

Cobalt Digital Inc.

**BBG-1090-RTR-MPEG-IP Streaming IP (MPEG2-TS)
Reclocking Distribution Amplifier and Router Units**

Product Manual

Version 1.3

COBALT[®]

**BBG-1090-RTR-OM
Version: 1.3**

openGear

BBG-1090-RTR • Streaming IP (MPEG2-TS) Reclocking Distribution Amplifier and Routers Product Manual

- Cobalt Digital Inc. Part Number: **BBG-1090-RTR-OM**
- Document Version: **1.3**
- Printed in the United States.
- Last Author: CGG

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

Copyright


© 2018 Cobalt Digital Inc.. All rights reserved.

Contents of this publication may not be reproduced in any form without the written permission of Cobalt Digital Inc.. Reproduction or reverse engineering of copyrighted software is prohibited.

Notice

The material in this manual is furnished for informational use only. It is subject to change without notice and should not be construed as commitment by Cobalt Digital Inc. Cobalt Digital Inc. assumes no responsibility or liability for errors or inaccuracies that may appear in this manual.

Trademarks

-  is a registered trademark of Ross Video Limited.
- [COBALT](#) is a registered trademark of Cobalt Digital Inc.
- DashBoard Control System™ is a trademark of Ross Video Limited.

All other product names and any registered and unregistered trademarks mentioned in this manual are used for identification purposes only and remain the exclusive property of their respective owners.

Important Regulatory and Safety Notices

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.

Products 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



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.



Notice — The symbol with the word “**Notice**” within the equipment manual indicates a situation, which if not avoided, may result in major or minor equipment damage or a situation which could place the equipment in a non-compliant operating state.



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



Caution — This product is intended to be a component product of an 8300 series frame. Refer to the frame User Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as its component products.



Warning — Certain parts of this equipment namely the power supply area still present a safety hazard, with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cords from the chassis’ rear appliance connectors before servicing this area.



Warning — *Service barriers within this product are intended to protect the operator and service personnel from hazardous voltages. For continued safety, replace all barriers after any servicing.*

This product contains safety critical parts, which if incorrectly replaced may present a risk of fire or electrical shock. Components contained within the product's power supplies and power supply area, are not intended to be customer serviced and should be returned to the factory for repair. To reduce the risk of fire, replacement fuses must be the same time and rating. Only use attachments/accessories specified by the manufacturer.

Maintenance/User Serviceable Parts

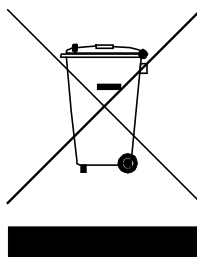
Routine maintenance to this Cobalt Digital Inc. product is not required. This product contains no user serviceable parts. If the frame does not appear to be working properly, please contact Technical Support using the numbers listed under the “Contact Us” section on the last page of this manual. All Cobalt Digital Inc. products are covered by a generous 5-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, Cobalt Digital Inc. 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 Cobalt Digital Inc. for more information on the environmental performances of our products.

Contents

Contents	5
Introduction.....	7
Product Overview	7
Redundancy Options	8
IP Input Address/Port Redundancy.....	9
Connection Redundancy	9
Connecting BBG-1090-RTR To DashBoard Network Remote Control	11
Indicators and Switches	13
Front Indicators.....	13
Front Panel Default Switch.....	14
Operation and Management.....	15
Product Tab.....	16
Network Tab	17
Network Configuration Tab.....	17
Network Statistics Tab.....	18
IP Inputs	20
IP Inputs: Configuration Tab	20
Common Parameters	21
Redundancy Control	22
Addressing Parameters.....	22
Active IP Inputs Table	24
Determining the Latency Settings.....	26
IP Inputs: Statistics Tab	26
IP Outputs	28
IP Outputs: Configuration Tab.....	28
Active IP Outputs Table.....	31
Managing Unicast MAC Addresses.....	32
IP Outputs: Statistics Tab.....	33
Connections.....	34
Connections Configuration Tab.....	34
Source Selection.....	34
Destination Selection	37
Establishing the Connection	38
The Current Connections Table.....	39
Connection Statistics Tab	40
Redundancy.....	41
Address/Port Redundancy.....	41
Connection Redundancy	42
Admin	44
Admin General Tab.....	45
Admin Firmware Tab.....	45
Admin Config Files Tab	46
User-Saved Configurations.....	47

Clear Current Configuration Button	48
Admin Test Packet Generator Tab.....	48
Admin License Keys Tab.....	50
Admin Event Log Tab	51
Control Tab	53
Control Port Configuration Tab	54
Control Port Statistics Tab	55
SNMP Configuration Tab	55
SNMP Statistics Tab	56
Warranty and Repair Policy.....	57
Contact Cobalt Digital Inc.	58
Visit us at the Cobalt Digital Inc. website.	58

Introduction

The BBG-1090-RTR-MPEG-IP (hereinafter called the BBG-1090-RTR) is an advanced openGear™ Streaming IP (MPEG2-TS) Reclocking Distribution Amplifier and Router, with the following features:

- Two 1GigE Ethernet ports, capable of transmitting and receiving at line rate.
- Internal stream replication – any input to the BBG-1090-RTR can be internally connected to up to eight outputs.
- Advanced redundancy features.
- Very low latency.
- Advanced IP de-jitter features.

Typical application scenarios for the BBG-1090-RTR is providing distribution copies of unicast or multicast IP streams. Unicast streams, by design, have only one destination and cannot easily be monitored by test equipment. To solve this, the BBG-1090-RTR provides copies that can easily be sent to multiple destinations for monitoring or other purposes. With the BBG-1090-RTR, the originating UDP/RTP stream can be replicated to reach its intended destination, as well as providing ample copies are available for monitoring or other purposes.

Product Overview

The BBG-1090-RTR is essentially a cross-connect switch where transport streams from inputs can be connected to one or more outputs. A given input can be connected to as many as 8 outputs.

The following inputs are available:

- Up to 8 IP inputs per Ethernet port (for a maximum of 16 IP inputs)
- One internal test packet generator (which can be used to generate IP test streams)

The following outputs are available:

- Up to 8 IP outputs per Ethernet port (for a maximum of 16 IP outputs)

Two BBG-1090-RTR models are available differing only in stream throughput capacity. Details on stream capacity as follows

- Model **BBG-1090-RTR-8X16-MPEG-IP**: 8 inputs available for routing to up to 16 outputs. Outputs can be on either or both GigE ports.
- Model **BBG-1090-RTR-16X16-MPEG-IP**: 16 inputs available for routing to up to 16 outputs. Outputs can be on either or both GigE ports.

Note: For all models, the two GigE ports each are limited to 8 inputs and 8 outputs per port. Also, replication limit is 8 (i.e., a given input can be replicated only up to 8 copies).

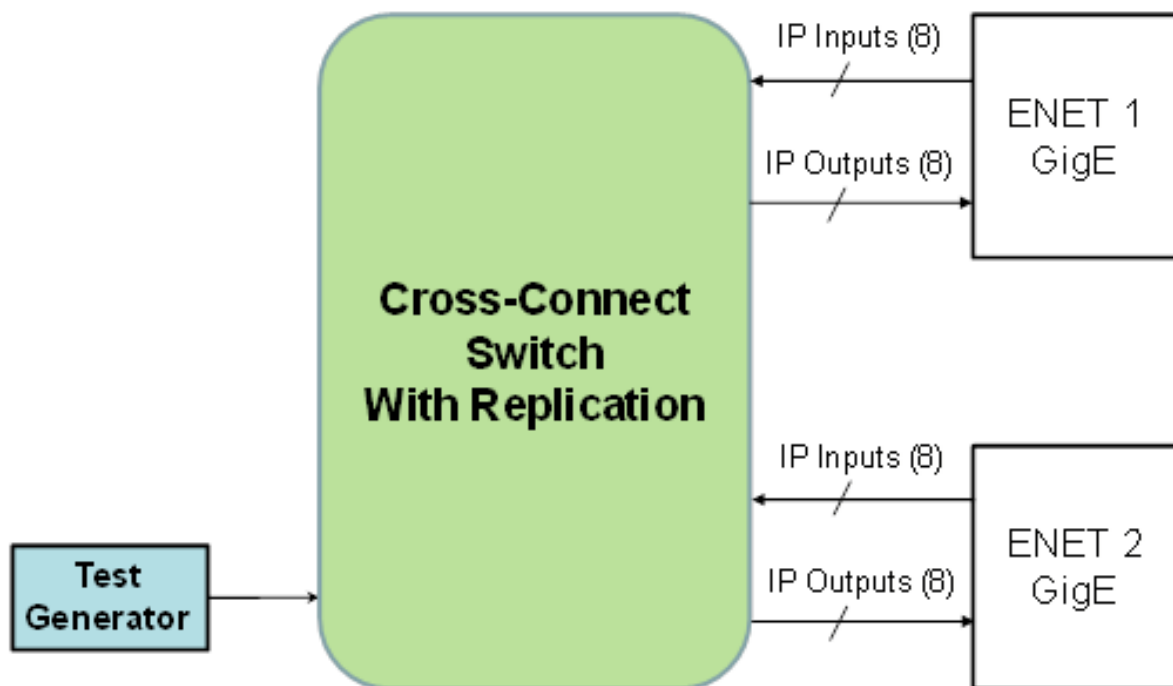
In general terms, configuring the BBG-1090-RTR is a two-step process:

Step 1: Configure the input.

Step 2: Configure the output. As part of this step, a connection between the input and the output can be established.

If you are making one-to-many connections, step 1 is performed once, and step 2 is performed multiple times. It is also possible to configure the output first (without making the connection to an input), configure the input next, and finally make the connection between the input and the output.

The overall architecture is depicted below.



Note: On model BBG-1090-RTR-8X16-MPEG-IP number of inputs is limited to eight (total), which can be distributed across either or both GigE interfaces.

For the remainder of this manual, we will use the term *port* for a physical input/output port (such as Ethernet), and *stream* for a transport stream present in the port.

Redundancy Options

The BBG-1090-RTR can be configured to support transport stream redundancy. This means that the unit can be configured with a “primary transport” and a “backup transport”. If the primary transport disappears, the unit may be set to automatically switch to the backup transport, after a configurable timeout. The following features are common to all redundancy modes:

- Transport stream redundancy can be set to “Manual” or “Automatic”. In “Automatic” mode, the unit will switch to the backup stream after a configurable timeout, if the primary stream disappears. In “Manual” mode, the switch has to be performed by the operator.

-
- Regardless of the Automatic/Manual mode, the operator always has the ability to instruct the unit to switch to the other transport stream.

The BBG-1090-RTR offers two independent redundancy levels, which can be combined if desired:

- IP Input Address/Port Redundancy
- Connection Redundancy

IP Input Address/Port Redundancy

An IP Input receives a transport stream over UDP/IP, on a given IP Address/UDP Port combination, with an optional Source IP address specification. For each IP Input, the unit allows an optional backup IP Address/UDP Port/Optional Source IP Address combination to be specified. If the transport stream disappears from the primary address/port combination, the port can switch to the backup address/port combination (if configured for automatic redundancy). The automatic switch timeout can be set to a value between 2 and 45 seconds.

This level of redundancy is available for all IP input ports, and is independent of any connections that may exist to the port. It uses no internal resources in the BBG-1090-RTR (i.e., it does not “count” as an input or as a connection), but it has the following limitations:

- It is only available for IP input ports.
- The primary and backup transport streams must be available on the same Ethernet port.
- The BBG-1090-RTR does not monitor the inactive stream. Therefore, if the active stream disappears and the other stream not running either, the BBG-1090-RTR will be switching back and forth until one of the two streams comes back.

The Connection Redundancy level does not have the above limitations, but it does use internal resources in the BBG-1090-RTR.

Connection Redundancy

In normal operation, an output port is connected to an input port. The BBG-1090-RTR offers the option of having a backup input port for each connection. If the transport stream coming from the primary input disappears, the connection can switch to the backup input if configured for automatic redundancy. The automatic switch timeout can be set to a value between 2 and 45 seconds.

Connection redundancy does use resources – two input ports must be created and available, and two connections are used (counting against the 8-connection maximum per input). This mode of operation offers the following features:

- Primary/backup IP streams on separate networks: an IP input in ETH1 can be configured as the primary, and another IP input in ETH2 can be configured as backup.
- The unit continuously monitors both the primary and the backup transport streams. It will only switch to the backup if it is active. In the situation where both streams are

inactive, and one of them starts flowing again, Connection Redundancy will recover faster than Address/Port Redundancy.

- A given input may be used as a primary or backup input for multiple output ports (up to 8 ports).

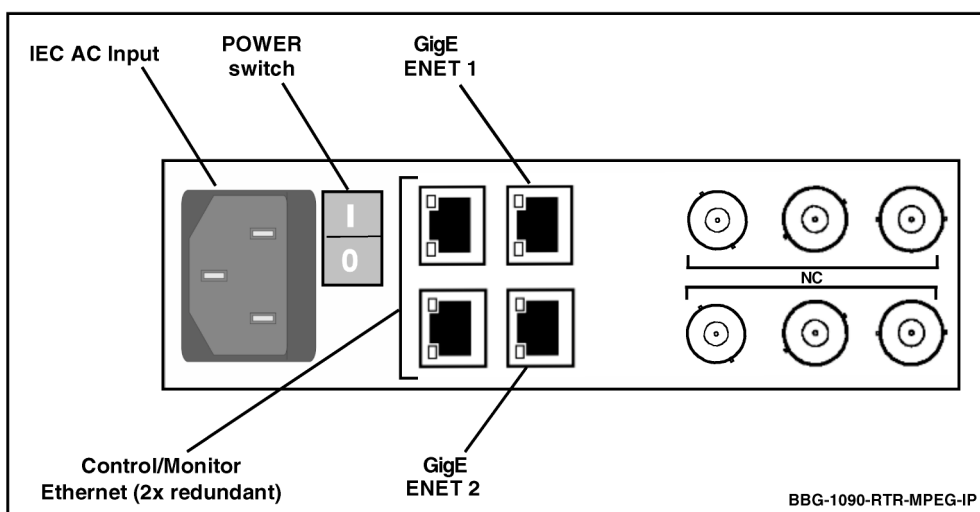
Note that the two redundancy levels can be combined. It is possible to have a primary and a backup IP input port for some output port, and each of these two IP inputs may be configured for Address/Port Redundancy.

