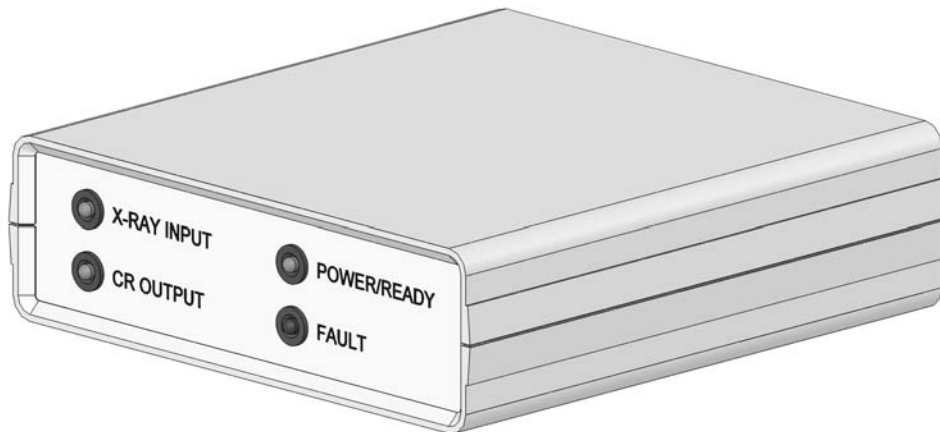


# LPI CR Protocol Bridge

## Technical Operations Manual

**Model 303**  
**X-Ray System to CR Console Bridge**

December 2007  
Version 3.04



**Livingston Products Inc.**  
**1377 Barclay Blvd.**  
**Buffalo Grove, IL 60089**

*Manual Part Number: 1242 10962*

# Technical Operations Manual

Model 303

X-Ray System to CR Console Bridge

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**Printed in the USA**

*Manual Part Number: 1242 10962*

## 1.0 Parts List

The following parts are provided as components of the LPI CR Protocol Bridge product:

<u>LPI Part Number</u>	<u>Item Description</u>
10933- <i>NN</i>	Main Unit (electronics enclosure); <i>Option -NN is described below.</i>
10935	CR Bridge Configuration Cable
10934	AC to DC Power Adapter
10962	<i>This Manual</i>
10963	<i>Configuration &amp; Troubleshooting Guide</i> manual;
11022	Configuration Software CD (includes manuals in PDF form);
◆◆◆	<i>X-Ray machine interface cable or cable kit</i> <i>(depends on the type of connected X-Ray equipment)</i>
◎◎◎	CR Console Interface Cable (depends on the CR Console type)

The product package should contain quantity 1 of each item listed above.

The CR Console Interface cable part number (shown as ◎◎◎ in the above list) depends on which CR Bridge connection option has been ordered, as discussed in the next section of this document.

The X-Ray Equipment Interface cable part number (shown as ◆◆◆ in the above list) depends on the type of X-Ray equipment which will be connected to the CR Bridge unit. For some X-Ray machines the product includes a single X-Ray interface cable, while a cable kit is provided for others. **The X-Ray equipment type must be specified at the time the CR Bridge is ordered.** Contact LPI to determine the part number of the cable or kit required for a specific X-Ray machine.

## 2.0 Connection Option

The type of CR Console to which the M303 unit is to be connected is designated by the connection option code (*-NN*) which follows the model number. This code must be specified at the time the product is ordered. Contact Livingston Products Inc or your distributor to determine which connection option is correct for the CR Console which is to be supported.

The information which follows applies to all of the connection options.

## 3.0 Introduction

The LPI CR Protocol Bridge product (hereafter called the *Bridge*) is a device which translates data output by X-Ray Equipment into a form which is accepted as input by a Mammography CR Console device.

