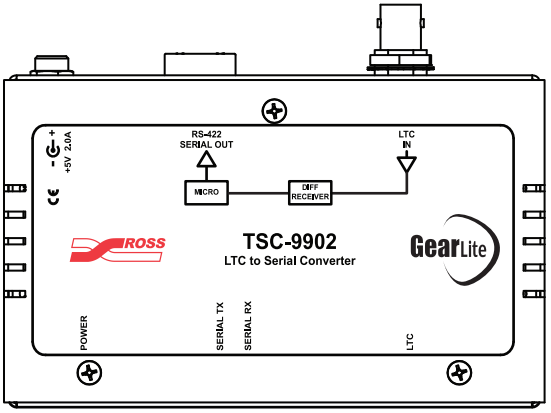
Ross Video Limited

TSC-9902
LTC to Serial Converter
User Manual



Live Production Technology

TSC-9902 • LTC to Serial Converter User Manual

- Ross Part Number: **9902DR-004-01**
- Release Date: July 14, 2010. Printed in Canada.

The information contained in this manual is subject to change without notice or obligation.

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Patents

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Important Regulatory and Safety Notices to Service Personnel

Before using this product and any associated equipment, refer to the "**Important Safety Instructions**" listed below to avoid personnel injury and to prevent product damage.

Product may require specific equipment, and/or installation procedures to be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these specific requirements.

Symbol Meanings

Protective Earth — *This symbol identifies a Protective Earth (PE) terminal, which is provided for connection of the supply system's protective earth (green or green/yellow) conductor.*

This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.

Warning — *The symbol with the word "**Warning**" within the equipment manual indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.*

Caution — *The symbol with the word "**Caution**" within the equipment manual indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.*

Warning Hazardous Voltages — *This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.*

ESD Susceptibility — *This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.*

Important Safety Instructions

1. **Warning** – Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. The safe operation of this product requires that a protective earth connection be provided. A grounding conductor in the equipment's supply cord provides this protective earth. To reduce the risk of electrical shock to the operator and service personnel, this ground conductor must be connected to an earthed ground.
6. Do not defeat the safety purpose of the grounding-type plug. A grounding type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit in to your outlet, consult an electrician for replacement of the obsolete outlet. Protect the power cord from being walked on or pinching particularly at plugs, convenience receptacles, and point where they exit from the apparatus.

7. **Warning – Indoor Use: WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
8. Do not block ventilation openings. Install in accordance with manufacturer's instructions.
9. Do not install near heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
10. Do not use this apparatus near water.
11. Only use attachments/accessories specified by the manufacturer.
12. Unplug this apparatus during lightning storms or when unused for long periods of time.
13. Clean only with a dry cloth.
14. To avoid electrical shock, disconnect the A/C power cord before any servicing.
15. Refer all servicing to qualified personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug damage, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

EMC Notices

United States of America
FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Notice — *Changes or modifications to this equipment not expressly approved by Ross Video Limited could void the user's authority to operate this equipment.*

CANADA

This Class "A" digital apparatus complies with Canadian ICES-003.

Cet appariel numerique de la classe "A" est conforme a la norme NMB-003 du Canada.

EUROPE

This equipment is in compliance with the essential requirements and other relevant provisions of **CE Directive 93/68/EEC**.

INTERNATIONAL

This equipment has been tested to **CISPR 22:1997** along with amendments **A1:2000** and **A2:2002**, and found to comply with the limits for a Class A Digital device.

Notice — *This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.*

Maintenance/User Serviceable Parts

Routine maintenance to this GearLite product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the

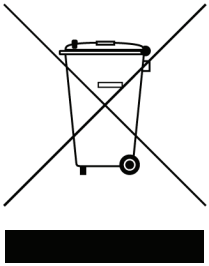
"Contact Us" section on the last page of this manual. All GearLite products are covered by a generous 3-year warranty and will be repaired without charge for materials or labor within this period. See the "Warranty and Repair Policy" section in this manual for details.

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performances of our products.

Introduction

Overview

The TSC-9902 LTC to Serial Converter is a high-quality signal conversion solution within the family of GearLite compact, self-contained modular products. Supporting Linear Timecode Signal (LTC) to Serial conversion, the TSC-9902 is the ideal converter for interpreting linear timecode and sending the timecode over a serial port to another device, such as the Ross Video CrossOver Live Production Switcher.

