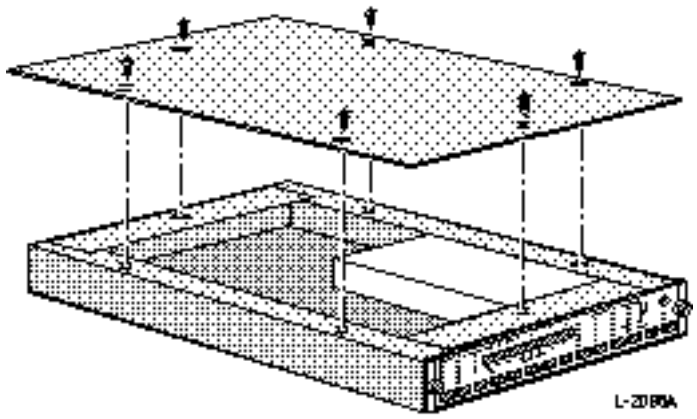


Figure Chapter 10 -5. Removing the Top Cover

Assembly

5. Insert the metal standoff, in place of the phillips screw from step 4.
6. Place the board in the module, aligning with the two plastic standoffs. (See Figure 10-6) Make sure that the front panel ribbon cable in connector J9 is not trapped under the film board.
7. Connect the loose end of the ribbon cable to J7 on the main board.
8. Press down on the option board, properly seating it on the two plastic standoffs.
9. Using the phillips screw from step 4, secure the film board to the metal standoff.
10. Unscrew the two front panel thumb screws and remove the panel. The panel will stay attached to the module by retaining lanyards.
11. Remove the two header jumpers marked option disable to enable the film board option. (See Figure 10-7)
12. Replace the front panel.
13. Replace the top cover. Insert and tighten the six phillips screws. Reconnect the cables and turn on the power.

Note:

Film software version LFI.001 and higher requires a wire jumper modification to the Film Option Card PCB. Factory units from Film PCB Serial Number **370101** will be shipped with this modification installed. If the wire jumper is missing, the Lynx-2 will display the error message [* NO FILM JMPR *]. Please refer to Service Bulletin SB94-004 for complete information.

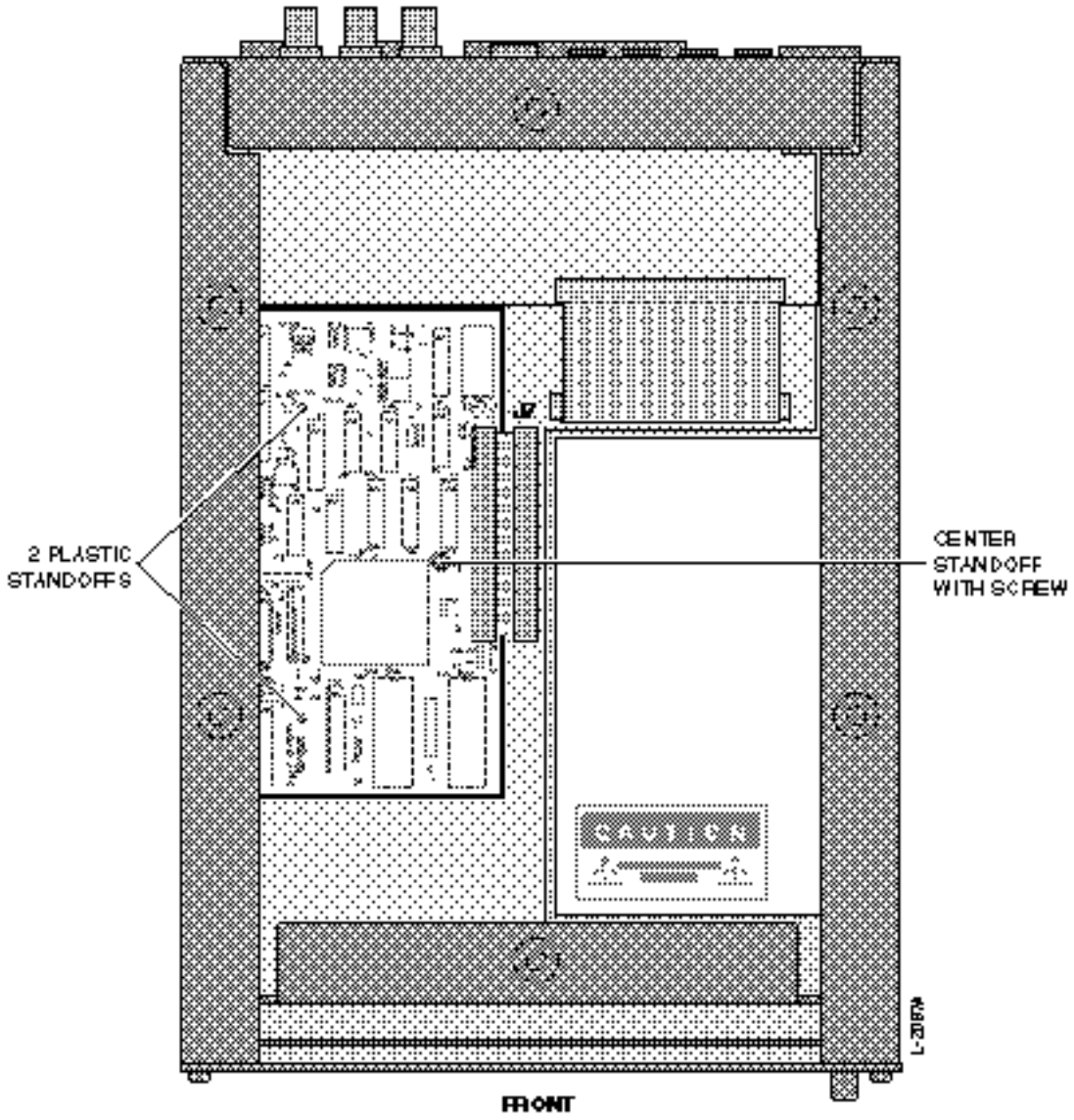


Figure Chapter 10 -6. Standoff Locations

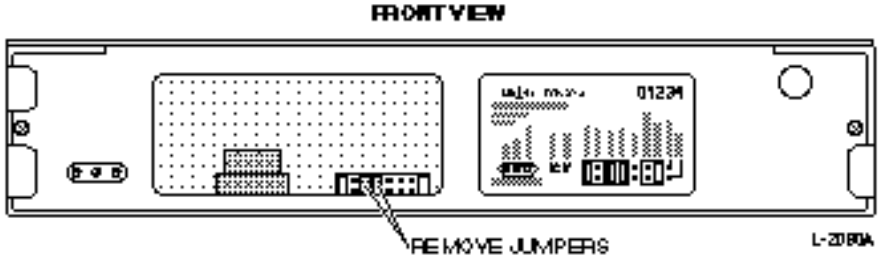


Figure Chapter 10 -7. Jumper Location

Theory of Operation

The movements of film transports are controlled by entirely different means than audio or video tape recorders. These differences complicate integrated control of sprocketed and non-sprocketed machines in the same system.

Control and Synchronization of Film Transports

Unlike tape machines, film transports always run under the direct control of their sprocket drive motors. Once the various pieces of film or mag film stock have been physically aligned to their individual start points on their respective transports, they will continue to run in exact frame lock because the motion of the drive sprockets on all transport is controlled from a single, common source known as a pulse interlock bus.

Film stock often has frame numbers physically printed on it at regular intervals, but these are only used as reference marks during the initial positioning of the film. Once the system is running, the sprocket holes provide all the reference that is necessary.

The pulse interlock bus, which controls a film chain most commonly, uses a two-component signal known as a "biphase" signal that conveys direction information in the phase relationship of the two components and speed information in their frequency.

A film chain's Fast Forward and Fast Reverse modes are frequency and phase variations of the pulse interlock signal, which is also used to drive the system at normal play speed. Any device that is used to control a film chain must generate the appropriate pulse interlock signal at all times, and must vary the frequency of the pulse interlock signal slowly and smoothly to ensure against damage to the sprocket holes in the film from too-rapid acceleration.

Additionally, the Film Module provides control over critical speed and acceleration parameters to handle unusual circumstances such as fragile film stock.

Functional Overview

The Lynx-2 Film option card contains two main functional blocks:

- Biphase Generator (Transmitter)
- Biphase Follower (Receiver)

The biphase sections of the Film Module can generate and follow biphase signals to all known frequency standards. All operating parameters are programmable from the unit's front panel and are retained in the module's battery backed-up memory.

For compatibility with film equipment from any manufacturer, the Lynx-2 Film option accommodates biphase frequencies ranging from 2x frame rate (DIN standard) to 100x frame rate (MTM standard). The nominal film frame rate can be set to 24, 25, or 30 fps.

Biphase control signals can be generated at up to 20x the nominal frequency, and followed at up to 40x the nominal frequency in fast-wind modes.

Biphase Generator

The biphase generator is programmable for film fast speed (maximum wind speed frequency limit) and acceleration. Deceleration adjustment is provided by the module's normal locate speed parameter. Default parameter set-ups are provided for each of the biphase frequencies. These defaults may be overridden as necessary, and any changes will be retained in the module's non-volatile memory.

The Film Module transmits film position information as time code frame numbers to the system via the RS422 serial port. These frame numbers are always tied to the biphase follower and are always related to the actual position of the film just as if they were actually being read from the film itself. You have only to program a starting frame number into the Film Module (using its front panel controls) with the film transports at their start marks.

You may optionally connect an external set of motion control switches to the Lynx-2 Film Module so that the module can function as a master film chain controller when it is the Master, in a stand alone system. In response to the motion control switches, the Lynx-2 Module generates a properly ramped biphase signal to control the film chain directly. Normal, Preset Wind, Fast, and Crawl speeds in both directions are available via these external motion control switches. (See Appendix for interconnect diagram.)

Biphase Follower

The biphase follower in the Film Module keeps track of all film motion relative to the start mark and the module generates the proper frame numbers at any running speed up to 40x the nominal speed. The frame numbers generated are displayed in real time on the Film Module's front panel for convenient visual reference.

Time Code Generator

The time code generator in the Lynx-2 Module will generate either SMPTE, EBU or FILM time code locked to an external video reference signal (e.g., "house sync") or one of the internal references if selected. As part of its power-up routine, the Lynx-2 Module auto detects if the video reference signal is NTSC or PAL and in normal operation automatically sets the generator to the SMPTE or EBU time code standards as appropriate.