Connecting BBG-1090-RTR To DashBoard Network Remote Control

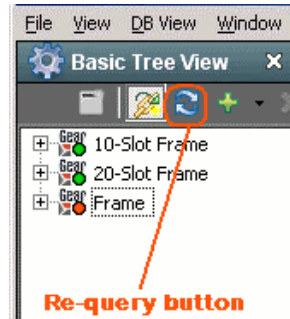
Note: The BBG-1090-RTR is functional with all DashBoard versions, however GUI display response is optimized using version 5.0.0 or later. DashBoard versions 4.0.0 and 4.1.0 may result in GUI pages taking more time to update.

DashBoard™ allows openGear® frames and their devices to be remote-controlled using a PC or Mac via a standard Ethernet connection. The DashBoard™ software can be downloaded from the Cobalt Digital Inc. website: www.cobaltdigital.com (enter “DashBoard” in the search window). When connected to your network, the BBG-1090-RTR appears in DashBoard just like any other device (similar to a frame).

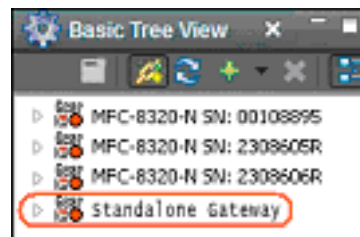
1. Install the DashBoard software as described above. DashBoard is available for Windows, Linux, and Mac OSX.
2. By default, the BBG-1090-RTR is configured with a factory IP address of **192.168.1.30** or **192.168.1.50** and a subnet mask of **255.255.255.0**. In order to perform the initial configuration, you will need to configure the PC/Mac running DashBoard for an IP address in the same network. We suggest you use **192.168.1.0**. Once you gain access to the BBG-1090-RTR, you can reconfigure its IP address to whatever value you require, or configure it to run DHCP.
3. Connect the PC/Mac running DashBoard and the BBG-1090-RTR to the same network. For simplicity, even running an Ethernet cable between the two devices will work. The BBG-1090-RTR has auto-crossover capabilities, so any Ethernet cable will work. Connect the cable to either one of the **Control/Monitor** ports in the BBG-1090-RTR, as illustrated below:



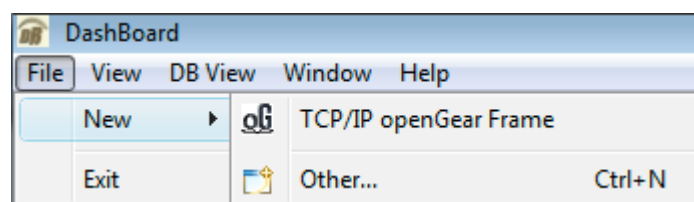
-
4. The DashBoard application should automatically find the BBG-1090-RTR and display it in the tree view on the left. If the BBG-1090-RTR is not automatically found, click on the re-query button at the top of the DashBoard tree view, as shown below:

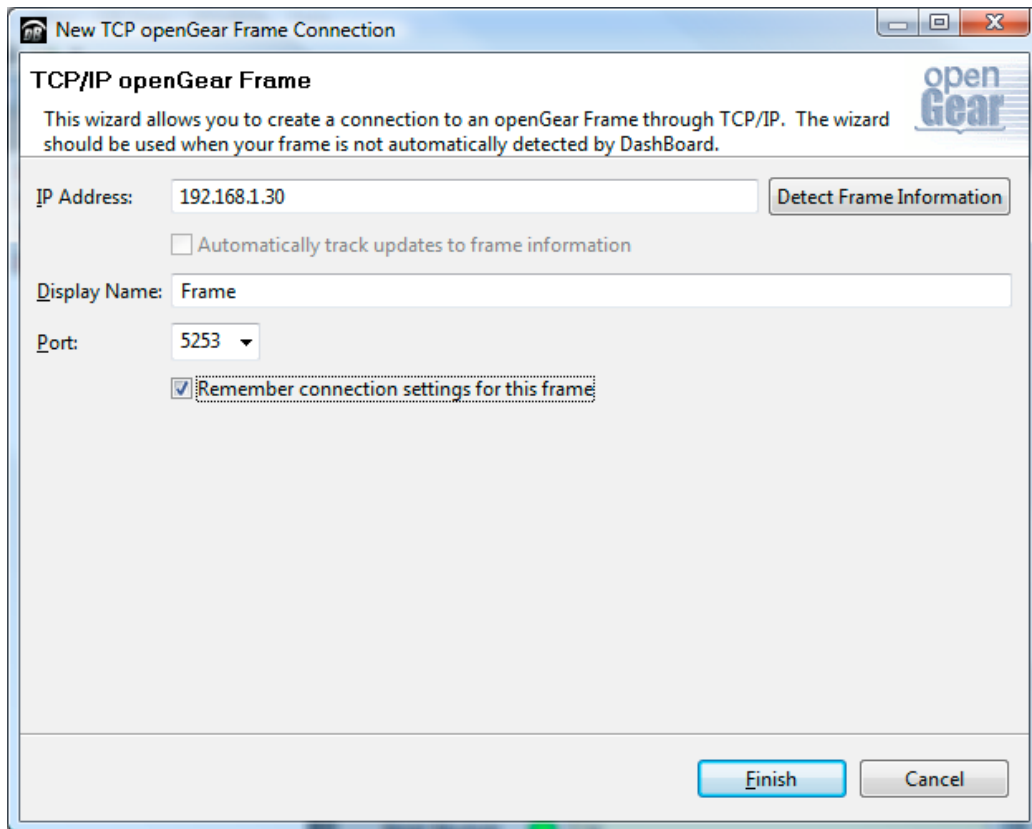


When the BBG-1090-RTR is found by DashBoard, it is identified as **Standalone Gateway**:



5. In the unlikely case that the BBG-1090-RTR is not automatically found by DashBoard, you can force a manual connection. Select **File** → **New** → **TCP/IP openGear Frame**, enter the IP address of the BBG-1090-RTR, and click on **Finish**:





6. When the BBG-1090-RTR is available on DashBoard, open its user interface (by double-clicking on **Standalone Encoder** to open it, and then on the device in slot 0). Go to the **Control** tab on the right; you can now configure the IP address of the BBG-1090-RTR as desired. You can also rename the device if you wish.

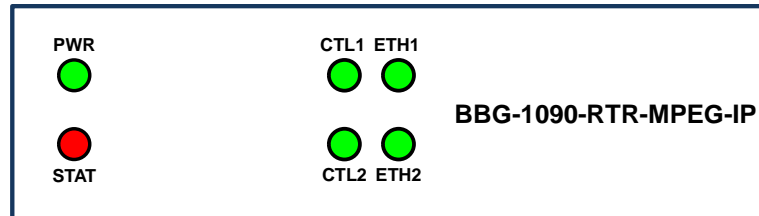
Indicators and Switches

Front Indicators

The LED indicators are as follows:

- **Status LED:** indicates the overall status of the unit.
 - **Green:** no active alarm
 - **Red:** at least one critical alarm present
- **Power OK LED:** indicates that the power received from the frame is OK.
 - **Green:** power OK
 - **Off:** no power (or insufficient voltage – check the frame power status)
- **CTRL1, CTRL2, ETH1 and ETH2 LEDs:** these indicate the status of the corresponding Ethernet connection.

-
- **Off:** no link
 - **On:** link OK, no activity
 - **Blinking:** link OK, port is transmitting and/or receiving packets



Front Panel Default Switch

The front panel has a recessed switch that can be used to restore the unit to its defaults. Use a pen or a small screwdriver to press this switch.



If the switch is pressed during normal operation, the control port IP address, mask and gateway are restored to the following factory default settings:

- IP Address: 192.168.1.30
- Subnet Mask: 255.255.255.0
- Gateway: 192.168.1.1

The **STAT** front panel indicator will change colors for about 3 seconds to acknowledge the change. Note that this operation **does not** disturb the encoding function or the streaming Ethernet ports (i.e., it is not service-affecting).

If you press and hold this switch when the unit is powered off, and then power up the unit while holding the switch, the following actions will be performed:

- The control IP address, mask and gateway are reset to the factory defaults as described above.
- The unit configuration is cleared.
- The unit reverts to the factory-installed firmware.

As before, the **STAT** LED will temporarily change color to acknowledge the command. When it changes color, you can release the switch. You can use this feature in the unlikely event of a corrupted firmware upgrade or a corrupted configuration.

Operation and Management

The BBG-1090-RTR is configured using the free Dashboard™ application, which is available for Windows, Apple OS X, and Linux. Dashboard can be downloaded from this link:

<http://www.opengear.tv/n/?p=94>

From this point forward, control and indicator descriptions here refer to the device instance as displayed in DashBoard. As with any openGear™ device, the device display is divided into a statistics panel on the left, and a configuration panel on the right. Each panel has multiple tabs, corresponding to the various functions in the device. Note that the **Card State** alarm indicator is also reflected in the green/red **Status** LED in the front of the board. The Status LED will be green when Card State is green or yellow, and will be red when Card State is red.

The following tabs are available:

- **Product:** this tab provides general information on the device, including firmware version, uptime, temperatures, and other parameters. It appears only on the Statistics panel.
- **Network:** this tab is used to configure the IP addresses and network information for the Ethernet ports. The statistics side of the panel includes some additional information such as link state.
- **IP Inputs:** this tab is used to configure/monitor the IP Input ports. The configuration panel provides the facilities to create, manage and delete ports; the statistics panel includes reception status information.
- **IP Outputs:** this tab is used to configure/monitor the IP Output ports. The configuration panel provides the facilities to create, manage and delete ports; the statistics panel includes transmission status information.
- **Connections:** this tab is used to configure/monitor connections. The configuration panel provides facilities to create, edit and delete connections; the statistics panel provides a table where the status of all the connections in the unit can be inspected at a glance.
- **Redundancy:** this tab is used to manage and monitor the redundancy function. Manual redundancy switches are initiated from the configuration panel.
- **Admin:** this tab is used for general administrative functions, such as firmware upgrades, licensing, logs, and configuration management. The Test Packet Generator configuration is also found under this tab.
- **Support:** this tab has information on how to contact Cobalt Customer Support, and has the ability to generate a tech support dump for the unit. When contacting Cobalt for support, always include the support dump from this tab.
- **Control:** this tab allows for configuration of the control Ethernet port and the built-in SNMP agent.

Product Tab

The Product Tab contains basic information about the BBG-1090-RTR.

The following information is available:

- **Build Date:** Date the firmware image was built.
- **Software revision:** This indicates the firmware revision currently running. The format is Major Version • Minor Version • Build Number.
- **Serial Number:** This is the serial number of this particular BBG-1090-RTR device.
- **Rear Module:** (Rear module status is not a concern on the standalone BBG-1090-RTR unit, as the device is factory-fitted with the proper rear module panel.) This indicates the status of the Rear I/O Module as follows:
 - **OK:** The Rear Module is the correct module for the BBG-1090-RTR.
 - **Not Installed:** The BBG-1090-RTR is not connected to a rear module. The device is operating normally, but it will not be useful as there are no input and output connections to it.
 - **Wrong Module:** The BBG-1090-RTR is connected to a rear module that was not designed for it.
- **Card Uptime:** Indicates how long the device has been running since it was last rebooted.
- **Ambient Temperature:** Temperature, in degrees centigrade, of the air intake of the device (measured at the front edge of the device).
- **Internal Temperature:** Temperature, in degrees centigrade, at the back of the device.
- **MDP Core Temperature:** Temperature, in degrees centigrade, of the core MediaStorm processing element.

The openGear™ frame is designed to operate in environments with up to 40°C ambient. There is typically a 5°C temperature raise from the external ambient to the “Ambient Temperature” measured by the BBG-1090-RTR. If that measurement is at 45°C or higher, action must be taken to cool down the ambient temperature.

Network Tab

The Network Tab allows for configuration/monitoring of the two Ethernet ports.

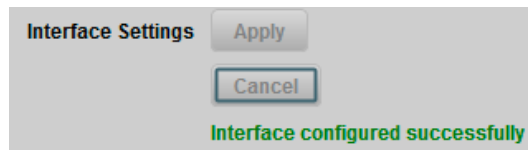
Network Configuration Tab

The Network Configuration Tab is used to set the individual parameters for each of the Ethernet ports.

The screenshot shows the 'Ethernet 1 Configuration' dialog box. It features a title bar at the top. Below it, there are several configuration options: 'Alarm on Link Loss' with radio buttons for 'Yes' and 'No' (the 'No' button is selected); 'IP Address' with a text input field containing '10.10.9.38'; 'Subnet Mask' with a text input field containing '255.255.255.0'; 'Default Gateway' with a text input field containing '0.0.0.0'; 'IGMP Version' with a dropdown menu currently set to 'Auto-Detect'; and 'Interface Speed' with a dropdown menu currently set to 'Auto-Negotiate'. At the bottom of the dialog, there are two buttons: 'Apply' and 'Cancel'.

The following parameters can be configured:

- **Alarm on Link Loss:** If set to Yes, the device will raise an alarm if this Ethernet interface loses link. The Card State indicator in Dashboard™ and the front Status LED will both be red. If set to No, the device will still report loss of link in the Statistics page but no alarm will be raised. It is recommended to turn on the alarm for ports that are in use; only turn it off if you do not plan to connect that port to a network.
- **IP Address:** Enter the desired IP address for this Ethernet port.
- **Subnet Mask:** Enter the desired subnet mask for this Ethernet port.
- **Default Gateway:** Enter the desired default gateway for this Ethernet port, or 0.0.0.0 if no gateway is available.
- **Interface Settings:** If you make any changes to the IP Address, Subnet Mask and/or Default Gateway fields, the **Apply** and **Cancel** buttons become active. The changes only take effect when you press the **Apply** button. Pressing the **Cancel** button reverts the fields back to their original values. Note that the BBG-1090-RTR will check the consistency of the data entered and will reject invalid combinations. Once the **Apply** button is pressed, a status message appears just below the **Cancel** button, as follows:



- **IGMP Version:** The BBG-1090-RTR implements the IGMP protocol for multicast reception. This parameter controls the version of the protocol to be used.
 - **Auto-Detect:** The BBG-1090-RTR will attempt to auto-detect the IGMP version in use by inspecting the Group Membership Requests received from the router. It defaults to IGMP Version 3 if no messages are received.
 - **IGMP Version 1:** Force the use of Version 1 only (not recommended)
 - **IGMP Version 2:** Force the use of Version 2 only
 - **IGMP Version 3:** Force the use of Version 3 only
- **Interface speed:** Configures the speed of the interface. The BBG-1090-RTR Ethernet interfaces only support two modes: 100 Mb/s Full-Duplex and 1 Gb/s Full-Duplex¹.
 - **Auto-Negotiate:** The Ethernet port will auto-negotiate the speed.
 - **100 Mb/s Full-Duplex:** Force the port to 100Mb/s Full-Duplex mode. Note that the port will still perform auto-negotiation, but it will only advertise this mode.
 - **1Gb/s Full-Duplex:** restrict the operation to 1Gb/s Full-Duplex mode. Note that the port will still perform auto-negotiation, but it will only advertise this mode.

