MB-652-DUO

2RU Monitoring Bridge

User Manual

ROSS

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Our mission is to:

1. Provide a Superior Customer Experience
    - offer the best product quality and support
2. Make Cool Practical Technology
    - develop great products that customers love

Ross has become well known for the Ross Video Code of Ethics. It guides our interactions and empowers our employees. I hope you enjoy reading it below.

If anything at all with your Ross experience does not live up to your expectations be sure to reach out to us at *solutions@rossvideo.com*.

David Ross
CEO, Ross Video
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Ross Video Code of Ethics

Any company is the sum total of the people that make things happen. At Ross, our employees are a special group. Our employees truly care about doing a great job and delivering a high quality customer experience every day. This code of ethics hangs on the wall of all Ross Video locations to guide our behavior:

1. We will always act in our customers' best interest.
2. We will do our best to understand our customers' requirements.
3. We will not ship crap.
4. We will be great to work with.
5. We will do something extra for our customers, as an apology, when something big goes wrong and it's our fault.
6. We will keep our promises.
7. We will treat the competition with respect.
8. We will cooperate with and help other friendly companies.
9. We will go above and beyond in times of crisis. *If there's no one to authorize the required action in times of company or customer crisis - do what you know in your heart is right. (You may rent helicopters if necessary.)*

MB-652-DUO · User Manual

- Ross Part Number: MB652DUODR-004-02
- Release Date: January 16, 2018.

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Patents

Patent numbers US 7,034,886; US 7,508,455; US 7,602,446; US 7,802,802 B2; US 7,834,886; US 7,914,332; US 8,307,284; US 8,407,374 B2; US 8,499,019 B2; US 8,519,949 B2; US 8,743,292 B2; GB 2,419,119 B; GB 2,447,380 B; and other patents pending.

Safety Notices

Refer to the "**Important Regulatory and Safety Notices**" document that accompanied your product.

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 their 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.

Australia

This equipment has been tested to AS/NZS CISPR 22:2009 and found to comply with the limits for a Class A Digital device.

International

This equipment has been tested to CISPR 22:2009 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 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. This product is covered by a generous 1-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 wheelie bin symbol invites you to use these systems.

If you need more information on the collection, re-use, and recycling systems, please contact your local or regional waste administration. You can also contact Ross Video for more information on the environmental performance of our products.

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Contents

Introduction

In This Chapter

The following topics are discussed:

- Overview
- Functional Block Diagram
- User Interfaces

A Word of Thanks

Congratulations on choosing a Ross Video MB-652-DUO Monitoring Bridge. Thank you for joining the group of worldwide satisfied Ross Video customers!

Should you have a question pertaining to the installation or operation of your MB-652-DUO, please contact us at the numbers listed on the back cover of this manual. Our technical support staff is always available for consultation, training, or service.

Overview

The MB-652-DUO Monitoring Bridge is a compact, 2RU audio monitoring bridge for embedded audio, with AES and analog audio. Designed to meet the demands of broadcast audio monitoring requirements, the MB-652-DUO is capable of de-embedding up to 16 channels of audio from an incoming SDI signal. The audio monitoring bridge provides both visual and aural monitoring with built-in front panel display and speakers.

The 16 digital VU/PPM meters monitor all 16 channels of embedded audio, while an intuitive control surface allows for easy channel source and mode selection for the built-in speakers. A meter and numerical display provides loudness measurements according to ***ITU1770/1771 LKFS***. Additional information such as true peak, input signal data and type are also displayed on screen.

High quality, full-range speakers, along with a high performance class D stereo amplifier, offer excellent sound quality suitable for any monitoring environment. The front panel also includes a volume control and a 1/4 inch headphone jack. The rear of the MB-652-DUO provides two SDI inputs with reclocked SDI outputs, AES and analog audio inputs, and two channels of analog audio outputs.

Features

The following features come standard on the MB-652-DUO:

- Two 3G/HD/SD SDI inputs
- Two reclocked SDI outputs
- One analog input
- One AES input
- One stereo monitor output
- Left, Right, SUM, Left Total/Right Total (Lt/Rt) downmix modes
- Push to Mute rotary shaft encoder
- High quality 1/4” long-frame headset jack
- 16 VU/PPM bar graph meters
- Provides ITU 1770/1771 LKFS measurements
- Full range speakers
- Class D power amplifier

Functional Block Diagram

Figure 1.1 outlines the workflow of the MB-652-DUO.

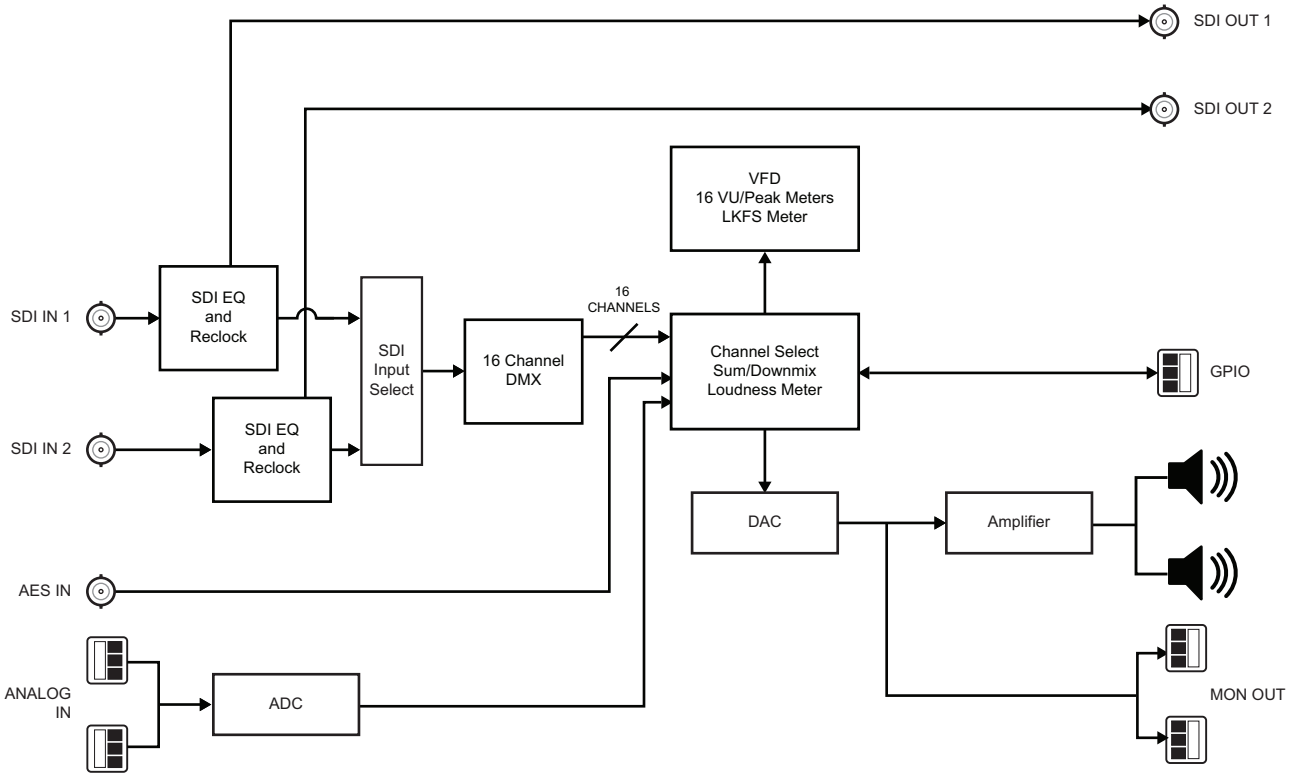


Figure 1.1 *MB-652-DUO — Simplified Block Diagram*

User Interfaces

The MB-652-DUO is intended to be controlled via the DashBoard client software, as well as through the physical controls on the panel.