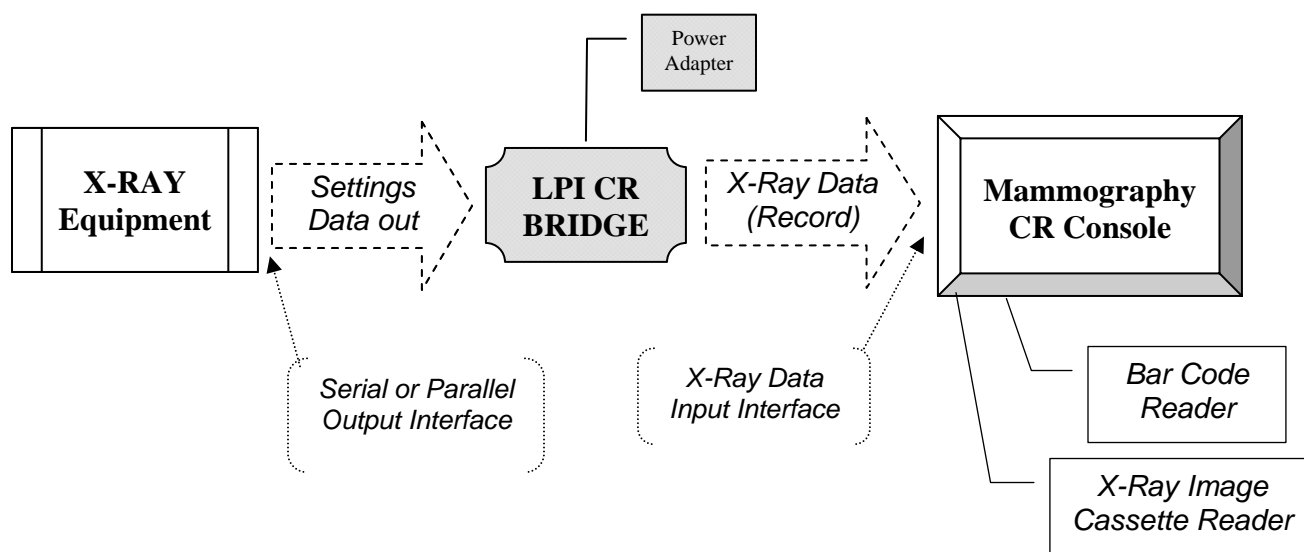
The purpose of the *Bridge* device is to allow the exposure settings data which are output by the X-Ray Equipment to be input into the CR Console as descriptive information which is appended to the corresponding digital X-Ray image. The *Bridge* device is not involved in the transfer of the X-Ray image into the CR Console.

The *Bridge* device is connected to the X-Ray Equipment via a serial communications cable or by a parallel-to-serial communications cable. In some cases by a cable kit is used that contains multiple cables and/or adapters. The cable/kit typically connects to the X-Ray Equipment's serial printer interface, parallel printer interface, or to an RIS system interface.

The *Bridge* device is connected to the CR Console unit via a serial communications cable. This connects to the CR Console's X-Ray input interface.

Data flows out of the X-Ray Equipment and into the *Bridge* device each time an X-Ray image is exposed. The *Bridge* device extracts certain settings information from the input, converts this information to the format that the CR Console expects, and transmits the result to the CR Console unit. The *Bridge* performs these functions without any manual interaction.

The following diagram illustrates the connection of the components and flow of data between these components.



The *Bridge* must be configured **at the time of installation** so that its X-Ray interface communications characteristics are the same as those set within the X-Ray Equipment. After the initial configuration is performed and cable connections are made to the X-Ray Equipment and to the CR Console, the *Bridge* performs its conversion function automatically. Normally, the *Bridge* will only need to be configured once.

*Note: If the Bridge user site changes the type of X-Ray Equipment to which the Bridge is connected, it is possible to reconfigure the Bridge to support the new equipment type. However, it may be necessary to obtain a new X-Ray cable/kit to support the physical connection between the Bridge and the new X-Ray unit.*

The *Bridge* does not provide any mechanism for associating X-Ray exposure data with specific images or with specific patients. The medical technician is responsible for using the CR Console and the X-Ray Equipment in a manner which allows images, patients, and exposure data to be correlated. One possible sequence of operations is as follows:

- The technician defines the patient information and exposure (examination) type at the CR console.
- The technician inserts the X-Ray cassette into the X-Ray Equipment and exposes the cassette with a patient's X-Ray.

This operation causes the X-Ray Equipment to transmit exposure settings data to the *Bridge* device. The *Bridge* acquires the data, converts the settings data to the proper format, and sends the resulting data record to the CR Console.

- The technician removes the X-Ray cassette from the X-Ray Equipment and reads its label bar code data into the CR Console.
- The technician inserts the X-Ray cassette into a cassette reader device attached to the CR Console. The reader transfers the X-Ray image into the CR Console.
- The CR Console uses the bar code information to internally associate the X-Ray exposure data from the *Bridge* with the X-Ray image from the reader.
- The X-Ray image is saved in DICOM format. The exposure data is recorded as a permanent part of the image (DICOM *tags*) which can be viewed whenever the image is viewed.

