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# Real Freedom

## Receiver

### Product Manual

[Comments]

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Manual part number: 20001-1-004





[Comments]

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This manual contains important information regarding the installation and operation of the Real Freedom Receiver. For safe and reliable operation, installers must ensure that they are familiar with, and fully understand, all instructions contained herein. Broadcast Sports International reserves the right to revise and improve its products as it sees fit. This publication describes the state of this product at the time of publication and may not always reflect the product in the future.

In this manual, the following symbols call your attention to important information:

	<b>CAUTION</b> Indicates that care is required when proceeding to avoid damage to the system.
	<b>NOTE</b> Used to draw your attention to additional important information.
	<b>TIP</b> Indicates information that may make procedures easier.
	<b>WARNING</b> Indicates a potentially hazardous situation.

### Warranty information

All products are warranted to be free from defects in materials or workmanship for a period of 24 months. If returned within the applicable warranty period, BSI will, at its sole discretion and at no cost to the customer, repair or replace the defective product with another unit of the same or equivalent model. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alterations or repairs.

### Contact details and technical support

Real Freedom Team	For product information and help with missing or damaged items. Email: <a href="mailto:EngineeringDepartment@BSINTL.COM">EngineeringDepartment@BSINTL.COM</a> Tel: +1-410-564-2642
Telephone Support Line	Product technical support is provided via a telephone support line. Trained technicians are available to offer setup and configuration advice and to assist in troubleshooting technical issues. Tel: +44 (0)1923 810131
Return Merchandise Authorization (RMA) Procedure	Problems that cannot be resolved on the telephone may require the device to be returned to BSI for repair. In such cases, the telephone operator will assist the customer in obtaining an RMA. Please note that no returns can be accepted without a valid RMA.

## Hazard warning labels

The following hazard warning labels are fixed to the Real Freedom Receiver for your information and safety.



## About this manual

This manual contains safety information and information for installing, configuring, and operating a Real Freedom Receiver.

It applies to the following products:

- IRX-3811: Real Freedom Receiver
- IRX-3812: Real Freedom Receiver

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The Real Freedom wireless camera system is designed to provide an end-to-end wireless video and audio link for professional television broadcast applications. The system comprises a camera back transmitter, a receiver unit and up to eight downconverters (receive antennas) with integrated camera control data.

## Overview

The Real Freedom Receiver, which forms the heart of the system, is a next generation Integrated Receiver Decoder (IRD) comprising up to eight UHF inputs, DVB-T and T2 demodulators, and both MPEG-2 and H.264 video decoders. The UHF inputs can be connected to a variety of Real Freedom Downconverters, providing wireless receive in a selection of frequency bands. The internal video decoders provide ultra low latency performance and, when used in conjunction with a Real Freedom Transmitter, can achieve one frame end to end delay or two frames when using receiver frame sync.

Eight RF inputs allow for diversity reception from four independent locations and decoding of a single video stream. The receiver also supports demodulation of dual pedestal RF signals, either as a single or dual video stream. In dual stream mode, you can select which stream is presented to the decoder, while the other stream can be passed to the ASI output for decoding elsewhere.

Designed with the hire customer in mind, the receiver features a simple interface with easy adjustment of the main system parameters. A 5-inch color panel displays the video and shows a Connection Map, audio peak meters and other key parameters when required. An integrated camera control feature allows you to configure the data transmitters and fine-tune the image remotely without using any additional cables.

Unique to the industry, the receiver also includes full camera control capability out of the box. A third-party camera Operator Control Panel/Remote Control Panel (OCP/RCP) can be connected to the receiver over Ethernet. Connecting a Real Freedom Data Transmitter to one of the system's downconverters provides a UHF back channel to the mobile camera and provides full remote control of the camera transmitter and the camera paint functions.

## System architecture

The receiver's main function is to demodulate and decode the video signal received from the camera back transmitter. The 5-inch color panel in the front of the receiver displays the decoded video providing a live preview and facilitating further control of configuration parameters, as required. Multiple receivers can be networked together enabling them to share a single data transmitter and single data channel for up to six networked RCPs.

The following schematic shows the connections between the various components in the system, the flow of control data from the control panel to the camera via the receiver, and the flow of video and audio from the camera to the receiver.

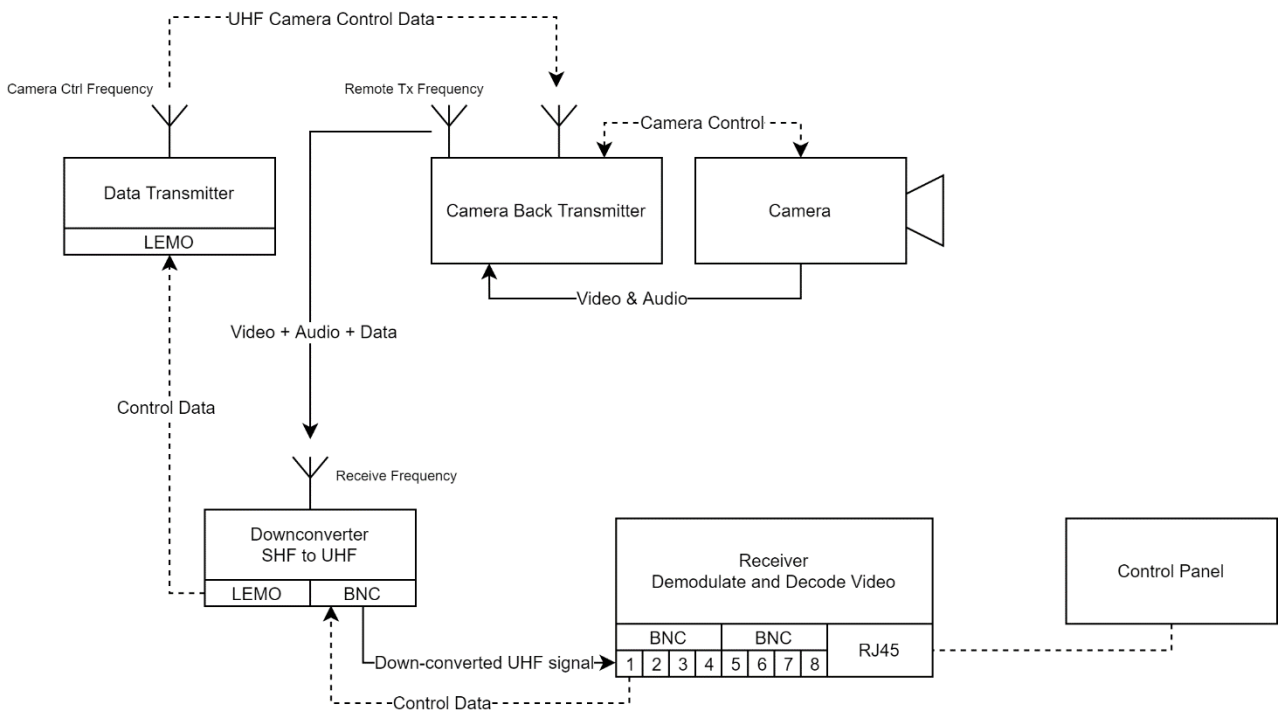


Figure 1: Connections and data flow

## Configuration examples

### Example 1

This example shows a simple configuration with eight downconverters connected to a single receiver.

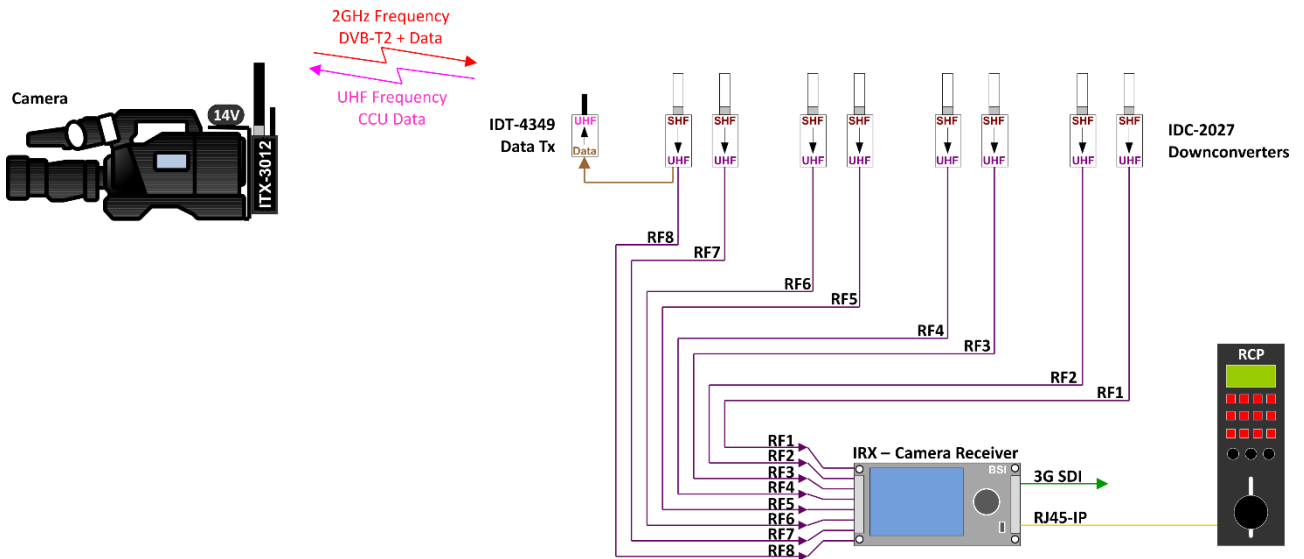


Figure 2: The data transmitter receives camera control data from an RCP via the Real Freedom Receiver and transmits a GMSK-modulated narrow band UHF signal of between 430 MHz and 490 MHz. For maximum flexibility, plug the data transmitter into any downconverter.



### Example 2

This example shows networked camera control of six cameras over one UHF frequency.