DashBoard Control System

The DashBoard client software enables you to monitor and configure the MB-652-DUO from a computer. The DashBoard software is available for download from our website.

The MB-652-DUO includes three DashBoard interfaces: Network Connect, MB-652-DUO, and MB-AUX-DUO. These interfaces are accessed by expanding the MB-652-DUO node in the DashBoard Tree View and selecting the appropriate sub-node. The Network Connect interface enables you to set up ethernet communications, and monitor those communications. the MB-AUX-DUO interface shows status of the second SDI input. The MB-652-DUO interface includes operational controls for the physical panel such as selecting the input source for the speakers and adjusting the volume level for the speakers.

For More Information on...

- configuring the MB-652-DUO for network communication, refer to the section "**Network Configuration**" on page 3-7.
- menus in DashBoard for the MB-652-DUO, refer to the chapter "**DashBoard Menus**" on page 4-1.
- installing and using DashBoard, refer to the ***DashBoard User Manual***.

Controls on the Physical Panel

The front panel of the MB-652-DUO provides the ability to monitor the LKFS and true peak values, the input signal format, and meters that represent VU/PPM data and loudness measurements. Buttons are provided to route audio sources to the speakers, selecting the operating mode, and volume control.

The rear panel provides connections for the power supply, BNCs for the SDI inputs and outputs, a BNC for the AES input, and 3-pin blocks for analog audio in and out.

For More Information on...

- the control and monitoring features of the front panel, refer to the section "**Front Panel Overview**" on page 2-3.
- the connections provided on the rear panel, refer to the section "**Rear Panel Overview**" on page 2-4.

Installation

In This Chapter

This chapter provides instructions for the physical installation of your MB-652-DUO, and basic cabling for the MB-652-DUO.

- Before You Begin
- Front Panel Overview
- Rear Panel Overview
- Physical Installation
- Configuring the DIP Switches

Before You Begin

Before you begin, ensure to review the following sections.

Static Discharge

Throughout this chapter, please heed the following cautionary 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 synthetic fiber clothing is worn. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Unpacking

Unpack each MB-652-DUO you received from the shipping container and ensure that all items are included. If any items are missing or damage, contact your sales representative or Ross Video directly.

Front Panel Overview

This section briefly summarizes the features of the front panel.

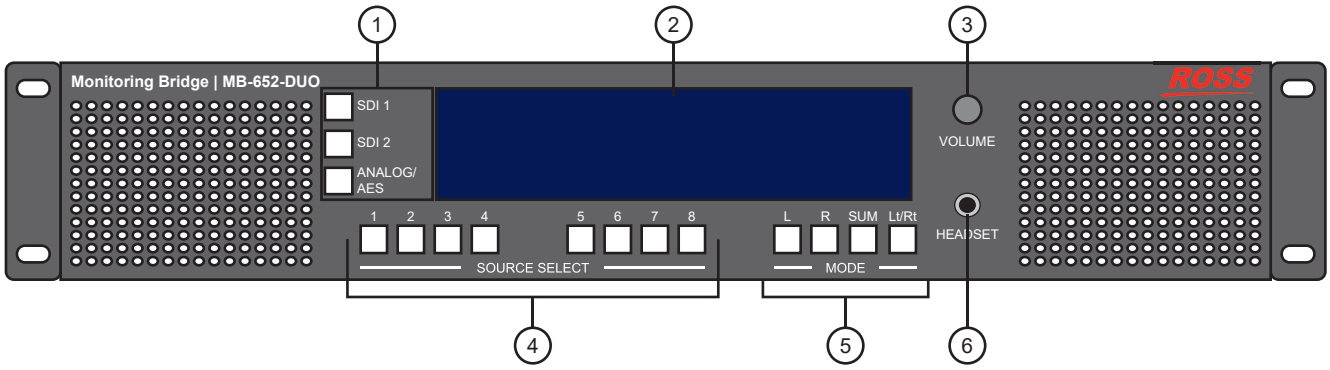


***Figure 2.1** MB-652-DUO — Front Panel*

1) Input Select Buttons	3) Volume Control	5) Mode Select Buttons
2) Display Panel	4) Source Select Buttons	6) Headset Jack

1. Input Select Buttons

This column of three push-buttons enable you to specify which input signal to monitor via the Display Panel. Choose from the following:

- **SDI 1** — selects SDI input 1.
- **SDI 2** — selects SDI input 2.
- **Analog/AES** — when active, Source Select 1 is the analog audio input, Source Select 5 is the AES input.

2. Display Panel

This vacuum fluorescent display panel displays the audio meters and input signal information. The following information is displayed:

- 16 bar graph VU/PPM meters
- a bar graph meter that reports LKFS ITU 1770-3/1771 loudness measurements
- a numerical readout of the LKFS and true peak measurement
- the input signal format

3. Volume Control

Turn the knob to control the volume. Push the knob to mute the audio.

4. Source Select Buttons

This row of eight push-buttons enable you to route the corresponding source to the speakers of the MB-652-DUO. Refer to the section "**Channel Source Selection**" on page 3-9 for details.

5. Mode Select Buttons

This row of four push-buttons enable you to quickly specify the operating mode of the MB-652-DUO. Refer to the section "**Mode Selection**" on page 3-9 for details.

6. Headset Jack

This is a long-frame 1/4" headset jack. When in use, the internal speakers of the MB-652-DUO are muted.

Rear Panel Overview

This section briefly summarizes the features of the rear panel.

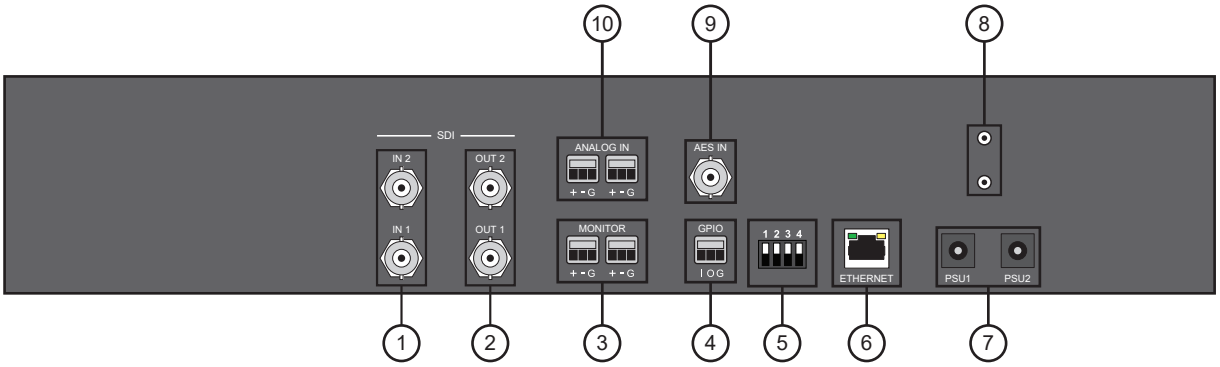


***Figure 2.2** MB-652-DUO — Rear Panel*

1) SDI IN BNCs	5) DIP Switches	9) AES IN BNC
2) SDI OUT BNCs	6) ETHERNET Port	10) ANALOG IN Connectors
3) MONITOR Ports	7) Power Supply Connections	
4) GPIO Port	8) Power Cord Bracket Inserts	

1. SDI IN BNCs

Each SDI IN BNC receives an 3G/HD/SD SDI input signal.