Some CR Console devices may operate in a slightly different manner. But the general concepts are the same.

## 4.0 Physical Characteristics

The *Bridge* device consists of the following components when used in its normal mode of operation:

- An enclosure which contains the device electronics. Connectors are present on the rear end panel of the enclosure. Status indicators are present on the front end panel.
- A external power adapter that converts AC electrical power to the DC electrical power required by the *Bridge* device's internal electronics;
- A cable (or cable kit) which connects the *Bridge* to the X-Ray Equipment;
- A cable which connects the *Bridge* to the CR Console;

### 4.1 Status Indicators

Four Light Emitting Diodes (LEDs) are provided on the front end panel of the *Bridge* device's enclosure. These LEDs are useful during initial setup of the device and to help with troubleshooting any communications problems which might later be encountered.

Following is a description of each LED's use:

- **POWER/READY**

When this LED is illuminated, it indicates that the *Bridge* device has power and is ready to process data. It should always be on during normal operation.

*Note that it may take several seconds after the Bridge device is plugged in for this LED to become illuminated.*

- **X-RAY INPUT**

This LED is illuminated when the *Bridge* device is processing input data it has received from the X-Ray Equipment. It is turned on when the first data character is received for each exposure and turned off when the last data character is received for that exposure. Typically, this LED is on for several seconds after an X-Ray is exposed during normal operations.

If this LED does not turn on and then off after an X-Ray is exposed, the *Bridge* device is not properly connected to the X-Ray Equipment or the *Bridge* device configuration does not match the configuration of the X-Ray Equipment's serial output interface.

- **CR OUTPUT**

This LED is illuminated when the *Bridge* device is attempting to communicate with the CR Console. This occurs when the power is first applied to the *Bridge* device and also each time the *Bridge* has X-Ray exposure data to send to the CR Console. During normal operation, the LED turns on briefly (less than 1 second) and then turns off. It does this twice for each exposure.

If the LED stays illuminated for several seconds or repeatedly goes on and then off, the *Bridge* device is not able to communicate with the CR Console properly. This may mean that the CR Console interface cable is not correctly connected or that the CR Console has been shut down.

- **FAULT**

This LED is only illuminated when the *Bridge* device detects a condition it does not expect. This indicates either that there is a problem with incoming X-Ray Equipment data or that there is a problem communicating with the CR Console.

If the *Bridge* receives X-Ray Equipment data that is not in the expected format, the Fault LED is turned on and remains on until the next X-Ray Equipment data is received.

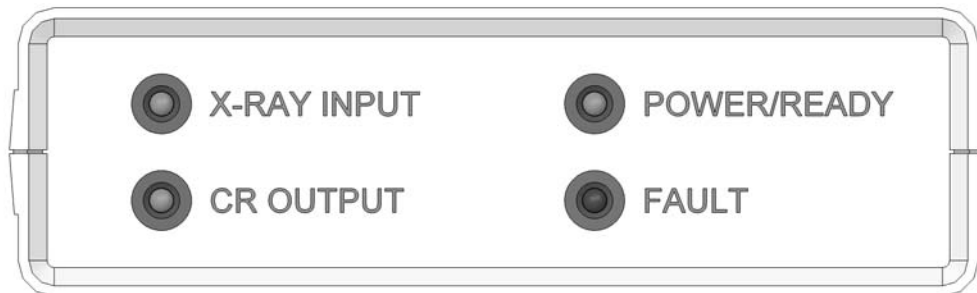
If the *Bridge* cannot communicate with the CR Console, the LED is turned on and remains on until communications can be established.

If the CR Console rejects data sent to it by the *Bridge*, the LED is turned on and remains on until the next X-Ray Equipment data is received.

If a problem is encountered during normal operation of the *Bridge* device, the person who reports the problem to LPI technical support should observe the status LEDs and record their behavior along with the problem description. LPI technical support may ask this person to examine the LEDs during troubleshooting sessions and report their on/off state.

When power is applied to the *Bridge* device, it illuminates all of its LEDs for 1 second. This acts as a lamp test to show that all LEDs are functioning properly.