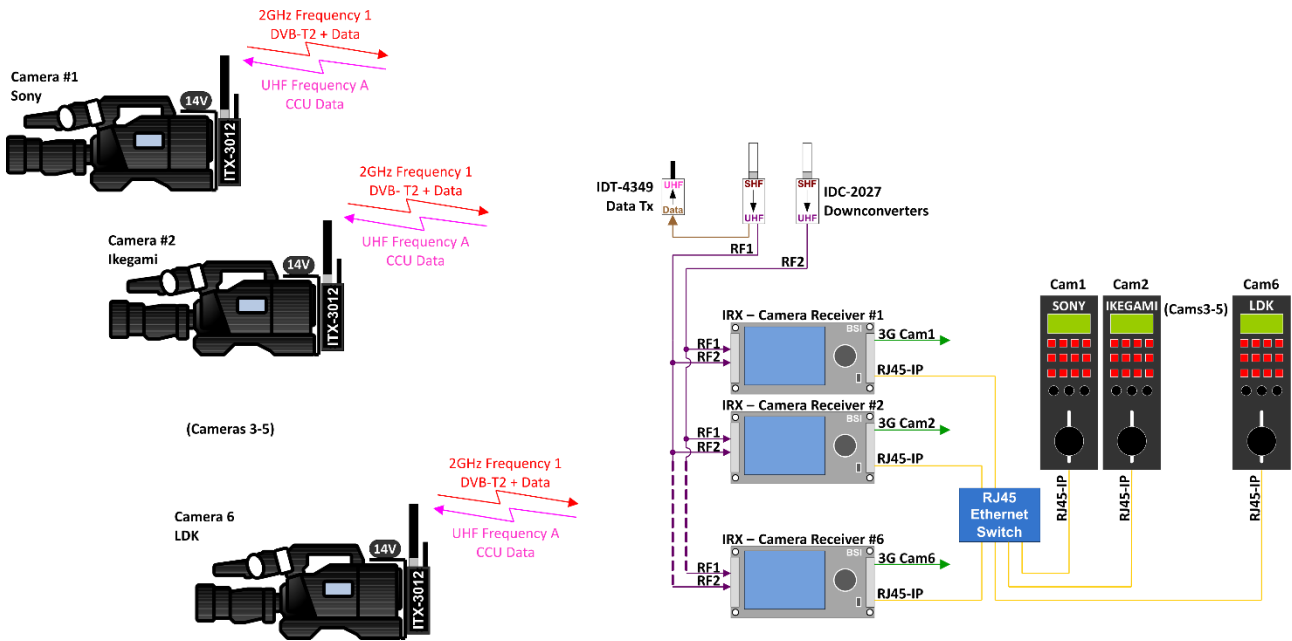


Figure 3: Networked camera control over one UHF frequency.

### Example 3

This example shows multiple RF cameras incorporating camera control deployed from a single remote site utilizing a single SMPTE hybrid fiber cable. The cable simultaneously powers remote Real Freedom Downconverters and Data Transmitters.

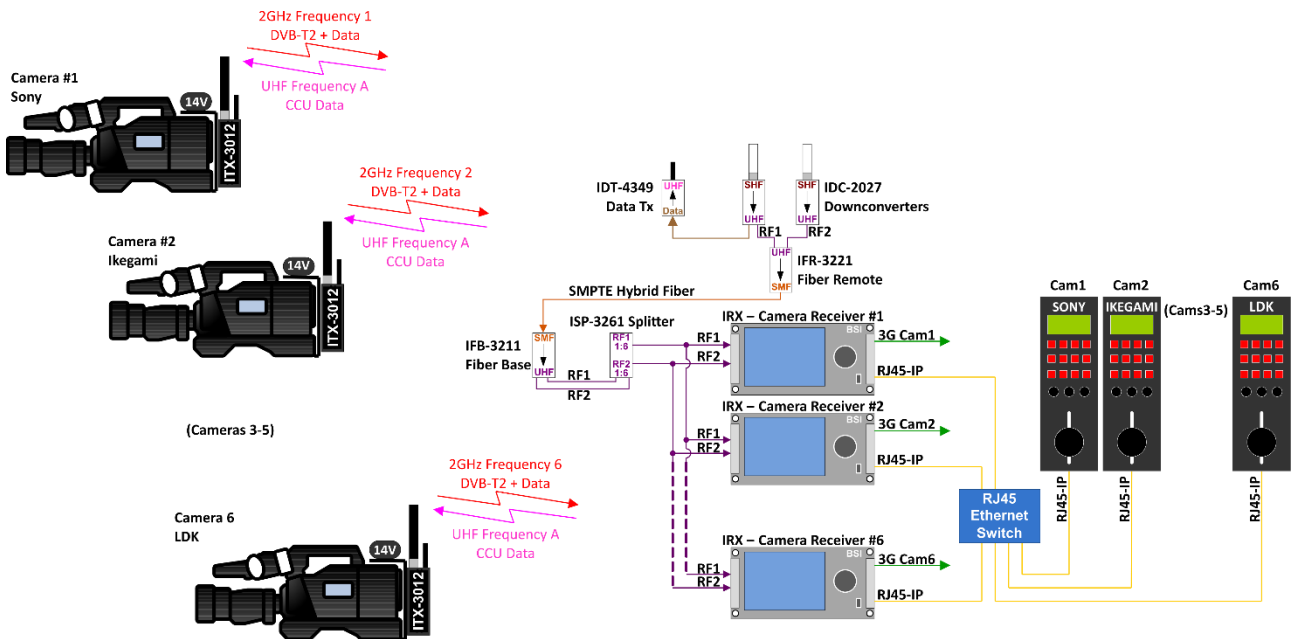


Figure 4: Networked multi camera reception with fiber antenna extender and active splitter. Up to six Real Freedom Receivers can be simultaneously supported by a single fiber base unit when utilized with the optional Real Freedom Active UHF Splitter.

## Location and functions of parts

This chapter provides an overview of the components and connectors on the front and rear panels of the Real Freedom Receiver.

You should familiarize yourself with this information before installing and operating the receiver.

### Receiver front panel

The front panel of the receiver provides an LCD display to view live video and display configuration options, a control pad and USB port.

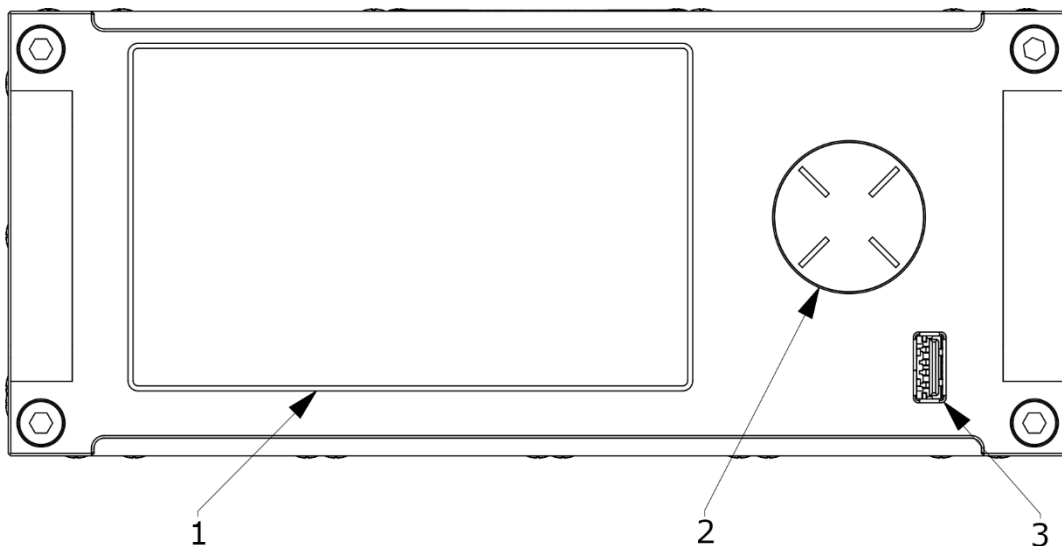


Figure 5: Receiver front panel

Key	Component	Description
1	LCD display	Provides a user interface to configure and control the Real Freedom system and allows you to view live video and monitor the status of the system.
2	Control pad	Used in conjunction with the user interface. Use the control pad to configure and control the Real Freedom system.
3	USB port	Accepts a standard USB memory stick to allow firmware update of the receiver. You can also use the USB port to connect BSI accessories, for example, an additional GMSK modem.

## Receiver rear panel

The rear panel of the receiver provides access to the RF inputs, video and audio ports, camera control and power connections.

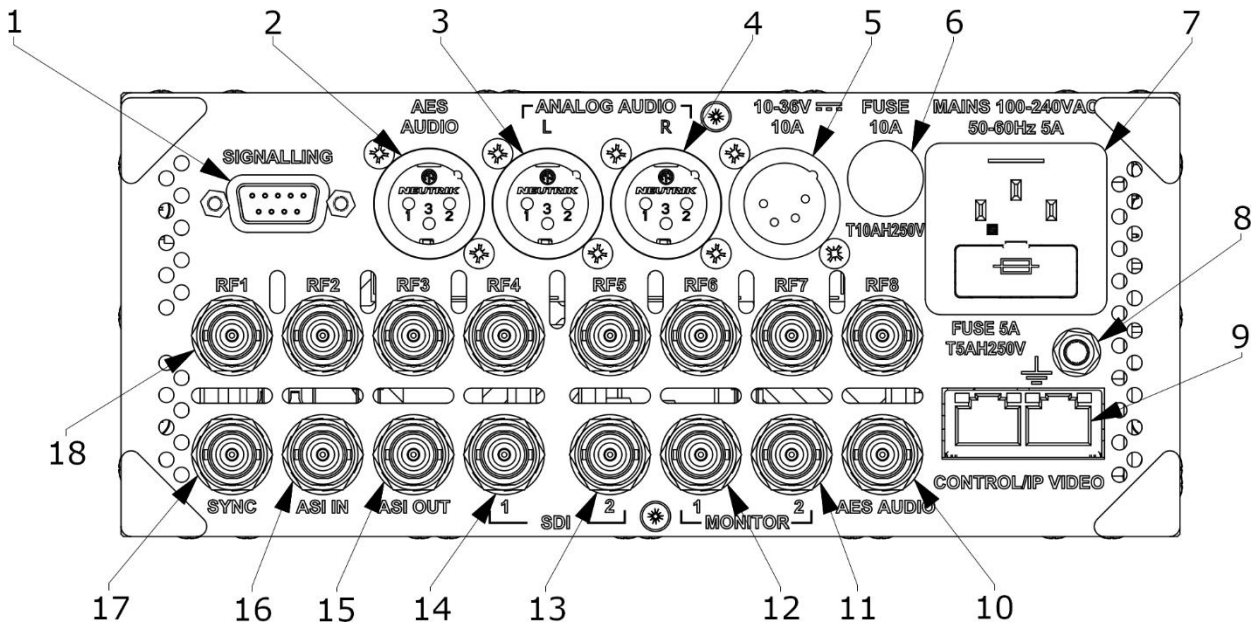


Figure 6: Receiver rear panel

Key	Component	Description
1	SIGNALLING	Provides RS232 control, dry red and green tally closure, and auxiliary controls to client equipment via a DB9 connector. Also allows the connection of BSI accessories, for example, a PTRZ joystick. Connector: 9-pin D-sub (F)
2	AES AUDIO	Provides balanced mono audio output, which is less susceptible to noise and interference. Note that balanced AES has a shorter transmission distance (up to 150 m) than the unbalanced version over coaxial cable. Connector: 3-pin XLR (M)
3	ANALOG AUDIO (L)	Provides analog stereo audio output to client-supplied equipment. Connector: 3-pin XLR (M)
4	ANALOG AUDIO (R)	
5	10-36V 10 A	Use to connect the receiver to a DC power source. Connector: 4-pin XLR (M)
6	FUSE 10A T10AH250V	Fuse for the DC power supply system.
7	MAINS 100-240VAC 50-60Hz 5A FUSE 5A T5AH250V	Use to connect the receiver to an AC power supply. Connector: IEC Fuse for the AC power supply system.
8	Earth stud	Use to connect the receiver to the equipment rack or some other kind of electrical ground.
9	CONTROL/IP VIDEO	Camera control. Use to connect the receiver to a camera control panel either directly or via a network switch. Or use to stream or receive IP video through an Ethernet network connection. Connector: RJ45