Notes:

- If the BBG-1090-RTR streaming Ethernet interfaces are connected to a 10 Mb/s switch, hub, or network feed, link will **not** be established and the port will not recognize the connection.
- If you select **100 Mb/s Full-Duplex** or **1 Gb/s Full-Duplex** and the corresponding streaming Ethernet interface is connected to a switch, hub or network feed that does not support the selected speed, link will **not** be established and the port will not recognize the connection.
- If the interface speed is set to **Auto-Negotiate**, the streaming Ethernet port will allow link to be established in 100 Mb/s Half-Duplex mode. However, this will be flagged as a warning in the Network Statistics Tab and in the Admin Event Log Tab.

Network Statistics Tab

The Network Statistics Tab reports the current IP configuration of each Ethernet port, as well as their link state and running status.

¹ Support for 10 Mb/s and Half-Duplex modes has been disabled, as these are unsuitable for MPEG transport over IP applications. Moreover, any modern switch supports at least 100 Mb/s Full-Duplex.

Ethernet 1 Configuration	
Alarm on Link Loss	Yes
IP Address	10.10.9.30
Subnet Mask	255.255.255.0
Default Gateway	0.0.0.0
IGMP Version	Auto-Detect
Interface Speed	Auto-Negotiate
Port 1 Link	● Link OK
Port 1 Status	● OK
Link Speed (Mb/s)	1000
MAC Address	02:30:1d:11:22:32

The following parameters are reported in the Network Statistics tab:

- **Alarm on Link Loss:** Reports the current setting of this parameter.
- **IP Address:** Reports the current IP Address for the port.
- **Subnet Mask:** Reports the current Subnet Mask for the port.
- **Default Gateway:** Reports the current Default Gateway for the port.
- **IGMP Version:** Reports the current setting for this parameter.
- **Interface Speed:** Reports the current setting for this parameter.
- **Port 1/2 Link:** This indicator has the following states:
 - ● **Link OK:** The port has established link with the switch.
 - ● **No Link:** The port does not currently have link. If Alarm on Link Loss is set to Yes, the Dashboard™ Card State will be red and the Status LED in the front of the board will also be red. If Alarm on Link Loss is set to No, this indicator will still be red, but the alarm will not propagate.
- **Port 1/2 Status:** This indicator is the port overrun status. It has the following states:
 - ● **OK:** The port is operating normally.
 - ● **TX Overflow:** In the current configuration, the IP outputs are attempting to transmit more than the port capacity (i.e., the overall output data for this port exceeds the interface speed of 100 Mb/s or 1 Gb/s). The Dashboard™ Card State will be red and the Status LED in the front of the board will also be red. In this case, reduce the output bit rate (either by externally controlling the inputs or by removing output ports). **If this indicator is red, data is being dropped.**
- **Link Speed (Mb/s):** This parameter reports the actual speed negotiated with the switch for the port. If the port has no link, the value reported here is zero.
- **MAC Address:** This reports the MAC address of the Ethernet port.

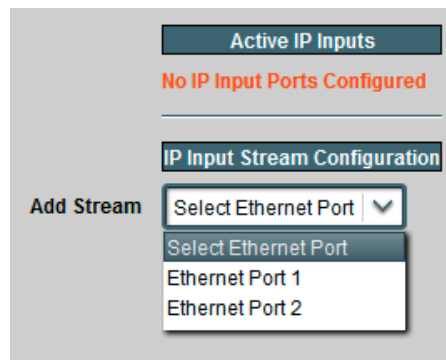
IP Inputs

IP Inputs receive transport streams over UDP/IP from the Ethernet ports, de-jitter them, and make them available for connections to outputs. The BBG-1090-RTR device supports up to 8 transport stream inputs per Ethernet port. IP Inputs have the following specifications:

- Format support: MPEG-2 Transport Packets over UDP/IP.
- Maximum data rate per stream: 120 Mb/s.
- Number of MPEG-2 Transport Packets per UDP datagram: between 1 and 7 (no support for IP fragmentation).
- Addressing support: unicast, multicast and broadcast.
- Configurable source IP address filtering.
- Configurable IP Address/UDP Port redundancy.

IP Inputs: Configuration Tab

Ports can be created, configured, and deleted. Before any ports are created, the Configuration Tab appears as depicted below:



To create an IP Input stream, first select the desired Ethernet port in the **Add Stream** drop-down box. Once that selection is made, the IP Input Stream Configuration is displayed, as depicted below. The configuration screen has three areas:

- **Common Parameters:** apply to the stream input as a whole, regardless of the redundancy options.
- **Redundancy Control:** allows selection of the redundancy mode.
- **Addressing Parameters:** allow selection of the network stream to be received

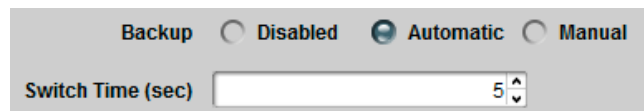
Common Parameters

- **Enabled:** This allows the stream to be enabled or disabled. If it is disabled, no packet reception takes place. This feature is provided for testing purposes (i.e., temporarily disable an input for fault-finding). Most users will leave the stream enabled.
- **Stream Name:** All BBG-1090-RTR inputs and outputs can be assigned a user-defined name. This name is used to identify the port later when making connections. Use any descriptive name suitable for your application, or accept the default.
- **Latency (ms):** This is the de-jitter latency, in milliseconds. This setting corresponds to the buffering latency introduced by the BBG-1090-RTR to remove IP jitter. At 120 Mb/s, the maximum latency supported is 100 ms; at lower rates, the maximum will be proportionally increased (for example, at 20 Mb/s, the maximum is 600 ms). Entering a value of 0 (zero) disables the de-jitter function. Once the port is created and in operation, the BBG-1090-RTR will measure the actual jitter. Therefore, if the input jitter is unknown (which is the most common case), set this parameter to 100 ms, run the unit for a representative period of time, read the measured jitter, and then reduce it. This process is described in detail later in the “Determining the Latency Settings” section.

Redundancy Control

As described in the Redundancy Options section, the IP Inputs offer option of defining a primary and a backup address/port combination. This is enabled in by the **Backup** parameter, which offers the following options:

- **Disabled:** no redundancy.
- **Automatic:** a redundant address/port can be defined, and the input will automatically switch between primary and backup if the stream disappears. If this option is selected, a new field is displayed, where the Switch Time can be configured; valid values are between 2 and 45 seconds:



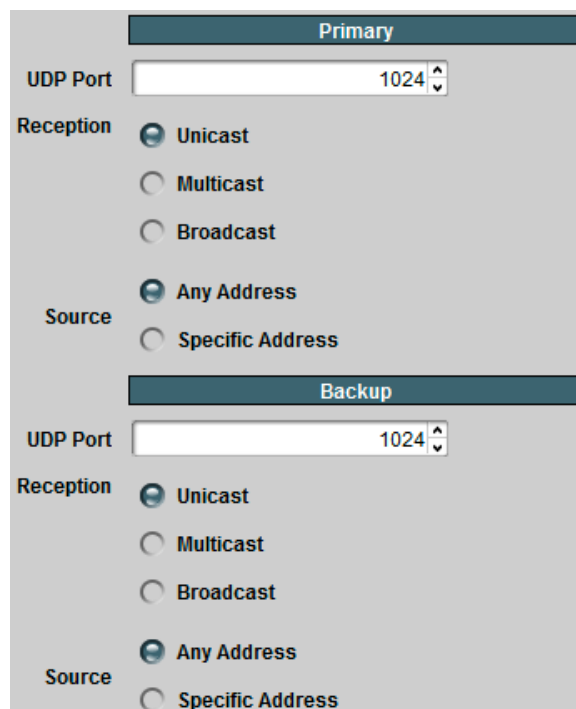
Backup Disabled Automatic Manual

Switch Time (sec)

- **Manual:** a redundant address/port can be defined, but the input will **not** automatically switch – that will have to be done manually by the operator. Redundancy switches are performed in the Redundancy Tab, described later in the Redundancy section.

Addressing Parameters

The Addressing parameters allow the definition of one or two address/port combinations for reception. If **Backup** is set to **Disabled**, only the primary settings are displayed; otherwise, both the primary and backup settings are displayed, as shown below.



Primary

UDP Port

Reception Unicast
 Multicast
 Broadcast

Source Any Address
 Specific Address

Backup

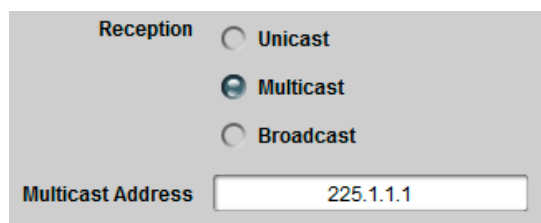
UDP Port

Reception Unicast
 Multicast
 Broadcast

Source Any Address
 Specific Address

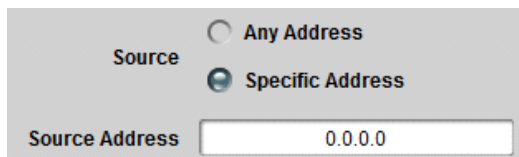
The Primary/Backup addressing parameters are configured as follows:

- **UDP Port:** selects the UDP port to receive from. Valid values are between 1 and 65535. Note that, in traditional IP networks, UDP ports between 1 and 1023 are reserved for administrative uses. It is recommended to use UDP ports 1024 and higher. The BBG-1090-RTR, however, will accept any legal value.
- **Reception:** selects the address to receive from. The options are:
 - **Unicast:** the packets are being sent to the IP address of this Ethernet port. The address of the Ethernet port can be set or reviewed in the Network Tab.
 - **Multicast:** the packets are being sent to a Class-D multicast address (between 224.0.0.0 and 239.255.255.255). If this option is selected, a new field is displayed to accept the multicast address:

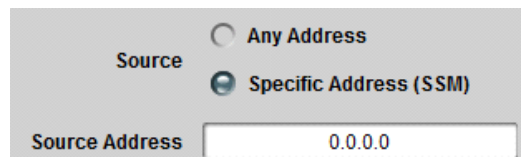


The BBG-1090-RTR will warn the user if the address entered in this field is not a multicast address. The device includes a full implementation of IGMP V1/V2/V3 to convey group membership information to upstream routers; IGMP is configured in the Network Tab.

- **Broadcast:** the packets are being sent to a broadcast address (either the all-hosts broadcast address of 255.255.255.255 or a subnet broadcast address). Note that this is extremely rare in practice.
- **Source:** If desired, the BBG-1090-RTR can filter packets by source IP address. This is useful when the network includes a primary and a backup stream, sent to the same address, but from different sources. The options are:
 - **Any Address:** this input will accept packets from any address.
 - **Specific Address:** this input will only accept packets from a given specific address. When this option is selected, a new field appears where the desired source IP address can be entered:



Unicast/Broadcast



Multicast

The **Source Address** must be a valid unicast address. In case of Multicast reception, the BBG-1090-RTR will go into SSM (Source-Specific Multicast) mode. If IGMP V3 is in use, the device will use it to inform the network of the choice selection. Note that the BBG-1090-RTR does **not** require an IGMP V3 network to operate in SSM mode, as it can filter packets in real-time at line rate.

The IP Input Ports will automatically detect the use of RTP, in a packet-by-packet basis. The BBG-1090-RTR will only accept RTP version 2 packets satisfying the following conditions:

- No header extensions (X=0)
- No CSRC list (CC=0)
- Payload type set to MPEG-2 Transport Streams (PT=33)

For more details, please consult RFC 1889, section 5.1. The BBG-1090-RTR does not receive, require, or process RTCP packets.

Once the configuration information is filled in, click on the **Apply** button to make it active. If there are no errors, the port will be created, and the configuration area disappears. If any errors are detected, they will be displayed at the top of the **Apply** button. The following errors are flagged:

- **Error: enter a Source Address or select "Any Address"**: you selected **Specific Address** for **Source** but left the **Source Address** field as 0.0.0.0.
- **Error: X.X.X.X is NOT a multicast address**: you selected multicast reception, and entered an address that is not multicast. Multicast addresses go from 224.0.0.0 to 239.255.255.255.
- **Error: X.X.X.X is NOT a valid unicast address**: you entered an invalid unicast address. Valid unicast addresses go from 0.0.0.1 to 223.255.255.255, with the exception of the loopback range of 127.0.0.0 to 127.255.255.255.
- **Error: Primary and Backup settings are the same**: you entered the exact same configuration settings for the primary and backup address/port. They must have at least one difference.
- **Error: Primary/Backup UDP Port/Address conflict with Port X/Y Primary/Backup**: you are attempting to configure an address/port combination that is already in use by another input in the same Ethernet port. The BBG-1090-RTR is capable of internally replicating transport streams; just use the other port again in the connection. There is, however, one special case: if you want to configure an input with a given address/port combination and any source, and another input with the same address/port combination and a specific source, you must configure the input with specific source first.
- **Error: Ethernet Port 2 not licensed**: operation of the second Ethernet port requires a license; please contact Cobalt Digital Inc.
- **Maximum number of streams exceeded on this port**: you will receive this message if you attempt to create more than 8 IP inputs on a given Ethernet port.

Active IP Inputs Table

Once the input is created, it is added to the **Active IP Inputs** table, which has **Basic** and **Advanced** views. This table provides a summary of the configuration and status of the input stream. An example of this table, in the Basic view, is depicted below

View Basic Advanced

Active IP Inputs								
	Enabled	Locked	TS	UDP	Reception	Stream	Edit	Delete
			Bit Rate(b/s)	Port	Address	Name	Port	Port
Port 1/1	Yes	Yes	100,001,155	1024	225.1.1.1	NBC Feed	Edit	Delete
Port 1/2	Yes	No	0	1025	10.10.9.10	ABC Feed	Edit	Delete
Port 1/3	Yes	No	0	1026	Broadcast	HBO West	Edit	Delete

The Basic view includes the following:

- **Enabled:** The configured value of this parameter.
- **Locked:** This column will have **Yes** for inputs that are receiving a valid transport stream, and **No** for inputs that are not.
- **TS Bit Rate (b/s):** This column provides the measured bit rate of the input transport stream. This does not include UDP and IP overhead.
- **UDP Port:** The active reception UDP port (i.e., the UDP port currently being used by the input).
- **Reception Address:** The active reception address (i.e., the address being currently used by the input). If you selected **Unicast**, this field will contain the IP address of the corresponding Ethernet interface. If you selected **Multicast**, this field will contain the configured multicast address. If you selected **Broadcast**, this field will contain the word “Broadcast”.
- **Stream Name:** The configured stream name.
- **Edit Port:** If you click on this button, you can modify all the parameters for this input. The configuration area will re-open with the current input settings.
- **Delete Port:** If you click on this button, the port is deleted and removed from the table.