2. SDI OUT BNCs

Each SDI OUT BNC outputs a reclocked copy of the SDI input signal.

3. MONITOR Ports

These connectors provide analog audio. For a -20dBFS input, there will be a +4dBu output.

Note — *If replacement 3-pin plugs are required, contact Ross Technical Support and order Ross part number 30-01089.*

4. GPIO Port

Shorting the **I** pin to the **G** pin will mute the front speakers, and the audio level on the rear monitor ports will be controlled by the front volume knob.

5. DIP Switches

SW1 and **SW2** are used in conjunction with the DashBoard menus to set the IP Address of the MB-652-DUO. Refer to the section "**Configuring the DIP Switches**" on page 2-8 for details.

SW3 is used to override the Master Password for the MB-652-DUO. This password limits access to the MB-652-DUO.

6. ETHERNET Port

Each MB-652-DUO includes an **Ethernet** port on the rear panel that is used for communication with DashBoard and software upgrades via DashBoard.

7. Power Supply Connections

These are the connectors for the primary (**PSU1**) and optional redundant (**PSU2**) supplies.

8. Power Cord Bracket Inserts

Install the provided brackets to help retain the power cords to the MB-652-DUO chassis.

9. AES IN BNC

This BNC is used for a 48kHz AES signal. This connection is internally terminated into 75ohms.

10. ANALOG IN Connectors

These connectors are used for line level analog audio inputs. Balanced signals are on 3-pin pluggable connectors.

For More Information on...

- power supplies for the MB-652-DUO, refer to the section "**Power Supplies**" on page 2-6.
- MB-652-DUO power consumption, refer to the section "**Technical Specifications**" on page 5-2.

Physical Installation

The MB-652-DUO mounts in the rack frame by means of four rack screws fastened through the front mounting ears. This should normally be sufficient to carry the load, including the weight of accompanying cables. Note that the MB-652-DUO installs in a standard 19” rack.

Installation Requirements

Keep the following in mind when installing your MB-652-DUO:

- Install the MB-652-DUO for maximum stability during operation and in such a way as to allow adequate ventilation.
- The MB-652-DUO cannot be sealed in a closed container and must be installed in free air space where the ambient temperature is monitored and controlled to not exceed 40°C (104°F).
- Ensure that adequate space exists in front and behind the MB-652-DUO and on both sides of the frame for airflow.
- The location of the MB-652-DUO should be accessible, dry, and dust-free.

Table 2.1 Frame Dimensions

Model	Rack Units	Height	Depth	Width
MB-652-DUO	2 RU	3.5” (8.89cm)	8.5” (21.59cm)	19” (48.26cm)

Power Supplies

The MB-652-DUO comes standard with one power supply (PS-MB-650) and one A/C power cable. A redundant power supply is available as an option. The PS-MB-650 power supply is a power factor corrected supply, capable of working with all world AC standards (100-240V). Contact your Ross Video sales representative to order a spare or redundant power supply.

This section includes information for connecting the power cables for the MB-652-DUO.

Warning Hazardous Voltages — *The safe operation of this product’s external power supply requires that a protective earth connection be provided. This protective earth is provided by the grounding conductor in the equipment's supply cord. To reduce the risk of electrical shock to operator and service personnel, this ground conductor must be connected to an earthed ground.*

Warning — *In some countries, it may be necessary to supply the correct mains supply cord. Use only an approved IEC 320 C-13 type A/C line cord rated for a minimum 10A at 250V and certified for the country of use.*

To connect the power cables for the MB-652-DUO

1. For each power cable, install the provided cable clamp (929-006R) and machine screw (850-005R) to help retain the power cable connectors to the rear of the MB-652-DUO chassis. These clamps and screws are included in the shipping container with the Monitoring Bridge.
2. Connect the DC plug to the power jack located on the rear panel of the MB-652-DUO. Refer to **Figure 2.2** for power connection location.
3. Connect the line cord to the PS-MB-650 power supply.
4. Connect the AC cord to an AC outlet.

Ethernet Cabling for the MB-652-DUO

The exact steps for connecting to your facility via an ethernet network depends on the network requirements of your facility.

Contact your IT Department before connecting to your facility network to ensure that there are no conflicts. They will provide you with an appropriate value for the IP Address, Subnet Mask, and Gateway for the MB-652-DUO.

You will require a standard network CAT-5 cable to connect the MB-652-DUO to your facility network. Ross Video does not supply this cable.

SDI Cabling

The rear panel includes two **SDI IN** BNCs and two **SDI OUT** BNCs.

AES Input Cabling

The rear panel includes one **AES IN** BNC.

Analog Input Cabling

The MB-652-DUO provides two sets of 3-pin audio terminal blocks each with a removable connector. Each connector has locations for the positive, negative, and grounded wires of a balanced audio cable.

For More Information on...

- the location of the **ANALOG IN** connector, refer to the section "**Rear Panel Overview**" on page 2-4.

Configuring the DIP Switches

This section briefly summarizes the **DIP Switch** settings on the MB-652-DUO. **Figure 2.3** shows the DIP Switches in the **UP** position.

***Figure 2.3** DIP Switches — Set to the UP Positions*

Setting the IP Address

SW1 and **SW2** are used in conjunction with the DashBoard menus to set the IP Address of the MB-652-DUO. Refer to **Table 2.2** for DIP Switch positions. For information on configuring the network settings for your MB-652-DUO, refer to the section "**Network Configuration**" on page 3-7.

Table 2.2 SW1 and SW2 Positions

SW1 Position	SW2 Position	Controlled via DashBoard	Descriptions
UP	**UP**	✓	The MB-652-DUO network settings can be set by the user from the DashBoard **Network** tab[a]. (default)
UP	**DOWN**		The MB-652-DUO network settings are automatically assigned (DHCP Mode).
DOWN	**UP**		The MB-652-DUO IP Address is set to 192.168.2.1 and the Subnet Mask is set to 255.255.255.0.
DOWN	**DOWN**		The MB-652-DUO IP Address is set to 10.1.2.1. and the Subnet Mask is set to 255.255.255.0.

a. DHCP Mode is assumed until the user changes the settings in DashBoard.

Master Password Override

SW3 is used to override the Master Password and allows a user to reset the Master Password. Refer to the section "**Using a Master Password in DashBoard**" on page 3-5 for details.

- **UP** — This is the recommended position. A user-specified Master Password is used. The default password is **`password`**. It can be changed using DashBoard as outlined in the section "**Setting the Master Password**" on page 3-5.
- **DOWN** — This position is used to recover a lost Master Password. The user-specified password is temporarily ignored, and the default value of **`password`** is used.

SW4

SW4 is not implemented at this time and should be left in the **UP** position.

Configuration

In This Chapter

This chapter provides instructions to configure basic communications for your MB-652-DUO.