The *Bridge* device enclosure's front panel status indicator layout is shown below:



## 4.2 Connectors

The *Bridge* device's rear panel contains connectors which allow the *Bridge* to be connected to the outside world. The following connectors are provided:

- **15VDC**

This is a DC power receptacle to which the electrical power adapter which converts AC to DC is connected.

Only the LPI provided electrical power adapter supplied with the *Bridge* device product should be attached to this connector.

It is possible to reset the *Bridge* device by removing the power adapter's wall plug, waiting 10 seconds, and then reconnecting the plug. The power adapter plug should not be removed from the *15VDC* receptacle while the adapter's wall plug is plugged into an electrical outlet.

- **X-RAY INPUT**

This is a **DB9 male** connector which is attached to the X-Ray Equipment interface cable.

During normal *Bridge* device operation, the X-Ray Equipment cable must always be attached to this connector and to the serial output interface of the X-Ray Equipment.

During the configuration process (only performed at installation time), this connector is not used.

- **CR OUTPUT**

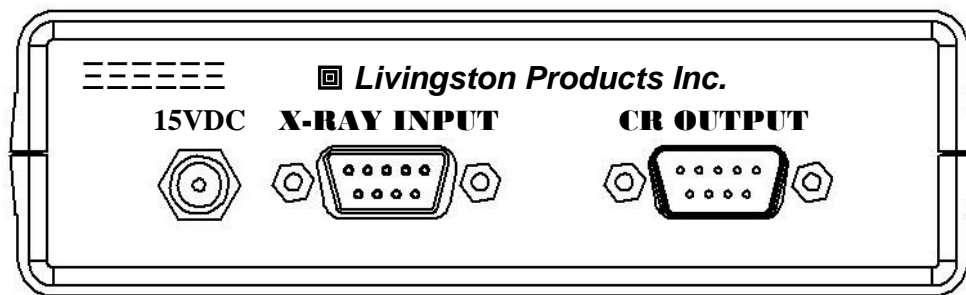
This is a **DB9 female** connector which is attached to the CR Console interface cable or to a special configuration cable;

During normal *Bridge* device operation, the CR Console cable must be attached to this connector and also to the CR Console unit. This connection is described in detail in the *Connectors* section of this document.

During the configuration process (only performed at installation time), this connector is attached to a special configuration cable (LPI part number **10935**) which also is attached to the personal computer that is used for the configuration procedure. The CR Console cable is not connected to the *Bridge* device during configuration.

The power adapter cable should always be removed prior to attaching cables to the *X-Ray Input* and *CR Output* connectors. This is also necessary when removing cables from these connectors.

The *Bridge* device enclosure's rear panel connector layout is shown in the following illustration:



On the bottom of the CR Bridge enclosure, there is a label attached that is similar to the following:

**CR PROTOCOL BRIDGE**  
**MODEL: M303-## S/N 1234**  
**MFG DATE: September, 2006**

The label shows model number, manufacture date, and serial number. The ## shown at the end of the model number will be a 2 digit number (for example "01", "02", "03", or "04") for an actual unit, indicating which CR Console connection option the unit supports. The serial number (1234 in the above example) follows the model number.

### 4.3 Cables

Two **normal operation** data communications cables are included with the *Bridge* device product. One (which may be a cable kit) is used to connect to the input interface. The other is used to connect to the output interface.

### CR Console Cable

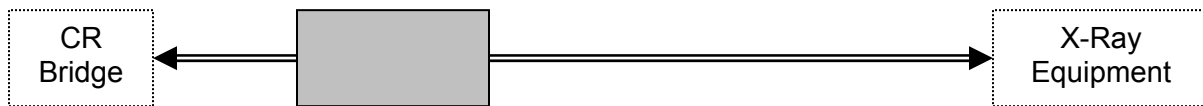
The cable used to connect the *Bridge* device to the CR Console unit is provided by LPI. The part number for this cable depends on the connection option, as discussed earlier. It is connected to the CR Console as follows:

- For M303-01 units, the end which has the **RJ-45 connector** (telephone style) is plugged into the CR Console device.
- For M303-02, M303-03, M303-13 and M303-04 units, the cable's **DB9 female connector** is plugged into the CR Console device.
- For all M303 units, the **DB9 male connector** end of this cable is connected to the *Bridge* device's *CR Output* connector.