When the Advanced view is selected, additional fields appear in the table, as depicted below:

View Basic Advanced

Reset Max Jitter Measurement

Active IP Inputs													
	Enabled	Locked	Backup	TS	IP Packet	Latency	Max Jitter	UDP	Reception	Source	Stream	Edit	Delete
			Mode	Bit Rate(b/s)	Rate(pkt/s)	(ms)	(ms)	Port	Address	Address	Name	Port	Port
Port 1/1	Yes	Yes	Automatic	100,001,362	9,498	100	0	1024	225.1.1.1	Any	NBC Feed	Edit	Delete
Port 1/2	Yes	No	Disabled	0	0	40	0	1025	10.10.9.10	192.168.5.5	ABC Feed	Edit	Delete
Port 1/3	Yes	No	Disabled	0	0	40	0	1026	Broadcast	Any	HBO West	Edit	Delete

The Advanced view includes all items in the Basic view plus the following:

- **Backup Mode:** The configured value of this parameter.

-
- **IP Packet Rate (pkts/s):** The measured IP input packet rate, in packets/second. This field is useful for debugging: if you have a non-zero IP Packet Rate, but a zero TS Bit Rate, this indicates that the packets being received by the BBG-1090-RTR do not contain a valid transport stream. This allows differentiation between a transport network problem (no packets being received) and a data format problem (packets contain invalid data).
 - **Latency (ms):** The configured value of this parameter.
 - **Max Jitter (ms):** The maximum jitter measured by the BBG-1090-RTR for this input stream. This is reported as zero if there is no reception.
 - **Source Address:** The active source address (i.e., the address currently being used by the input). This will have the word “Any” if the Source was configured as **Any Source**, or the configured IP address.

Additionally, when you select the **Advanced** view, a button to reset the Max Jitter measurement becomes available. When pressed, it resets the measurement for all configured input streams.

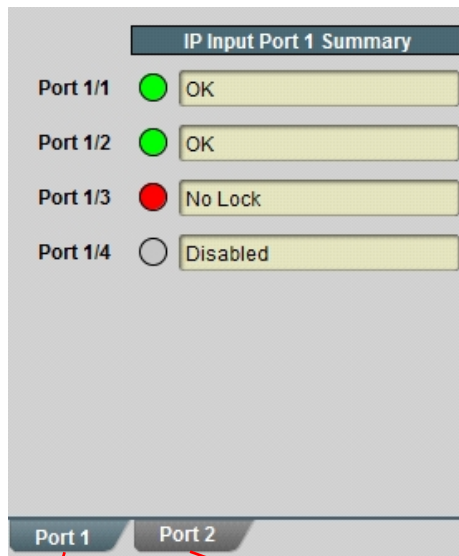
Determining the Latency Settings

The data in the **Advanced** view is useful in determining the best **Latency** setting for the input stream. The procedure is as follows:

1. Configure the desired input streams, using a high value for the latency setting – 100 milliseconds is a good starting point.
2. Make sure that your streams are operating as desired, and that your network is properly set up.
3. Click on the “Reset Max Jitter Measurement” button in the **Advanced** view.
4. Let the system run for a period of time – a good choice would be 24 to 48 hours.
5. For each input, check the Max Jitter measurement in the **Advanced** view. For proper operation, the Latency setting must be higher than the Max Jitter. We recommend adding a 30% margin.
6. Reconfigure the latency value on each port to the optimum value. Note that changing the latency setting causes a short stream interruption.

IP Inputs: Statistics Tab

The Statistics tab for the IP input ports contains a summary of each port status. There are two sub-tabs: one for Ethernet 1, and another for Ethernet 2. The tab is depicted below:



The indicators can have the following values:

- **OK:** The IP Input is receiving a valid transport stream.
- **No Lock:** The IP Input is not receiving a valid transport stream. If there is a connection to this input, Dashboard™ Card State and the Status LED will be red.
- **Disabled:** The IP Input has been disabled (by setting **Enable** to **No**).

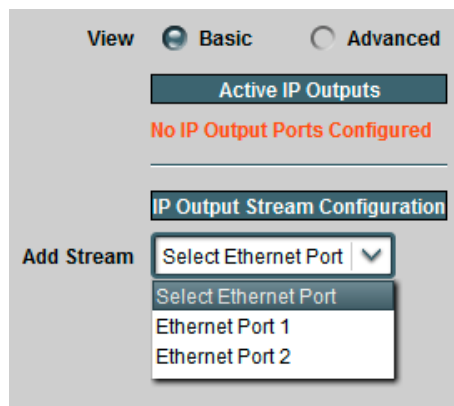
IP Outputs

IP Outputs receive data from connected inputs, format this data for transmission over UDP/IP, and send it with very precise timing over the Ethernet ports. The BBG-1090-RTR device supports up to 8 transport stream outputs per Ethernet port. IP Outputs have the following specifications:

- Formats supported:
 - MPEG-2 Transport Packets over UDP/IP
 - MPEG-2 Transport Packets over RTP/UDP/IP
- Number of MPEG-2 Transport Packets per UDP datagram: fixed at 7.
- Addressing support: unicast, multicast and broadcast.
- Advanced control over the IP header fields available.

IP Outputs: Configuration Tab

The IP Output Configuration follows a similar workflow as the IP Inputs. Ports can be created, configured, and deleted. Before any ports are created, the Configuration Tab appears as depicted below:



To create an IP Output stream, first select the desired Ethernet port in the **Add Stream** drop-down box. Once that selection is made, the IP Output Stream Configuration is displayed, as depicted below (Basic View). The configuration screen has two areas:

- **IP Output Parameters:** these are the parameters specific to the IP Output configuration. The set of parameters available for configuration depends on the **View** selection. In the **Basic** view, suitable default values are entered for the advanced parameters.
- **Connection Parameters:** these allow a standalone or redundant connection to be made to the output port.

The Connection Parameters are common to all output ports, and will be described in the Connections section, later in this document.

The screenshot shows the 'IP Output Stream Configuration' dialog box. It is divided into two main sections. The top section, labeled 'IP Output Parameters' in orange text to the right, contains: 'Add Stream' (dropdown menu showing 'Ethernet Port 1'), 'Enabled' (radio buttons for 'Yes' and 'No', with 'Yes' selected), 'UDP Port' (spin box showing '1028'), 'Destination Address' (text box showing '225.1.1.5'), and 'Stream Name' (text box showing 'Port 1 Stream 5'). The bottom section, labeled 'Connection Parameters' in orange text to the right, contains: 'Primary Source' (text label), 'Source Port' (dropdown menu showing 'IP Input 1'), 'Source Stream' (dropdown menu showing 'Select Input Stream'), and 'Backup Connection' (radio buttons for 'Disabled', 'Automatic', and 'Manual', with 'Disabled' selected). At the bottom of the dialog are 'Apply' and 'Cancel' buttons.

The Basic View configuration parameters are as follows:

- **Enabled:** This allows the output stream to be enabled or disabled. If it is disabled, no packet transmission takes place. This feature is provided for testing purposes (i.e., temporarily disable an output for fault-finding). Most users will leave the stream enabled.
- **UDP Port:** selects the UDP port to transmit to. Valid values are between 1 and 65535. Note that, in traditional IP networks, UDP ports between 1 and 1023 are reserved for administrative uses. It is recommended to use UDP ports 1024 and higher. The BBG-1090-RTR, however, will accept any legal value.
- **Destination Address:** selects the IP address to transmit to. Any unicast or multicast address can be entered here, with the exception of the loopback range (127.0.0.0 to 127.255.255.255). The BBG-1090-RTR will also accept the broadcast IP address of 255.255.255.255, and will transmit the packets as Ethernet broadcasts. Use of broadcasts, however, is strongly discouraged.
- **Stream Name:** All BBG-1090-RTR input and output ports can be assigned a user-defined name. This name is used to identify the port later when making connections. Use any descriptive name suitable for your application, or accept the default.

If the Advanced View is selected, four more parameters are available for configuration:

View Basic Advanced

IP Output Stream Configuration

Add Stream ▼

Enabled Yes No

UDP Port ▲▼

Destination Address

Stream Name

TOS

TTL ▲▼

DF Bit Set Not Set

RTP

Advanced Parameters

- **TOS:** This parameter allows the configuration of the Type-Of-Service (TOS) byte in the IP header (also known as the Differentiated Services – DS – field). Valid values are between 0 and 255. Configuring this is only useful if the downstream router is configured to honor the field.
- **TTL:** This parameter allows the configuration of the Time-To-Live (TTL) byte in the IP header. Valid values are between 0 and 255. If not explicitly configured, it defaults to 128. This field controls how many hops the packet can traverse before it is dropped by a router. The default value of 128 is suitable for virtually all applications.
- **DF Bit:** This parameter allows the configuration of the Do-not-Fragment (DF) bit in the IP header. The BBG-1090-RTR will never produce fragmented packets, and with the UDP payload set to 7 transport packets, the IP packets are guaranteed to fit inside the Ethernet MTU. This control is provided for compatibility with legacy switches/routers. Some legacy equipment may exhibit performance problems if this bit is not set. This is not an issue with current network equipment.
- **RTP:** If this box is checked, the BBG-1090-RTR will include RTP (Real Time Protocol) headers in the output flow. If it is not checked, the transport stream will be sent over UDP/IP without any additional headers. Note that RTP requires the use of even UDP port numbers.

Once the configuration information is filled in, click on the **Apply** button to make it active. If there are no errors, the port will be created, and the configuration area disappears. If any errors are detected, they will be displayed at the top of the **Apply** button. Two types of errors can be reported:

1. Errors related to the port configuration itself. These are listed below.
2. Errors related to the connection, if you are configuring one. These will be described in the Connections section.

The following configuration-related errors are flagged:

- **Error: UDP Port/Address conflict with Port X/Y:** you have configured two IP Output streams with the same destination IP Address and UDP port, on the same Ethernet interface. Please review your settings.
- **Error: No Output License Available:** output transport streams are individually licensed in the BBG-1090-RTR. Contact Cobalt Digital Inc. to obtain additional licenses.
- **Error: Ethernet Port 2 not licensed:** operation of the second Ethernet port requires a license; please contact Cobalt Digital Inc.
- **Maximum number of streams exceeded on this port:** you will receive this message if you attempt to create more than 8 IP inputs on a given Ethernet port.
- **Error: UDP Port must be even if RTP is enabled:** if you check the RTP box in the **Advanced** view, the UDP port number must be even. Either select an even number or uncheck the RTP box.

If the configuration is successful, the output stream will be added to the Active IP Outputs table.

Active IP Outputs Table

Once the output is created, it is added to the **Active IP Outputs** table, which has **Basic** and **Advanced** views. This table provides a summary of the configuration and status of the output stream. An example of this table, in the Basic view, is depicted below

View		<input checked="" type="radio"/> Basic	<input type="radio"/> Advanced	Active IP Outputs						
	Enabled	TS	UDP	Destination	Stream	Edit	Delete			
		Bit Rate(b/s)	Port	Address	Name	Port	Port			
Port 1/1	Yes	100,000,566	5555	225.5.5.5	Modulator Connection	Edit	Delete			
Port 1/2	Yes	0	1025	192.168.1.2	Studio Link	Edit	Delete			
Port 1/3	Yes	0	1026	10.10.9.1	Decoder Monitor	Edit	Delete			
Port 2/1	Yes	20,000,000	7777	227.7.7.7	Port 2 Stream 1	Edit	Delete			

The Basic view includes the following:

- **Enabled:** The configured value of this parameter.
- **TS Bit Rate (b/s):** This column provides the current bit rate of the output transport stream. This does not include UDP and IP overhead.
- **UDP Port:** The configured value of this parameter.
- **Destination Address:** The configured value of this parameter.

- **Stream Name:** The configured stream name.
- **Edit Port:** If you click on this button, you can modify all the parameters for this output. The configuration area will re-open with the current output settings.
- **Delete Port:** If you click on this button, the port is deleted and removed from the table.

When the Advanced view is selected, additional fields appear in the table, as depicted below:

Active IP Outputs												
Enabled	TS	UDP	Destination	TOS	TTL	DF	RTP	Destination	Stream	Edit	Delete	
	Bit Rate(b/s)	Port	Address					MAC	Name	Port	Port	
Port 1/1	Yes	8,001,301	5555	225.5.5.5	0	128	Set	No	01005e050505	Modulator Connection	Edit	Delete
Port 1/2	Yes	0	1025	192.168.1.2	0	128	Set	No	Unknown	Studio Link	Edit	Delete
Port 1/3	Yes	0	1026	10.10.9.1	0	128	Set	No	0014d11aa6bd	Decoder Monitor	Edit	Delete
Port 2/1	Yes	20,000,000	7777	227.7.7.7	0	128	Set	No	01005e070707	Port 2 Stream 1	Edit	Delete

The Advanced view includes all items in the Basic view plus the following:

- **TOS:** The configured value of this parameter.
- **TTL:** The configured value of this parameter.
- **DF:** The configured value of this parameter.
- **RTP:** The configured value of this parameter
- **Destination MAC:** The destination MAC address for this IP Output. For multicast destination addresses, this is derived from the destination IP address using the rules from RFC 1112. For unicast destination addresses, this is obtained using the ARP protocol. If this entry is the word **Unknown**, the BBG-1090-RTR has failed to obtain a destination MAC address. The port is **not** streaming. A more detailed description of the unicast MAC address algorithms used in the BBG-1090-RTR is presented below.

Managing Unicast MAC Addresses

When the BBG-1090-RTR is configured with a unicast destination address, it needs to obtain a corresponding MAC address (corresponding to either the final destination, if it is in the same subnet, or to the default gateway). These MAC addresses are obtained using the ARP protocol. The BBG-1090-RTR uses a custom MAC address management algorithm, designed specifically for MPEG operation.