The following topics are discussed:

- Using the Front Panel Display
- Using DashBoard
- Using a Master Password in DashBoard
- Network Configuration
- Audio Configuration
- Monitoring the Loudness Value
- Software Upgrades

Using the Front Panel Display

This section provides a brief summary of the display panel located on the front of the MB-652-DUO. From this panel you can monitor the MB-652-DUO.

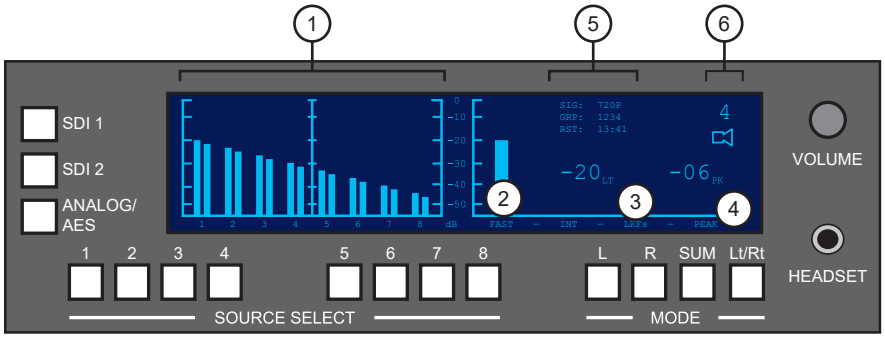


Figure 3.1 *MB-652-DUO Front Panel — Display*

1) Audio Channel Bar Graph	3) Long Term Readout Time	5) Signal Data Display
2) FAST Bar Graph	4) True Peak Readout	6) Speaker Volume

1. Audio Channel Bar Graph

This sixteen channel bar graph represents the VU/PPM meter where reference can be -20dBFS (the default value) or -18dBFS. This value can be set in DashBoard via the Settings tab as outlined in **Table 4.7** on page 4-5.

2. FAST Bar Graph

This ITU 1770-3 LKFS bar graph reports the FAST 1 second integration time.

3. Long Term Readout Time

This value is configurable via the options on the LKFS tab in DashBoard.

- ITU 1770 LKFS non-gated moving variable. (1 to 30sec)
- ITU 1770-2 LKFS gated moving loudness (LT). (30sec)
- ITU 1770-2 LKFS gated window (LT). (1-1200sec)

4. True Peak Readout

This value is the ITU 1770-3 LKFS numerical read-out of the true peak (PK).

5. Signal Data Display

This area includes the following fields:

- **SIG** field — Displays the type of SDI signal.
- **GRP** field — Indicates which groups of audio are present.
- **RST** field — Represents the minute reset timer and is configured via the Front Panel Display options on the LKFS tab in DashBoard as follows:
  - › This field is reset each time you select a different source.
  - › If the **Front Panel Display** is set to **Var Win**, it will display the window set time.
  - › If the **Front Panel Display** is set to **Gated Win**, a fixed 30sec window will be indicated.
  - › If the **Front Panel Display** is set to **Integrated**, it will count to the Gate Time value (on the LKFS tab in DashBoard), and stop.

6. Speaker Volume

This area represents the speaker volume level. A flashing number with an **X** underneath it indicates that the speakers are muted (the **VOLUME** control knob was pushed inwards).

Using DashBoard

Before proceeding, ensure that DashBoard is installed on a PC connected to your facility network. The DashBoard software and user manual are available from the Ross Video website.

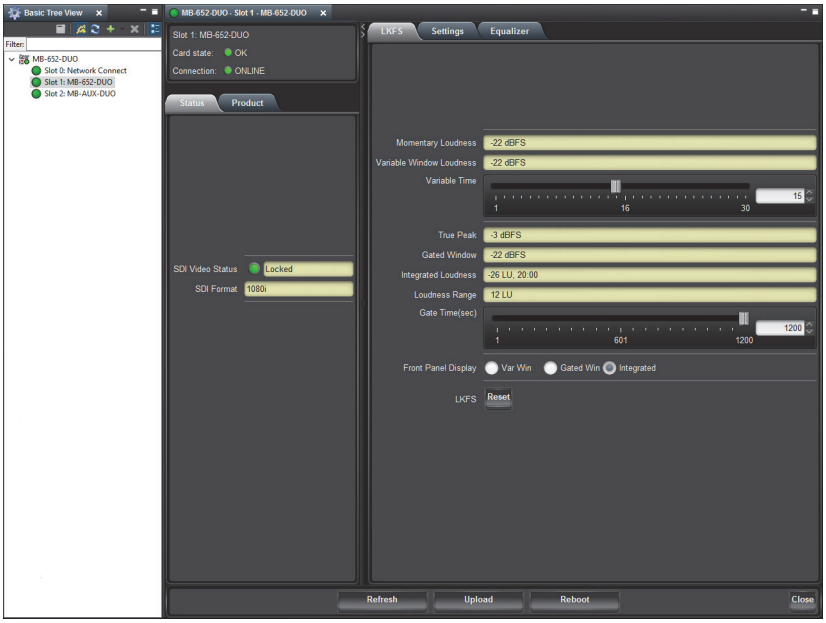
The MB-652-DUO provides two interfaces in DashBoard that display as nodes in the Tree View under the MB-652-DUO. The Network Connect interface (Slot 0 node) provides menus for configuring the communication settings for the MB-652-DUO. The MB-652-DUO interface (Slot 1 node) enables you to set up the audio features for the physical panel.

To launch DashBoard

1. Ensure that you are running DashBoard software version 8.1.0 or higher. The software and ***DashBoard User Manual*** are available from the Ross Video website.
2. Launch DashBoard by double-clicking its icon on your desktop.
3. Locate the MB-652-DUO in the Tree View of DashBoard.

To access the MB-652-DUO interface

1. From the **Tree View**, expand the node for the MB-652-DUO you wish to access.
2. Select the **Slot 0** node to display the configuration options for the MB-652-DUO in the right-half of DashBoard.
3. Select the **Slot 1** node to display the audio interface in the right-half of DashBoard.
4. Select the **Slot 2** node to monitor the AUX inputs of the MB-652-DUO.



Example of an MB-652-DUO in DashBoard

Using a Master Password in DashBoard

Right-clicking the MB-652-DUO node in the tree view of DashBoard provides the option to **Lock/Unlock Access** which requires the user to enter a Master Password before gaining access to the Monitoring Bridge This Master Password can be the same for all MB-652-DUOs listed in the DashBoard client, or unique to each MB-652-DUO, or a mix.

When using the DashBoard Server and URM, MB-652-DUO nodes in the Tree View display a lock icon to inform the user that restrictions are in place. This lock icon indicates that the node is locked and requires a Master Password, or that the user must log into the DashBoard client with a valid user account, to gain access to the node.

For More Information on...

- the lock icon, refer to the ***DashBoard Server and URM User Manual***.

Setting the Master Password

Right-clicking a MB-652-DUO node in the Tree View of DashBoard provides the option to Lock/Unlock Access which requires the user to enter a Master Password before gaining access to the MB-652-DUO.

Setting the DIP Switch

Your MB-652-DUO includes **SW3** (a DIP Switch) that enables you to override the Master Password.

Use this DIP switch when the Master Password needs to be reset (e.g. when you have forgotten the password text). If you change the configuration of the DIP Switch, you must reboot the MB-652-DUO before the changes take effect.