In 30-frame systems, if the video reference signal is an NTSC color video signal, the time code frame rate is 29.97 fps rather than the nominal frame rate of 30 fps. In this situation, as the system master reference is derived from the generator the actual film frame rate is decreased by 0.1% (e.g., from 24 fps to 23.976 fps) as is standard practice. If the video reference signal is a true monochrome signal rather than an NTSC signal, the time code frame rate will be 30 fps and the actual film frame rate will be equal to the selected nominal film frame rate.

When 30.00 or 29.97 frame rates are selected then SMPTE time code may be generated in either drop-frame or non-drop frame formats. The Lynx-2 module also has a cross frame generator option, which allows generation of a different code type from the selected nominal video or mains system reference.

A Tach-to-Time code function is also provided, which outputs time code frame numbers at the standard time code frame rate in a continuous jam sync mode. This time code signal provides frame accurate position information in all motion modes but may not be readable by all time code readers since some time code frame numbers may be skipped, repeated, or in reverse numerical sequence depending on the speed and direction of the film transport.

Note, the nominal film frame rate may be different from the time code frame rate. For example, the film chain may run at a nominal 24 fps while the Lynx-2 generates 25 frame (EBU) time code.

Interface

Pulse Interlock Selection

The Lynx-2 Film option is compatible with both biphase and the less common Tach & Direction transmission schemes. Jumper JP2 on the Film option circuit board, inside the Film Module, allows selection of the pulse interlock output format.

The Film option card is factory preset for biphase generation. If necessary, reconfigure the film option card for Tach and Direction output by moving pin jumper JP2.

The pulse interlock input format can be software selected in the AUX-1 setup menu. To access the AUX-1 menu, press [SHIFT] and [MSTR] simultaneously, followed by {AUX-1}. Use the {LAST} and {NEXT} keys to step to the film input selection and the [↑] and [↓] to select either Biphase of TACH/Dir input. The Lynx-2 software defaults to the Biphase selection.

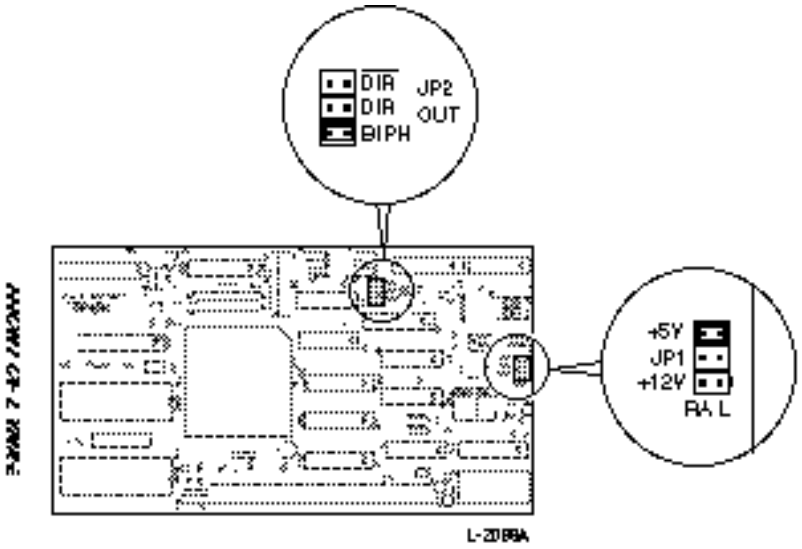


Figure Chapter 10 -8. Jumper Locations

Pulse Voltage Selection

The Lynx-2 Film Module is compatible with both TTL and CMOS Input/Output voltages. Jumper JP1 on the Film option circuit board, allows selection of the following voltage levels:

5 V = TTL or CMOS
12 V = CMOS

The Film option card is factory preset for 5 Volt operation.

Pulse Frequencies

The Lynx-2 Film Module can be operated at any of the standard pulse interlock or biphase frequencies. The biphase pulse rate is selected from the TRAN front panel setup menu, and is retained in battery backed-up memory when the module is powered down.

To operate a Lynx-2 module with a film transport the film option card must be selected, this is done by setting the module transport type to FILM in the transport setup menu. To access the TRAN menu, press [SHIFT] and [MSTR] simultaneously, followed by {TRAN}. Use the {LAST} and {NEXT} keys to step to the transport setting FILM and the [↑] and [↓] to select the biphase pulse rate.

Table Chapter 10 -6. Biphase Rates in Lynx-2 Film Module

Nominal Sync Frequency (@ 24 fps)	Standard (or Mfr.)	Maximum Generator Speed Multiple (& Freq.)	Maximum Follower Speed Multiple (& Freq.)
48 Hz	DIN	20x (960 Hz)	40x (1920 Hz)
96 Hz		20x (1920 Hz)	40x (3840 Hz)
240 Hz	MTE	15x (3.6 kHz)	40x (9.6 kHz)
480 Hz		15x (7.2 kHz)	40x (19.2 kHz)
600 Hz		7x (4.2 kHz)	32x (19.2 kHz)
1200 Hz		7x (8.4 kHz)	16x (19.2 kHz)
2400 Hz	MTM	7x (16.8 kHz)	8x (19.2 kHz)

Note:
The actual biphase frequency will be decreased from their nominal value by 0.1% when the Film Module is referenced to an NTSC color (29.97 fps) video signal.

Features and Controls

Film Indicators

The column of four LEDs in the transport section to the left of the display window shows the selected biphase frame rate of the Lynx-2 Film option card. The indicated frame rate is the actual frame rate of the film on the sprocketed transports. The film frame rate is very often different from the time code frame rate used by the controller or video editing system. When the film frame rate is different from the system time code rate the appropriate LED flashes to indicate the system rate.

The film frame rate indicated by these LEDs is automatically set to a default value based on the video reference signal sensed in the Video Detect routine during the module's power-up sequence, but may be changed to any other value in the AUX-1 Setup menu. If NTSC sync is detected, the module defaults to a 24 fps film frame rate, and if PAL sync is detected, the module defaults to a film frame rate of 25 fps.

Frame Rate Indicators

30 Indicator

When solid indicates that the biphase generator and biphase follower are set for a film frame rate of 30 frames-per-second at sync speed. If the module reader display is selected to TC, LED indicates the reader time code type. When flashing indicates the system frame rate.

DF Indicator

This LED is not used when a film transport is selected and the reader display is selected to Biphase. If the module reader display is selected to TC, LED indicates the reader time code type.

25 Indicator

When solid indicates that the biphase generator and biphase follower are set for a film frame rate of 25 frames-per-second at sync speed. If the module reader display is selected to TC, LED indicates the reader time code type. When flashing indicates the system frame rate.

24 Indicator

When solid indicates that the biphase generator and biphase follower are set for a film frame rate of 24 frames-per-second at sync speed. If the module reader display is selected to TC indicates the reader time code type. When flashing indicates the system frame rate.

TACH Indicator

Film motion is indicated by the TACH indicator in the Transport reader source section of the module. When the TACH LED is lit it indicates that the Film Module's biphase generator is outputting a biphase signal to drive the film chain and the module's biphase follower (reader) is receiving that signal. This LED will also indicate when the film transport is controlled locally in SAL master mode. This indicator remains off when the biphase signal is stationary.

DSPL SEL Key

The display select key is used to step the main display through the display options so the GEN, RDR, SYNC PT, OFFSET and ERR time code values can be read.

When the display is selected to RDR and [SHIFT] is pressed with the [DSPL SEL] key the display toggles between "TC", the time code reader input, "Bi", the film position and "UB" the time code user bits value. If the reader display is set to show the film position then the film subframe position will be displayed in Stop and slow motion modes. When the film is in play the subframe position is masked.

The Film position can be entered from the front panel of the Lynx-2 module or can be transmitted to the module from an external controller such as the TimeLine Keyboard Control Unit. To enter the film position from the front panel position the film transport at the start mark or another known cue point and use the modules display set/hold procedure to store a time code position.

The film position is always displayed in the "time code" type of the biphase frame rate. For example if the film frame rate is 24 fps then the reader position will be displayed in 24 frame time code.

STORE Key

The store key is used to enter a time code value in to any one of the Lynx-2 time code register, and can be used to enter a new film position. To enter or alter a time code number the module must be in the set/hold mode, press the [SET HOLD] key to enter set/hold mode. When the Film Module is in the Set/Hold mode (SET/HOLD indicator flashing), pressing [STORE] will load the current numeric value in the display window into the register corresponding to the display selection and exit Set/Hold mode.

The right arrow on the [STORE] key, pointing toward the [DSPL SEL] key is an indicator that the displayed number will be stored into the register that corresponds to the display selection.

When the module is in the Set/Hold mode, press the [DSPL SEL] key until the display is selected to RDR, the film position, change the displayed value with the [↑] and [↓] keys. Press the set hold key to step through each of the pairs of time code digits until the correct number is displayed, press [STORE] to save the new film position.

TRAN MODE Key

This key is used to put the Film Module Online or Offline, the modules status is indicated by the ONLINE indicator above the key.

When online, the Film Module transport may be controlled by a SAL master Lynx-2 module, controller or video editor. When offline, the Film Module's biphase generator will not respond to any motion commands from the master module, external controller or video editor. The biphase generator will, however, respond to commands from a set of external motion control switches connected to the film module so that the film transport may still be operated locally from the module when it is offline.

The film module's biphase follower functions whether the module is online or offline so that the module is always aware of any movement of the transport and can update the current film position.

Online Indicator

Indicates that the module is online and the film transport will be controlled by the master Lynx-2, controller or video editor.

When extinguished, indicates that the module is offline and the film transport will not respond to control commands. If the module is connected to a controller or video editor it will report its status to the controller as "OFFLINE" or "LOCAL".

Resolve Indicator

When lit, indicates that the film transport is running in Forward and that it's position is within 25 subframes (1/4 frame) of lock with the master transport or editor timeline.

If the LOCK indicator is lit and the RESOLVE indicator is flashing, it indicates that the module achieved lock initially, but an Offset Error has developed that is in excess of 25 subframes.

Lock Indicator

When lit, indicates that the film transport is running in Forward and that it is within two subframes (1/50 frame) of sync with the master transport or editor timeline. When the display is selected to ERR, a ">L" or ">XL" appears in the left of the display and the numerical frame and subframe offset error in the right of the display as an additional indication of lock status. The "XL" indicates that the film frame rate is cross frame to the system frame rate.

The LOCK indicator can only be lit if the module is online, and the RESOLVE indicator is also lit (or flashing).

GEN REF Key

In setup mode the GEN REF key is used to select the AUX 1 menu, the AUX 1 menu is used to access the film option card setup options.