Key	Component	Description
10	AES AUDIO	Provides unbalanced audio output using a coaxial cable. Note that unbalanced coaxial cable is better for long distances than balanced twisted-pair cable. Connector: BNC (F)
11	MONITOR 2	Video outputs. Duplicate video outputs with overlaid status information. Connector: BNC (F)
12	MONITOR 1	
13	SDI 2	SDI video outputs. Clean video outputs for production use. Connector: BNC (F)
14	SDI 1	
15	ASI OUT	ASI (compressed video) output. Connector: BNC (F)
16	ASI IN	ASI (compressed video) input. Connector: BNC (F)
17	SYNC	Provides a connection to a client-supplied B&B or tri-level signal used to synchronize the video image. Connector: BNC (F)
18	RF1–RF8	RF input ports. The Real Freedom Receiver is available with up to eight RF input ports. Each port can be connected to a Real Freedom Downconverter using a standard coaxial cable. Downconverters are available in a variety of frequency bands. Choose the downconverters to match the frequency of the transmitter. Connector: BNC (F)

This chapter contains the installation instructions for the Real Freedom Receiver.

Before installing and connecting other components to the receiver, you should familiarize yourself with the [Location and functions of parts](#), which provides information about the receiver's front and rear panel connectors.

## Preparation

Before installing the receiver and other components of the system, you should familiarize yourself with the receiver's environmental, power and space requirements.

### Environmental requirements

The following table summarizes the environmental requirements for the operation and storage of a Real Freedom Receiver.

Table 1: Environmental specifications

Specification	Details
Humidity	95% non-condensing
Operating and storage temperature	14° to 140°F / -10° to +60°C

### Power requirements

The following table summarizes the power requirements for a Real Freedom Receiver.

Table 2: AC and DC power specifications

Specification	Details
AC supply	100–240 V AC, 50/60 Hz, 5 A
AC supply connector	IEC 60320, C14
DC supply	10–36 V DC, 10 A
DC supply connector	XLR-4 (M)

### Physical requirements

The following table summarizes the physical requirements for a Real Freedom Receiver.

Table 3: Physical specifications

Specification	Details
Size (W x H x D)	8.27 x 3.46 x 13.39 inch / 210 x 88 x 340 mm (½ rack width, 2RU high)
Weight	8.16 lb. / 3.7 kg

## Unpack the receiver

Unpack the Real Freedom Receiver and refer to the packing list to ensure that all items are included. Report any missing items immediately to the Real Freedom Team.

Inspect the receiver for signs of damage. Report any damage to the Real Freedom Team.

## Additional items required for installation

To install the Real Freedom Receiver, you will require the following additional items:

- Standard 19-inch or half-width equipment rack with at least 2RU of free space if you intend to rack mount the receiver.
- The other components of your Real Freedom installation, which may include one or more downconverters, data transmitters, camera back transmitters and cameras, fiber base and remote units, and active UHF splitters.

## Cable requirements

To install the Real Freedom Receiver, you will require the following cables:

- IEC 60320 AC power cable to power the receiver from an AC supply.

To power the receiver from a DC supply you will require a suitable power supply or battery that can accommodate the voltage and current ratings of the unit and a DC power cable with 4-pin XLR female connector (for example, Neutrik NC4FX).

- Coaxial cables with BNC connectors.

It is recommended that you use good quality cable with the correct impedance: 50 Ohm cable for RF connections and 75 Ohm cable for video connections.

- Ethernet cables (Cat 5) to connect a control panel to the receiver or to connect the receiver to a network switch.
- Audio cables. Twisted pair (3-pin XLR female connector) or 75 Ohm coaxial (BNC female connector).

## Rack mount the receiver

The Real Freedom Receiver is designed to be mounted in a standard 19-inch (48.3 cm) equipment rack. The unit is two Rack Units (RU) high and half rack width. Rack mount kits allow a single receiver to be mounted in a standard equipment rack or two receivers to be mounted side by side. If a half-width rack is available, the receiver can be installed without any additional hardware.

Tip



**NOTE:** You can also place a single receiver on a solid, stable surface.

## Tools

To rack mount a Real Freedom Receiver, you will require the following tools:

- #3 Phillips head screwdriver

## Precautions

You should read these precautions before you install a Real Freedom Receiver in an equipment rack.

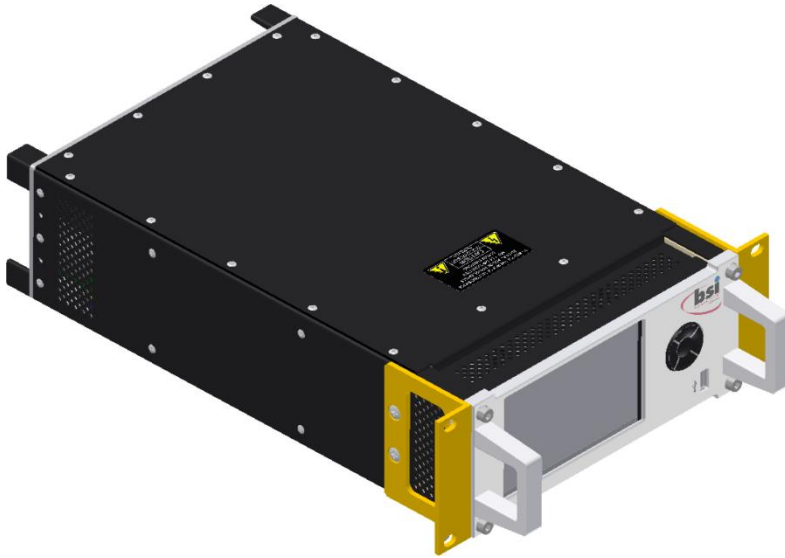
- Before you begin the installation, make sure that the receiver is disconnected from the power source.
- Mount receivers directly on top of each other in the equipment rack.
- Close any open spaces in the rack with blank panels since open spaces will reduce cooling efficiency.
- To prevent risk of overheating, use in a well-ventilated area. Never block the receiver's air vents.

- The rack should be a minimum of two inches (5.1 cm) away from the receiver, and the back of the rack should be a minimum of four inches (10.2 cm) from the receiver's back panel.
- Since there is no power button (on/off switch) on the receiver, ensure that you have access to the rear of the rack or leave a sufficient wire management loop to pull the unit out from the front of the rack.

## Mounting procedure for a single receiver

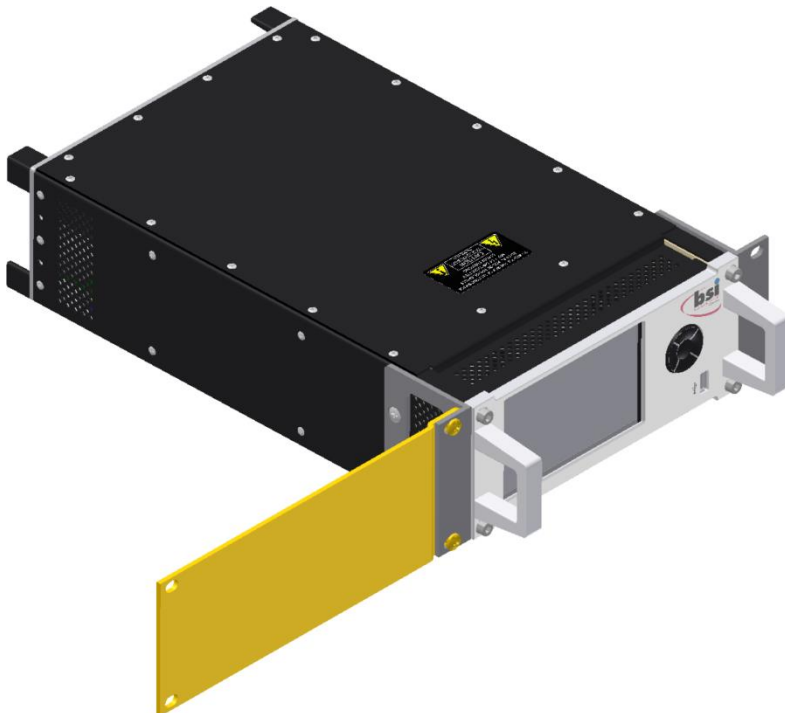
To mount the receiver, you will require 2RU (3.5 inches, 89 mm) of vertical rack space and a Real Freedom Single Receiver Rack Mount Kit (BRK-0005-00).

1. Attach the *Bracket Fixing 2U* to each side of the receiver using four M5 x 12 Phillips screws.



2. Attach the *Rack Mount Spacer* to the *Bracket Fixing 2U* using two M5 screws.

You can install the spacer on the left or right side of the receiver. If you are installing the receiver in a half-width rack, no spacer is required.



3. Install the receiver at the desired location in the equipment rack and secure to the vertical uprights using four rack screws.