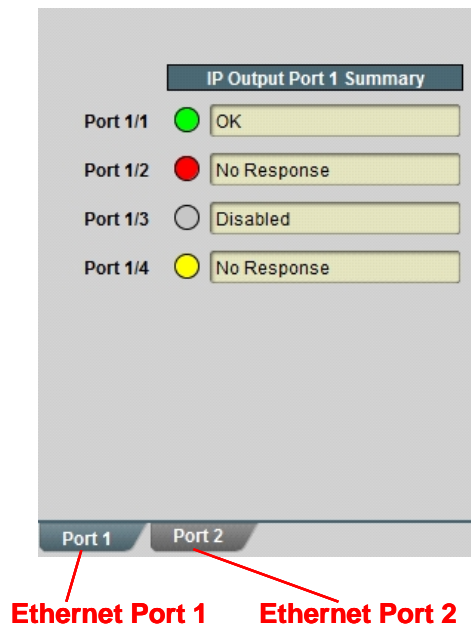
When an IP Output port with a unicast destination address is created, the BBG-1090-RTR immediately starts attempting to obtain a MAC address for it, using standard ARP requests. These requests are issued every two seconds until answered. No packets will be transmitted on that IP Output until a MAC address can be obtained. Note that this process will happen even if the port is configured to be in the disabled state.

Once a MAC address is obtained, the BBG-1090-RTR will cache it for about 5 minutes, as it is usual for IP devices. Unlike other IP devices, the BBG-1090-RTR will keep on using the MAC address until a response is received, to avoid stream interruptions. If no response is received at that time, the BBG-1090-RTR will raise a yellow alarm. This alarm can be seen in the IP Output Statistics tab, described in detail below.

The current state of the BBG-1090-RTR current streaming ARP cache is available in the Advanced View of the Active IP Outputs table, described above.

IP Outputs: Statistics Tab

The Statistics tab for the IP output ports contains a summary of each port status. There are two sub-tabs: one for Ethernet 1, and another for Ethernet 2. The tab is depicted below:



The indicators can have the following values:

- **OK:** The IP Output is operating normally (either streaming or ready to stream).
- **No Response:** The IP Output is configured for unicast operation, but it does not have a destination MAC address. If there is a connection to this output, Dashboard™ Card State and the Status LED will be red.
- **No Response:** The IP Output is configured for unicast operation, and the destination stopped responding to ARP. The IP Output is using an old cached MAC address. If there is a connection to this output, the Dashboard™ Card State will be yellow (but packets are being transmitted).
- **Disabled:** The IP Output has been disabled (by setting **Enable** to **No**).

Connections

The Connections allows the creation, deletion, and management of input-output connections. The Statistics tab includes all connected input/output status indicators and an overall summary status indicator, which allows the operator to immediately pinpoint errors.

Connections Configuration Tab

The Connections configuration tab is depicted below. The message “Connection Table Empty” will be displayed if there are no configured input/output connections in the BBG-1090-RTR. As indicated in the figure, the Connections configuration area is divided into two parts: a source port selection, and a destination port selection.

Connection Table Empty

Stream Display Stream Names Stream Addresses

Add/Edit Connections

Primary Source

Source Port IP Input 1

Source Stream Select Input Stream

Backup Connection Disabled Automatic Manual

Destination Port IP Input 1

Destination Stream Select Output Stream

Apply

Cancel

Source Selection

Destination Selection

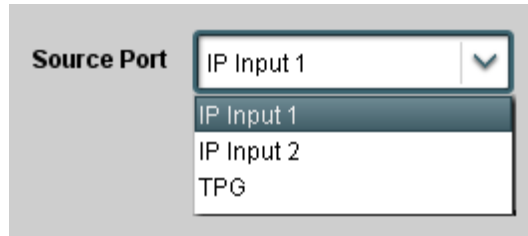
To establish a connection, simply select a source (and optionally a backup source), a destination, and then click on Apply.

Source Selection

The Source Selection area is available in the Connections tab, as well as in the IP Outputs tab. This allows the operator to establish a connection to a given output as that output is being configured. The operation is the same regardless of the location of the control.

The Source Port Selection is a two-step process:

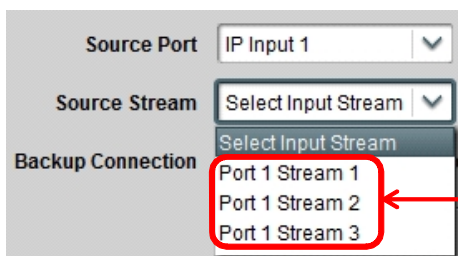
- **Step 1:** Select the port type in the **Source Port** drop-down list. The options are:
 - **IP Input 1:** UDP/IP Input streams from Ethernet Port 1.
 - **IP Input 2:** UDP/IP Input streams from Ethernet Port 2.
 - **TPG:** Test Packet Generator (internal test stream).



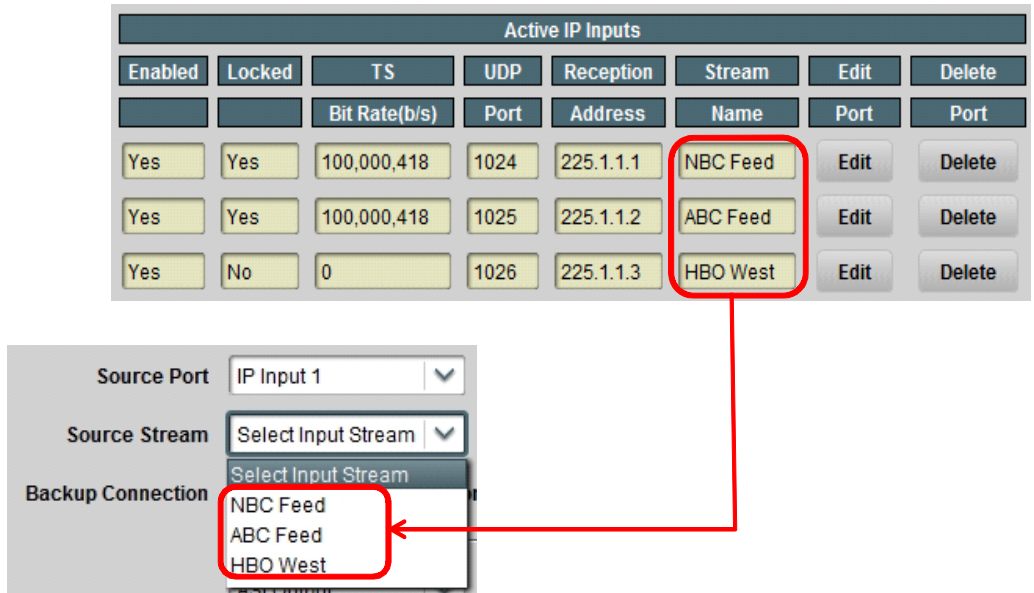
- **Step 2:** Select the individual stream in the **Source Stream** drop-down list. The names presented here are the Stream Names configured when the ports were created. If no streams were configured in that port, no options will be presented. This process is illustrated below.

Default Names:

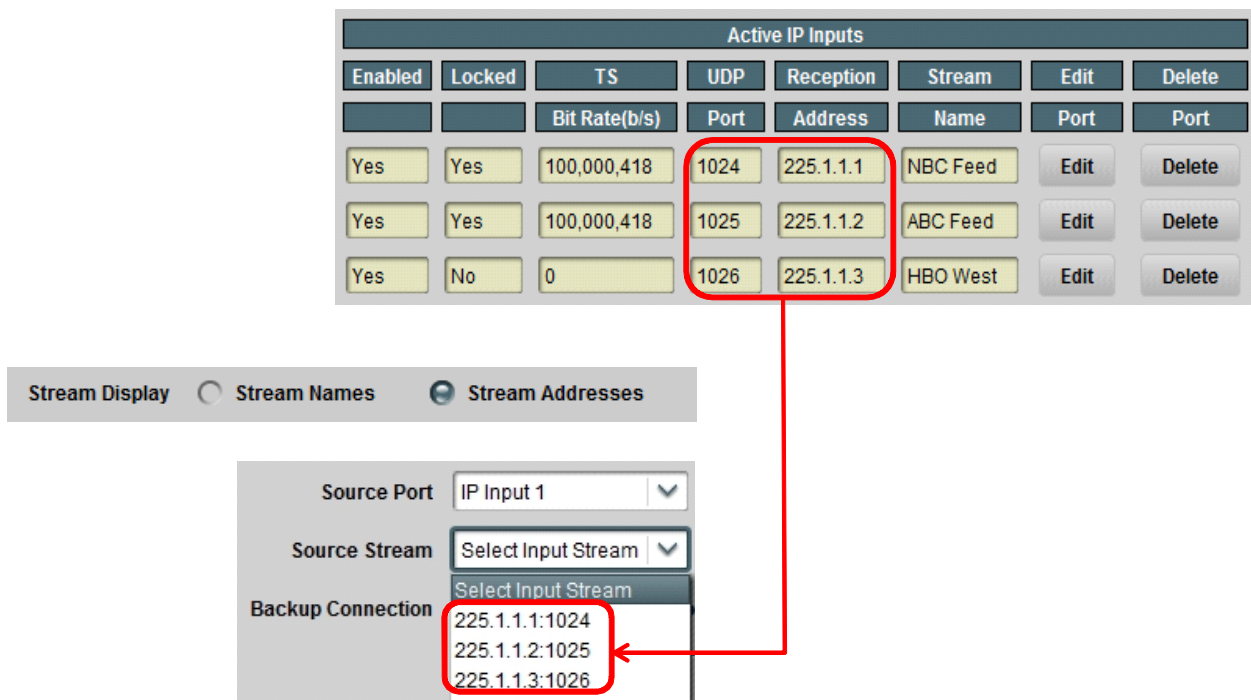
Active IP Inputs							
Enabled	Locked	TS	UDP	Reception	Stream	Edit	Delete
		Bit Rate(b/s)	Port	Address	Name	Port	Port
Yes	Yes	100,001,053	1024	225.1.1.1	Port 1 Stream 1	Edit	Delete
Yes	Yes	100,001,053	1025	225.1.1.2	Port 1 Stream 2	Edit	Delete
Yes	No	0	1026	225.1.1.3	Port 1 Stream 3	Edit	Delete



Customized Names:



In some situations, it may be desirable to identify the IP streams by their address/port combinations rather than using a name. This mode can be enabled by selecting **Stream Addresses** in the **Stream Display** control, as depicted below. This operation does not affect the user-defined names.



If a backup connection is desired, it can be selected at this point as well. The same two options are available: **Automatic** redundancy, where the BBG-1090-RTR will switch by itself after a configurable timeout, and **Manual** redundancy, where the operator is responsible for switching. If **Automatic** redundancy is selected, a field to configure the switch time becomes available. Valid values are from 2 to 45 seconds. This is illustrated below.

The image shows two screenshots of a configuration interface for Backup Connection. The top screenshot shows the 'Automatic' radio button selected, with a 'Switch Time (sec)' input field containing the value '5'. The bottom screenshot shows the 'Manual' radio button selected, and the 'Switch Time (sec)' field is not visible.

If you select **Automatic** or **Manual** for the **Backup Connection**, a second set of Source Port/Source Stream drop-down menus are displayed, to select the backup source. These operate in exactly the same fashion as the primary source selections. The complete interface is shown below.

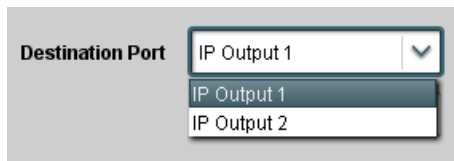
The image shows a configuration interface with two main sections: 'Primary Source' and 'Backup Source'. In the 'Primary Source' section, the 'Source Port' dropdown is set to 'IP Input 1' and the 'Source Stream' dropdown is set to 'Port 1 Stream 1'. In the 'Backup Source' section, the 'Source Port' dropdown is set to 'IP Input 2' and the 'Source Stream' dropdown is set to 'Port 2 Stream 1'. Red boxes highlight these dropdown menus. The 'Backup Connection' section is set to 'Automatic' with a 'Switch Time (sec)' of 5.

Destination Selection

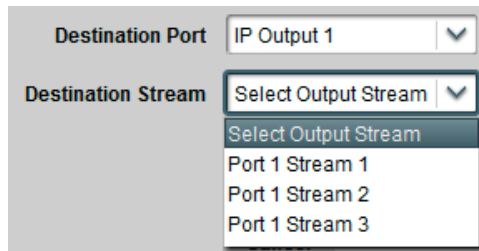
The Destination Selection operates in the same fashion as the Source Selection. It is again a two-step process, where a port is selected, and then a stream on that port is selected. Note that only one connection can be made to any given output; therefore, the BBG-1090-RTR will only offer unconnected outputs in the Destination Selection. If you wish to modify an existing route, either delete and recreate it, or edit it. This process is explained later in this section.

The Destination Port Selection is depicted below. The options are as follows:

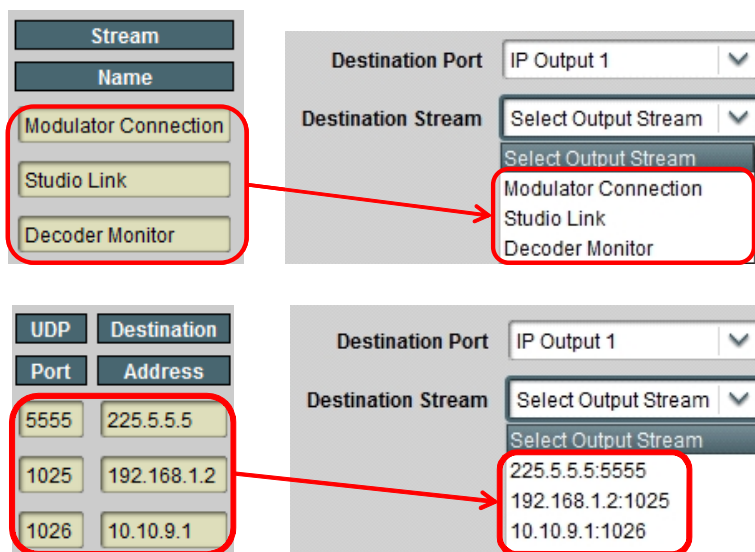
- **IP Output 1:** UDP/IP Output streams transmitted on Ethernet Port 1.
- **IP Output 2:** UDP/IP Output streams transmitted on Ethernet Port 2.