AUX 1 Setup Menu

In setup mode, the GEN REF key accesses the AUX-1 menu. To access the AUX-1 menu, press [SHIFT] and [MSTR] simultaneously, followed by {AUX 1}. The AUX 1 menu is available only when a film interface option board is fitted in the Lynx-2 module. It provides access to the following film options:

- Film frame rate
- Film acceleration
- Film fast speed
- Film input
- Film reader format

To select items in the AUX-1 menu, use the {NEXT} and {LAST} keys to scroll left and right through the menu. Use the [↑] and [↓] arrows to set the option that corresponds with your requirements.

Press [SHIFT] and [MSTR] to exit and save these selections as part of the module's default setup. Once selected, the Lynx-2 will initialize to these settings each time the module is powered-up.

Table Chapter 10 -7. AUX-1 Setup Menu

KEY	MENU	SUB-MENU	RANGE
GEN REF	AUX-1	Film fps	24 25 30
		Film accel	4-32
		Film fast spd	1-20 (limited by selected pulse rate)
		Film In	BI-PHASE TACH/DIR
		Film TC	FILM GEN SYSTEM

Film Frame Rate

This option selects the nominal film frame rate at sync speed. It can be set to 24, 25, or 30 frames-per-second. The selected frame rate is indicated by the 24, 25 and 30 transport code type LED's.

> NOTE:
> If NTSC video is selected as the system reference, the biphase generator will run 0.1% slow.

Film Acceleration

This option sets the ramp or acceleration rate of the biphase generator. The acceleration values are normalized to play speed. An acceleration value of '1' means the biphase output accelerates at 1x play speed per second, with a value of '5', the output will accelerate at '5' times play speed per second.

Film Fast Speed

This option sets the maximum fast wind speed of the biphase generator. The fast speed value is expressed as a multiple of play speed; a value of '6' would limit the wind speed to 6x play speed. The maximum fast speed that can be set, is also limited by the selected biphase pulse rate.

Film Input

The film follower or biphase reader input can be set to read either biphase or tach and direction signal inputs.

Film Time Code

This menu allows the operator to set the time code format used by the Lynx-2 reader, thus controlling the film cross-framing method.

FILM: The reader will operate and display the biphase frame rate. Note, the biphase frame rate is set by the Film FRMS/SEC menu option.

GEN: The reader will use the time code format of the LTC generator. This corresponds to the way the original Lynx Film Module operated.

SYSTEM: If the Lynx-2 Film is a slave, the reader will automatically follow the time code type of the master module. If the Lynx-2 film is a master, then

a. In a KCU system, if the Lynx-2 Film Module is also the reference transport, the reader time code type will be determined by the KCU FILM menu “Ref Code Type”. Otherwise, the reader code type will be that of the actual reference transport.
b. In a Stand-alone system, the reader will use the same time code format as the LTC generator.

GEN ON Key

In shift mode the [GEN ON] key is used to set the time code generator jam mode.

Generator TACH mode

When lit, indicates the film module's time code generator is in Tach-to-time code jam mode.

To select generator jam to Tach-mode press [SHIFT] and the [GEN MODE] key until the generator TACH LED comes on. Enable the generator by pressing the [GEN ON] key, the generator output will follow the film transport motion:

When the generator is enabled in the Tach-Jam mode, film motion automatically initiates time code generation. When the film stops, the generator repeats the last frame number in the stopped position for 1 second, then automatically switches off. The generator ON LED will flash to indicate the generator is on but is not currently generating code. When film motion restarts the generator will automatically restart and jam to the incoming Biphase signal.

In the Tach-to-Time code mode, the default frame rate for the module's generator is determined by the system frame rate. This default may, of course, be overridden by the operator at any time as long as the generator is not running.

The Tach-to-Time code mode always generates time code words at the same bit rate as normal sync speed time code (e.g., 30 frames-per-second X 80 bits-per-frame - 2400 bits-per-second), regardless of the actual running speed of the film, to allow reading by devices that cannot read high speed time code.

Whenever the film is moving, but not running in lock at sync speed, the module's generator performs a "flying jam" to the current film position on a frame-by-frame basis so that each time code frame number generated corresponds to the instantaneous position of the film at the start of the time code word. As a consequence, time code numbers will not be sequential when the film is not running at sync speed. Frame numbers will be skipped if the film is running faster than sync speed, and will be repeated when the film is running slower than sync speed.

When the film transport achieves lock, the generator performs a single Jam Sync operation and then continues to generate normal, sequential time code that is locked to the film position.

The individual time code words generated by the Lynx-2 Film Module are always generated in the normal, forward sequence (bit #1 to bit #80) regardless of the direction of film motion. If the film is moving in the reverse direction, the module generates normal time code words, which are in reverse numerical order.

Interface Connections

Transport Connector

The primary interface to the Lynx-2 Film Module is the 50-pin transport connector, which contains all of the module's logic and control signal inputs and outputs.

- Biphase generator output (film transport control)
- Biphase follower input (to follow film transport motion)
- Internal C/O relay (switches biphase based on operating mode)
- Record and Rehearse command outputs
- External motion control switch inputs
- Film transport mode tally outputs
- Mute relay (to initiate external muting functions)
- Remote Lock indicator output

TimeLine does not offer a manufactured interface cable for the film module due to the customized nature of most film module installations. Please refer to Table 10-8 for a complete listing of the pin assignments for the TRANSPORT connector and the appendix for a recommended interconnect schematic.

Table Chapter 10 -8. Rear Panel, 50-Pin Transport Cable Connector, For Film Module

Pin	Signal	Pin	Signal
1	Ground	26	Rewind command switch
2	Transport ground sense	27	Channel 2 insert command
3	Stop tally	28	Channel 3 insert command
4	Capstan frequency output	29	Servo relay-A N/O
5	Record command switch	30	Servo relay A common
6	Play reverse tally	31	Servo relay-B N/C
7	Fast forward tally	32	Biphase A Out (TACH)
8	Play reverse command switch	33	Biphase B Out (Direction)
9	Play forward command switch	34	Ground
10	Lock Light or Ch 4 insert command	35	Record-off command emitter (-)
11	Channel 1 insert command	36	Search command emitter (-)
12	Rehearse command	37	Play forward tally
13	Servo relay-A N/C	38	Search volts out
14	Servo relay-B common	39	Capstan volts out
15	Servo relay-B N/O	40	Record-on command
16	Biphase A In (Direction)	41	Stop command switch
17	Biphase B In (TACH)	42	Search command switch
18	+5V (50 mA max)	43	AUX Out O/C
19	Record-off command collector (+)	44	-12V (50 mA max)
20	Search command collector (+)	45	+12V (50 mA max)
21	Adaptor detect	46	Mute relay N/O
22	Record tally	47	Mute relay N/C
23	Tally common	48	Mute relay common
24	Rewind tally	49	Search speed B
25	Fast forward command switch	50	Search speed A

Biphase Connections

The only essential connections between the Lynx-2 Film Module and the film transport(s) are the connections to the biphase generator output and the biphase follower input. The biphase connections shown in the "Lynx-2 Film Module Suggested Interconnect" drawing in the Appendix to this manual make use of the servo changeover relay inside the Lynx-2 film module.

In the standard (Master/Slave synchronization) version of the film module, this relay automatically reconfigures the biphase connections depending on whether the module's biphase output is controlling the transports or whether the film module is simply following the biphase from an externally-controlled film transport such as a telecine machine.

When the module is connected to a video editor, the changeover relay is not required to reconfigure the connections because the film transport must always be under the control of the module's biphase output. The connections to the relay are therefore optional.

> Note:
> Phase A leads phase B (by approximately 90°) for forward film motion. Also note that in Tach & Direction systems, the phase A connection is used for the tachometer signal and the phase B connection for the direction signal.

Switch Inputs

The logic inputs to the film module for the external motion control switch connections are high-impedance, active-high inputs. (note, record in and wind speed selection are active low inputs.) Any voltage from +5 to +24 can be safely used for the high, or active, logic level. (The 50 mA +5 volt supply that is available on Pin 18 of the TRANSPORT connector may be used for this purpose.) Because of the high impedance of these logic inputs, we recommend using a pull-down resistor to ground or grounding the normally closed contact of a double-throw switch as shown on the "Lynx-2 Film Module Suggested Interconnect" drawing to suppress transients that may be picked up when a long cable length is used between the film module and the switches.

Record Command Connections

The Lynx-2 Film Module has separate outputs for Record On and Record Off commands to allow the module to initiate and terminate Record mode on the film transport in response to edit commands from a controller or video editor. Each of these commands are issued as a signal pulse of approximately 60 milliseconds duration. The normal Lynx-2 record TIMING setup menu is available to adjust the record command advance timing to the film transport. See Features & Controls, Section 6 for more details.

Rehearse Command Connections

The Lynx-2 Film Module also supports a Rehearse command output to control any Rehearse or Preview function that is available on the film transport or in the audio control system. The film module may send various combinations of Rehearse and Record commands to initiate and terminate the rehearse mode. The normal Lynx-2 rehearse command selections are available for a film transport in the TIMING setup menu. See Features & Controls, Chapter 6 for more details.

External Motion Control Switches

The Lynx-2 Film Module provides for direct control of the biphase generator in the film module via an external set of six motion control push buttons. (Stop, Forward, Reverse, Fast Forward, Fast Rewind & Search). This would most commonly be used when the Film Module is being used as a stand alone master or when offline (not under editor control) to allow the operator to position the film to a start mark. An alternate application could be the connection of a local "emergency stop" switch in a remote machine room.

External Speed Control Switches

The Lynx-2 Film Module also provides for external wind speed selection. Two logic inputs on the transport connector allow preset wind speeds of 2X, 4X, & 6X play speed and Maximum wind to be selected by the user. These inputs are active low.

The switches used for external motion control should be a conventional momentary contact type, with either a single-pole or changeover configuration; suggested circuits are shown for both switch types on the "Lynx-2 Film Module Suggested Interconnect" drawing in the Appendix.

External Transport Mode Tally's

The film module provides five tally outputs to indicate the motion mode of the sprocketed transport and a Record tally. These tally outputs appear on the TRANSPORT connector.

The tally outputs are the open collector outputs of photo-Darlington optoisolators. The emitters of this group of six optoisolators are all tied together as the Tally Common. Note that all of these connections are isolated from the Module Ground.

> Note:
> The mode tally indication changes immediately upon receipt of a new mode command from the editor or from the external motion control switch while the module's biphase generator will take a finite amount of time to ramp its frequency between modes.

Mute Relay Connections

The film module provides a single-pole, changeover relay, driven by the module's transport mode logic. This relay was originally intended to provide a "dry" closure that could be used to mute the audio output of the film transport or to mute the monitoring system, but its use is not limited to this type of function.