## Mounting procedure for two receivers

To mount two receivers side by side, you will require 2RU (3.5 inches, 89 mm) of vertical rack space and a Real Freedom Dual Receiver Rack Mount Kit (BRK-0006-00).

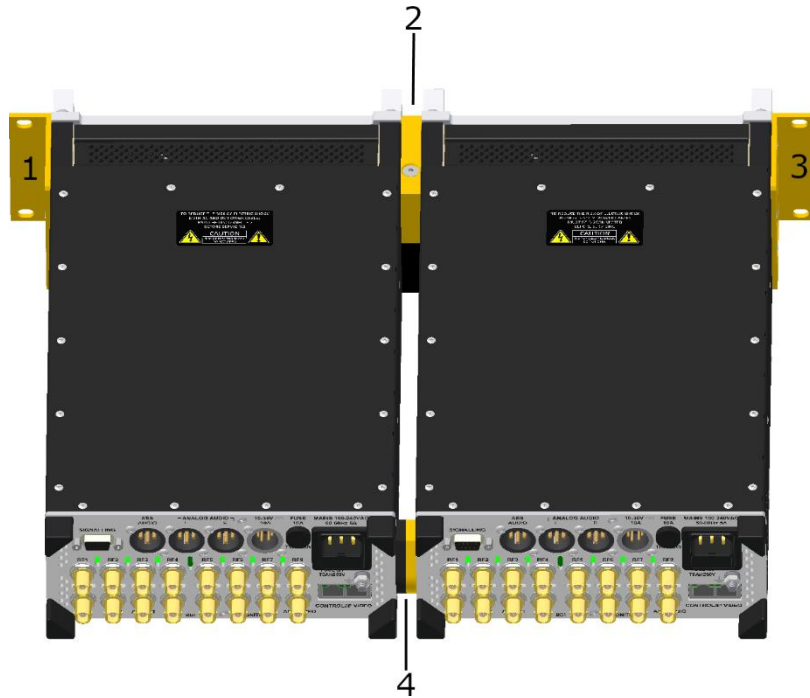


Figure 7: Joining two receivers for rack mounting.  
1 Bracket Fixing 2U, 2 Joining Blocks, 3 Bracket Fixing 2U, 4 Block Joining Rear.

1. Attach a *Bracket Fixing 2U* to the left-hand side of one receiver and to the right-hand side of the other receiver using four M5 x 12 Phillips screws.
2. Attach a *Joining Block* the other side of each receiver using two M5 x 25 Philips screws.  
You should attach the *Joining Block* in the 'top' position on one receiver and in the 'bottom' position on the other receiver.
3. Attach a *Block Joining Rear Tapped* to one receiver and a *Block Joining Rear CSK* to the other receiver using two M3 x 12 Philips screws.  
You should attach these blocks on the same sides of the receivers as the joining blocks.
4. Position the receivers together and secure the front and rear joining blocks.  
Connect the front joining blocks using two M5 x 60 Phillips screws (one inserted through the top block, and the other inserted through the bottom block).  
Connect the two rear joining blocks using an M5 x 25 Philips screw.
5. Install the two receivers at the desired location in the equipment rack and secure to the vertical uprights using four rack screws.

## Power connections

The receiver can be powered from an AC or DC supply. Both supplies may be connected at the same time although this configuration is not recommended since a seamless handover between supplies cannot be guaranteed.



**WARNING:** Both AC and DC power supply cables must be disconnected before servicing.

If the power is 'dirty', it is recommended that you find a 'clean' power source. Use a surge protector or power strip to mitigate damage to the equipment in the event of a power surge.



Since systems are typically installed in shared circuits, be aware of how many units are plugged into the source and the total current draw.



**WARNING:** Connect the product only to a power source with the specified voltage rating.

### AC SUPPLY

When powering from an AC supply, you must connect the receiver to the mains supply using the IEC mains cable provided.

The receiver does not include an AC power switch and therefore the mains plug is to be used as the disconnect device. Position the receiver to allow easy access to the plug socket.

### DC SUPPLY

When powering from a DC supply, connect the receiver to the supply using a DC power cable (not supplied).

The DC power supply must have the following characteristics:

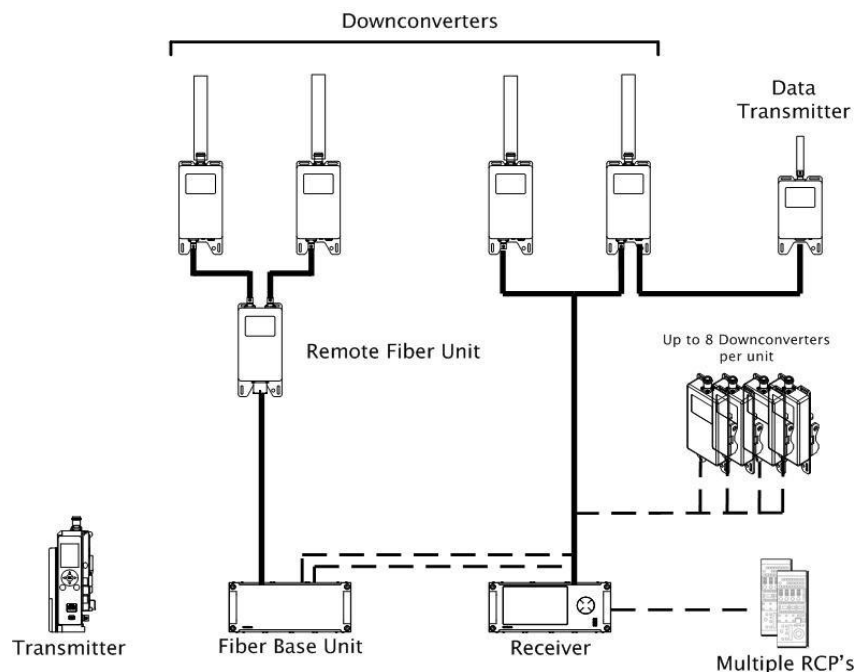
*Table 4: DC Power supply characteristics*

Characteristic	Specification
Output voltage	10 to 36 V DC
Output power	>100 W continuous
Connector	4-pin XLR female connector (for example, Neutrik NC4FX)
Cable	Twin core with minimum 2.5 mm <sup>2</sup> copper conductors

The receiver does not include a DC power switch and therefore the DC power cable (XLR-4 female plug) is to be used as the disconnect device. Position the receiver to allow easy access to the plug socket.

## Connect Real Freedom components

Before powering the receiver and setting the configuration parameters for the system, you should connect the various Real Freedom components. The following diagram shows the components in a simple Real Freedom system.



*Figure 8: Components of a typical Real Freedom system*



**NOTE:** Refer to the relevant product manual for more information about how to connect each component in the system.

Depending on your configuration, you will typically need to:

- Connect downconverters to the receiver.
- Connect one or more data transmitters. A data transmitter connects to a downconverter.
- Connect a remote fiber extender system (fiber base and remote unit) to extend the range of the system. In this instance, connect downconverters to the remote unit and connect the base unit to the receiver. Alternatively, use an active UHF splitter to connect six Real Freedom Receivers to a single fiber base unit.



**CAUTION:** To prevent damage, it is recommended that you only use BSI supplied cables and accessories with the receiver.

## Connect downconverters to the receiver

Up to eight downconverters can be directly connected to the receiver using coaxial cables. Each downconverter connects to one of the UHF BNC connectors on the rear panel of the receiver. The downconverters can be powered from the receiver via the UHF connector. To use this option, you must enable BNC power to the appropriate UHF connectors via the receiver's **Receive** configuration menu.



**CAUTION:** Before connecting a downconverter to a receiver that is powered, you **must** switch off power to all BNC connectors on the back of the receiver to avoid damage to the downconverter's the OOK chip. To switch off BNC power, go to the receiver's **Receive BNC Power** option in the **Receive** menu and disable power to all slots.

The BNC output power supply is dependent upon the receiver power supply and has the following characteristics:

Table 5: AC and DC output voltage and BNC current limits

Receiver supply	BNC output voltage	BNC current limit
AC	24 V DC	2 A (each port) / 8 A (total)
DC (10 to 36 V DC)	Follows input supply	2 A (each port) / 4 A (total)

All downconverters should be of the same type and frequency band. For best RF performance, downconverters should always be installed in pairs with a separation of at least 30 cm between antennas.



**CAUTION:** Never connect anything other than a BSI downconverter to the UHF BNC connectors. These ports include output voltage that may damage other equipment.

The coaxial cable between the downconverter and the receiver should be a good quality cable such as RG59 or RG11 and have a characteristic loss of <20 dBm/100 m at 1 GHz. 75 Ohm cable should be used. The downconverter provides gain to compensate for the cable loss.

## Connect a data transmitter to a downconverter

If required, a Real Freedom Data Transmitter can be connected to any downconverter in the system via the downconverter's power/control connector. A one-meter cable assembly is supplied with the data transmitter for this purpose.



**NOTE:** Up to six Real Freedom Receivers can be IP-chained over a local area network to one Real Freedom Data Transmitter.

## Connect a fiber antenna extender/active UHF splitter

The Real Freedom Fiber Antenna Extender allows you to simultaneously extend camera control and receive antennas by up to 2 km / 1.5 miles with a single hybrid fiber cable.

Connect downconverters to the remote unit using coaxial cable and connect the remote unit to the base unit using a fiber cable. Then, either connect the base unit's RF outputs directly to a receiver or use a Real Freedom Active UHF Splitter to connect six Real Freedom Receivers to a single fiber base unit.



**NOTE:** The connection between the downconverter output (BNC) and the next stage (receiver or fiber remote) cannot exceed a reasonable distance without beginning to affect performance. The chosen system configuration will influence the placement of components and the cable lengths required.

## Connections checklist

Before powering the receiver and configuring the system, use the following table to ensure that all component connections are correct.