Once the port is selected, the **Destination Stream** drop down menu is populated with the available output streams on that port. Only streams that are unconnected and enabled are presented:



In the same fashion as with the Source Selection, the names can be customized, and the selection can be presented as addresses rather than names. Both situations are illustrated below.



Establishing the Connection

Once the connection is configured, click on **Apply** to establish it. If no errors are detected, the connection is established and added to the **Current Connections** Table. If the connection fails, an error message will appear next to the **Apply** button. The following errors are detected:

- **Error: Missing primary source selection:** you have not selected a primary source for the connection.
- **Error: Missing destination selection:** you have not selected a destination for the connection.

- **Error: Missing backup source selection:** you have selected **Automatic** or **Manual** redundancy, but you did not select a backup source. Either select **Disabled** on **Backup Connection** or select a backup source.
- **Error: Primary and backup selections are the same:** you have selected **Automatic** or **Manual** redundancy, and you selected the same source for both primary and backup. Either select **Disabled** on **Backup Connection** or select different source for either primary or backup.
- **Error: Maximum number of connections exceeded for primary/backup:** the BBG-1090-RTR can support only a maximum of 8 connections to any given input. This was exceeded for either the primary or backup.

The Current Connections Table

As connections are established (either in the Connections tab, or as part of the output port configuration), they are added to the Current Connections table. Regardless of how they got added, the connections can be edited or deleted using the functions in this table. A sample of this table is depicted below.

The following columns are available in this table:

- **Source Port, Source Stream:** these columns have the current source for the connection. If there is a redundancy switch, these fields will change accordingly. The Source Stream column will change to indicate address/port if **Stream Display** is set to **Stream Addresses**.
- **Backup Mode:** this column contains the configured value for this parameter.
- **Destination Port, Destination Stream:** this column contains the destination for the connection. The Destination Stream column will change to indicate address/port if **Stream Display** is set to **Stream Addresses**.
- **Edit:** if you click on this button, you can edit the connection. The selection area below the table will be populated with the connection parameters.
- **Delete:** if you click on this button, the corresponding connection will be deleted.
- **Select/Delete Selected Connections:** if you need to delete multiple connections, mark them in the **Select** column, and then click the **Delete Selected Connections** button.

Stream Display Stream Names Stream Addresses

Current Connections							
Source Port	Source Stream	Backup Mode	Destination Port	Destination Stream	Connection	Select	Connection
IP Input 1	DVO_0	Disabled	IP Output 1	Port 1 Stream 1	Edit	<input type="checkbox"/>	Delete
IP Input 1	DVO_1	Disabled	IP Output 1	Port 1 Stream 2	Edit	<input type="checkbox"/>	Delete
IP Input 1	DVO_2	Disabled	IP Output 1	Port 1 Stream 3	Edit	<input type="checkbox"/>	Delete

Delete Selected Connections

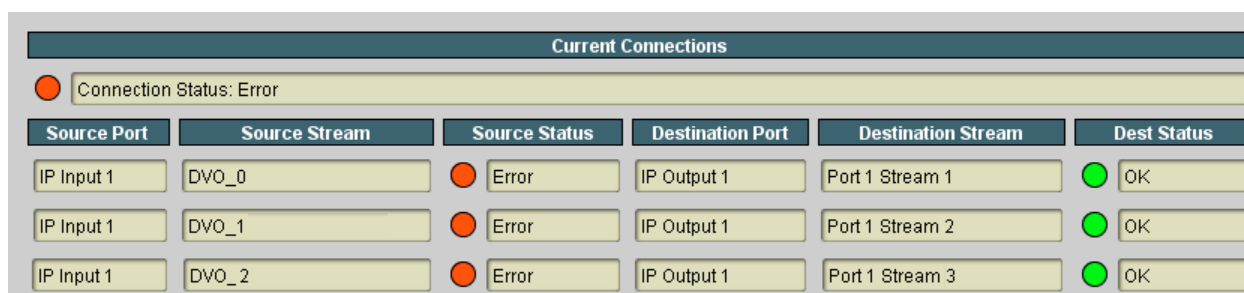
Connection Statistics Tab

The Connection Statistics Tab presents the combined status of all the established connections, in one table. It includes the Source Port, Source Stream, Destination Port and Destination Stream fields to identify the connections, and the rows are in the same order as the table in the Configuration Tab. The Statistics tab contains two additional fields, the **Source Status** and the **Destination Status**. Since these are color-coded, it is simple to quickly identify any problems. The Statistics Tab also includes an overall **Connection Status** indicator, which contains the highest priority alarm in the table. If the **Connection Status** indicator is red, the Dashboard™ Card State will be red as well, and the Status LED in the front of the device will also be red. If the **Connection Status** indicator is yellow, the Dashboard™ Card Status may also be yellow (unless there is a higher priority alarm elsewhere).

The meaning of the indicators is as follows:

- **OK**: The stream is operating normally. If it is an input, it means that a transport stream is being received by it; if it is an output, it means that it is either transmitting or ready to transmit.
- **Warning**: The stream is configured but disabled. Simply enabling the stream may clear this situation.
- **Error**: The stream is configured but has detected a problem. If it is an input, this normally means that no data is being received (e.g., an IP input is not seeing any packets). If this is an output, it normally means that the output is either unable to send (e.g., an IP output configured for unicast but unable to find the destination MAC address) or dropping packets).

A sample of the Connection Statistics Tab is depicted below.



The screenshot shows a window titled "Current Connections". At the top, there is a status bar with a red circle icon and the text "Connection Status: Error". Below this is a table with the following columns: Source Port, Source Stream, Source Status, Destination Port, Destination Stream, and Dest Status. The table contains three rows of data.

Source Port	Source Stream	Source Status	Destination Port	Destination Stream	Dest Status
IP Input 1	DVO_0	● Error	IP Output 1	Port 1 Stream 1	● OK
IP Input 1	DVO_1	● Error	IP Output 1	Port 1 Stream 2	● OK
IP Input 1	DVO_2	● Error	IP Output 1	Port 1 Stream 3	● OK

Redundancy

The Redundancy Tab provides a unified view of all configured primary/backup pairs, for both Address/Port Redundancy and Connection Redundancy. The following features are available on this tab:

- Display of all primary/backup parameters.
- For each primary/backup pair, indication of which setting is online (active).
- Ability to manually switch the redundancy.

The Configuration and Statistics Redundancy Tabs are depicted below. Note that Address/Port Redundancy and Connection Redundancy have their own individual tabs, both in the Statistics and in the Configuration areas.

The screenshot shows a web interface for configuring redundancy. The main window has tabs for Network, IP Inputs, IP Outputs, Connections, Redundancy, Admin, and Support. The Redundancy tab is selected. On the left, there's a sidebar with tabs for Connections, Redundancy, and Admin. Under Redundancy, there are sub-tabs for Product, Network, IP Inputs, and IP Outputs. The main area shows two tabs: Address:Port Redundancy (selected) and Connection Redundancy. The Address:Port Redundancy tab displays a table with the following data:

Primary Port	Primary Address	Primary Source	Primary State	Backup Port	Backup Address	Backup Source	Backup State	Switch	Manual
1025	10.10.9.24	Any	<input checked="" type="radio"/> A	1027	10.10.9.24	Any	<input type="radio"/> X	5	Switch

As redundant address/port and connection pairs are configured, they automatically appear in the tabs above.

Address/Port Redundancy

A populated Address/Port Redundancy table is depicted below. The only difference between the Configuration and Statistics area is that the former includes a **Switch** button; otherwise they are the same.

Configuration Tab

	Primary	Primary	Primary	Primary	Backup	Backup	Backup	Backup	Switch	Manual
	Port	Address	Source	State	Port	Address	Source	State	Time (sec)	Redundancy
Port 1/1	1024	225.1.1.1	Any	<input checked="" type="radio"/> A	2024	225.10.1.1	Any	<input type="radio"/> X	5	<input type="button" value="Switch"/>
Port 1/2	1025	225.1.1.2	10.10.9.36	<input checked="" type="radio"/> A	1025	225.1.1.2	192.168.1.1	<input type="radio"/> X	0	<input type="button" value="Switch"/>

Statistics Tab

	Primary	Primary	Primary	Primary	Backup	Backup	Backup	Backup	Switch
	Port	Address	Source	State	Port	Address	Source	State	Time (sec)
Port 1/1	1024	225.1.1.1	Any	<input checked="" type="radio"/> A	2024	225.10.1.1	Any	<input type="radio"/> X	5
Port 1/2	1025	225.1.1.2	10.10.9.36	<input checked="" type="radio"/> A	1025	225.1.1.2	192.168.1.1	<input type="radio"/> X	0

The fields in the table are:

- **Primary/Backup Port:** Configured UDP port for primary/backup.
- **Primary/Backup Address:** Configured reception IP address for primary/backup.
- **Primary/Backup Source:** Configured source IP address for primary/backup. If the setting is to receive from any source, this field will contain the word **Any**.
- **Primary/Backup State:** This indicates which setting is online (active) and which setting is offline. The indicator has the following possible values:
 - A** : This indicates that the setting is online (active).
 - X** : This indicates that the setting is offline (inactive).
- **Switch Time (sec):** This indicates the automatic redundancy switch time, in seconds. If manual redundancy is configured, the value displayed here is 0 (zero). In the example above, Port 1/1 is in automatic redundancy with a switch time of 5 seconds, while Port 1/2 is in manual redundancy.
- **Manual Redundancy Switch:** This control is in the configuration tab only. If you click on this button, a manual redundancy switch is initiated. The button is available for both manual and automatic redundancy modes. Note that, if the port is in automatic redundancy mode, and you manually switch it to a stream that is not running, it will switch back to the running stream after the configured switch time.

Connection Redundancy

A populated Address/Port Redundancy table is depicted below. The only difference between the Configuration and Statistics area is that the former includes a **Switch** button; otherwise they are the same.

Configuration Tab

Primary	Primary	Primary	Backup	Backup	Backup	Destination	Destination	Switch	Manual
Source Port	Source Stream	State	Source Port	Source Stream	State	Port	Stream	Time (sec)	Redundancy
IP Input 1	Contribution Feed	<input checked="" type="radio"/> A	IP Input 1	Backup Contribution Feed	<input type="radio"/> X	IP Output 2	QAM Output	0	Switch
IP Input 2	Local Encoder	<input type="radio"/> X	IP Input 1	NBC Feed	<input checked="" type="radio"/> A	IP Output 2	Modulator Output	5	Switch

Statistics Tab

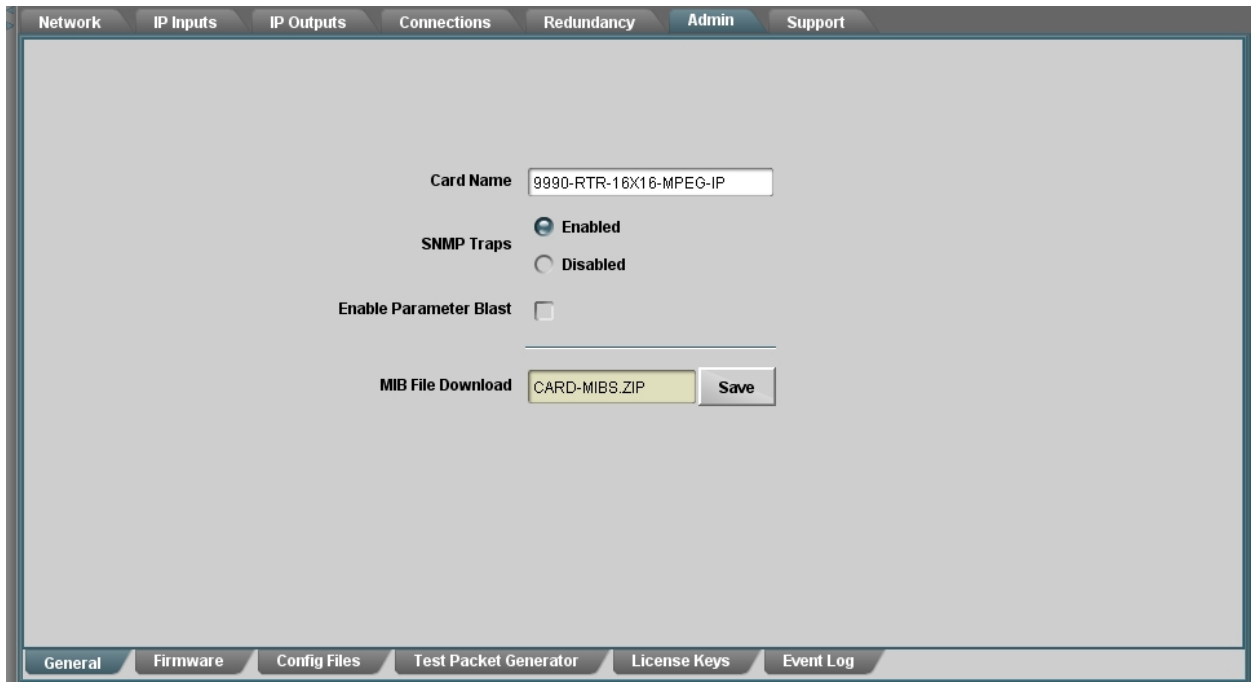
Primary	Primary	Primary	Backup	Backup	Backup	Destination	Destination	Switch
Source Port	Source Stream	State	Source Port	Source Stream	State	Port	Stream	Time (sec)
IP Input 1	Contribution Feed	<input checked="" type="radio"/> A	IP Input 1	Backup Contribution Feed	<input type="radio"/> X	IP Output 2	QAM Output	0
IP Input 2	Local Encoder	<input type="radio"/> X	IP Input 1	NBC Feed	<input checked="" type="radio"/> A	IP Output 2	Modulator Output	5

The fields in the table are:

- **Primary/Backup Source Port/Source Stream:** These fields contain the configured port/stream for the primary and backup connection sources.
- **Primary/Backup State:** This indicates which setting is online (active) and which setting is offline. The indicator has the following possible values:
 - A : This indicates that the setting is online (active).
 - X : This indicates that the setting is offline (inactive).
- **Switch Time (sec):** This indicates the automatic redundancy switch time, in seconds. If manual redundancy is configured, the value displayed here is 0 (zero). In the example above, Port 1/1 is in automatic redundancy with a switch time of 5 seconds, while Port 1/2 is in manual redundancy.
- **Manual Redundancy Switch:** This control is in the configuration tab only. If you click on this button, a manual redundancy switch is initiated. The button is available for both manual and automatic redundancy modes. Note that, if the port is in automatic redundancy mode, and you manually switch it to a stream that is not running, it will switch back to the running stream after the configured switch time.