In the normal operating mode the relay is energized when the module is in Fast Forward, Reverse, or Fast Reverse modes and is unenergized in Stop, Forward and Crawl modes. Three additional operating modes are provided under the Options setup menu, which will additionally energize the relay while the transport is accelerating up to sync speed and achieving lock. See Features & Controls for further information.

All three connections to the mute relay are isolated from the film module's circuitry to permit maximum flexibility in making external connections. The relay contacts are rated at 2 Amps for low voltage DC applications (up to 30 Volts DC), or 600 mA for higher voltage use (up to 110 Volts DC or 125 Volts AC).

Initializing the Lynx-2 Film Module

Once the Film module is connected to the film transport(s), an external controller, if one is being used and a suitable video reference signal, it is necessary to set the operating parameters of the module. This setup procedure includes:

- Setting the nominal biphase frequency in the module initialization procedure. This also loads the default parameters for that particular biphase frequency setting.
- Setting the appropriate Serial Address or Editor setting for proper communications with the external controller or editor.

- Setting the film frame rate if it is different from the default value (which is determined by the type of video reference signal connected to the module). At the same time, you may also modify the biphase generator parameters from their default values.
- Setting a starting frame number for the module's film position counter.

All operating parameters of the Lynx-2 Film Module are retained in a battery backed-up (non-volatile) memory device inside the Lynx-2 module. It is generally unnecessary to repeat any of the module setup procedures unless the operational conditions change or unless it is desired to "reboot" the module and erase all the data stored in the battery memory.

Setting the Biphase Frequency

Hold the [CLR] key and turn on the module's power switch to erase the battery memory and enter the initial configuration mode. Refer to the Getting started section on initialization. The module will first display, TimeLine, the software version number (V700-xx") and then show "AEG M20" flashing in the window.

Press the {NEXT} key to step through to FILM and then use the [↑] and [↓] keys to select one of the available biphase frequencies. Press the [STORE} key to save your setting. Now follow steps 3-7 of the initialization process in the Getting Started section to complete the module configuration and store it in RAM. The module will now reboot and sequentially display the information that you entered.

Default Parameters

When you select the nominal biphase frequency, the film module automatically loads a set of default parameters. Any or all of these default parameters may be over ridden as necessary in the AUX -1 setup menu. Any changes you make to these parameters will be retained in the module's non-volatile memory until you change the biphase frequency or reinitialize the module.

The default parameters for each of the biphase frequency selections are shown in Table 10-9. Refer to the Aux-1 setup menu earlier in this chapter for instructions on how to alter these parameters.

Table Chapter 10 -9. Default Parameters

Menu Selection	Film fps Film Frames per Second	Film accel Acceleration Ramp Rate	Film fast spd Wind Speed Multiple
48	24/25	032 (4x)	012
96	24/25	008 (1x)	005
240	24/25	008 (1x)	005
480	24/25	008 (1x)	005
600	24/25	008 (1x)	005
1200	24/25	008 (1x)	005
2400	24/25	008 (1x)	005

Film fps - Sets the film frame rate of the biphase generator and follower this is normally dependent on the type of video reference signal; the default is 024 (24 fps) if NTSC video is detected or 025 (25 fps) if PAL sync is detected.

Film accel - Sets the ramp or acceleration rate of the biphase generator.

Film fast spd - Sets the maximum fast speed of the biphase generator expressed as a multiple of sync speed.

Operating the Lynx-2 Film Module

Serial Communications

Once the film module has been initialized, it is necessary to establish communications between the modules or the external video editor or controller:

Press the [TRAN MODE] key to put the module ONLINE. If the module is being used standalone with other Lynx-2 modules make one of the modules a master and check to see that 422 communications are established.

If the module is being used with an editing system reset or reboot the editor so that it polls or interrogates it's serial port(s). The editor should now be in communication with the Lynx-2 Module.

Verify that the RS422 light on the Film Module is illuminated, which indicates that the module has been addressed by the editor and is receiving valid serial messages.

Note that failure of communications can be caused by incorrect Editor or serial address setting or improper serial cable connections between the module and the editor.

Appendix

Introduction

The appendix has three sections: Time Code Overview, Quick Reference Guide, Cable Reference Guide and Glossary.

Time Code Overview

A review of how and why the various SMPTE/EBU time code formats evolved, what they mean and how they impact the production process.

Quick Reference and Cable Reference Guide

Provides setup and cabling information to help you configure and use the Lynx-2.

Auto Serial Transport Table

Contains a list of the serially controlled transports currently recognized by the transport menu setting AUTO Ser TRAN.

Keyboard Control Unit Modifications

Provides Service Bulletin (SB91-003) modification instructions for the KCU.

Lynx-2 Film Option Card PCB Modifications

Provides Service Bulletin (SB94-004) modification instructions for the Film Option Card.

Glossary

An alphabetic list of terms used during the discussion of the Lynx-2.

Technical Information

Provides drawings and interface information referenced within the text of the manual.

Time Code Overview

Introduction

The following is a review of how and why the various SMPTE/EBU time code formats evolved, what they mean and how they impact the production process.

When the television broadcast industry moved from film and live performance to prerecorded video production, a method was required to reliably synchronize and edit the new medium. Historically, film rushes were marked with footage numbers and, by default, the film was automatically synchronized by its sprocket holes.

Unfortunately, video tape had neither of these attributes. This created a problem: how to synchronize music, picture, dialogue and effects that have been recorded on separate reels of tape?

The solution was SMPTE time code. SMPTE, which stands for the Society of Motion Picture and Television Engineers, was chosen as the industry standard in 1971. When the European Broadcast Union (EBU) adopted the code standard, it became officially known as SMPTE/EBU time code.

SMPTE/EBU time code is a biphase encoded, analog signal containing specific address and speed information. This data can be recorded on audio or video tape, and used for accurate positioning and synchronization.

If you know precisely where a piece of program is and how fast it is playing, it is possible to use that information to control other machines; so that they are all in the same place at exactly the same time.

A SMPTE/EBU frame or word consists of 80 bits that convey the time code message of Hours, Minutes, Seconds and Frames. This message is usually abbreviated as HH:MM:SS:FF.

Each bit is represented by a binary '1' or '0' that is specially encoded for recording onto tape. A continuous stream of these 80-bit words is recorded linearly along the tape to form Longitudinal Time Code (LTC). The code's design and organization makes it suitable for use over a very wide range of play-speeds, both forward and backward. The frequency of the LTC signal is always proportional to the tape speed.

There are 60 minutes in an hour and 60 seconds in a minute. But how many frames are there in a second? This is where time code gets confusing if you don't understand and use the correct terminology.

Time code always provides two pieces of information: The rate or speed at which a tape is moving *and* the counting method that is employed, when displaying the time code numbers on a display. They are not always the same.

The confusion arises because there are different operating speeds for color TV, B&W TV, and film in the USA and Europe that were historically related to the AC power line frequencies. Thus, time code has several different *formats*, defined by combining one of four different *frame rate*s, with one of four different counting methods or *code types*.

"Frame rate" is the terminology used to define the speed, in frames-per-second, that time code is generated. (30, 29.97, 25 and 24 Hz.)

"Code type" defines the method or way in which frames are counted. (NDF, DF, 25 and 24.)

It is quite common to use "short hand" references without specifying all the necessary time code information. If someone asks what time code format you are using and you say, "non-drop frame", the other person has a 50/50 chance of getting the frame rate or speed correct. Accurate use of terminology will eliminate many opportunities for confusion when working with machine control synchronizers.

Example: Time code running at a frame rate of 29.97 can use, as its code type, Non-Drop Frame or Drop Frame. Defining a time code format as 29.97 DF means that the time code was generated at a rate of 29.97 fps, and is using the drop frame counting method. Therefore, time code format is a combination of both frame rate and code type.

30 NDF and NTSC

NTSC stands for National Television Standards Committee. Electrical wall current in the U.S. has a frequency of 60 Hz. NTSC used 60 Hz as a convenient reference for the 30 Hz frame sync pulse needed to control the vertical hold of a B&W picture. When black and white TV was the only game in town, video frames were advanced at a rate of 30 fps. This monochrome standard is now known as 30 Non-Drop Frame (30 NDF).

When using 30 NDF, the time code display, the elapsed time of a program and the "clock on the wall" are all in agreement.

Drop Frame

When color television was invented, things got more complicated, for technical reasons. NTSC decided that 60 Hz wasn't quite right and changed the color reference to 59.940026 Hz. Consequently the monochrome frame rate standard of 30 fps was reduced to approximately 29.97 fps, which became the color frame rate standard.

When the frame rate was reduced to 29.97 Hz, a whole host of potential problems arose. To begin with, one hour on the time code display did not represent an hour of elapsed program time.

In order to compensate for the difference between the color reference and the actual elapsed time, some form of frame counting adjustment was required. As the clock ticks away each second, only 29.97 frames are broadcast instead of 30 frames.

Because the video is running fractionally slower than the clock on the wall, only 29.97 frames instead of 30 frames roll by for each second of real time. At this rate, over the course of an hour, the time code display shows that the program tape has run 3.6 seconds (or 108 frames) slower than the clock on the wall. Example:

NDF: 60 sec. x 30 fps = 1800 fpm x 60 min/hr. = 108,000 elapsed frames.

DF: 60 sec. x 29.97 fps = 1798.2 fpm x 60 min/hr. = 107,892 elapsed frames.

NDF		108,000
DF	-	107,892
Difference	=	108 frames

Somehow, a counting method had to be developed to make the time code display match real time. The drop frame counting format was the answer. Now keep in mind, all that is happening is that the time code display is using a non-linear counting method that ignores same numbers. The frame rate or number of frames that pass by each minute is not altered.

DF skips the first two frame counts in each minute (with the exception of minutes 00, 10, 20, 30, 40, 50). This has the effect of adjusting the frame count so that it agrees with the actual elapsed time of the program. (You don't suppose the IRS would allow this as an alternative accounting method do you?)

Example: Two frames each minute x 60 min = 120 fph. As seen above, the goal was to make up exactly 108 frames. For the final adjustment, the solution was to *not* drop the first two frame counts on minutes 00, 10, 20, 30, 40, 50.

By not dropping two frames from those 10-minute marks, the time code display could make up exactly 108 frames over the course of one hour. Now when the sync display and the "atomic wall clock" are stopped after exactly one hour, they both read 01:00:00:00.