Table 6: Connections checklist

Component	Connector/cable type	Notes
Downconverter UHF	BNC out to receiver ANT (antenna inputs 1–4)	Up to eight downconverters per camera
Downconverter UHF	BNC out to receiver ANT (antenna inputs 5–8)	
Downconverter antenna	Standard N-type connector	Must use BSI antenna
Data transmitter	LEMO 4-pin out to downconverter LEMO power control connector	Connect data transmitter to the first downconverter (ANT1)
Receiver signaling/tally	DB9 dry tally closure to client-supplied equipment	Optional
Receiver REF	BNC SYNC out to client-supplied tri-level REF	Optional
Receiver analog audio	XLR-3 (L/R) out to client-supplied equipment	Optional
Receiver digital audio	BNC SDI out	Embedded SDI audio
Receiver network control	CAT5 control out to Ethernet switch	
Receiver power	IEC mains cable	Only use included cable
Fiber remote unit RF	BNC to downconverter	Up to two downconverters per remote unit
Fiber remote unit	Hybrid fiber cable to base unit	
Fiber base unit RF	BNC to receiver or active splitter	
Active UHF splitter RF	BNC to receiver	Connect six receivers to a single fiber base unit

# Receiver configuration

Once you have connected all the Real Freedom components and made the connections to the Real Freedom Receiver, you must enter some basic configuration information. If the camera is live, you should see a preview of the video on the receiver's screen, which can help during the configuration process.

## Overview

After powering on the Real Freedom Receiver, enter the configuration menu by pressing the left arrow button from the front panel constellation navigation controls. This menu allows you to make all the essential adjustments for basic operation of the system. Use the arrow keys to select the menu item that you require and then press **OK**.

To setup the receiver, you must do the following:

- Set the IP address, subnet/network mask and gateway address to establish a connection to the RCP.
- Configure the camera settings.
- Configure the receive and transmit settings.



**TIP:** Use the [Connection Map](#) to view which components are connected to the system. You can then go on to check the status of the system as it is configured and tested.

## Before you start

To configure the system, you will need the following information:

- Network configuration details from the RCP.
- Video and production settings.
- Transmit frequency for video and camera control.



**NOTE:** The receiver retains the last-used configuration, and you may not need to change many settings other than receive and transmit frequencies.

## Network configuration

You need to set the Internet Protocol (IP) address of the receiver and the subnet/network mask and gateway address to establish a connection to the RCP. To define the receiver's network settings, you will require the network configuration details from the RCP.

From the main menu, select **Settings** and then select **Network Configuration** and configure as follows.

Table 7: Network configuration settings

Setting	Description
Use DHCP	Specifies whether to dynamically assign an IP address and other network configuration parameters to the receiver. Clear this check box to disable DHCP while only running static IP addresses, installing a device that runs DHCP and there is already a DHCP server on the network, and while configuring network settings.

Setting	Description
IP Address	Enter the required IP address (for example, 192.169.040.101) to identify the receiver on the network. When connecting the receiver to another point, the same IP address must be used except the last subnet number which can be any number between 0 to 254. This IP address must match the subnet of the OCP/RCP. For a Sony RCP, the IP address is the same as the Target Address with the RCP set to Bridge mode.
Network Mask	Enter the required subnet/network mask (for example, 255.255.255.0). This must be the same as the RCP's subnet mask.
Gateway Address	Enter the required gateway address. This must be the same as the RCP's gateway address and is the address of the router interface that is connected to the network.

## Network configuration notes

Both Sony RCP-1500 and GV OCP-400 require that the Real Freedom Receiver and the RCP/OCP are in the same subnet and have a subnet mask of 255.255.255.0.

Sony RCPs require a Power Over Ethernet (POE) port on the Ethernet switch.

A Sony RCP-1500 requires that the RCP be set in Bridge mode and have the target address under Bridge mode set to the IP address of the associated Real Freedom Receiver (in other words, receiver set to 192.168.40.101, RCP set to 192.168.40.201 and the Sony RCP target address set to 192.168.40.101).

Grass Valley (GV) OCPs are powered externally with a 4-pin XLR 12 V DC power supply and do not require a POE Ethernet switch. You can, however, still use POE power with GV OCPs.

A GV OCP-400 just needs to be in the same subnet and set to Ethernet. The association between the receiver and the OCP is achieved by an auto-discovery function when the camera number or the receiver and the camera number of the OCP match.

When an RCP/OCP associates with a Real Freedom Receiver:

- The third icon (RCP) in the top right of the Real Freedom Receiver screen is green.
- The [Camera Ctrl Peripheral Status](#) page (displayed when the RCP icon is selected) reports the IP address of the RCP/OCP and shows 'Connected' next to RCP Status.

## Camera control settings

You need to specify the camera control frequency, camera type and camera number using the **Camera Ctrl** configuration option. You should also check the other settings to ensure that they are correct for the camera that you wish to control via the data transmitter.



**NOTE:** Select a BSI camera type to remotely-control the transmitter from the receiver. When under 'BSI control', the receiver is the 'master' and the 'transmitter' the slave. If the system is not under 'BSI control', the transmitter parameters can be set independently to those on the receiver.

From the main menu, select **Camera Ctrl** and configure as follows.

Table 8: Camera control settings

Setting	Description
Camera Ctrl Transmitter	Enables or disable the data stream from the RCP. If you select 'Disable', no data passes from the RCP to the data transmitter(s) connected to the system.
Throttle	Defines how often data is sent out. Note that this setting only applies to legacy BSI equipment which cannot cope with the full packet rate. 'Off' is the default. Use '1/2' for legacy BSI data receivers, for example, HDDR.

Setting	Description
Camera Ctrl Frequency	<p>Sets the frequency for Slot A (the data transmitter attached to the downconverter connected to RF1 on the receiver) and Slot B (if applicable).</p> <p>Use the frequency assigned for your event. If you use an unauthorized frequency, you could impact other users.</p> <p><b>Note that you can connect two data transmitters to the receiver, one on Slot A (RF1–4) and the other on Slot B (RF5–8). Do not add the data transmitters to the same slot.</b></p>
Camera Ctrl Transmit Power	<p>Defines the RF power level for the data transmitter.</p> <p>Start with the lowest power and increase if a greater coverage area is required after testing. The recommended value is 1 W, but a lower value may be required due to frequency coordination restrictions. More power gives the data path more range. If you are not using a slot, set the value to 'Off'.</p> <p>Refer to the <a href="#">Connection Map</a> to check which slots have data transmitters attached.</p>
Camera Type	<p>Defines the camera type.</p> <p>A BSI camera type allows remote control of the transmitter from the receiver when the full control infrastructure is established with an associated RCP/OCP. The system can include up to two data transmitters, but they can only control the camera identified by the camera number.</p>
Camera Number	<p>Specifies the camera number.</p> <p>This number corresponds to the camera you want to control and is also set on the camera back transmitter. This number automatically populates the camera number on the RCP.</p> <p>If you enter the wrong number, you will be controlling the wrong camera or some non-existent camera.</p>
PTRZ	<p>Only applies to a Pan, Tilt, Roll &amp; Zoom (PTRZ) camera.</p> <p>Select 'On' if you are using a joystick connected to the receiver to control the camera.</p>
Camera Number (cont'd)	<p>Defines the additional camera numbers that you want to control using the joystick.</p> <p>Note that a single joystick attached to the receiver can control up to four cameras.</p>
BSI Iris	<p>Only applies to a BSI camera without linear iris control.</p> <p>Select 'On' if you are using a BSI Point of View (POV) camera that does not have a linear iris.</p>
BSI POV Timeout	<p>Only applies to a BSI POV camera.</p> <p>Defines the timeout value for the Iris and Tilt commands.</p>
Camera Control IP Multicast	<p><b>Time-to-live (TTL)</b></p> <p>The TTL controls the scope or range in which a packet may be forwarded. The default value is 1, which restricts the packet to the same subnet.</p> <p><b>Do not change the default value of 1 without approval from your Network Administrator. If you do change the value, ensure that you restart the receiver.</b></p>
	<p><b>Multicast Address</b></p> <p>The camera sends a single instance or copy of its video stream to the designated multicast IP address. The network duplicates and distributes the transmitted video stream to all interested parties.</p>

## Receive settings

You need to specify the receive frequency and enable the RF ports that will receive input from downconverters. You should also check the other receive settings and, if necessary, apply a gain boost for selected downconverters if the RF reception is poor.

From the main menu, select **Receive** and configure as follows.

Table 9: Receive settings

Setting	Description
Receive Frequency	Sets the receive frequency assigned for your event.
Update Remote Tx Parameters	When selected, keeps the receive and transmit frequency at the same value. If you change the receive frequency, the remote transmitter frequency automatically changes to the same value.  It is recommended that you link these parameters, but during diagnostic testing you might want to not change the transmitter frequency but change the receive frequency setting to look at another camera.
Receive Input Enable	Enables input streams for live RF ports in Slot A and Slot B with a downconverter attached. It is recommended that you select all RF ports.  Note that enabled input streams are fed to the diversity switch, which connects the downconverter antennas to the receiver. Disabled inputs are tuned but ignored.
Receive BNC Power	Enables power to selected BNC connectors in Slot A (RF1–4) and Slot B (RF5–8). It is recommended that you turn off BNC power to unused ports.  Downconverters connected directly by coax cable require power (DC power over coax), downconverters connected through the Real Freedom fiber system do not.  BNC power is required to be enabled if the Real Freedom Active UHF Splitter is attached as the Real Freedom fiber alone is protected against DC power.  Note that an electrical short or overcurrent automatically disables power on selected BNCs.
Receive Gain Boost	Activates high gain mode for selected downconverters in Slot A and Slot B. Select the check boxes to apply a receive gain boost of 20 dB. You may wish to do this for extra long cable runs where signal loss is anticipated or where the RF reception level is poor.  Refer to the <a href="#">Receive Status</a> page to determine whether you need to enable receive boost.
LO Frequency	Only required when using third-party downconverters.  Defines the Local Oscillator (LO) frequency used to convert the transmit frequency down to the frequency range required by the receiver. The required value is usually marked on the downconverter.  Note that if you are using Real Freedom downconverters, the required frequency is automatically populated and cannot be changed.
Receive Band	Specifies the frequency range for signal reception. Choose the band that encompasses the receive frequency for the downconverters.  If you change the receive band, the receive frequency will change if the value that you have set is out of the selected band.
Modulation Scheme	Defines the modulation scheme. The default value is 'DVB-T', a European digital video broadcasting standard.  In 'BSI control' mode, the selected scheme syncs with the transmitter.

Setting	Description
Dual Pedestal	Specifies whether you want to use a double-capacity wireless link. 'Single Stream' creates a single video link with double capacity. 'Dual Stream' creates two independent video streams. In 'BSI control' mode, the selected setting syncs with the transmitter.
Bandwidth	Defines the bandwidth of the RF transmission. In 'BSI control' mode, the selected value updates the camera back transmitter. If the bandwidth is not correct, the system will still work if under 'BSI control', but if not, you will need to match the value to the transmit parameters.
ASI Input	Defines which rear panel RF inputs are diversified with the rear panel ASI input. This is always RF1–8, unless you have selected 'Dual Stream' mode, where you can select which set of RF inputs are diversified with the ASI input.