The TSC-9902 provides a single DB-9 connector for 38,400 baud serial RS-422 communication, and one BNC connector for LTC input. Note that the shell of the BNC connector is isolated from ground. Power, LTC Status, and Serial Tx LEDs show activity status.

A universal power adaptor and line cord, suitable for the country of use, is supplied with each module. Various mounting options are included that enable a wide range of installation choices.

Functional Block Diagram

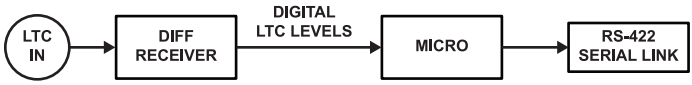


Figure 1 *Simplified Block Diagram of TSC-9902 Functions*

Features

The TSC-9902 LTC to Serial Converter includes the following features:

- One BNC connector for the LTC input
- One RS-422 Serial connector for the LTC output
- Accepts balanced[1] and unbalanced SMPTE 12M-1 LTC signals
- Power, LTC Status, and Serial Tx Status indicator LEDs
- Small brick form factor
- 5V universal adapter with locking DC connector
- 3-year warranty

1. Balanced input signals require the use of a balun, or an adapter. Refer to the section "**Setup and Operation**" on page 11 for details on using an adapter.

Installation

Static Discharge

Whenever handling the TSC-9902 LTC to Serial Converter and other related equipment, please observe all static discharge precautions as described in the following note:

ESD Susceptibility — *Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments, such as carpeted areas, and when wearing synthetic fiber clothing. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Unpacking

Unpack each TSC-9902 module you received from the shipping container and check the contents against the packing list to ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video directly.

Mounting and Installation

The TSC-9902 LTC to Serial Converter can be mounted in any convenient location. However, to ensure long life for this product, observe the following precautions and operating requirements:

- Maintain an ambient temperature of 0°C to 40°C (32°F to 104°F).
- Allow for air circulation around the chassis for convectional cooling.

Many different mounting positions are possible with the included mounting hardware. Some installation options are permanent and require careful consideration of the final positioning before installation. Please note that in some mounting locations, the power adaptor must be affixed in a similar manner as the chassis.

Other possible options include the use of adhesive magnetic sheets (not included) affixed to the chassis and the power adaptor, for removable mounting on metal cabinets etc.

Cable ties may be necessary in some applications to relieve strain on the mounting hardware and the connectors.

Surface Mount Strips

The included VELCRO® brand surface mount strips allow the GearLite module and power supply to be affixed to a permanent location during use and easily removed for adjustments. Carefully consider the installation location before proceeding; the adhesive is very aggressive and is not easily removed. The adhesive will cure fully in 24 hours.

Installing the Surface Mount Strips

Use the following procedure to install the surface mount strips:

1. Remove the **Protective Backing Film** from the adhesive on the bottom of the two VELCRO® brand **Surface Mount Strips**.
2. Adhere the **Surface Mount Strips** to the bottom side of the chassis **Figure 2**.

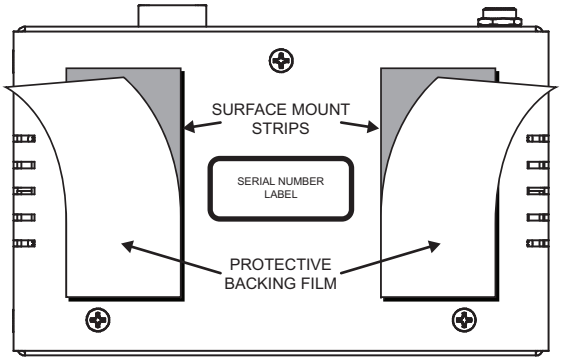


Figure 2 *Surface Mount Installation Option*

3. Remove the **Protective Backing Film** from the other side of the VELCRO® brand **Surface Mount Strips**.
4. Press the chassis into position on the surface you want to mount it to.

Operating Tip — *An additional VELCRO® brand **Surface Mount Strip** is available to mount the power adapter.*

This completes the procedure for installing the surface mount strips.