30 DF

30 DF is a *non-standard* time code format. It indicates time code that has a frame rate of 30 fps, but is counted with specified frame numbers dropped every minute. The time code display is 0.1% faster than elapsed time.

29.97 DF

29.97 DF is a standard time code format. It indicates time code that has a frame rate of 29.97 fps and is counted with specified frame numbers dropped every minute. This time code display is identical to elapsed time.

29.97 NDF

29.97 NDF is a standard time code format. It indicates time code that has a frame rate of 29.97 fps, but is counted normally with no frames dropped. The time code display is 0.1% slower than elapsed time.

25, 25 or EBU/PAL

In Europe, the standard wall AC current frequency is 50 Hz. Thus there is another video format: PAL (Phase Alternate Line). This standard was established by the European Broadcast Union (EBU) for color and B&W television. The time code runs at half the frequency 25 Hz, and 25 frames are counted per second.

Drop Frame is never necessary, nor an option, when operating with 25 frame time code. The code display is identical to elapsed time.

24, 24 or Film

24 is the standard film rate and code type, and has remained the same since the days of its invention.

Drop Frame is never necessary, nor an option, when operating with 24 frame time code. The time code display is identical to elapsed time.

> Note
>
> Do not use non-standard 30 DF time code unless you are an expert and have a good reason to do so. This is only used to increase play back speed by 0.1% to correct program speed errors.

Frame Rates by Region

Region	TV Standard	Mains Frequency	Frame Rate
USA, Japan	NTSC	60 Hz	30 Hz (nominal)
Europe	PAL/SECAM	50 Hz	25 Hz

Code Types by Region

Frame Rate	Code Type	Display	Application
30	NDF	real time	NTSC B&W standard for USA & Japan
30	DF	0.1 % fast	Non-standard
29.97	DF	real time	NTSC color standard for USA & Japan
29.97	NDF	0.1% slow	Music recording for USA & Japan
25	25	real time	European TV & music recording
24	24	real time	Film

SHIFT Mode

To access a shifted function, press [SHIFT] plus:

KEY	NAME	ACTION
TRAN MODE	RSLV	Reserved for future use
SYNC POINT	<<	Transport rewind
SET HOLD	>>	Transport fast forward
DOWN ARROW	□	Transport stop
CLR	>	Transport play
UP ARROW	REH	Transport rehearse
STORE	REC	Transport record
DSPL SEL	UBITS	Display user bits
GEN CODE	JAM	Manual generator jam
GEN ON	MODE	Selects jam mode: JAM TC - Jam to reader after 2 frames JAM UB - Jam reader time into user bits TACH - Gen follows tach
GEN REF	BWL	Toggles bandwidth limit
MSTR REF	VERS	Display software versions
MSTR	SETUP	Enter Setup mode

SETUP Mode

To enter setup mode press [SHIFT] + [SETUP]. Then press:

KEY	MENU	SUB-MENU	RANGE
GEN CODE	ADDR	Address	0 - 127
		Editor	KCU Old KCU CMX GVG ACE VRC2 BOSS CASS POGOL TLC
		Mstr type	V500 V7/600
GEN ON	OPT	Capst wild	-128 - +127
		Gen msg hold	OFF ON
		Lift dft	OFF AUTO WIND ALWAYS
		Locate speed	20 - 255
		Lock delay	0-50 frames
		Lock window	0-75 subframes
		Mute	NORMAL UNTIL RSLV UNTIL LOCK NOT LCK/STP IF NOT LOCK
		Park ahead	0 - 30
		Phase lock	ON OFF
		Pilot out	GEN RDR
		Sample rate	48 44.1
		Ser init	ON OFF
		Ser Tape/ee	TAPE LCL AUTO
		Ser TC	OFF [TT1] LTC/VITC LTC VITC
		Ser TC lock	ON OFF
		Vid park win	0-10 frames
		X-frame gen	ON OFF
GEN REF	AUX-1	Film FRMS/SEC	24 25 30
		Film accel	4-32
		Film fast spd	1 - 20
		Film in	BI-PHASE TACH/DIR
		Film TC	FILM GEN SYSTEM

SETUP Mode (continued)

KEY	MENU	SUB-MENU	RANGE
DISPL SEL	TRAN	AEG	M-20
		Akai	DR-1200
		Ampex	ATR-100 VPR-3 ATR-124 VPR-6 MM1200 VPR-80 VPR-300
STORE	TIMING	IN ADV High	0 - 255 ms
		OUT ADV High	0 - 255 ms
		IN ADV Med	0 - 255 ms
		OUT ADV Med	0 - 255 ms
		IN ADV Low	0 - 255 ms
		OUT ADV Low	0 - 255 ms
		Rehearse IN	0 - Latch REH 1 - Pulse REH 2 - Pulse REH + PLAY 3 - Pulse REH + REC IN 4 - Latch REH + REC IN 5 - Pulse REC 6 - Long Latch REH + REC IN
		Rehearse OUT	0 - Unlatch REH 1 - Pulse PLAY 2 - Pulse REH 3 - Pulse PLAY + REC OUT 4 - Pulse REC 5 - Pulse REH then PLAY

Cable Reference Guide

Lynx Transport Control Cables				
TimeLine Part No.	***Transport Manufacturer***	***Machine Model***	***Setup Menu Description***	***Cable Type Description***
71C079	Accom	WSD	WSD	**Lynx Serial**
Special Order	AEG	M-20	M-20	**M-20**
71C031	Akai	ADAM	DR-1200	**DR-1200**
71384	Alesis	AI2/ADAT	AI2/ADAT	**AI2/ADAT** (Lynx-2 only)
71C001	Ampex	ATR-100	ATR-100	**ATR-100**
71C002	Ampex	ATR-124	ATR-124	**ATR-124**
71C003	Ampex	MM-1200	MM-1200	**MM-1200**
71C079	Ampex	VPR-3 VPR-6 VPR-80 VPR-300	VPR-3 VPR-6 VPR-80 VPR-300	**Lynx Serial**
71C077	Denon	DN-3603 RA	DN-3603 RA	**DEN-3603**
	Denon	DN-3603G	DN-3603G	
71388	Fostex	Model 20	Model 20	**Model 20**
71C079	Fostex	D-20 RD-8	D-20 RD-8	**Lynx Serial**
71C004	Fostex	E-2 E-8 E-16 E-22 G-16 G-24	E-16	**E & G Series**
71C005	JVC	CR-850 CR-600	CR-850	**JVC Type A** (Parallel interface) (Y Cable)
71C079	JVC	CR-850	CR-850 s	**Lynx Serial**
71C007	JVC	BR-610 BR-611	BR-610	**JVC Type B** (Y Cable)
		BR-810 BR-811	BR-810	
		BR-5610 BR-5810 BR-8600U BR-7700U	BR-8600	
		BR-8600E BR-7700E	BR-8600E	
71C008	JVC	CR-5500 CR-6650 CR-8250	CR-8250	**JVC Type C** (Y Cable)
Special Order	3M	M-79	M-79	**M79** (Dealer installation recommended)
71C010	Mitsubishi	X-86	X-86	**X-86**

Cable Reference Guide Continued

Lynx Transport Control Cables				
TimeLine Part No.	***Transport Manufacturer***	***Machine Model***	***Setup Menu Description***	***Cable Type Description***
71C011	Mitsubishi	X-850	X-850 a X-850 d	**X-850**
		X-880	X-880 a X-880 d	
71C012	Otari	MTR-10/1 MTR-12/1	MTR-10-1 MTR-12-1	**MTR-10/12,** Series I (20-pin Honda connectors)
71C029	Otari	MTR-10/2 MTR-12/2 MTR-20 MTR-15 MX-55 MX-70 MX-80 MX-70 Layback MTR-100 MTR-100V	MTR-10-2 MTR-12-2 MTR-20 MTR-15 MX-55 MX-70 MX-70 MX-70 L MTR-100 MTR-100 v	**Otari Type A**
		DTR-900/1	DTR-900-1a DTR-900-1d	
		DTR-900/2	DTR-900-2a DTR-900-2d	
71C013	Otari	MTR-90/1	MTR-90-1	**MTR-90**, Series I (50-pin & 9-pin "D" connector) (Y Cable)
71C030	Otari	MTR-90/2 MTR-90/2 Layback MTR-90/3	MTR-90-II MTR-90-IIL MTR-90-II v	**MTR-90**, Series II (25-pin Honda connector)
71C014	Otari	MX-5050/3	5050-III	**MX-5050 MkIII** Series, 16-pin (older machines)
71C015	Otari	MX-5050/3	5050-III	**MX-5050 MkIII** Series, 34-pin (current machines)
71C016	Otari	MX-5050/3	5050-III	**MX-5050 MkIII** Series, 34-pin "Y" (current machines) (Y Cable)
71C079	Otari	DTR-90	DTR-90	**Lynx Serial**
71C079	Panasonic	AG-7750 AG-7700	AG-7750	**Lynx Serial**
		AJ-D350	AJ-D350	
71C078	Saturn	824	824	**824** (a.k.a. Soundcraft Saturn)
71C017	Sony	PCM-3402	3402 a 3402 d 3402 sa 3402 sd	**Sony Type A**
		APR-24 APR-5000	APR-24 APR-5000	
(No longer available)	Sony	BVU-800	BVU-800 p	**BVU-800** (Parallel interface)
71C019	Sony	JH-24 JH-114 Late Model JH-16	JH-24	**JH-24** (Machines with 12-pin "Autolocator" connector) (Y Cable)
71C020	Sony	JH-110 ABC JH-114 Early Model	JH--114	**JH-110** (Machines with 21-pin "Synchronizer" connector) (Y Cable)

Cable Reference Guide Continued

Lynx Transport Control Cables				
TimeLine Part No.	***Transport Manufacturer***	***Machine Model***	***Setup Menu Description***	***Cable Type Description***
71C021	Sony	PCM-3324	3324 a 3324 d	**PCM-3324**
		PCM-3324S	3324s a 3324s d	
		PCM-3348	3348 a 3348 d	
71389	Sony	PCM-7030fm	7030 fm	**PCM-7030 FM** (Vari-speed operation)
71C022	Sony	VO-5800	5850 ext	**VO-5850** (Lynx only) (Y Cable)
71380	Sony	VO-5850	5850 int	**VO-5850 Straight cable** (Lynx-2 only)
71C079	Sony	PCM-7030 PCM-7050	7030	**Lynx Serial**
		VO-9800 VO-9850	9800	
		BVW-10 BVW-40 BVW-75	BVM-10 BVW-40 BVW-75	
		BVU-800	BVU-800 s	
		BVU-950	BVU-950	
		BVH-2000 BVH-2800 BVH-3000	BVH-2000	
		DMR-4000	DMR-4000	
		DVR-10/18 DVR-1000	DVR-10 DVR-1000	
		DVW-500 DVW-A500 DVW-510 DVW-A510 DVW-CA510 DVW-CA510	DVW-500	
		UVW-1800	UVW-1800	
Special Order	Stellavox	TD-9	TD-9	**TD-9**
71C034	Studer	A-807	A-807 p A-807 s	**Studer Type B**
		A-810	A-810	
		A-812	A-812 p A-812 s	
		A-820 1/2”	A-820 p A-820 s	
		A-820 32 Hz	A-820 p A-820 s	
		A-827 32 Hz	A-827 p A-827 s	
		D-820	D-820 a D-820 d	
71C024	Studer	A-80VU	A80 16 A80 18	**A-80-VU**
71C025	Studer	A-800/1 A-800/3	A-800-I A-800-III	**A800**