Override the Master Password using the DIP Switch as follows:

- **UP** — This is the recommended position. A user-specified Master Password is used.The default password is `password`. It can be changed using DashBoard as outlined in the section "**To set a new master password for the MB-652-DUO**" on page 3-5.
- **DOWN** — This position is used to recover a lost Master Password. The user-specified password is temporarily ignored, and the default value of password is used.

To set a new master password for the MB-652-DUO

1. From the **Tree View**, right-click the node for the MB-652-DUO you want to access.
2. Select **Lock/Unlock Access** to display the **Change Master Password** dialog.
3. From the provided list, select the check box for the MB-652-DUO you wish to change the password for.
4. Type the current password in the **Old Password** field.
5. Type the new password in the **New Password** field.
6. Type the new password in the **Confirm** field.
7. Click **OK**.

Accessing a MB-652-DUO

You can access a MB-652-DUO using your user account, assuming you have permissions to do so. If DashBoard URM is implemented in your facility and your DashBoard client is version 4.0.0 or higher, you log in as outlined in the procedure "**To use a valid user account**". If DashBoard URM is unavailable, you log in as outlined in the procedure "**To use the Master Password**".

To use a valid user account

1. Launch the DashBoard client on your computer.
2. Log into the DashBoard client with your user account and password.
3. Navigate to the MB-652-DUO in the Tree View of the DashBoard client.

To use the Master Password

1. Launch the DashBoard client on your computer.
2. Navigate to a locked MB-652-DUO displayed in the Tree View of the DashBoard client.
3. Double-click the MB-652-DUO node to display the **Password Required** dialog. You can also double-click the MB-652-DUO name and select **Open**.
4. Enter the Master Password for the MB-652-DUO in the provided field.
5. Select one of the following methods:
   - Click **Try Password** to connect to the selected MB-652-DUO; or
   - Click **Try for All** to connect to all locked MB-652-DUOs displayed in the Tree View. Only when you attempt to connect to additional locked MB-652-DUOs and the login fails, are you prompted for the password.
6. If the password was incorrect, an error message displays to prompt you for another log in attempt.

Network Configuration

Each MB-652-DUO includes an **Ethernet** port on the rear panel that is used for communication with DashBoard and software upgrades.

Before You Begin

Verify the positions of **SW1** and **SW2** on the rear panel. These DIP switches assign the IP address for your MB-652-DUO. Refer to the section "**Setting the IP Address**" on page 2-8 for details.

Automatic Configuration using DHCP

This method assumes that the MB-652-DUO is using the factory default values for the network settings.

To establish communications with the MB-652-DUO

1. Ensure that the MB-652-DUO is connected to the same network as your DashBoard computer.
2. Launch the DashBoard application on your computer.
3. Power on the MB-652-DUO.
4. Wait approximately 30 seconds while the MB-652-DUO establishes network communications.
5. Verify that the MB-652-DUO displays in the Tree View of DashBoard.
6. Should the MB-652-DUO fail to display after two minutes:
   - Verify the ethernet cables are properly connected.
   - Check the link/activity LEDs found on the ethernet RJ-45 connector.
   - Ensure the network settings for the MB-652-DUO are set to the factory default values.
   - If all cables are connected and the LEDs do not indicate an error, then automatic configuration is not possible.

Custom User Configuration via DashBoard

Once communication is established with the MB-652-DUO, the network settings may be further adjusted using the following procedure. Note that the steps are optional, you may perform as many, or as few, as needed.

To configure the network settings via DashBoard

1. From the **Tree View**, expand the node for the MB-652-DUO you want to access.
2. Select the **Network Connect** node to display the interface in the right-half of DashBoard. The **Network** setup tab is automatically displayed.
3. To change the **Network Time Server** address, enter the new IP Address in the **NTP Server** field.

4. To change between **Static** and **DHCP** addressing, select an option in the **Addressing Mode** area.
5. Configure the network settings as required:
   - **IP Address** — This is the IP Address of the MB-652-DUO.
   - **Subnet Mask** — This is the Subnet Mask address for your LAN.
   - **Default Gateway** — This is the IP Address for connection outside the subnet.
6. To save the new settings, click **Apply** in the **Network** setup tab. The settings are saved immediately and take effect.

Audio Configuration

This section provides information for specifying the channels to monitor and configuring the operating mode.

Channel Source Selection

Selecting the audio channels you want to monitor is provided by eight push-buttons located directly below the audio meters allowing the user to intuitively select whichever stereo pair they would like to route to the speakers.

Push-buttons numbered 1-8 allow the user to select the embedded audio pairs.

Note —*If Analog/AES is selected, Source 1 is analog audio, and Source 5 is AES.*

Mode Selection

The four push-buttons located to the right side of the source selection switches are for the mode selection.

Table 3.1 Mode Selection

Mode	Description
L only	Routes the Left Channel of the selected source to both speakers
R only	Routes the Right Channel of the selected source to both speakers
SUM	Allows any of the channels to be summed together to monitor more than one source at a time
Lt/Rt	Provides an Lt/Rt downmix of your 5.1 surround mix. Select the pair where your 5.1 mix starts then press the Lt/Rt button the unit then selects the two pairs beside it and creates the downmix from these 6 channels.

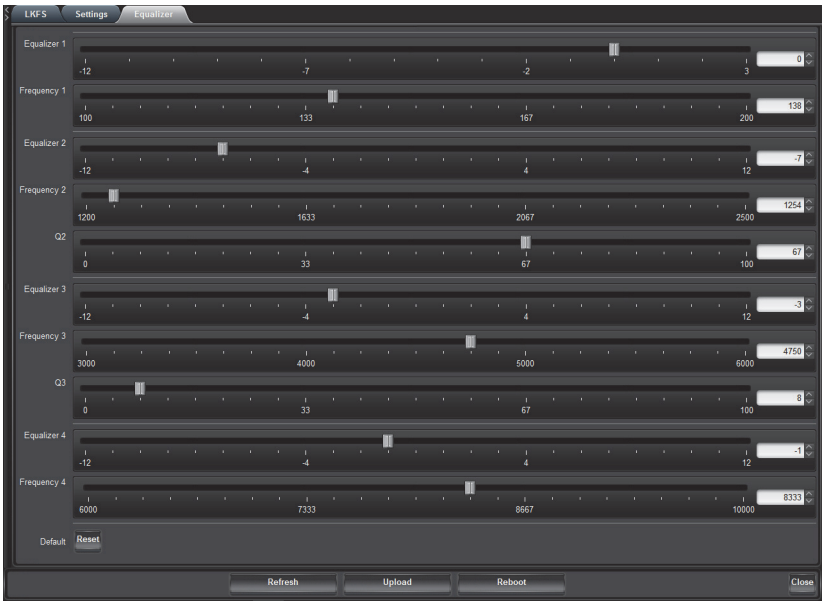
Adjusting the EQ Levels

The MB-652-DUO includes a feature for attenuating the levels of different frequencies in an audio signal. This feature is a parametric 4-band equalizer where:

- Equalizer 1/Frequency 1 are the low shelf.
- Equalizer 2/Frequency 2 are the first mid-range band. This band includes a Q adjustment.
- Equalizer 3/Frequency 3 are the second mid-range band. This band includes a Q adjustment.
- Equalizer 4/Frequency 4 are the high shelf.

To adjust an equalizer band

1. From the **Tree View**, expand the node for the MB-652-DUO you wish to access.
2. Select the **Slot 1** node to display the audio interface in the right-half of DashBoard.
3. Select the **Equalizer** tab.