## Remote transmitter control settings

You need to set the frequency that the camera back transmitter will use to transmit the video stream. You should also check the other settings, adjust the transmit power, and ensure that the camera video format is correct for the production.

From the main menu, select **Remote Tx Ctrl** and configure as follows.

Table 10: Remote transmitter control settings

Setting	Description
Remote Transmitter	Defines whether RF is switch on or off. 'Power On' is the operating state. Select 'Standby' when the system is not required (RF turned off) and you want to save power, for diagnostics or to re-boot a POV camera connected to the transmitter.
Remote Tx Frequency	Sets the transmit frequency assigned for your event.
Update Receive Frequency	When selected, keeps the receive and transmit frequency at the same value. If you change the transmit frequency, the receive frequency automatically changes to the same value. It is recommended that you link these parameters, but during diagnostic testing you might want to not change the transmitter frequency but change the receive frequency setting to look at another camera.
Remote Tx Transmit Power	Defines the transmit output power. Start with the lowest power output and increase only if the Received Signal Strength Indicator (RSSI) is low. If the power is set too high for your application, you will see a reduction in Carrier to Noise Ratio (CNR) as the downconverters become overloaded. You can view the RSSI and CNR on the <a href="#">Receive Status</a> page. For most applications 100 mW is the recommended setting. Optimal receive strength is between -50 dB and -20 dB. If you set the value too high, you could overload the system in certain situations. If the power is too low, the camera range may be insufficient resulting in loss of RF signal and video image.
Remote Tx Modulation	Sets the robustness of the wireless link and the quality of the video image. Choosing the wrong values impacts the range of the wireless link and quality of the video image. 16QAM, 3/4, 1/32 is a good starting point.



Setting	Description
	<p><b>Symbols</b> Lower order modulation formats like QPSK do not transmit data as fast as the higher modulation formats such as 64-QAM, but they can be received when signal strengths are lower.</p> <p><b>Code Rate</b> Match the code rate to the requirements of the broadcast network. The higher the level of error correction that is applied, the greater the level of supporting error correction data that needs to be transmitted, which reduces the data rate of the transmission. For example, if you select 2/3, for every 2 bits of data, you are sending out 3 bits, one of which is for error correction.</p> <p><b>Guard Interval</b> Choose the appropriate guard interval so that distinct transmissions do not interfere with each other. 1/4 results in the best protection but the lowest data rate; 1/128 provides the lowest protection and the highest data rate.</p>
Camera Video Format	<p>Specifies the camera video format. Select the mode and frame rate to match the camera and production workflow.</p> <p>Note that if you set the video format to 'Auto', the image may be in the wrong format for the production.</p>

## Fiber remote and splitter settings

If the system includes fiber remote and active UHF splitter components, there are some settings that you may need to change.

From the main menu, select **Fiber & Splitter** and configure as follows.

Table 11: Fiber remote and splitter settings

Setting	Description
Fiber Remote	<p><b>Attenuation</b> Select the check boxes to enable RF attenuation in the fiber remote unit (if this is connected in the system). You may need to do this if RF system experiences an 'overloading' condition. This can occur if the transmitter RF power level is too high, and the transmitter is too close to the downconverters or if you have some external interference.</p> <p>Use the <a href="#">Connection Map</a> to check what is connected in the system and select the appropriate check boxes.</p> <p><b>Downconverter Power Status</b> Re-enables power if a short circuit is detected on the connections between the remote fiber unit and downconverters.</p>
Splitter	<p><b>Active Mode (Gain Boost)</b> Adds a gain boost into the splitter system when RF levels are too low. Use the Connection Map to check whether the system includes an active UHF splitter.</p> <p>The numbers refer to which connections are made on the rear panel RF connectors. When selected, you get a gain boost, although the default setting is for these <b>not</b> to be selected.</p> <p>If selected when RF levels are not too low can cause the system to overload/saturate.</p>

## Video settings

You should check and adjust the video settings so that they are appropriate for the production. These settings include the video source, format, and output.

From the main menu, select **Video** and configure as follows.

Table 12: Video settings

Setting	Description
Video Source	<p>Specifies the video source (RF or ASI).</p> <p>'RF' is the default setting and means that the source for video decoding is taken from the diversification of the rear panel RF inputs (RF1–RF8) on the receiver.</p> <p>'ASI' means that the source for video decoding is taken from the rear panel ASI IN.</p>
Video Format	<p>Specifies the video mode and frame rate. This is defined by the production format.</p> <p>If the video format is incorrect, you will either get no video image or a corrupted image.</p>
Frame Sync	<p>Sets the Lines and Pixels offsets to synchronize the image to the production workflow.</p> <p>You can synchronize the image by connecting a B&amp;B or tri-level signal to the receiver's SYNC connector. If the parameters are incorrect, the video may not be synchronized at the video mixer, which will give production issues when cutting between different images.</p> <p>If you are required to frame sync your image, then it does not matter what values are applied here.</p>
Video Latency	<p>Sets the required sync offset to delay the video feed. The required offset depends on the transmitter, so you must check and select the type of BSI transmitter that you are using. If set incorrectly, the image may freeze or result in picture judder.</p> <p>If you are using third-party equipment, consult BSI Technical Support who will advise on the correct setting.</p> <p>Note that 'BSI Freedom Tx (Low Delay 1080i)' only needs to be applied when a Real Freedom Camera Back Transmitter is used in 'Low Delay' and '1080i' format. For all other cases, set the video latency to 'BSI Freedom Tx' when a Real Freedom Camera Back Transmitter is used. This includes 'Super-Low Delay' mode.</p>
Video Output	<p>Sets the video output from the rear panel SDI 1 and SDI 2 connectors.</p> <p>'Level A' is the default, and almost all production workflows will handle either. Some obscure production workflows may only be able to handle 'Level B'.</p> <p>'Level A' directly maps an uncompressed 1080p/50 video stream into a serial digital interface operating at a nominal rate of 3 Gbit/s.</p> <p>'Level B' multiplexes the two signals from the dual-link format of a 1080p/50 video stream into a serial digital interface operating at a nominal rate of 3 Gbit/s.</p>

## Audio settings

The audio settings allow you to check the peak levels on each audio channel and to change the analog audio gain on the transmitter. The peak levels on the four audio channels also displays on the [Audio Status](#) page.

From the main menu, select **Audio** and configure as follows.

Table 13: Audio settings

Setting	Description
Audio Tx Gain	Sets the audio transmit gain for each channel. Range -20 dB to +20 dB. Note that this controls the analog (not embedded) audio gain at the transmitter when under 'BSI control'. This value corresponds to a value that can also be set manually on the transmitter. If the transmitter is configured as 'BSI control', then this overrides anything that you may set on the transmitter.
Audio Output	Defines which audio channels will be output onto the two rear panel audio XLR connectors. Select 'Off' if those outputs need to be muted because they are connected to something downstream.
Audio Latency	Sets the required audio latency. Note that this is an advanced setting which should not be changed under normal circumstances. If you are using third-party equipment, consult BSI Technical Support who will advise on the correct settings.
Audio PID Selection	Defines the packet identifier (PID) to identify the audio content stream on channels 1&2 and on channels 3&4. Note that this is an advanced setting which should not be changed under normal circumstances. If you are using third-party equipment, consult BSI Technical Support who will advise on the correct settings.

## Other settings

Once you have defined the main configuration settings, you can use the other options on the **Settings** sub menu to:

- Set camera, RF and ASI port names.
- Set the system time and date.
- Configure input tallies and DB9 connector logic.

### Camera and RF names

You can name the camera, RF ports and ASI port to help to identify the camera and the locations of the downconverters attached to the receiver's RF ports. These names appear on the [Receive Status](#) page. The name and camera number (allocated in the [Camera Ctrl](#) configuration settings) also appear in the top left of the receiver screen.

From the main menu, select **Settings**, then select **Cam & RF Names** and configure as follows.

Table 14: Camera and RF names

Setting	Description
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Setting	Description
Camera name, ASI name, RF names	Assigns a camera name, ASI name, and/or RF names. To make this easier, plug a USB keyboard into the USB port on the front of the receiver and type the required names. If you are accessing the receiver menus using a web browser, you can use your computer's keyboard to type the required names.

## System time and date

You can set the system time and date.

From the main menu, select **Settings**, then select **Time & Date** and configure as follows.

*Table 15: System time and date*

Setting	Description
System Time	Sets the system time.
System Date	Sets the system date.

## Tallies

A tally is a signal sent from the production workflow to the camera indicating that the camera is 'live'. This normally displays as a red or green light on the camera to show the presenter that the camera is live and in the camera viewfinder to alert the camera operator. These signals are connected to the DB9 connector (SIGNALLING) on the rear of the receiver. When the tally signal is activated, a red or green (or both) bar appears on the receiver's screen. This signal is also passed on to the camera via the camera control link.

From the main menu, select **Settings**, then select **Tallies** and configure according to your requirements.

*Table 16: Tallies*

Setting	Description
Input Tallies	Choose the option required by the production workflow.
Output DB9 Pins	The DB9 connector is used for tally inputs, RS232 control (for example, BSI PTRZ joystick) and some auxiliary I/O for special user requirements. Choose the required logic for the connector. Refer to <a href="#">Connector pinout assignments</a> for the SIGNALLING connector pinout.

Once connected and correctly configured, no further changes are generally required to the system during routine operation. Should you need to make changes to the configuration, monitor audio, preview the video output, or access the status screens, you can do this from the receiver directly or remotely access the receiver using a web browser.



**NOTE:** All Real Freedom system components, including the camera back transmitter, can be controlled from the receiver, or from any connected PC.

## Individual component indicators

Use the indicators on the components attached to the receiver to help you to determine whether the system is operating correctly or if there is a problem.



**NOTE:** If no video displays on the receiver's screen when the camera is operating, you should initially check that the transmit / receive frequencies on the receiver and the camera back transmitter are the same. Refer to [Troubleshooting](#) for further details on how to diagnose and fix common issues when operating the system.