Cable Reference Guide Continued

Lynx Transport Control Cables				
TimeLine Part No.	***Transport Manufacturer***	***Machine Model***	***Setup Menu Description***	***Cable Type Description***
71C079	Studer	D-827	D-827	**Lynx Serial**
71C026	Tascam	40 Series	40	**Tascam Type A**
		ATR-60 ATR-80	60 ATR-80	
71C035	Tascam	MSR-16 MSR-24 BR-20T	MSR-16	**Tascam Type B**
		TSR-8	TSR-8	
71C027	Tascam	50 Series	50	**50 Series**
71C079	Tascam	DA-88	DA-88	**Lynx Serial**
		DA-60	DA-60	
Special Order	Tascam	DA-800	DA800	**DA-800**

Key

a - non-release
d1 - Standard lock and release
d2 - Tight lock and release (digital dubbing)
ext - External 5850 interface
Hp - 512 Hz Tach/Parallel
Hs - 512 Hz Tach/Serial
int - L2 Internal 5850 interface
L - Layback
Lp - 32 Hz Tach/Parallel
Lpa - 32 Hz Tach/Parallel/Non-release
Lpd - 32 Hz Tach/Parallel/Standard lock and release
Ls - 32 Hz Tach/Serial
Lsa - 32 Hz Tach/Serial/Non-release
Lsd - 32 Hz Tach/Serial/Standard lock and release
p - Parallel
s - Serial
v - Voltage control

This is an exact and accurate list of transports available at the current time. TimeLine reserves the right to modify or update machines to this list when necessary.

Auto Serial Transport Table

The transport selection AUTO Ser TRAN will automatically detect the presence of most serial transports, and load the appropriate transport parameters. The following table lists the serially controlled transports currently recognized, and shows the transport selection that will be invoked when each transport is found.

Serial Transport	TRAN Selection	
Sony BVH-2000	SONY	BVH-2000
Sony BVH-2180	SONY	BVH-2000
Sony BVH-2500	SONY	BVH-2000
Sony BVH-2700	SONY	BVH-2000
Sony BVH-2800	SONY	BVH-2000
Sony BVH-2830	SONY	BVH-2000
Sony BVH-3000	SONY	BVH-2000
Sony BVH-3100	SONY	BVH-2000
Sony BVU-800	SONY	BVU-800s
Sony BVU-820	SONY	BVU-800s
Sony BVU-850	SONY	BVU-800s
Sony BVU-870	SONY	BVU-800s
Sony BVU-900	SONY	BVU-950
Sony BVU-920	SONY	BVU-950
Sony BVU-950	SONY	BVU-950
Sony VO-9800	SONY	9800
Sony VO-9850	SONY	9800
Sony BVW-10	SONY	BVW-10
Sony BVW-40	SONY	BVW-40
Sony BVW-11	SONY	BVW-10
Sony BVW-15	SONY	BVW-10
Sony BVW-60	SONY	BVW-75
Sony BVW-65	SONY	BVW-75
Sony BVW-95	SONY	BVW-75
Sony BVW-96	SONY	BVW-75
Sony BVW-70	SONY	BVW-75
Sony BVW-75	SONY	BVW-75
Sony PVW-2600	SONY	BVW-75
Sony PVW-2800	SONY	BVW-75
Sony PVW-2650	SONY	BVW-75
Sony BVW-D75	SONY	BVW-75
Sony DVR-1000	SONY	DVR-1000
Sony DVR-2000	SONY	DVR-1000
Sony DVR-2100	SONY	DVR-1000
Sony DVR-10	SONY	DVR-10
Sony DVR-18	SONY	DVR-10
Sony DVR-20	SONY	DVR-10
Sony DVR-28	SONY	DVR-10
Sony PCM-3402	SONY	3402 sd
Sony PCM-7030	SONY	7030
Sony PCM-7050	SONY	7030
Sony EVO-9800	SONY	9800
Sony EVO-9850	SONY	9800
Alesis AI2	ALESIS	AI2/ADAT
JVC CR-850	JVC	CR-850s
Fostex D-20	FOSTEX	D-20
Otari DTR-90	OTARI	DTR-90
Panasonic AG-7750	PANA	AG-7750
Panasonic AJ-D350	PANA	AJ-D350
Tascam DA-88	TASCAM	DA-88
Ampex VPR-80	AMPEX	VPR-80
Ampex VPR-3	AMPEX	VPR-3
Ampex VPR-6	AMPEX	VPR-6
Ampex XVR-80	AMPEX	VPR-80
Ampex VPR-300	AMPEX	VPR-300
Ampex VPR-305	AMPEX	VPR-300
Ampex VPR-350	AMPEX	VPR-300
Ampex VPR-200	AMPEX	VPR-300
Ampex VPR-250	AMPEX	VPR-300
Ampex DCT-700d	AMPEX	VPR-300

Serial Transport	TRAN Selection

Keyboard Control Unit Modifications

Keyboard Control Unit Hardware Upgrade

Service Bulletin No. 91-003

Description:

When a Keyboard Control Unit (KCU) is used with Lynx-2 modules, the KCU processor board must be modified for the system to operate correctly. Failure to perform this modification will cause operational errors.

Required Tools:

Static safe workstation	Phillips screwdriver
Grounding wrist strap	X-acto Knife
Soldering iron	30 AWG Wire

Procedure:

1. Turn off the power to the KCU power supply. Disconnect all cables.
2. Place the KCU on a static safe workstation. Ground yourself and the workstation anti-static mat.
3. Remove the two phillips screws holding the PROM cover to the chassis. (Figure A-1) Remove the cover by lifting up, out and sideways.

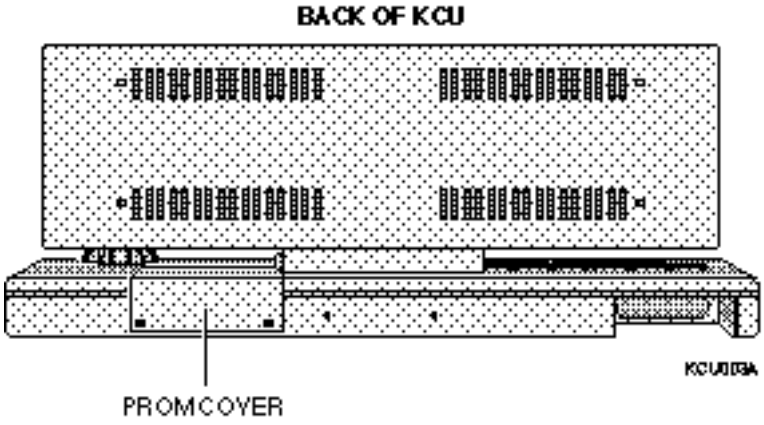


Figure A-1. Remove the PROM Cover

Figure A-2. KCU Board Modifications

4. Turn the KCU over and remove the four phillips screws holding the bottom cover to the KCU chassis. Remove the bottom cover. It is not necessary to remove the PC boards form the chassis.
5. Referring to Figure A-2, cut the trace connecting the two flowthrough holes. These holes are located next to RN3.
6. Solder a 30 AWG jumper wire between the top flowthrough hole and pin 10 of U10 as shown in Figure A-2.
7. Examine the trace between pins 7 and 8 of U10. If this trace has been cut, there will be a wire jumper between pins 8 and 14. Remove the jumper between pins 8 and 14 and solder a 30 AWG wire between pins 7 and 8.
8. Replace the bottom cover on the KCU chassis. Insert and tighten the four phillips screws to secure the cover to the chassis.
9. Set the KCU upright in its normal operating position.
10. Replace the PROM cover. Insert and tighten the two phillips screws. Note, using too much forward pressure when installing the screws could damage the KCU bottom cover. Reconnect the cables and turn on the power.

Lynx-2 Film Option Card PCB Modifications

Service Bulletin No. SB94-004

Description:

The following modifications must be performed to bring the film card up to Rev. 2E PCB specifications. this update is required for operation of V700-10 and LFI-001 software.

Require Tools:

Static safe workstation	Phillips screwdriver
Grounding wrist strap	Soldering iron
30 GA Black wire wrap wire	

Procedure:

Disassembly

1. Remove the power cord and all other cables from the back panel.
2. Place the unit on a static safe workstation.
3. Remove the six phillips screws from the top cover, and remove. (See Figure A-3)

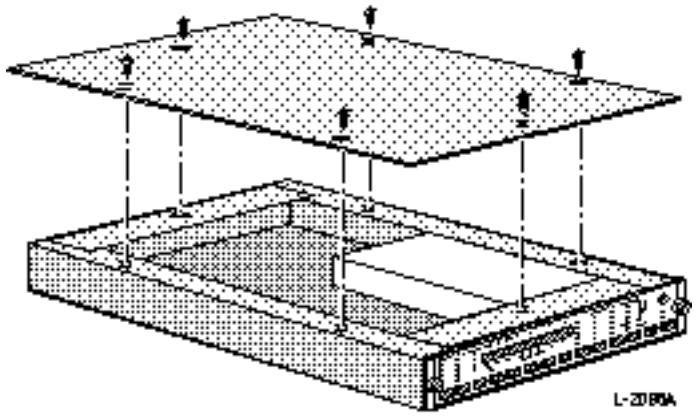


Figure A-3. Removing the Top Cover

4. Remove the phillips screw securing the film board to the metal standoff. (See Figure A-4)

5. Disconnect the ribbon cable at J7. (See Figure A-4) Compress the two plastic standoffs and remove the film board from the module.