Admin

The Admin tab contains a number of general administrative functions, each on its own tab. The general layout is shown below:



The Admin tabs are:

- **General:** Manages a number of general device parameters; provides an SNMP MIB download.
- **Firmware:** Manages firmware images.
- **Config Files:** The BBG-1090-RTR has the ability to store multiple configurations, and it has a number of pre-set configurations as well. These are managed in this tab.
- **Test Packet Generator:** Manages the Test Packet Generator.
- **License Keys:** Contains the current licensing state of the BBG-1090-RTR, and allows for new license keys to be entered.
- **Event Log:** The BBG-1090-RTR contains a non-volatile event log. It can be inspected and downloaded from this tab.

Note: Some screen depictions here may show “9990-RTR” as model. This is inconsequential, as both 9990-RTR and BBG-1090-RTR models function identically.

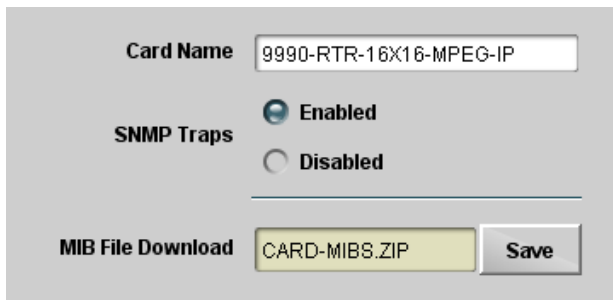
The Admin Statistics tabs are simplified read-only versions of the corresponding Admin Configuration tabs. They will not be explicitly described here.

Admin General Tab

The Admin General Tab includes the following parameters:

- **Card Name:** This field defaults to “BBG-1090-RTR” but can be set to any descriptive name. The name provided here will also appear in the Dashboard™ Tree View.
- **SNMP Traps:** This allows SNMP traps to be enabled or disabled². Note that this setting does not take effect immediately – it will become active the next time the device is rebooted.
- **MIB File Download:** The BBG-1090-RTR provides an up-to-date copy of its MIBs. If you click on the **Save** button, a zip file with the relevant MIBs will be downloaded to your computer. This zip file contains the device MIBs, as well as the Ross Video and openGear MIBs required to compile the device MIBs.

The Admin General Tab is depicted below:



The screenshot shows a configuration panel with three sections. The first section, 'Card Name', has a text input field containing '9990-RTR-16X16-MPEG-IP'. The second section, 'SNMP Traps', has two radio buttons: 'Enabled' (selected) and 'Disabled'. The third section, 'MIB File Download', has a text input field containing 'CARD-MIBS.ZIP' and a 'Save' button.

Admin Firmware Tab

The BBG-1090-RTR can hold up to three distinct firmware images: a **Factory** image, and two upgrade images, called **Image 1** and **Image 2**. The Factory image can never be overwritten, and will always be available as a fall-back in case of problems or failed updates. Image 1 and Image 2 can be updated at will. Since the device offers two upgrade images, it is always possible to fall back to the previous image if there are any problems with the current one. The device will also automatically fall back to the factory image if it detects a corrupted firmware image. Finally, the push buttons on the front of the device allow for a forced override to the factory image.

BBG-1090-RTR firmware is updated in the same fashion as with any standard openGear™ device. Once you obtained the upgrade image from Cobalt Digital Inc., place it anywhere in your computer and click on the Dashboard **Upload** button, as shown below. A dialog box allows you to select the upgrade file. Note that you can simultaneously upgrade all of your BBG-1090-RTR devices over multiple chassis if you wish. For more detail, consult the **Dashboard User Manual**, chapter 6, section **Upgrading Device Software**. The Dashboard manual can be downloaded from:

² SNMP is an optional feature in the openGear™ frame controller. The BBG-1090-RTR SNMP functions are only available if SNMP is licensed in the frame controller.

<http://www.opengear.tv/n/?p=94>

Note that uploading firmware to the BBG-1090-RTR does not affect its operation in any way and does not introduce any glitches in the inputs/outputs.

The fields in the Firmware Image Management tab are:

- **Factory Image, Image 1, and Image 2:** These contain version and release date information for the corresponding firmware images. If no image is present, this field will indicate **No Image**.
- **Upload Location:** This field contains the location where the image upload will go. The BBG-1090-RTR automatically chooses a location that will not overwrite the currently running image.
- **Boot Location:** This field indicates which image will be used in the next boot. If an image is successfully uploaded through Dashboard, this automatically changes to point to that image. It can also be manually changed.
- **Auto-Reboot After Update:** This field controls whether or not the BBG-1090-RTR will automatically reboot after a successful firmware upload through Dashboard. By default, the BBG-1090-RTR will **not** reboot after an update. You can upload the firmware at any time, and reboot later during a maintenance window.

Admin Config Files Tab

As you make configuration changes to the BBG-1090-RTR, they are automatically persisted in non-volatile storage. If the device is rebooted or power-cycled, it will come back in the same configuration.

In addition to automatic configuration persistency, the BBG-1090-RTR also offers the ability to save up to 5 complete configurations, load them, and even export them. This can be used to quickly configure it for different scenarios, or for saving configuration “checkpoints” as a complex configuration is built. Since configurations can be exported, they can be archived outside the device as well.

The layout of the Admin Config Files tab is shown below.

Configuration Management						
Config	Status	Name	Config	Config	Config	Download Config
1	Saved	Monitor 1	Load	Delete	Save	Slot 4 9990-RTR-16X16-MPEG-IP Config 1.ogd Save
2	Empty		Load	Delete	Save	Slot 4 9990-RTR-16X16-MPEG-IP Config 2.ogd Save
3	Empty		Load	Delete	Save	Slot 4 9990-RTR-16X16-MPEG-IP Config 3.ogd Save
4	Empty		Load	Delete	Save	Slot 4 9990-RTR-16X16-MPEG-IP Config 4.ogd Save
5	Saved	Bring-Up	Load	Delete	Save	Slot 4 9990-RTR-16X16-MPEG-IP Config 5.ogd Save

Saved configuration 1

Clear Current Configuration

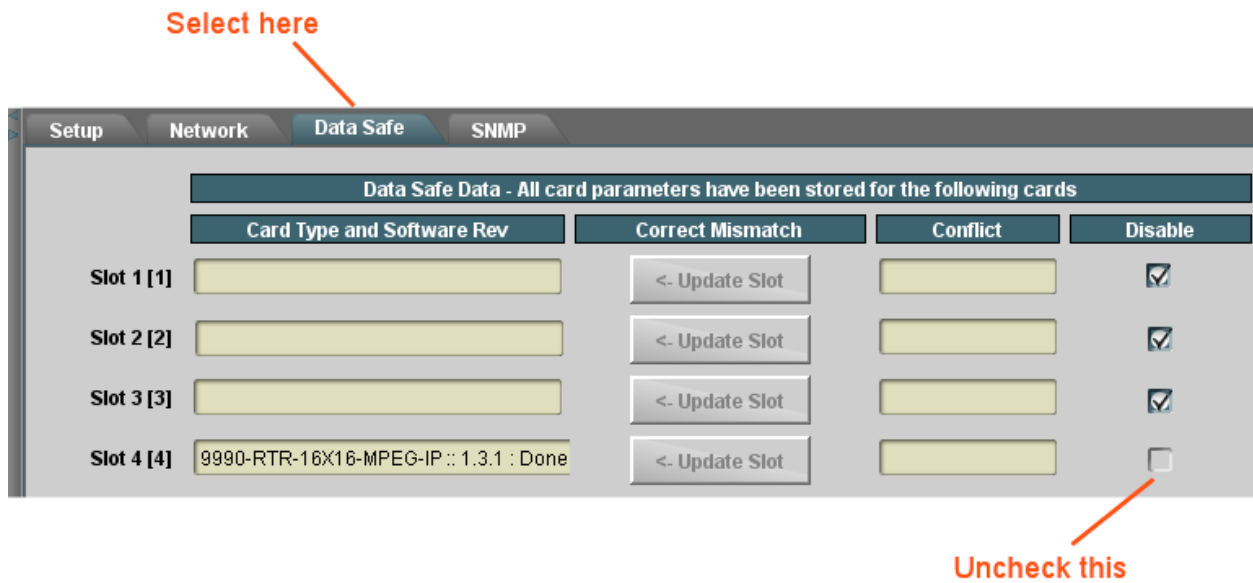
User-Saved Configurations

The fields in the user-saved configuration are:

- **Status:** This indicates whether there is a saved configuration on that particular slot. It will contain the words **Saved** or **Empty**.
- **Name:** This is an optional name for the configuration. It is not required but highly advisable. The name can be edited at any time (even when there is no saved configuration).
- **Config Load Button:** If you click on this button, the corresponding configuration is loaded in the BBG-1090-RTR device. It will replace the currently-running configuration. Dashboard™ will take a few seconds to reload (longer if you are accessing over a wide-area network), but the actual configuration in the BBG-1090-RTR is virtually instantaneous. The Status Message Area will indicate the result of the operation.
- **Config Delete Button:** If you click on this button, the corresponding configuration and its description are deleted.
- **Config Save Button:** If you click on this button, the current device configuration is saved on the corresponding slot, possibly replacing the configuration saved there if it is not empty.
- **Download Config:** If you click on the **Save** button, the corresponding file is downloaded to your computer. This feature is provided to allow configuration backups.

If you save a configuration to your computer, and later wish to restore it to the BBG-1090-RTR, use the following procedure:

1. On Dashboard™, open the user interface for the frame controller (slot 0).
2. Select the **Data Safe** tab in the configuration area.
3. Uncheck the **Disable** checkbox corresponding to the card you wish to restore the configuration. This step is depicted below.



4. On the Dashboard™ Tree View, right-click on the device, and select **Restore Configuration**. Follow the prompts and navigate to the file you wish to restore.

This process is discussed in further detail in the **Dashboard User Manual**, chapter 5, section **Restoring Configurations to Devices**.

Clear Current Configuration Button

The **Clear Current Configuration** button clears all the configured ports and streams as follows:

- All IP Inputs are deleted.
- All IP Outputs are deleted.
- All Connections are removed.
- The Test Packet Generator is disabled.

The button does not affect the following areas:

- The settings in the **Network** tab are not changed.
- The settings in the **Admin General** tab are not changed.
- Saved configurations are not modified in any way.

Dashboard™ will take a few seconds to reload (longer if you are accessing over a wide-area network), but the actual configuration in the BBG-1090-RTR is virtually instantaneous. The Status Message Area will indicate the result of the operation.

Admin Test Packet Generator Tab

The BBG-1090-RTR includes a Test Packet Generator (TPG) that is capable of generating a configurable constant bit rate sequence of MPEG-2 Transport Packets with very strict timing. The TPG is considered an input port, and is available to be connected to any output port. As

with any input in the BBG-1090-RTR, it supports up to 8 connections. The user interface for the TPG is depicted below:

The screenshot shows the 'Test Packet Generator' GUI. It is divided into two main sections: 'Current Configuration' and 'Modify Configuration'.
In the 'Current Configuration' section, there are three yellow input fields:

- Mode:** Ramp48 Packets
- PID (hex):** 100
- Bit Rate (bps):** 15,000,000

In the 'Modify Configuration' section, there are radio buttons for the Mode, followed by two input fields:

- Mode:** Disabled, NULL Packets, Ramp48 Packets (selected), PCR Packets
- PID (hex):** 100
- Bit Rate (bps):** 15000000

At the bottom of the 'Modify Configuration' section is an 'Apply Settings' button.

To configure the TPG, make your selections in the **Modify Configuration** area of the GUI, and click on **Apply Settings**. The TPG configuration parameters are:

- **Mode:** controls the type of MPEG-2 transport packets generated. The options are:
 - **Disabled:** TPG is disabled. No packets are being generated.
 - **NULL Packets:** TPG is generating NULL packets. If you select this option, the **PID** parameter becomes read-only with the value 1FFF.
 - **Ramp48 Packets:** TPG is generating packets with a “Ramp48 Payload”. A “Ramp48 Payload” is composed of the bytes 0x48, 0x49, 0x4A, ..., 0xFF. Generated packets have the Payload bit set, no Adaptation Field, and a valid Continuity Counter field. On request, Cobalt Digital Inc. can supply a test program for Windows or Linux that receives the Ramp48 packets and checks them.
 - **PCR Packets:** TPG is generating packets with a valid PCR field (stamped corresponding to the packet’s departure time at the configured bit rate). The packets have a small payload with random data, so the Continuity Counter field is valid and counting.
- **PID (hex):** controls the PID of the generated packets. This is specified in hexadecimal.
- **Bit Rate (bps):** controls the bit rate of the generated packets. The minimum value is 64,000 bps and the maximum value is 213,000,000 bps.

Admin License Keys Tab

The BBG-1090-RTR has a number of optional licensable features. The Admin License Keys Tab is used to manage these features. Using this tab, you can see how many licenses you have for each optional feature, and how many you are currently using.

The BBG-1090-RTR has the concept of a temporary license. If you want to try out a certain feature, contact Cobalt Digital Inc. You will receive a license key that enables that feature for a specific period of running time (license time does not “count” when the device is off).

The Admin License Keys Tab includes a License Status table, and a configuration area, as shown below. The table rows are license counts, and the columns correspond to different licensable features. The rows are:

- **Permanent Licenses:** This is the number of non-expiring licenses for each feature.
- **Temporary Licenses:** This is the number of temporary licenses for each feature. Once the license period expires, they are removed.
- **Total Licenses:** This is the total number of licenses for each feature. It is simply the sum of the permanent and temporary licenses.
- **Used Licenses:** This is the number of licenses in use for each feature by the current device configuration.

If you have temporary licenses, the **Time Remaining** field indicates how long until they expire. If you do not have temporary licenses, this field has the message “No active temporary licenses”.

The table columns correspond to the licensable features, as follows:

- **Enable GE2:** This field will have **1** if Ethernet Port 2 is licensed or in use.
- **TS Outputs:** This column provides a count of transport stream outputs licensed and in use. The BBG-1090-RTR always includes a license for 16 transport stream outputs.
- **IP Inputs:** The BBG-1090-RTR requires one license per IP input. The 8X16 model includes 8 input licenses, and the 16X16 model includes 16 input licenses. It is possible to convert an 8X16 model to a 16X16 model using a license key.