### X-Ray Equipment Cable/Kit

The cable (or cable kit) used to connect the *Bridge* device to X-Ray Equipment is provided by LPI (the part number depends on the connected X-Ray equipment type).

For some X-Ray equipment, the primary cable includes a short section and a longer section, with a noise suppression box between the sections. Both sections end with DB9 female connectors. The short section's connector is attached to the *Bridge* device's *X-Ray Input* connector. The longer section's connector is attached to the X-Ray Equipment's serial output port.



*The cable type shown above is not used for all types of X-Ray equipment.*

Other types of equipment may require a cabling kit which includes either a pair of cables or a cable and a NULL Modem adapter. Connection instructions are included with the kit.

*Note: Certain cable kits are used to support an entire family of X-Ray equipment. These kits include a NULL Modem adapter that is required for some X-Ray machines within the equipment family, but not for other machines within that family. Contact LPI technical support if you require information on when the adapter is required.*

For some types of X-Ray machine, there are two different points at which the X-Ray cable kit may be connected – both a serial interface and a parallel interface. **Each type of physical connection requires a different cable kit** – a serial interface cable kit cannot be used to connect to a machine's parallel interface and the parallel interface cable kit cannot be used to connect to a machine's serial interface.

For some X-Ray machine vendor families, there are different cable kits for different machines, even though the machines all provide a parallel printer interface. This is true because some machines require an internal cable to bring the parallel connection point to the outside of the unit's case, while other machines already have this case connection point as a standard feature.

## Configuration Cable

The Configuration cable which is included with the product (Part number **10935**) is not used during normal operation. It is used instead of the CR Console cable during configuration. The **DB9 male connector** end of this cable is connected to the *Bridge* device's *CR Output* connector. The **DB9 female connector** end of this cable is connected to the personal computer.

### **4.4 Power Adapter**

An AC to DC power adapter is included with the *Bridge* product. This adapter is provided by LPI as part number **10934**.

The adapter has a multi-prong plug cord at one end, the converter module in the center, and a round receptacle plug cord at the other end. The receptacle plug is first plugged into the *Bridge* device's *15VDC* receptacle. The pronged cord is then plugged into the wall electrical outlet.

When power is to be removed from the *Bridge* device, the wall plug should always be unplugged first.

## **5.0 Configuration**

The *Bridge* device stores information about its connection to the X-Ray Equipment and data handling options internally, in its non-volatile memory. This information must be set in the *Bridge* device at the time the device is installed.

In general, the following information must be stored in the *Bridge* device:

- The type (vendor and model) of the connected X-Ray Equipment;
- The serial communications settings (for example, the baud rate, data size, and parity) use by the X-Ray Equipment for its output interface;
- The desired state, *enabled* or *disabled*, of some optional features;

The procedure for storing this information in the *Bridge* device's non-volatile storage is called *configuration*.

Because the *Bridge* device does not include a keyboard or a display, configuration is performed using a personal computer connected to the *Bridge* device by a special configuration cable. An LPI configuration utility program (provided on CD **11022**) is executed on the personal computer (MS/Windows™ based) to provide a human interface for saving configuration information in the *Bridge* device.

The configuration process is described by a separate LPI document:

*“CR Protocol Bridge - Configuration & Troubleshooting Guide”*

A copy of that document is provided with the product.

During its normal operation, the *Bridge* device stores troubleshooting information within its internal non-volatile memory. The same mechanism that is used for configuration can be used to retrieve the troubleshooting information. This information only needs to be accessed if an interface problem is encountered.

It is possible to configure the *Bridge* more than once to support changes in equipment usage or enhancements to the CR Console. There is no practical limit on the number of times the *Bridge* can be configured.

It is also possible to load new firmware (control software) into the *Bridge* using the configuration mechanism. This allows product enhancements to be utilized as they become available.

**NOTE:** *The Connection Option (type of CR Console to which the Bridge device is connected) is **not** specified as an install time configuration parameter. The connection type **must be specified at the time the Bridge device is ordered.***

## 6.0 Breaking the Enclosure Seal

The *Bridge* device has no field serviceable components. Its enclosure must not be opened. **Opening the enclosure will void the *Bridge* device's LPI warranty.**

## 7.0 How to Contact LPI

To order this product or other LPI products and for technical questions, please contact us as follows:

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**USA**

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