Table 17: Individual component indicators

Component	LED state	Description
Downconverter	Off	No power.
	Red	Alarm/error. There is a problem with the downconverter.
	Green	Low gain mode (approximately 25 dB). Gain represents the input power; low gain means low power and high gain means higher power.
	Flashing green	High gain mode (approximately 40 dB).
Data transmitter	Off	No DC voltage, the data transmitter is not powered by the downconverter.
	Red	Connected and powered but data not enabled.
	Alternate Red/Green	Alarm/error. Usually due to data packet loss.
	Green	Transmitting data.
Fiber base and remote units	All lights solidly illuminated	Connections are correct, and the system is operational.
	Flashing lights at either end	There is an issue.
Active UHF splitter	Flashing green lights	The splitter is powered and in active mode (adding gain for splitter loss).
	Flashing red lights	The splitter is powered and in passive mode (no additional gain being added for splitter loss).

## Access the receiver menus and status screens remotely

After fully configuring a Real Freedom system, you can access receiver menus and status screens via a web-based graphical user interface (GUI) using a computer with an Ethernet port connected to the receiver/RCP network switch.

To remotely access the receiver, follow these steps:

1. Connect a CAT5 network cable from the computer to a port on the Ethernet switch.
2. Navigate to computer's network settings and choose the wired connection.
3. Enter an 'available' IP address and the same [subnet mask](#) assigned to the Real Freedom Receiver.
4. Open a Chrome or Firefox browser window and enter the IP address of the receiver you wish to monitor or control.

If you are viewing more than one Real Freedom Receiver, you must open a tab/window for each receiver and enter the IP address of the receiver you wish to control/monitor.

5. Use the arrow and Enter keys on your computer's keyboard to navigate through the receiver menus. This navigation mirrors the control pad on the receiver.

## Monitor the status of the system

The Real Freedom Receiver provides on-screen status reports. With no menus or status displayed on the receiver screen, press **OK**. Navigate through the receiver's status pages using the left and right arrow keys.

As each status page is displayed, the top row icons enlarge to indicate the status you are monitoring. An orange icon indicates that the item is currently inactive, and a green icon indicates it is active and functioning properly. A grey icon indicates the function is either not connected or not in use.

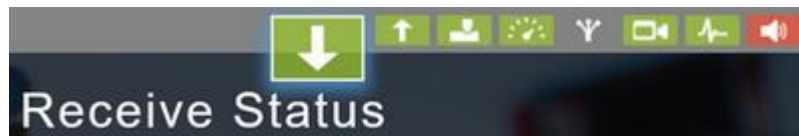


Figure 9: Receive Status is selected, fiber is not connected, and audio is inactive.

### Receive status

Select the down arrow icon  to view **Receive Status**.

Use the information on the **Receive Status** page to check which video channels are active and to monitor signal strength and CNR. A strong signal strength, shown in the RSSI section, and a high CNR provide good quality of reception.

Green and blue are good channels; green indicates the channel that is being used to decode the video. The 'Lock' column indicates which channels have RF lock. RF lock is required on at least one channel; this is demodulated and passed to the video decoder.

If the RSSI is low, you should increase the transmit output power. Change the transmit output power using the [Remote Tx Ctrl](#) configuration options. However, if the power is set too high, you will see a reduction in CNR as the downconverters become overloaded. Optimal receive strength is between -50 dB and -20 dB.

### Connection map

Select the up-arrow icon  to view the **Connection Map**.

Use the **Connection Map** page to check which components you have in the system and how they are connected. In the following example, the system includes fiber components, four downconverters, and a data transmitter attached to the downconverter on RF1. The downconverters are installed in pairs and are of the same frequency band.



Figure 10: Example connection map

## Camera control peripheral status

Select the RCP icon  to view **Camera Ctrl Peripheral Status**.

Use the **Camera Ctrl Peripheral Status** page to view information about the RCP, including the IP address and whether the panel is connected. You can also view the IP address of the receiver (set in the receiver's [network configuration](#)).

If you are using a PTRZ camera, you can also view the camera numbers that are under joystick control and check if data has been sent to the camera. Camera type and IDs are specified using the [Camera Ctrl](#) settings.

## Remote transmitter telemetry

Select the telemetry icon  to view **Remote Tx Telemetry**.

Use the **Remote Tx Telemetry** page to view data obtained from the camera back transmitter, including the unit's temperature and available battery.

## Fiber status

Select the fiber icon  to view **Fiber Status**.

Use the **Fiber Status** page to view fiber optic signal levels, voltages and currents of connected equipment, and real-time health check information, which can help to alert you when RF performance is affected. If the fiber levels are low or extremely low, you will see amber and red signal indicators. This usually indicates that you need to clean the fibers.

## Video status

Select the camera icon  to view **Video Status**.

Use the **Video Status** page to view information about the video stream, including the streaming speed, source, format, and encoding.

## Sync status

Select the heartbeat icon  to view **Sync Status**.

Use the information on the **Sync Status** page to check whether the video is synchronized and locked to the video reference signal. The signal type and pulse rate are also displayed.

## Audio status

Select the speaker icon  to view **Audio Status**.

Use the **Audio Status** page to view and monitor the peak levels and peak hold on the four audio channels. Configure the audio settings, including applying audio transmit gain for each channel, using the [Audio](#) configuration options.



This chapter provides troubleshooting information for Real Freedom Receivers.

Use this information to help you to solve some of the problems that you may encounter when using a receiver in a Real Freedom system.

## Audio issues

The following table contains information to help you troubleshoot audio issues.

Table 18: Troubleshooting audio issues

Symptom	Possible cause	Actions
Poor audio signal.	Audio settings are not correct.	<ul style="list-style-type: none"> <li>Monitor incoming audio channels and determine if gain should be applied or reduced.</li> <li>You can monitor and change the gain by selecting the <a href="#">Audio option</a> from the receiver's main menu.</li> <li>You can also monitor audio channels using the <a href="#">Audio Status</a> page.</li> </ul>
No audio signal.	Incorrect audio settings.	<ul style="list-style-type: none"> <li>Analog audio is available at the 3-pin XLRs on the back of the receiver and embedded audio is always available on the SDI 1 and SDI 2 outputs.</li> </ul>
	Loose or incorrect connections at the receiver.	<ul style="list-style-type: none"> <li>Check all physical connections.</li> </ul>

## Fiber issues

The following table contains information to help you troubleshoot fiber issues.

Table 19: Troubleshooting fiber issues

Symptom	Possible cause	Actions
Poor fiber signal.	Loose or dirty connections.	<ul style="list-style-type: none"> <li>Check that all fiber connectors are securely fastened.</li> <li>Remove the fiber connection and clean the glass tip. Reconnect and verify the signal.</li> </ul>
No fiber signal.	Fiber not connected.	<ul style="list-style-type: none"> <li>Check that fiber is connected to the correct ports on both the fiber remote and fiber base units (S to S and D to D).</li> <li>Turn off <a href="#">power</a> to the receiver's RF ports carrying fiber.</li> </ul>

## Video issues

The following table contains information to help you troubleshoot video issues.

Table 20: Troubleshooting video issues

Symptom	Possible cause	Actions
No video displayed.	No video input to the camera back transmitter.	<ul style="list-style-type: none"> <li>Check the camera back transmitter connections.</li> </ul>
	Incorrect video source.	<ul style="list-style-type: none"> <li>Ensure that the video source is set based on the input cable. For example, if the cable is connected to 'RF', set the video source to 'RF'.</li> </ul>
	Mismatches frequencies.	<ul style="list-style-type: none"> <li>Ensure that the transmit and receive frequencies for the camera back transmitter and receiver are the same.</li> <li>You can link the receive and transmit frequency to keep them at the same value. If you then change the receive or transmit frequency, the remote transmitter frequency or receive frequency automatically changes to the same value.</li> </ul>

## Camera transmitter issues

The following table contains information to help you troubleshoot camera transmitter issues.

Table 21: Troubleshooting camera transmitter issues

Symptom	Possible cause	Actions
No remote control from receiver.	Incorrect configuration or no control data sent.	<ul style="list-style-type: none"> <li>Check the receiver is correctly configured and connected to the RCP.</li> <li>Remote control is only possible when data is active, and the receiver is properly coded and connected to the client RCP.</li> </ul>
Connection error.	Frequency settings do not match.	<ul style="list-style-type: none"> <li>Verify that the frequency settings on the receiver and transmitter match.</li> <li>You can link the receive and transmit frequency to keep them at the same value. If you then change the receive or transmit frequency, the remote transmitter frequency or receive frequency automatically changes to the same value.</li> </ul>
Dark screen/display on the camera back transmitter.	The display has 'timed out'.	<ul style="list-style-type: none"> <li>Touch all four quadrants of the screen within one second; trace a U or X pattern on the display to wake. You can disable the screen timeout from the camera back transmitter's <b>Settings</b> page.</li> <li>The screen backlight is set too low. Adjust the screen backlight from the camera back transmitter's <b>Settings</b> page.</li> </ul>

## IP connection issues

The following table contains information to help you troubleshoot IP connection issues.

Table 22: Troubleshooting IP connection issues

Symptom	Possible cause	Actions
No IP connection.	IP configuration or setup issues.	<ul style="list-style-type: none"> <li>Verify the IP address assigned to the RCP. A Sony RCP requires that the Target Address be set to RX IP. A GV OCP requires that the subnet and camera number must match between the OCP and Real Freedom Receiver camera number.</li> <li>Verify the IP address is in the same subnet as the IP address and subnet on the receiver.</li> <li>If using a Sony RCP, the switch must supply Power Over Ethernet (POE).</li> </ul>

## RCP issues

The following table contains information to help you troubleshoot RCP issues.

Table 23: Troubleshooting RCP issues

Symptom	Possible cause	Actions
Blinking alarm on Sony RCP.	-	<ul style="list-style-type: none"> <li>This is the normal operation of the alarm button in the Real Freedom system.</li> </ul>

## RF issues

The following table contains information to help you troubleshoot RF issues.