MB-652-DUO Interface — Equalizer Tab

4. Use the **Equalizer** slider for a band to adjust the gain.
5. Use the **Frequency** slider for a band to as follows:
   - For Frequency 1 and 4, use the slider to adjust the 3dBF point.
   - For Frequency 2 and 3, use the slider to adjust the center point of the equalizer.
6. For Equalizer 2 and/or 3, use the **Q** slider to determine how sharp the filter will be where Q is adjusted from high-to-low.

Line Out Control

The MB-652-DUO provides a Volume Control knob on the front panel that provides volume and mute controls The GPIO Port on the rear panel determines whether to mute the front speakers, or whether the audio level on the rear monitor ports will be controlled by the front volume knob.

In DashBoard, the Control tab provides the option to override the GPIO Port settings as follows:

- Toggle the **Line Out** button to **Variable** — Adjust the amplitude via the Volume Control knob on the front panel. The GPIO Port setting is ignored.
- Toggle the **Line Out** button to **Fixed** — The output amplitude is fixed, unless overridden by the GPIO Port setting, to the value listed in **Table 5.1** on page 5-2.

Monitoring the Loudness Value

The LEQ algorithm calculates values for programs consisting of 1 to 5 channels. Gains are designed for 5.1 program audio so that channels 4 and 5 have a special gain factor of 1.41 (used in multi-mode).

The MB-652-DUO loudness algorithm reports the following output values in DashBoard:

1. True peak.
2. LEQ Average 1, Momentary (1 second)
3. LEQ Average 3, Variable (1-30 seconds)
4. Integrated Continuous Gated moving window, Variable (1-30 seconds)
5. Integrated Gated Loudness window (1770-2)
6. Loudness Range, EBU-128R

Software Upgrades

This section provides instructions for upgrading the software for your MB-652-DUO using DashBoard. There are three places to upload software:

1. Slot 0 interface — use this interface to upgrade the Dashboard Network Connect software.
2. Slot 1 interface — use this interface to upgrade the Monitoring Bridge software, firmware, and DSP code.
3. Slot 2 interface — use this interface for the Auxiliary inputs.

Note *—Performing a software upgrade to the MB-652-DUO requires the unit to be rebooted, and may be off-line for several minutes, ensure that your system is not in use.*

Upgrade Components

The MB-652-DUO software consists of the following components:

Table 3.2 Upgrade Components

File	Type	Description
MB_652DUO_net_connect_vX_xx	Network Connect	• installed in Slot 0 • provides the connection of the Monitoring Bridge to DashBoard. • a power cycle is required.
MB-652-DUO_sw_vX_xx	Software	• installed in Slot 1 • must be loaded before the FPGA and DSP files. • a reboot is required.
MB-651_2_DUO_fpga_Main_vX_xx	FPGA Filter	• installed in Slot 1 • must be loaded after the software file • a reboot is required
MB-652_DUO_1_2_DSPvX_xx	DSP Code	• installed in Slot 1 • must be loaded after the software and FPGA • when complete, a power cycle is required
MB-AUX-DUO_fpga_vX_xx.bin	FPGA file	• installed in Slot 2
MB-AUX-DUO_sw_vX_xx.bin	Software	• installed in Slot 2

Upgrade Overview

Only newer files need to be uploaded. Depending on the situation, an upgrade may consist of one of the following scenarios:

- Full upgrade: Slot 0 (Network Connect) Slot 1 (Monitoring Bridge) and Slot 2 (Auxiliary Inputs).
- Slot 0 Network Connect only.
- Slot 1 Monitoring Bridge only — software, firmware, and DSP files.
- Slot 2 Auxiliary Inputs only — software and firmware files.

Before You Begin

Before upgrading your MB-652-DUO, ensure the following tasks are completed:

1. Connect the MB-652-DUO via an Ethernet cable to your local network. Refer to the section "**Ethernet Cabling for the MB-652-DUO**" on page 2-7 for details.
2. Connect a Microsoft® Windows® PC to the same network.
3. Ensure that you have DashBoard running on the PC.
4. Verify that the MB-652-DUO displays in tree view of DashBoard.
5. Ensure that you have the required data files for the system upgrade.
6. Ensure that the data files are in the same folder on the PC.

Upgrading the DashBoard Connect Software

Use this procedure if the Slot 0 DashBoard Connect software is newer than the currently installed software.

To upgrade the DashBoard Connect software

1. Display the **Slot 0 Network Connect** interface in DashBoard as outlined in the procedure "**To access the MB-652-DUO interface**" on page 3-4.
2. Disconnect the input signal. Refer to the section "**SDI Cabling**" on page 2-7 for port location.
3. In DashBoard, click **Upload** to display the **Open** dialog.
4. Use the **Open** dialog to select the `MB_652DUO_net_conn_vX_XX.bin` file.
5. Click **Open** > **Finish** to start the upload process.
6. Wait for the upgrade to complete.
7. After the file uploads, click **OK**.
8. Power cycle the MB-652-DUO to complete the upgrade procedure.
9. Confirm in DashBoard that **Software Rev** field in the **Slot 0 Device** tab displays the correct version number.
10. Re-connect the input signal.

Upgrading the Monitoring Bridge Software, FPGA, and DSP

You must upload the files in the following order:

1. Monitoring Bridge software file
2. FPGA file
3. DSP file

To upgrade the monitoring bridge software

1. Display the **Slot 1** MB-652-DUO interface in DashBoard as outlined in the procedure "**To access the MB-652-DUO interface**" on page 3-4.
2. Disconnect the input signal. Refer to the section "**SDI Cabling**" on page 2-7 for port location.

3. In DashBoard, click **Upload** to display the **Open** dialog.
4. Use the **Open** dialog to select the `MB-652-DUO_sw_vX_xx.bin` file. This software file MUST be the first one loaded in Slot 1.
5. Click **Open** > **Finish** to start the upload process.
6. Wait for the upgrade to complete.
7. After the file uploads, click **OK**.
8. Click **Reboot** (located at the bottom of the DashBoard window).
9. Confirm in the **Product** tab that the software is at version indicated in the file name from step 4.

To upgrade the FPGA

1. Display the **Slot 1** MB-652-DUO interface in DashBoard as outlined in the procedure "**To access the MB-652-DUO interface**" on page 3-4.
2. Disconnect the input signal. Refer to the section "**SDI Cabling**" on page 2-7 for port location.
3. In DashBoard, click **Upload** to display the **Open** dialog.
4. Use the **Open** dialog to select the `MB-651_2_DUO_fpga_Main_vX_xx.bin` file.
5. Click **Open** > **Finish** to start the upload process.
6. Wait for the upgrade to complete.
7. After the file uploads, click **OK**.
8. Click **Reboot** (located at the bottom of the DashBoard window).
9. Confirm in the **Product** tab that the FPGA is at version indicated in the file name from step 4.

To upgrade the DSP

1. Display the **Slot 1** MB-652-DUO interface in DashBoard as outlined in the procedure "**To access the MB-652-DUO interface**" on page 3-4.
2. Disconnect the input signal. Refer to the section "**SDI Cabling**" on page 2-7 for port location.
3. In DashBoard, click **Upload** to display the **Open** dialog.
4. Use the **Open** dialog to select the `MB652_DUO_1_2_DSPvXxx`.bin file.
5. Click **Open** > **Finish** to start the upload process.
6. Wait for the upgrade to complete.
7. After the file uploads, click **OK**.
8. Power cycle the MB-652-DUO.
9. Confirm in the **Product** tab that the DSP is at version indicated in the file name from step 4.
10. Re-connect the input signals.