Flat Metal Plate

Use the flat metal plate for permanent mounting to a rack, a desk, or any other location where bolts or screws can be applied. Be sure to position the module to allow for operator adjustments, if required.

Installing the Flat Metal Plate

Use the following procedure to install the flat metal plate:

1. Remove the **2** screws from the bottom of the chassis.
2. Install the **Flat Metal Plate** onto the bottom of the chassis (**Figure 3**) using the screws removed in **Step 1.**.

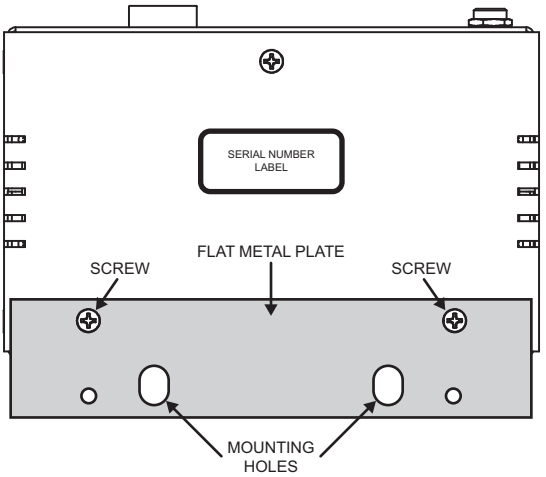


Figure 3 *Flat Metal Plate Installation Option*

3. Install the chassis in the desired location using the **Mounting Holes** on the **Flat Metal Plate**. Mounting screws are not provided by Ross Video.

This completes the procedure for installing the flat metal plate.

Non-Slip Pads

Four non-slip adhesive pads have been supplied for desktop placements. Simply remove the protective backing film from the adhesive and affix one non-slip pad to each of the four corners on the bottom of the chassis.

Optional Mounting Accessories

Ross Video is committed to providing practical solutions for the needs of your high-quality broadcast facility. The following products may be ordered separately to expand your installation options.

BPM-9000

The BPM-9000 Angle Mounting Bracket (**Figure 4**) allows a single GearLite module to be installed in positions not possible with the flat metal plate. The bracket has a 90° angle. Mounting screws are not provided by Ross Video.

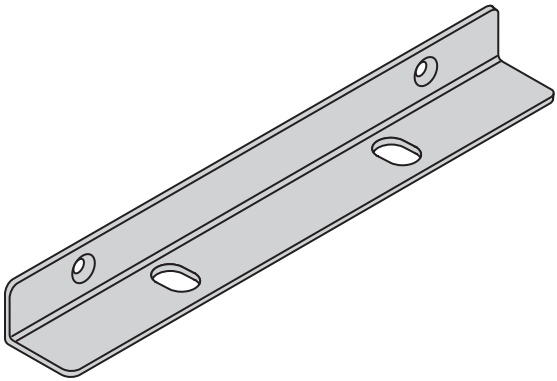


Figure 4 *BPM-9000 90° Mounting Bracket*

Setup and Operation

Cable Connections Overview

There are three connections to the TSC-9902:

- A female BNC connection for the LTC Input
- A female DB9 RS-422 serial connection
- A power supply connection to the GearLite PS-9000 power adaptor

LTC Device Connection

The TSC-9902 uses a female BNC connector for the LTC input.

- For a single-ended, or unbalanced, sources, connect directly using a BNC cable. The center pin carries the signal and the BNC cable shield is grounded.
- For a double-ended, or balanced sources, connect TC- to the shield, the TC+ to the center pin, and the cable shield is not connected to the TSC-9902. The other end of the cable shield should be connected to the chassis of the LTC Device.

The LTC IN BNC can support a minimum of 0.4Vpp to a maximum of 12Vpp.

Connect the LTC input cable to the TSC-9902 according to the designations indicated on the chassis label (**Figure 5**). It is not necessary to terminate unused outputs.