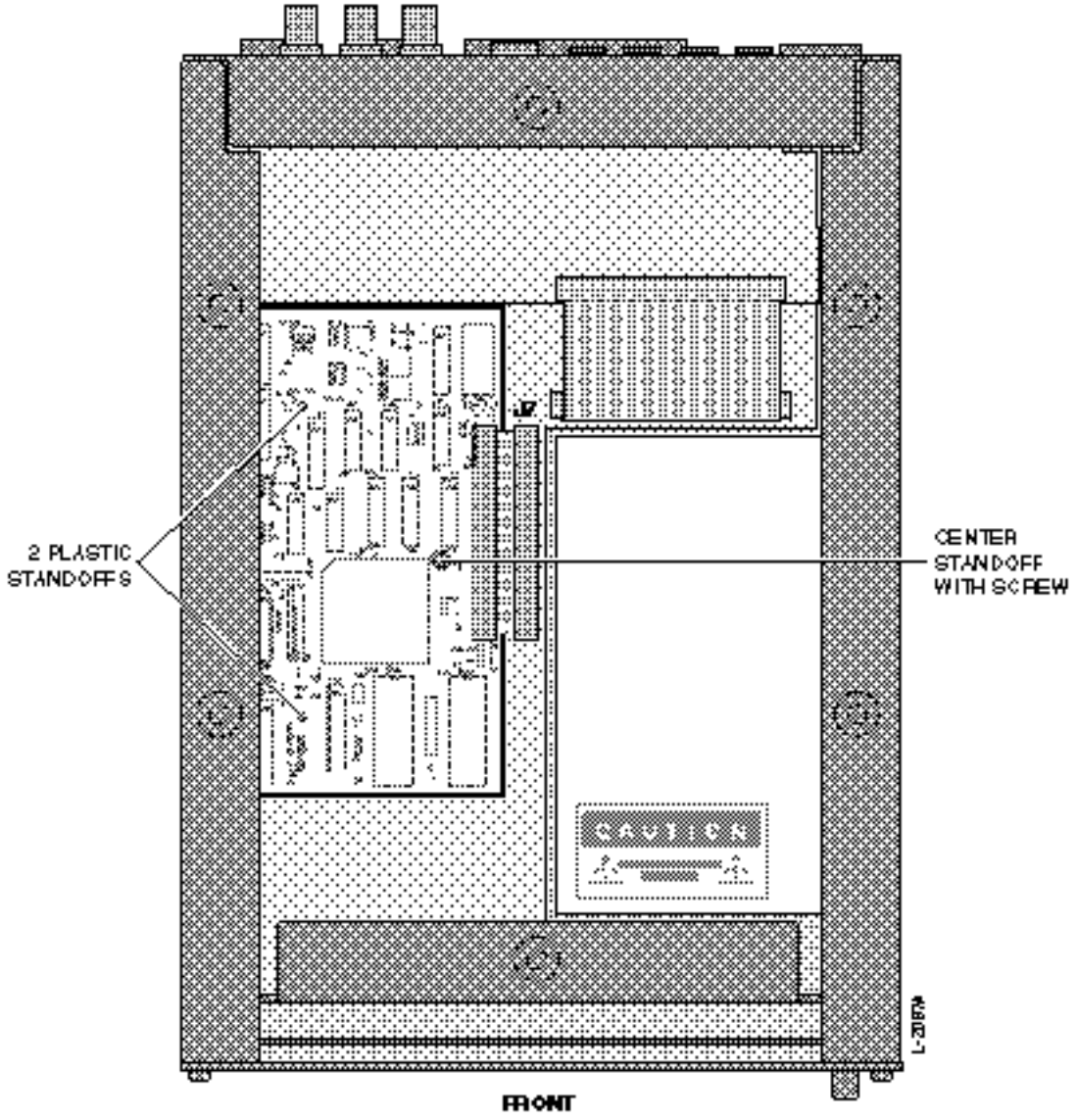


Figure A-4. Standoff Locations

6. On the solder side of the film board, locate DH2 and DH4. Using the 30 GA black wire wrap wire, solder a jumper between DH2 Pin 5 and DH4 Pin 7. (See Figure A-5)

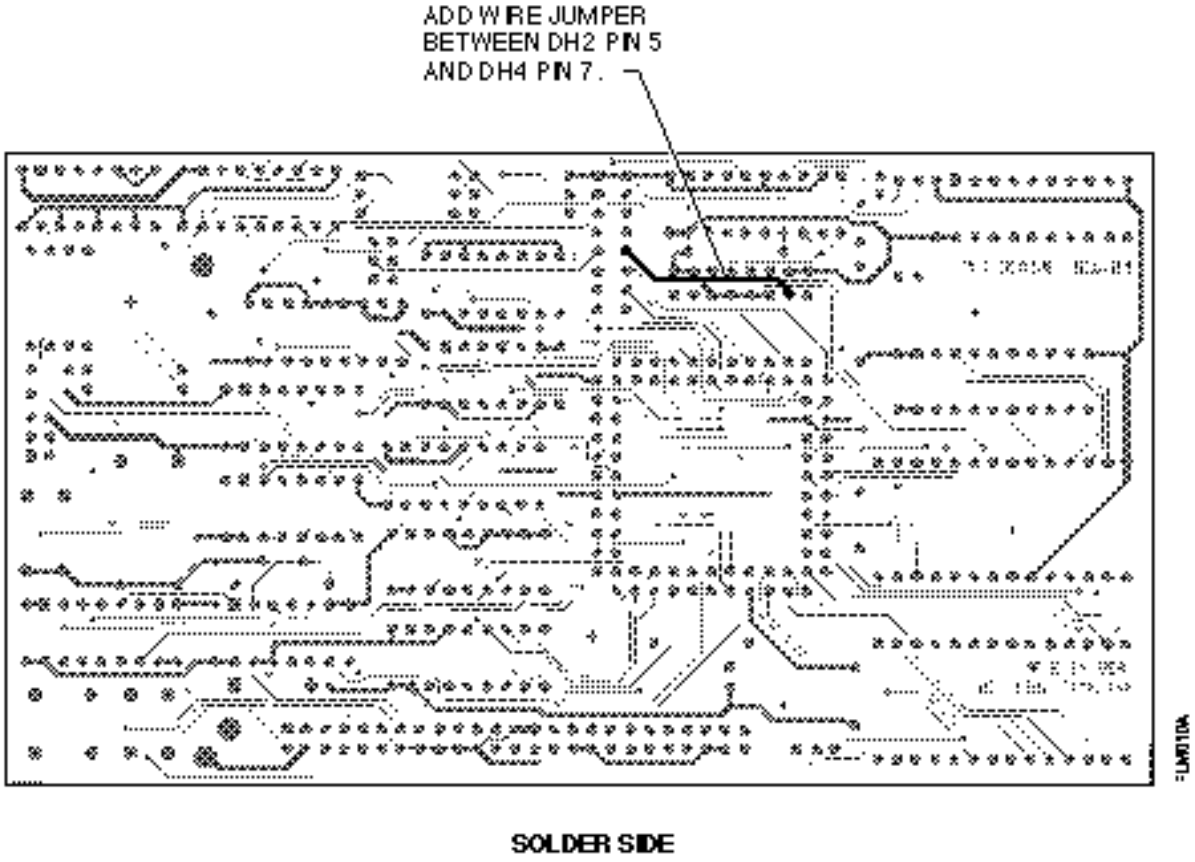


Figure A-5. Jumper Location

Assembly

7. Replace the board in the module, aligning with the two plastic standoffs. Make sure that the front panel ribbon cable in connector J9 is not trapped under the film board.
8. Connect the ribbon cable to J7 on the main board.
9. Press down on the option board, properly seating it on the two plastic standoffs.
10. Insert the phillips screw from Step 4 and secure the film board to the metal standoff.
11. Replace the top cover. Insert and tighten the six phillips screws. Reconnect the cables and turn on the power.

Glossary

24	'24' refers to both the film-standard speed and code type.
25	'25' refers to both the EBU/PAL speed and code type.
29.97	'29.97' refers to a SMPTE frame rate only, in frames-per-second.
30	'30' refers to a SMPTE frame rate only, in frames-per-second.
Address	SMPTE/EBU time code address. Also referred to as time code value. A specific and unique address in the time code data stream. A set of SMPTE or EBU time code numbers indicating a specific position on tape. A complete SMPTE address includes hours, minutes, seconds, and frames.
ADR	Automated Dialog Replacement. A technique for replacing production dialog in the studio.
Analog Audio	The "traditional" means of recording and reproducing sound, using fluctuating electronic voltages to replicate audio waveforms.
ATR	Audio Tape Recorder.
Autolocator	A device that can hold multiple tape locations in memory and chase to those locations on command, using SMPTE addresses, tach pulses, or control track pulses to find a desired point on tape.
Binary Numerical System	A system for expressing numerical values using two digits, 0 and 1. The binary system is used in digital audio, SMPTE, MIDI, and other microprocessor-related data formats.
Biphase Encoding	The way in which SMPTE time code gets encoded onto tape. It expresses binary '1' and binary '0'. Biphase encoding reverses the signal polarity halfway through a bit to represent a '1' and leaves the bit polarity unchanged to represent a '0'.

Blanking Interval The blanking interval occurs at the end of a frame. Video information is absent during the blanking interval. The interval occurs when the CRT electron gun scanner goes from the bottom right corner of the screen to the beginning of the next field in the top left corner.

BNC Bayonet-Nut Coupler.

Byte A byte is made up of two or more bits, which can be either a 0 or 1. A group of related binary data or a word that can be read, interpreted, and acted on by a microprocessor.

Code Type See Time Code Type.

Configuration See Setup Mode. The process of defining the user-selected operational parameters, such as defining a specific transport or lifter-defeat mode.

Control Track A synchronizing signal on the edge of a tape, which provides a reference for tracking control and tape speed.

DAW Digital Audio Workstation. Usually refers to a computer-based, hard disk recording and editing environment.

DF Drop frame. See drop frame.

Digital Audio A means of storing and transmitting sound using binary digits to replicate the audio waveforms.

Display Numeric display. Time Code/Message Display.

Drop Frame Drop frame is one of the two SMPTE code types, and is the NTSC color television standard. When using this code type, 108 specific frame numbers are "dropped" for each hour of time code. See Appendix -A for more detailed time code information.

EBU EBU time code is 25 frame running at 25 fps.

Edit Decision List (EDL) A list, either on paper or in computer memory, of time code addresses indicating successive scenes of source video footage that will make up a complete program.

EDL See Edit Decision List.

ERR Error or offset error. Indicates that the display shows the difference between the actual position of the machine in relation to where it should be.

Foley The process of adding incidental sounds, such a footsteps, door slams, etc., to a video program or motion picture.

Format See Time Code Format.