Upgrading the Auxiliary Inputs Software and FPGA

You must upload the files in the following order:

1. Auxiliary inputs software file
2. Auxiliary FPGA file

To upgrade the auxiliary inputs software

1. Display the **Slot 1** MB-652-DUO interface in DashBoard as outlined in the procedure "**To access the MB-652-DUO interface**" on page 3-4.
2. Ensure that there are no input signals on the second SDI input and no input signals on the AES input. Refer to the section "**Rear Panel Overview**" on page 2-4 for port locations.
3. In DashBoard, click **Upload** to display the **Open** dialog.
4. Use the **Open** dialog to select the `MB-AUX-DUO_sw_vX.xx.bin` file.
5. Click **Open** > **Finish** to start the upload process.
6. Wait for the upgrade to complete.
7. After the file uploads, click **OK**.
8. Click **Reboot** (located at the bottom of the DashBoard window).
9. Confirm in the **Product** tab that the software is at version indicated in the file name from step 4.

To upgrade the auxiliary inputs FPGA

1. Display the **Slot 1** MB-652-DUO interface in DashBoard as outlined in the procedure "**To access the MB-652-DUO interface**" on page 3-4.
2. Ensure that there are no input signals on the second SDI input and no input signals on the AES input. Refer to the section "**Rear Panel Overview**" on page 2-4 for port locations.
3. In DashBoard, click **Upload** to display the **Open** dialog.
4. Use the **Open** dialog to select the `MB-AUX-DUO_fpga_vX_xx.bin` file.
5. Click **Open** > **Finish** to start the upload process.
6. Wait for the upgrade to complete.
7. After the file uploads, click **OK**.
8. Power cycle the MB-652-DUO.
9. Confirm in the **Product** tab that the software is at version indicated in the file name from step 4.
10. Re-connect the input signals.

DashBoard Menus

In This Chapter

This chapter provides information the DashBoard menus available for the MB-652-DUO. Default values are indicated with an asterisk (*). The DashBoard Control System enables you to setup an IP address for the MB-652-DUO and monitor its status from a computer. You can download the DashBoard software and manual from the Ross Video website.

The following topics are discussed:

- Network Connect Interface
- MB-652-DUO Interfaces
- MB-AUX-DUO Interfaces

Network Connect Interface

This section summarizes the tabs displayed in DashBoard for the Network Connect Interface.

Device Tab

Table 4.1 summarizes the read-only information displayed in the **Device** tab.

Table 4.1 Device Tab Items

Tab Title	Item	Parameters	Description
Device	Device Name	MB-652-DUO	
	MAC Address	##-##-##-##-##-##	MAC Address for the MB-652-DUO
	Software Rev	#.##	Indicates the network connect software version

Network Status Tab

Table 4.2 summarizes the read-only information displayed in the **Network** status tab.

Table 4.2 Network Status Tab Items

Tab Title	Item	Parameters	Description
Current Settings	Network Source	DHCP - set by user	The **Addressing Mode** is set to **DHCP** in DashBoard. The network automatically assigns the MB-652-DUO ethernet settings.
		Static - set by user	The **Addressing Mode** is set to **Static** in DashBoard. User defines the ethernet settings from the **Network** tab.
	IP Address	##.#.###.###	IP Address of the MB-652-DUO
	Subnet Mask	###.###.#.#	Subnet Mask for the Monitoring Bridge
	Default Gateway	##.#.#.#	Monitoring Bridge gateway
	NTP Server	##.#.#.#	IP Address of the NTP server used as a time source
Connection Management	Access Mode	Open	No access restrictions; the Monitoring Bridge accepts connections from all DashBoard clients
		Authenticated Only	Access control enabled; only DashBoard clients version 4.0.0 or higher can connect. The user must be authenticated by the DashBoard Server and URM, or must know the Master Password of the Monitoring Bridge.

Table 4.2 Network Status Tab Items

Tab Title	Item	Parameters	Description
Connection Management	Master Password	********	Indicates that a user-specified password is set for the Monitoring Bridge
	Active Connections	#	Number of external control devices, such as DashBoard, connected via TCP to the Monitoring Bridge
Internal Bus Status	Active Cards	#	Reports on the sub-nodes in the Tree View of the Monitoring Bridge
	Bus Load (%)	#	Communication traffic of the internal CAN Bus of the Monitoring Bridge. A high value indicates a high amount of traffic.

Network Tab

Table 4.3 summarizes the **Network** configuration options available in the Network Connect interface in DashBoard.

Table 4.3 Network Tab Items

Menu Title	Item	Parameters	Description
Network	Device Name	#	Assigns a unique identifier for your Monitoring Bridge. The Device Name is automatically updated in the Product tab, Tree View, and tab titles.
	NTP Server	##.#.#.#	This is the IP Address of the NTP server used as a time source
	Current DIP Switch (read-only)	User Settings	This field is fixed.
	Addressing Mode	Static	User defines the Network settings of the Monitoring Bridge
		DHCP*	DashBoard obtains network settings automatically for the Monitoring Bridge
	IP Address	##.#.#.###	Enables you to set the IP Address of the Monitoring Bridge if the **Addressing Mode** is set to **Static**.
	Subnet Mask	###.###.###.#	Enables you to set the Subnet Mask of the Monitoring Bridge if the **Addressing Mode** is set to **Static**
	Default Gateway	##.#.#.#	Enables you to set the Default Gateway of the Monitoring Bridge if the **Addressing Mode** is set to **Static**
	Apply		Applies and saves any changes made to the **Network Settings**
	Cancel		Cancels any setting changes and resets the **Network Settings** to the previous values

MB-652-DUO Interfaces

This section summarizes the tabs displayed in DashBoard for the MB-652-DUO interface.

Status Tab

Table 4.4 summarizes the read-only information displayed in the **Status** tab.

Table 4.4 Status Tab Items

Tab Title	Item	Parameters	Description
Status	SDI Video Status	Locked (Green)	A valid SDI signal is detected on SDI IN 1
		Unlocked (Red)	A valid SDI signal is not detected on SDI IN 1
	SDI Format	#	Indicates the input video format

Product Tab

Table 4.5 summarizes the read-only information displayed in the **Product** tab.

Table 4.5 Product Tab Items

Tab Title	Item	Parameters	Description
Product	Card Name	Audio Bridge	
	Product	MB-652-DUO	Indicates the model of the Monitoring Bridge
	Supplier	Ross Video Ltd.	Indicates the supplier of the Audio Bridge
	Serial Number	#########	Indicates the Monitoring Bridge serial number
	Software Rev	#.##	Indicates the Monitoring Bridge software version
	DSP Rev	#	
	FPGA Rev	#	

LKFS Tab

Table 4.6 summarizes the read-only information displayed in the **LKFS** tab.