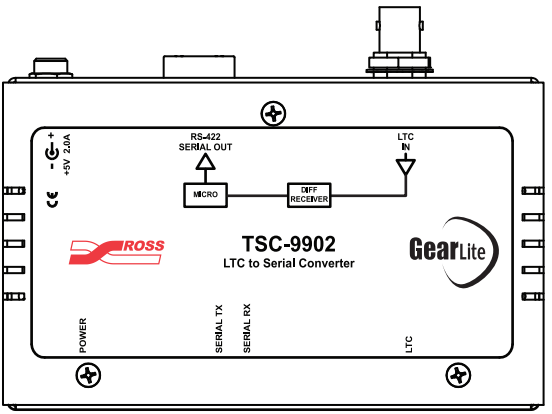


Figure 5 *TSC-9902 Cable Connections Indicator Label*

Serial Connection

The TSC-9902 includes an **RS-422 Serial** output port that is a DB9 female connector supporting a Baud Rate of 38400, 1 start bit, 1 stop bit, and no parity. The pinouts for the **RS-422 Serial** port are listed in **Table 1**.

Table 1 RS-422 Serial Port

Pin	RS-422
1	n/c
2	RxA (Rx-)
3	TxB (Tx+)
4	Ground
5	Ground
6	n/c
7	RxB (Rx+)
8	TxA (Tx-)
9	n/c

Connect the RS-422 serial cable to the TSC-9902 according to the designations indicated on the chassis label (**Figure 5** and **Figure 6**). It is not necessary to terminate unused outputs.

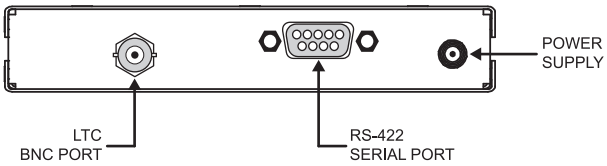


***Figure 6** TSC-9902 Cable Designations*

Serial Communication Protocol

The TSC-9902 transmits timecode information to the serial port using the same packet format as the incoming LTC packet. Refer to **Table 3** on page 14 for the format the TSC-9902 uses to send timecode information out the **RS-422 Serial** port.

Table 2 LTC Serial Packet Format

Message	Byte	Description
Start of System	1 Byte	0xF0
Data Payload	8 Bytes	• Each payload byte represents a byte of the LTC codeword (refer to ***SMPTE 12M-1 Table 11***). • All the LTC codeword bits are sent out the RS-422 serial port with no translation. • The sync word is not sent out the RS-422 Serial port.
End of System	1 Byte	0xF7

Connecting an LTC Device to CrossOver

The TSC-9902 can be used to connect an LTC Device to the CrossOver Live Production Switcher. The **Interface Cables** are not provided by Ross Video.

Use the following procedure to connect an LTC Device to a CrossOver Live Production Switcher using a TSC-9902:

1. Connect the TSC-9902 to the LTC Device as follows:
   - Connect one end of a **BNC Cable** to the **LTC Timecode** BNC port on the TSC-9902.
   - Connect the other end of the **BNC Cable** to an output port on the **LTC Device**.

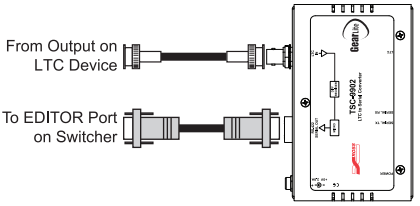


Figure 7 TSC-9902 Cabling — LTC Device to CrossOver

2. Connect the TSC-9902 to a CrossOver Live Production Switcher as follows:
   - Connect and secure the **9-Pin**, **Male** end of the **Interface Cable** to the **RS-422 Serial** port on the TSC-9902 (**Figure 7**).
   - Connect the other end of the **Interface Cable** to the **EDITOR** port on the **CrossOver Live Production Switcher**.

This completes the procedure for connecting an LTC Device to a CrossOver Live Production Switcher using a TSC-9902.

Power Adapter and Supply

Connect the PS-9000 power adaptor to the power supply connector. The PS-9000 provides regulated +5V DC (5%) @ up to 2A. The DC power cord has a locking connector that securely fastens into the power supply DC jack on the TSC-9902. The TSC-9902 has a standard miniature power jack (center pin positive). If using an adaptor other than the PS-9000, ensure that the polarity is correct and that the voltage is +5V DC regulated to 5% and it can supply sufficient current for the TSC-9902. Use of improper adaptors may damage the TSC-9902 and will void the warranty.