Frame A single image on a motion picture film or a television picture formed from two interlaced fields. One complete video scanning cycle, one complete SMPTE time code word.

Frame Lock Frame lock syncs the Master and Slave(s) using *all* of the information available in the reference TCA. The Phase 0 option off, sets the module into Frame lock mode.

Frame Rate The number of frames that go by in one second of audio, film or video tape. Film and different types of video all have different frame rates.

30	30 fr/s	Monochrome TV, & audio
NTSC	29.97 fr/s	Color videotape, TV operations
PAL	25 fr/s	European TV, European Broadcast, & audio
Film	24 fr/s	Film cameras & projectors

GEN REF Generator reference. May also be referred to as reference source.

Generate Indicates the process of activating the time code generator so that time code is available at the rear panel GEN OUT jack.

Generator Indicates a time code generator. Each Lynx-2 module has a time code generator. This generator receives its speed reference from one of 5 internal or external sources.

Guard Band A track of multitrack tape adjacent to the sync track (such as SMPTE or Control Track), which is left unrecorded in order to prevent the time code from bleeding onto the audio program material.

HH:MM:SS:FF Hours:Minutes:Seconds:Frames. A SMPTE time code address or value.

Initialize Completely clear the module's RAM. Press and hold the [CLR] key while you power-up the module.

Jam Sync A technique used to start a time code generator from another running time code. It can be used to recreate missing time code or to add time code onto a tape.

Jam Time Code The Jam Time Code or Jam Sync function. Picks up the next consecutive address after a problem and generates new, continuous code.

KCU Keyboard Control Unit. TimeLine's external machine control unit. The KCU provides centrally-controlled access to all modules in a system.

Local Transport The machine or transport that the Lynx-2 module is connected to and controlling. See Synchronized Units.

Lock The transport has synchronized with the system reference [GEN REF].

LTC Longitudinal Time Code. Time code information encoded in binary coded decimal (BCD) form which is recorded as an audio signal on a designated track of a VTR or an ATR.

Machine Machine refers to the generic concept of tape or hard disk-based record/playback hardware.

MIDI Musical Instrument Digital Interface. This serial data language is used by microprocessors in synthesizers, sequencers, drum machines, signal processors, and computers. It provides musical pitch and rhythm information, synthesizer performance parameters, song position markers, stop/start/continue commands for sequencers and computers, and synchronizing data called MIDI Clock, which is based on 24 pulses per quarter-note. MIDI is frequently used with SMPTE for sync-to-tape functions.

MIDI is transmitted between microprocessors at 32.125 kBits per second. It can also be used by lighting systems and mixing consoles.

MTC MIDI Time Code.

N/A Not available. Not active. Not applicable.

Non Drop Frame NDF or ND is one of the two SMPTE code types and is the black & white television standard. When using this code type, every frame of time code is counted in real time. See Appendix -A for more time code information.

Non-contiguous Not a continuous, predictable sequence. i.e., 1, 2, 4, 5, 6, 8, 9 is a non-contiguous number sequence.

NTSC A system of coding color information for television transmission used primarily in the USA and Japan. Named after the National Television System Committee.

Offset Offset is the difference between two time codes at the point at which they are to be synchronized. Offsets are subframe-accurate and are displayed using the HH:MM:SS:FF format. Offsets are always applied to the slave modules.

PAL Phase Alternate Line. PAL is another name for the 25 time code format, which is the standard for European color and B&W television.

Phase Lock A mode of synchronizer operation that uses phase information derived from SMPTE time code and, after initial synchronization, ignores specific frame addresses. It is also called Sync Lock.

On the Lynx-2, the Phase 1 option sets the module in the Phase or Sync lock mode. This mode precisely synchronizes the Slave(s) to the Master using the phase information contained in the time code's 16-bit Sync Word. The synchronizer ignores the master's absolute TCA values.

Pilot Tone The Pilot output signal is a sinusoidally-shaped output, which is always 2 times the frame rate of the time code that is being referenced or generated.

Post-production Activities that take place after the raw footage has been shot for a video program or motion picture. Includes video editing and a number of audio processes, such as ADR, Foley, and mixing.

Production The initial stages in the making of a film or television program, which includes the shooting of raw footage and recording of production audio.

RAM Random Access Memory. The module's configuration parameters are stored in battery-backed RAM. And recalled each time the unit is turned on.

Rate Frame rate or speed. See Frame Rate or Speed.

REF SRC Reference source. The signal that is used to determine the rate that the generator and synchronizer will run at. The reference source can be thought of as the system time base. The reference source can be internal crystal, external video, MAINS, or external pilot tone or the time code reader.

Register The generator register is the module's memory buffer that holds numeric time code values that are entered or captured. The Lynx-2 module also has reader, sync point, offset, user bit and error registers.

Reshape The output signal is the same as the input signal, but it has been reshaped with correct risetime values and a fixed voltage output. This type of output does not correct for Bit or timing errors.

Resolving A technique for regulating the play speed of a tape machine by matching the rate of pulses recorded on tape with a pulse rate from another stable source or a master tape machine.

Sequencer A device that can record performance data for synthesizers and other electronic instruments and then, on playback, pass that data on to the instruments so that they'll play what has been recorded. Modern sequencers use MIDI as their communications protocol.

SER SERial port. SER LED lights when time code data is connected to one of the rear panel serial ports.

Setup Mode The process of defining the user-selected operational parameters, such as defining a specific transport or lifter-defeat mode.

Shuttle Fast-wind. Fast-forward or Rewind.

SMPTE Society of Motion Picture and Television Engineers. An industry standards committee. The group responsible for developing SMPTE time code.

Speed Speed, Frame Rate and Rate are synonymous. Time code speed is counted in frames per second (fps). SMPTE time code has two speeds: 30fps and 29.97fps.

SUBF UBITS Sub frame user bits.

Sync Lock See Phase Lock.

Sync Word Included at the end of every 80-bit time code word is a 16-bit Sync Word. The sync word provides direction and Phase-lock speed information, and marks the end of each time code word.

Synchronized Unit A synchronized unit consists of one machine and one Lynx-2 module. See Local Transport.

Synchronizer A device that reads time codes recorded on two or more tape machines, compares the codes, and adjusts the machine's tape positions and speeds based on the results of that comparison.

System BUS When two or more Lynx-2 modules are used to form a system, a communications link must be established between the modules. This is done by looping from one module to the next, via the RS422 ports on the rear panel of the module.

TCA Time Code Address. The HH:MM:SS:FF bits of the TC word.

TCG See Time Code Generator.

Time Code Format Time code format defines both the frame rate and code type being used. Example: To describe a time code format as 30NDF is to say that the frame rate is 30fps and the code type is non-drop frame. Simply saying either 30 or drop frame defines only part of the SMPTE time code.

Time Code Generator A special signal generator designed to generate and transmit SMPTE time code at one of the international formats and rates.

Time Code Reader A counter designed to read and display SMPTE time code.

Time Code Type The word "type" is the key to understanding this phrase. *Type* defines the counting method that is employed by the TCM. There are two SMPTE types: 30 (also called non-drop "ND" or non-drop frame "NDF") and DF (drop frame). EBU and film types are the same as their respective speeds, 25 and 24.

Toggle To toggle is to consecutively press a key several times in order to step through a series of choices.

Transport Transport refers to a part or subassembly of a machine, i.e., a transport connector or a transport cable.

TRS Tip - Ring - Sleeve. A 1/4", balanced termination plug or jack. Typically wired T = +, R = -, S = shield.

Type See Time Code Type.

UB See User Bit.

User Bit Each time code frame or word consists of 80 bits that convey SMPTE/EBU time code information. Thirty-two of those bits are user bits, and are available for storing information such as IDs, reel numbers, session dates or another time code number.

Value Values are generally time code addresses. They may also be a custom user bit IDs.

Video Sync A reference video signal generated by an extremely stable source. This signal is used to control the speed of video machines, digital audio machines and is used as a timing reference to ensure accurate synchronization.

Virtual Tracks Used to describe any circumstance whereby the method for reproducing audio tracks is not directly analogous to the linear tape track format. Hard disk systems (DAW's) and MIDI sequencers are typical examples.

MIDI performance commands can be stored in a sequencer. Because the sequencer can "play" these parts in real time, synchronized to tape, they can be regarded as extra or "virtual" tracks, not on the tape, but present nonetheless.

VITC Vertical Interval Time Code. An alternative to the LTC format of SMPTE time code. It is recorded in the blanking interval of the video signal, which is not used for the picture.

VSO Variable Speed Override. Variable Speed Oscillator.

VTR Video Tape Recorder.

Workstation See DAW.

Technical Information

Circuit Board Interface

50-pin Transport Connector

Pin	Signal	Relay or I/O Device
1	Ground	
2	Transport ground sense	
3	Stop (still) command	U16B, U17B
4	Capstan frequency output	U5F
5	N/C	
6	Lifter drop command	U18D, U19D
7	Fast forward/direction command	U16C, U17C
8	Record tally	U15C
9	Auxiliary in 2	U14B
10	Lock Light or Ch 4 insert command	U27
11	Channel 1 insert command	U20B, U21B
12	Rehearse command	U27
13	Servo relay-A N/C	K1
14	Servo relay-B common	K1
15	Servo relay-B N/O	K1
16	RS422 (-)/RS232 TX (-)	JP2, U40
17	N/C	
18	+5V (50 mA max)	
19	Record-off command collector (+)	U18B, U19B
20	Search command collector (+)	U18A, U19A
21	Adaptor Detect	
22	AUX Out Opto	U20D, U21D
23	Transport command common	
24	Rewind command	U16D, U17D
25	Play tally	U15D
26	Tach direction sense	U15B
27	Channel 2 insert command	U20C, U21C
28	Video insert command or Ch 3	U20A, U21A
29	Servo relay-A N/O	K1
30	Servo relay A common	K1
31	Servo relay-B N/C	K1
32	RS422 TX (+)	JP2, U40
33	N/C	
34	Ground	
35	Record-off command emitter (-)	U18B, U19B
36	Search command emitter (-)	U18A, U19A
37	Play command	U18C, U19C
38	Search volts out	U44A
39	Capstan volts out	U45C
40	Record-on command	U16A, U17A
41	Auxiliary in 1	U14A
42	Tach pulse in	U15A
43	AUX Out O/C	U27
44	-12V (50 mA max)	
45	+12V (50 mA max)	
46	Mute relay N/O	K2
47	Mute relay N/C	K2
48	Mute relay common	K2
49	RS422 RCV (-)/RS232 RCV (-)	U40
50	RS422 RCV (+)	U40