Table 4.6 LKFS Tab Items

Tab Title	Item	Parameters	Description
	Momentary Loudness	#dBFS	Specifies the (fixed) 1sec non-gated rating based on ITU-1770-3
	Variable Window Loudness	#dBFS	Specifies the variable non-gated rating based on ITU-1770-3
	Variable Time	#	Specifies the Variable Window size (in seconds) for the Variable Window Loudness

Table 4.6 LKFS Tab Items

Tab Title	Item	Parameters	Description
	True Peak	#dBFS	Indicates the ITU 1770-3 LKFS numerical readout of the true peak (PK)
	Gated Window	#dBFS	Defines the gated ITU-1770-3 moving 30sec window
	Integrated Loudness	#LU, mm:ss	**#LU** represents the gated program rating based on ITU-1770-3 **mm:ss** represents the number of minutes and seconds the since current #LU was measured
	Loudness Range	#LU	Specifies the integrated program range based on EBU-R128
	Gate Time (sec)	#	Specifies the gated program time (in seconds) for the Integrated Loudness and Loudness range fields
	Front Panel Display	Var Win	The RST field on the front panel display reports the Variable Window Loudness range
		Gated Win	The RST field on the front panel display reports the fixed 30sec gated window range
		Integrated	The RST field on the front panel display counts until it reaches the Gate Time value
	LKFS	Reset	Resets all fields on the LKFS tab

Settings Tab

Table 4.7 summarizes the options available in **Settings** tab in DashBoard.

Table 4.7 Settings Tab Items

Tab Title	Item	Parameters	Description
	Input	SDI 1	
		SDI 2	
		AA/AES	
	Channel	#	Specifies the audio channel to route to the speakers
	Mode[a]	Stereo	Outputs the channel pair
		SUM	Allows any of the channels to be summed together to monitor more than one source at a time
		Lt/Rt	Outputs an Lt/Rt downmix of your 5.1 surround mix
	Volume	#	Sets the volume level of the speakers.
	Line Out	Variable	Adjusts the amplitude as dictated by the Volume Control knob on the front panel
		Fixed	

Table 4.7 Settings Tab Items

Tab Title	Item	Parameters	Description
	Meter Reference	-20*	Sets the front panel VU/PPM meter reference value
		-18	

a. This feature is not implemented in DashBoard.

Equalizer Tab

Table 4.8 summarizes the options available in **Equalizer** tab in DashBoard.

Table 4.8 Equalizer Tab Items

Tab Title	Item	Parameters	Description
Equalizer	Equalizer #	#	Adjusts the gain of that audio band
	Frequency #	#	Adjusts the frequency of the equalizer
	Q#	#	Specifies how sharp the filter will be. Moving the slider to the left sharpens the filter, while moving the slider to the right widens the filter.
	Default	Reset	Resets all values on the Equalizer tab to the default values listed in **Table 4.9**

Default Values

Table 4.9 lists the default values for the equalizer.

Table 4.9 Equalizer Menu Default Values

Type	Default
Equalizer 1	0
Frequency 1	150
Equalizer 2	0
Frequency 2	1850
Q2	50
Equalizer 3	0
Frequency 3	4500
Q3	50
Equalizer 4	0
Frequency 4	8000

MB-AUX-DUO Interfaces

This section summarizes the tabs displayed in DashBoard for the MB-AUX-DUO interface.

Status Tab

Table 4.10 summarizes the read-only information displayed in the **Status** tab.

Table 4.10 Status Tab Items

Tab Title	Item	Parameters	Description
Status	SDI 2 Format	#	Indicates the input video format

Product Tab

Table 4.11 summarizes the read-only information displayed in the **Product** tab.

Table 4.11 Product Tab Items

Tab Title	Item	Parameters	Description
Product	Card Name	#	
	Product	MB-AUX-DUO	Indicates the model of the Monitoring Bridge
	Supplier	Ross Video Ltd.	Indicates the supplier of the Monitoring Bridge
	Serial Number	#########	Indicates the Monitoring Bridge serial number
	Software Rev	#.##	Indicates the MB-AUX-DUO software version
	FPGA Rev	#	Indicates the MB-AUX-DUO FPGA version

Settings Tab

The **Settings** tab is left intentionally blank.

Specifications

In This Appendix

This appendix provides information on the specifications for your MB-652-DUO. Note that specifications are subject to change without notice.

The following topics are discussed:

- Technical Specifications

Technical Specifications

This section provides the technical specifications for the MB-652-DUO.

Table 5.1 MB-652-DUO Technical Specifications

Category	Parameter	Specification
SDI Input and Output	Number of Inputs	2
	Number of Outputs	2
	Standards Accommodated	Reclocked SMPTE 259M, SMPTE 292M, SMPTE 424M
	Connector Type	75ohm BNC
	Signal Level	800mV nominal
	Cable Equalization	SD: 200m @ 270Mbps
		HD: 120m @ 1.5Gbps
		3G: 80m @ 3Gbps
AES Input	Number of Inputs	1
	Standards Accommodated	AES-3id-2001
	Impedance	75ohm
	Level	1Vp-p typical
	Sampling Rate	32kHz to 96kHz
	Connector Type	BNC
Analog Inputs	Number of Inputs	2
	Impedance	>20kohm
	Maximum Input Level	+24dBu
		+4 typical
	Frequency Response	+/- 0.1dB 20Hz to 20kHz
	THD	<0.005% 20Hz to 20kHz
	Connector Type	3-pin terminal blocks for left and right input
Analog Audio Monitor Outputs	Number of Outputs	2
	Output Reference Level	-20dBFS = +4dBu
	Output Frequency Response	+/-0.5dB 20Hz to 20kHz
	Analog Output Distortion	<0.01% THD + N (20Hz to 20kHz)
	Connector Type	3-pin terminal blocks for left and right output
Dimensions	Width	19” (48cm)
	Height	3.5” (9cm)
	Depth	8.5” (22cm)
	Weight (approximate)	8lbs (3.6kg)
Power	Power Consumption	90-240 VAC 50/60Hz 90W

Service Information

In This Chapter

This chapter contains the following sections:

- Troubleshooting Checklist
- Warranty and Repair Policy

Troubleshooting Checklist

Routine maintenance to the MB-652-DUO is not required. In the event of problems with your MB-652-DUO, the following basic troubleshooting checklist may help identify the source of the problem. If the MB-652-DUO still does not appear to be working properly after checking all possible causes, please contact your Ross Video products distributor, or the Technical Support department at the numbers listed in the section "**Contact Us**".

1. **Visual Review** — Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the MB-652-DUO, and any associated peripheral equipment for signs of trouble.
2. **Power Check** — Verify that the power cable is connected to a power source and that power is available at the power main.
3. **Input Signal Status** — Verify that source equipment is operating correctly and that a valid signal is being supplied.
4. **Output Signal Path** — Verify that destination equipment is operating correctly and receiving a valid signal.
5. **Unit Exchange** — Exchanging a suspect unit with a unit that is known to be working correctly is an efficient method for localizing problems to individual units. ‘

Warranty and Repair Policy

The MB-652-DUO is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of one (1) year from the date of shipment from our factory. In the event that your MB-652-DUO 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 MB-652-DUO 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 ONE (1) 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 MB-652-DUO User Manual provides all pertinent information for the safe installation and operation of your MB-652-DUO. Ross Video policy dictates that all repairs to the MB-652-DUO 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 MB-652-DUO, 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 MB-652-DUO. If required, a temporary replacement 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.

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

Technical Support	Telephone:	+1 613 • 652 • 4886
	After Hours Emergency:	+1 613 • 349 • 0006
	Email:	techsupport@rossvideo.com
General Information	Telephone:	+1 613 • 652 • 4886
	Fax:	+1 613 • 652 • 4425
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	Website:	http://www.rossvideo.com

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