	License Status		
Feature	Enable GE2	TS Outputs	IP Inputs
Permanent Licenses	1	16	16
Temporary Licenses	1	0	0
Total Licenses	1	16	16
Used Licenses	1	10	3
Time Remaining	2 days, 3 hours		
	License Key Installed OK		
License Key	<input type="text"/>		
	<input type="button" value="Apply License Key"/>		
Serial Number	ac23f0000100		

If you want to request a license key from Cobalt Digital Inc., you will need to provide the device serial number. It can be found in the Product Tab and in the Admin License Key Tab as well. Once you receive the key from Cobalt Digital Inc., enter it in the **License Key** field shown above, and click on the **Apply License Key** button. If the key is accepted, you will see the message *License Key Installed OK*, as illustrated above. If there are any problems, you will see an error message in the same location. The following are the possible error messages:

- **Invalid key: missing characters:** the key you entered is too short. Double-check that you entered all the characters.
- **Invalid/Corrupted Key:** the key you entered has the correct number of characters, but it is invalid. Double check what you entered.
- **Serial number mismatch: this key is for serial xxxxxxxxxxxx:** BBG-1090-RTR license keys are specific to a device. You entered a valid license key, but it is intended for a different device, whose serial number is displayed in the message. You must use this key on the correct device.
- **This key has already been applied:** License keys can only be applied once. This is a valid key for this device, but you have already applied it, and its features are already available.

Admin Event Log Tab

The BBG-1090-RTR includes an Event Log in non-volatile storage. This event log can be used for fault-finding, and to check for error conditions. The following information is included in each BBG-1090-RTR event in the log:

- **Date:** The calendar date in which the event occurred.
- **Time:** The time at which the event occurred.
- **Severity:** The severity of the event. The BBG-1090-RTR defines three severity levels:

- **Error:** These are events that affect the operation of the device. For example, an IP Input no longer receiving packets. An error will impact service until addressed.
- **Warning:** These are events that may produce visible glitches, but they do not have a continuous service impact. Examples of warnings are automatic redundancy switches and ARP renewal failures.
- **Info:** These are informational events. All configuration actions are logged with this severity. When an error is cleared, the event is logged with this severity as well.
- **Subsystem:** The subsystem affected by the event. This may be a port, a stream, or the device itself.
- **Event:** This is a textual description of the event.

The BBG-1090-RTR does not have a battery-backed real-time clock. It depends on an external Network Time Protocol (NTP) server to obtain current date and time. By default, the BBG-1090-RTR will initialize its internal time-of-day clock to January 1, 2010, GMT.

The NTP server IP address can be entered in the Control Tab.

If your device has access to the Internet, you can point it to one of the public NTP servers for your region. You can find more details on this link:

<http://psp2.ntp.org/bin/view/Servers/WebHome>

The full Admin Event Log tab is displayed below:

The screenshot shows the 'Event Log' interface. At the top, there is a 'Log Download' section with a text input field containing '9990-RTR-16X16-MPEG-IP Slot 4 Log.csv' and a 'Save' button. Below this is the 'Log View' section with radio buttons for 'All', 'Error', 'Warning', and 'Info', where 'All' is selected. The main area is a table titled 'Event Log' with the following columns: Date, Time, Severity, Subsystem, and Event. The table contains 11 rows of event data. At the bottom of the interface, there is a 'Time Zone' dropdown menu set to 'GMT-7', a 'Current Time' display showing 'Mon Jan 15 15:05 2018', a 'Clear Log Display' button, and a 'Note' stating 'Time starts at 01/01/2010, 00:00 GMT, unless adjusted by NTP'.

Date	Time	Severity	Subsystem	Event
01/15/18	14:42:17	Info	System	No reception on primary and backup settings - further flip logs suppressed
01/15/18	14:10:28	Error	IP In 1/2	Automatic Redundancy Flip
01/15/18	14:10:28	Warning	IP In 1/2	Automatic Redundancy Flip
01/15/18	14:10:22	Warning	IP In 1/2	Automatic Redundancy Flip
01/15/18	14:10:17	Warning	IP In 1/2	Port OK
01/15/18	14:10:13	Info	IP Out 2/2	Port OK
01/15/18	14:10:13	Info	IP Out 2/1	Port OK
01/15/18	14:10:13	Info	IP Out 1/8	Port OK
01/15/18	14:10:13	Info	IP Out 1/7	Port OK
01/15/18	14:10:13	Info	IP Out 1/6	Port OK

The fields are:

- **Log Download:** The user interface only displays the last 10 events of each type. If you would like to see the whole event log, it can be downloaded to your computer by clicking on the **Save** button. The log will be in CSV format, and it can be opened by any utility that can read text files; ideally, you should use a spreadsheet program such as Microsoft Excel or similar so it is presented in tabular format. The log will be in chronological order, oldest entry to newest.
- **Log View:** The user interface can display the last 10 events. You can choose to see the last 10 events of any kind by selecting **All**, or you can restrict the view only to **Info**, **Warning**, or **Error**.
- **Event Log:** This table presents the last 10 events of the selected type.
- **Time Zone:** To simplify the correlation of the events with your local time, you can set your time zone using this drop-down menu. Note that the BBG-1090-RTR presents a simplified list, with standard GMT offsets. Note that standard GMT offsets do not change back and forth with Daylight Savings; you will need to make this adjustment manually if it is relevant to you.
- **Current Time:** This field indicates the BBG-1090-RTR view of what the current date and time is. If your device is not NTP-synchronized, this is useful to figure out “how long ago did this event happen”.
- **Clear Log Display:** If you click on this button, it clears all log views. This is useful to quickly identify any new events after the unit has been set up. Note that this action does not clear the logs stored in non-volatile memory.

The BBG-1090-RTR will store up to about 400 kBytes of logs in non-volatile memory. When that limit is reached, the oldest half of the stored logs will be deleted to make space for new logs.

Control Tab

The Control Tab is used to configure the management Ethernet ports in the BBG-1090-RTR. This includes both the IP information, as well as the SNMP parameters.

The BBG-1090-RTR has two physical management (control) Ethernet ports. However, from a logical standpoint, they are a single port with a single IP address; the two connections are provided for control redundancy. If one port loses link, the unit can still be controlled from the other. If you do not need control redundancy, you can leave one of the ports disconnected. The unit will automatically and dynamically select the control port as follows:

- If only one port has link, that port will be used for control.
- If both ports have link, but at different speeds, the port with the highest speed will be used for control.
- If both ports have link at the same speed, Port 1 will be used for control.

Both ports support operation at 10, 100 and 1000 Mb/s, both half-duplex and full-duplex, with auto-negotiation and auto-crossover detection.

The Control Tab has two bottom tabs:

- **Control Port** is used to configure the IP parameters of the control port.
- **SNMP** is used to configure the SNMP parameters for the unit.

Control Port Configuration Tab

The control configuration window is depicted below:

The screenshot shows a configuration window titled "Control Interface Configuration". At the top, there is a "Device Name" field containing "Standalone Gateway". Below this is a section for "IP Configuration" with two radio buttons: "Static IP" (which is selected) and "DHCP". Underneath, there are four text input fields: "IP Address" with the value "192.168.129.71", "Subnet Mask" with "255.255.255.0", "Default Gateway" with "192.168.129.1", and "NTP Server" with "192.168.129.10". At the bottom of the window are two buttons: "Apply" and "Cancel".

The configuration parameters are:

- **Device Name:** This field controls the top-level name of the device in the Dashboard tree. It defaults to “Standalone Gateway”. Changes to this field take effect immediately.
- **IP Configuration:** This field selects the control port IP configuration mode, as follows:
 - **Static IP:** This option selects a static IP address, specified by the IP Address, Subnet Mask, and Default Gateway fields.
 - **DHCP:** This option selects control port IP address configuration by DHCP. If this option is selected, the IP Address, Subnet Mask and Default Gateway fields are not shown.
- **IP Address:** This field is only shown if **IP Configuration** is set to **Static IP**. Enter the desired control port IP address. You cannot set this IP address to the same value as the Ethernet1/Ethernet2 IP addresses (see the Network Configuration Tab section earlier in this document).
- **Subnet Mask:** This field is only shown if **IP Configuration** is set to **Static IP**. Enter the desired control port subnet mask.

- **Default Gateway:** This field is only shown if **IP Configuration** is set to **Static IP**. Enter the desired control port default gateway.
- **NTP Server:** If you want the unit to be NTP-synchronized (for logging purposes), enter the IP address of an accessible NTP server in this field. If you do not need NTP, you can leave this field at 0.0.0.0. If your BBG-1090-RTR has access to the Internet through the control port, you can point it to one of the public NTP servers for your region. You can find more details on this link:

<http://psp2.ntp.org/bin/view/Servers/WebHome>

- **Apply/Cancel:** Use these buttons to apply or cancel the changes to the control port IP configuration. Note that if you change the IP address, DashBoard may lose contact with the BBG-1090-RTR. The IP Address, Subnet Mask and Default Gateway entries will be checked for consistency and will be rejected if invalid.

Control Port Statistics Tab

The Control Port statistics screen is depicted below. It contains the current settings for the control port. If you have configured the unit for DHCP, it will include the current IP Address, Subnet Mask and Default Gateway obtained from the DHCP server. It also includes the link state for the individual control Ethernet ports.

Device Name	Standalone Gateway
Control Interface Configuration	
IP Configuration	Static IP
IP Address	192.168.129.71
Subnet Mask	255.255.255.0
Default Gateway	192.168.129.1
NTP Server	192.168.129.10
Control 1 Link	● Link OK
Control 1 Speed	100 Mb/s Full Duplex
Control 2 Link	● Link OK
Control 2 Speed	100 Mb/s Full Duplex

SNMP Configuration Tab

The BBG-1090-RTR includes a built-in SNMP agent with support for SNMP V1 and V2C. It will respond to SNMP transactions only on the control port, for security reasons. This tab includes the parameters for the SNMP configuration. Changes to these parameters take effect immediately.

SNMP Configuration	
Read Community	public
Write Community	private
System Contact	Contact Not Set
System Location	Location Not Set
Trap Destinations	
Trap Destination 1	0.0.0.0
Trap Destination 2	0.0.0.0
Trap Destination 3	0.0.0.0
Trap Destination 4	0.0.0.0
Trap Destination 5	0.0.0.0

The SNMP parameters are as follows:

- **Read Community:** this is the SNMP Read-Only community string.
- **Write Community:** this is the SNMP Read-Write community string.
- **System Contact:** this configures the value for the MIB-II System variable System Contact. Whatever value entered here is returned for SNMP queries to that variable.
- **System Location:** this configures the value for the MIB-II System variable System Location. Whatever value entered here is returned for SNMP queries to that variable.
- **Trap Destinations:** the BBG-1090-RTR supports up to 5 trap destinations. Enter the desired IP addresses here. Note that the BBG-1090-RTR will only generate SNMP V2C traps.

SNMP Statistics Tab

The SNMP statistics tab displays the current SNMP configuration.

SNMP Configuration	
Read Community	public
Write Community	private
System Contact	Contact Not Set
System Location	Location Not Set
Trap Destinations	
Trap Destination 1	0.0.0.0
Trap Destination 2	0.0.0.0
Trap Destination 3	0.0.0.0
Trap Destination 4	0.0.0.0
Trap Destination 5	0.0.0.0

Warranty and Repair Policy

Cobalt Digital Inc. Limited Warranty

This product is warranted to be free from defects in material and workmanship for a period of five (5) years from the date of shipment to the original purchaser, except that 4000, 5000, 6000, 8000 series power supplies, and Dolby® modules (where applicable) are warranted to be free from defects in material and workmanship for a period of one (1) year.

Cobalt Digital Inc.'s ("Cobalt") sole obligation under this warranty shall be limited to, at its option, (i) the repair or (ii) replacement of the product, and the determination of whether a defect is covered under this limited warranty shall be made at the sole discretion of Cobalt.

This limited warranty applies only to the original end-purchaser of the product, and is not assignable or transferrable therefrom. This warranty is limited to defects in material and workmanship, and shall not apply to acts of God, accidents, or negligence on behalf of the purchaser, and shall be voided upon the misuse, abuse, alteration, or modification of the product. Only Cobalt authorized factory representatives are authorized to make repairs to the product, and any unauthorized attempt to repair this product shall immediately void the warranty. Please contact Cobalt Technical Support for more information.

To facilitate the resolution of warranty related issues, Cobalt recommends registering the product by completing and returning a product registration form. In the event of a warrantable defect, the purchaser shall notify Cobalt with a description of the problem, and Cobalt shall provide the purchaser with a Return Material Authorization ("RMA"). For return, defective products should be double boxed, and sufficiently protected, in the original packaging, or equivalent, and shipped to the Cobalt Factory Service Center, postage prepaid and insured for the purchase price. The purchaser should include the RMA number, description of the problem encountered, date purchased, name of dealer purchased from, and serial number with the shipment.

Cobalt Digital Inc. Factory Service Center

2506 Galen Drive

Champaign, IL 61821 USA

www.cobaltdigital.com

Office: (217) 344-1243

Fax: (217) 344-1245

Email: info@cobaltdigital.com

THIS LIMITED WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON COBALT'S PART. ANY SOFTWARE PROVIDED WITH, OR FOR USE WITH, THE PRODUCT IS PROVIDED "AS IS." THE BUYER OF THE PRODUCT ACKNOWLEDGES THAT NO OTHER REPRESENTATIONS WERE MADE OR RELIED UPON WITH RESPECT TO THE QUALITY AND FUNCTION OF THE GOODS HEREIN SOLD. COBALT PRODUCTS ARE NOT AUTHORIZED FOR USE IN LIFE SUPPORT APPLICATIONS.

COBALT'S LIABILITY, WHETHER IN CONTRACT, TORT, WARRANTY, OR OTHERWISE, IS LIMITED TO THE REPAIR OR REPLACEMENT, AT ITS OPTION, OF ANY DEFECTIVE PRODUCT, AND SHALL IN NO EVENT INCLUDE SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS), EVEN IF IT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Contact Us

Contact Cobalt Digital Inc.

PHONE	General Business Office and Technical Support	217.344.1243
	Fax	217.344.1245
E-MAIL	General Information	Info@cobaltdigital.com
	Sales Information	Sales@cobaltdigital.com
POSTAL SERVICE	Cobalt Digital Inc.	2506 Galen Drive
		Champaign, IL 61821 USA

Visit us at the Cobalt Digital Inc. website.

<http://www.cobaltdigital.com/>

- Online catalog
- Related products and full product lines
- Trade show information
- Dealer information
- Cobalt Digital Inc. news