Refer to the **Important Regulatory and Safety Notices** section at the front of this manual for details.

If using an adaptor other than the PS-9000, ensure that:

- the polarity is correct
- the voltage is +5V DC regulated to 5%
- sufficient current for the TSC-9902 is supplied

Caution — *Use of improper adaptors may damage the TSC-9902 and will void the warranty.*

Status LEDs

The front edge (**Figure 8**) of the TSC-9902 includes LEDs that display the status of power, LTC input activity, as well as RS-422 serial status.

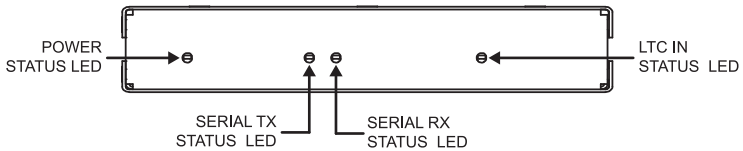


***Figure 8** TSC-9902 Front Edge Status Indicator LEDs*

Refer to **Table 3** for a description of the status LEDs available on the TSC-9902.

Table 3 Status LED Descriptions

LEDs	Function
POWER (Green)	LED is *continually lit* when power is supplied to the TSC-9902.
LTC IN (Green)	LED flashes when the TSC-9902 determines that there is a valid LTC signal on the input.
SERIAL TX (Yellow)	LED is lit when RS-422 serial communication signals are being transmitted.
SERIAL RX	This LED is not implemented.

Specifications

Technical Specifications

Specifications are subject to change without notification.

Table 4 TSC-9902 — Technical Specifications

Category	Parameter	Specification
Serial Input	Transmission Standard	RS-422
	Baud Rate (fixed)	38,400 bps
LTC Input	Standards Accommodated	SMPTE 12M-1
	Input Voltage	0.4 to 12Vpp (balanced or unbalanced)
	Speed	Normal forward play speed at 25 or 30 frames/second
	Impedance	High Z (40k ohm)
Power	Required Voltage	+5V DC (5% regulation)
	Current Consumption	< 200mA typical
	Total Power	<1W typical
Other	Warranty	3-year transferable
	Thermal Environment	0°C to 40°C (32°F to 104°F) ambient, non-condensing
	Delay	1 Frame +2.2ms from LTC to Serial Out

Service Information

Warranty and Repair Policy

The GearLite TSC-9902 is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of **THREE (3)** years from the date of delivery to the customer. In the event that your GearLite TSC-9902 proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this GearLite TSC-9902 has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the THREE (3) year warranty period.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This GearLite TSC-9902 LTC to Serial Converter User Manual of our Digital Products line provides all pertinent information for the safe installation and operation of your GearLite Product. Ross Video policy dictates that all repairs to the GearLite TSC-9902 are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your GearLite TSC-9902, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your GearLite TSC-9902. If required, a temporary replacement module will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

The Ross Video Technical Support Department will continue to provide advice on any product manufactured by Ross Video Limited, beyond the warranty period without charge, for the life of the equipment.

Ordering Information

Standard Equipment

- **TSC-9902 LTC to Serial Converter**, including:
  - › one User Manual
  - › an installation kit with various mounting hardware
  - › one **PS-9000** 5V Universal Power Adaptor and line cord (pre-packaged for the country of use)

Optional Equipment

- **9902DR-004-01**, additional User Manual
- **PS-9000**, additional 5V Universal Power Adaptor and line cord (pre-packaged for the country of use)
- **BPM-9000**, 90° Angle Mounting Bracket (90° angle metal mounting bracket for rack and desk installation)

Your TSC-9902 LTC to Serial Converter is part of the GearLite line of the GearLite family of products. Ross Video Limited offers a full line of GearLite digital terminal equipment including distribution, conversion, monitoring, synchronizers, encoders, decoders, amplifiers, keyers, switchers, as well as analog audio and video products.

Notes

Contact Us

Contact our friendly and professional support representatives for the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

PHONE	**General Business Office and Technical Support**	613 • 652 • 4886
	After Hours Emergency	613 • 349 • 0006
	Fax	613 • 652 • 4425
E-MAIL	**General Information**	solutions@rossvideo.com
	Technical Support	techsupport@rossvideo.com
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