Table 24: Troubleshooting RF issues

Symptom	Possible cause	Actions
Poor RF signal.	Cable runs too long.	<ul style="list-style-type: none"> <li>Ensure cable runs have not exceeded recommended lengths (400 feet for LMR240 or 200 feet for other high-quality cable).</li> <li>Apply a <a href="#">receive gain boost</a> for extra long cable runs where signal loss is anticipated.</li> </ul>
	Downconverters positioned incorrectly.	<ul style="list-style-type: none"> <li>Check the placement of downconverters. Microwave, especially at higher frequencies, is best when the line of site to a downconverter is maintained.</li> <li>Coverage may not be sufficient.</li> </ul>
	Antenna mismatch.	<ul style="list-style-type: none"> <li>Verify there is no mismatch of antennas.</li> <li>All downconverter and transmitter antennas should match your band of operations.</li> </ul>
	No power to BNC ports.	<ul style="list-style-type: none"> <li>Downconverters require BNC power. Ensure that <a href="#">power</a> is enabled on BNC ports connected to downconverters.</li> <li>The downconverters should have green illuminated LEDs.</li> </ul>

Symptom	Possible cause	Actions
	Transmitter power set too low.	<ul style="list-style-type: none"> <li>Adjust the <a href="#">output power</a> of the transmitter. However, if the CNR falls as you increase the power of the transmitter, more power is not the solution.</li> <li>CNR is dependent on frequency band. Typically, a good CNR at 1.4 GHz is 25–30 dB, at 2 GHz is 23–27 dB, and at 7 GHz is 20–25 dB</li> </ul>
	Transmitter settings incorrect.	<ul style="list-style-type: none"> <li>Check the transmitter's audio settings, including analog, SDI embedded, Mic/Line and phantom power.</li> </ul>

## Reset the software

If the software hangs, you can do a quick reset which closes and restarts the receiver's software functions. If you are resetting the software to work around an issue, insert a memory stick containing a diagnostic log file into the USB port in the front panel. When you reset the software, details of where the software stopped working are saved onto the memory stick. Contact BSI Support for more information.

To reset the receiver software, follow these steps:

1. From the main menu, select **Settings** and then select **Software Reset**.
2. Press **OK** to select **Quick Reset**.
3. Press **OK** again to reset the software.

## Reboot the receiver

If you cannot easily access the power socket on the rear panel of the receiver, you can use the reboot option to power cycle the receiver. You may need to do this during a [firmware update](#).

To reboot the receiver, follow these steps:

1. From the main menu, select **Settings** and then select **Software Reset**.
2. Select **Reboot**.
3. Press **OK** to reboot the receiver.

This chapter describes the maintenance, cleaning, and storage procedures for Real Freedom Receivers.

## Routine maintenance procedures

You should perform the following maintenance procedures on a regular basis.



**WARNING:** The Real Freedom Receiver does not contain user serviceable parts. Warranty is void if the device is opened. Refer servicing to qualified BSI personnel only.

## Performance monitoring

It is recommended that you periodically monitor the overall performance of the Real Freedom system. If you experience failure or deterioration in the performance of the system, check cables and adapters, input, and output connectors for damage.

## Visual inspection

Depending on operating environments and use, periodically inspect the Real Freedom Receiver for signs of damage, dirt, or corrosion. Check that all markings and warning labels are in good condition.

## Cleaning

Once the device is unplugged, use a lint-free cloth sprayed with alcohol or bleach-free fluid to wipe the surfaces, controllers, and cables. Use a slim brush to carefully nudge dirt out from around the buttons.

If necessary, use low-pressure compressed air cleaning to remove small particles and debris from the surface of the receiver.

Clean connector surfaces with a cotton swab moistened with a small quantity of alcohol. Use a lint-free cloth to wipe connector surfaces after cleaning.



**CAUTION:** Do not use abrasive cleaners.

## Storage

Store receivers in the rack at operating temperature.

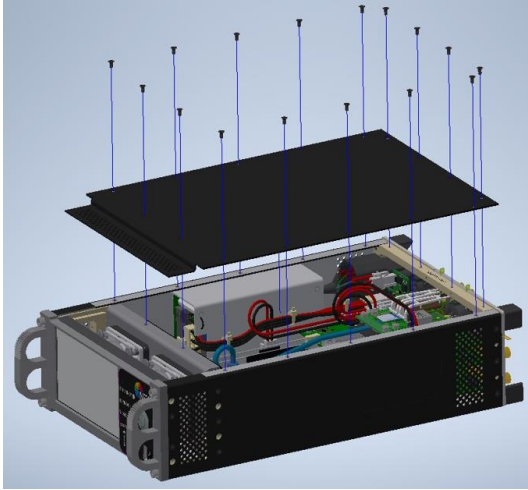
For long term storage:

1. Disconnect all cables from the Real Freedom Receiver.
2. Cover the connectors with suitable dust covers.
3. Place the Real Freedom Receiver in protective packaging and store in a cool, dry environment.

## Clean/Replace the receiver's fan filters

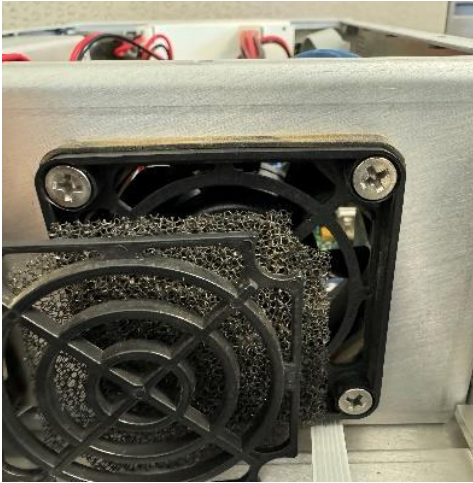
It is recommended to periodically clean or replace the fan filter as dust will accumulate over time. Follow the steps below to efficiently clean or replace the filter for optimal performance.

1. **Remove the Top Plate:** Locate the screws securing the top plate and unscrew them to detach the top plate from the unit.



### 2. Access the Fan Filter:

- Once the top plate is removed, you'll find a front plastic foam retainer.
- The foam is held in place by a clip-in front retainer, which can be gently teased off.
- Carefully remove this retainer to access the foam and filters.



### 3. Clean/Replace the Foam and Filter:

#### **Cleaning:**

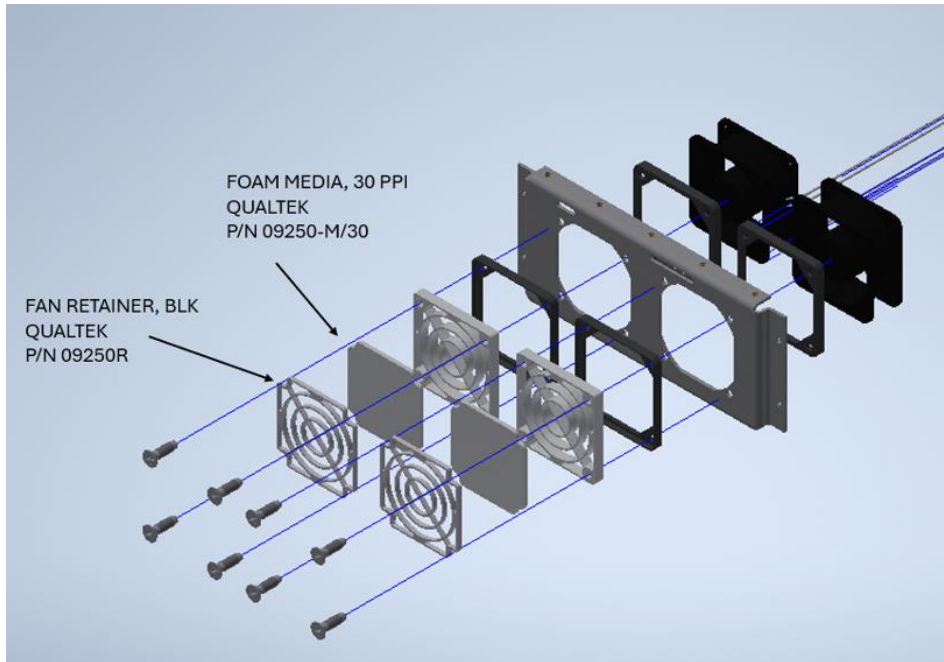
Once you clip out the foam and filters from their housing, clean them thoroughly using a soft brush to remove dust and debris effectively.

#### **Replacing:**

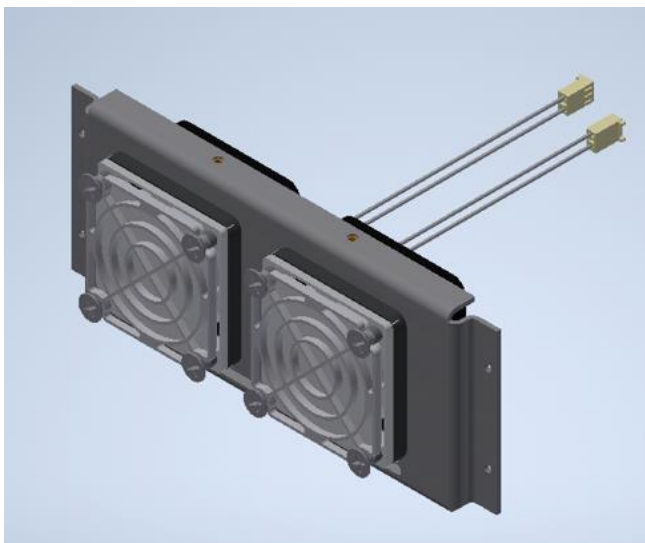
- a. Replacement filter can be purchased at, [30 PPI Foam Media](#).
- b. Secure the replacement filter back by clipping the front retainer back into the housing place.

**NOTE:**

Some units may have the fan filter assembled in reverse, making it difficult to access the filter/retainer without removing the mounting screws. If you encounter this issue, refer to the drawing below, which clearly illustrates how the filter assembly should be mounted so that the filter and retainer are forward-facing, allowing easy access.



*Fig: Assembly Layers Before Fastening*



*Fig: Final Assembly with Secure Fastening*

4. **Re-assemble the Top Plate:** Close the top plate back onto the unit and secure it by fastening the screws back into their original positions.

## Update the receiver's firmware

From time to time, new firmware will become available for the receiver. Be aware that updating the firmware is a sensitive process that may take some time. Make sure the receiver is undisturbed and do not switch off the receiver during the update process.



**NOTE:** Download new firmware files from <https://www.bsintl.com/real-freedom>

To update the firmware, follow these steps:

1. From the main menu, select **Settings** and then select **Firmware Update**.

The receiver displays the current firmware version.

2. Insert a USB stick containing the new firmware into the USB port on the front of the receiver.
3. Select **Scan** to locate the new firmware.
4. To begin the update, select **Update**.
5. To complete the firmware update process, power cycle the receiver when the receiver indicates that the update is successful.



# Configuration menu structure

The following diagram shows the receiver's configuration menu options.

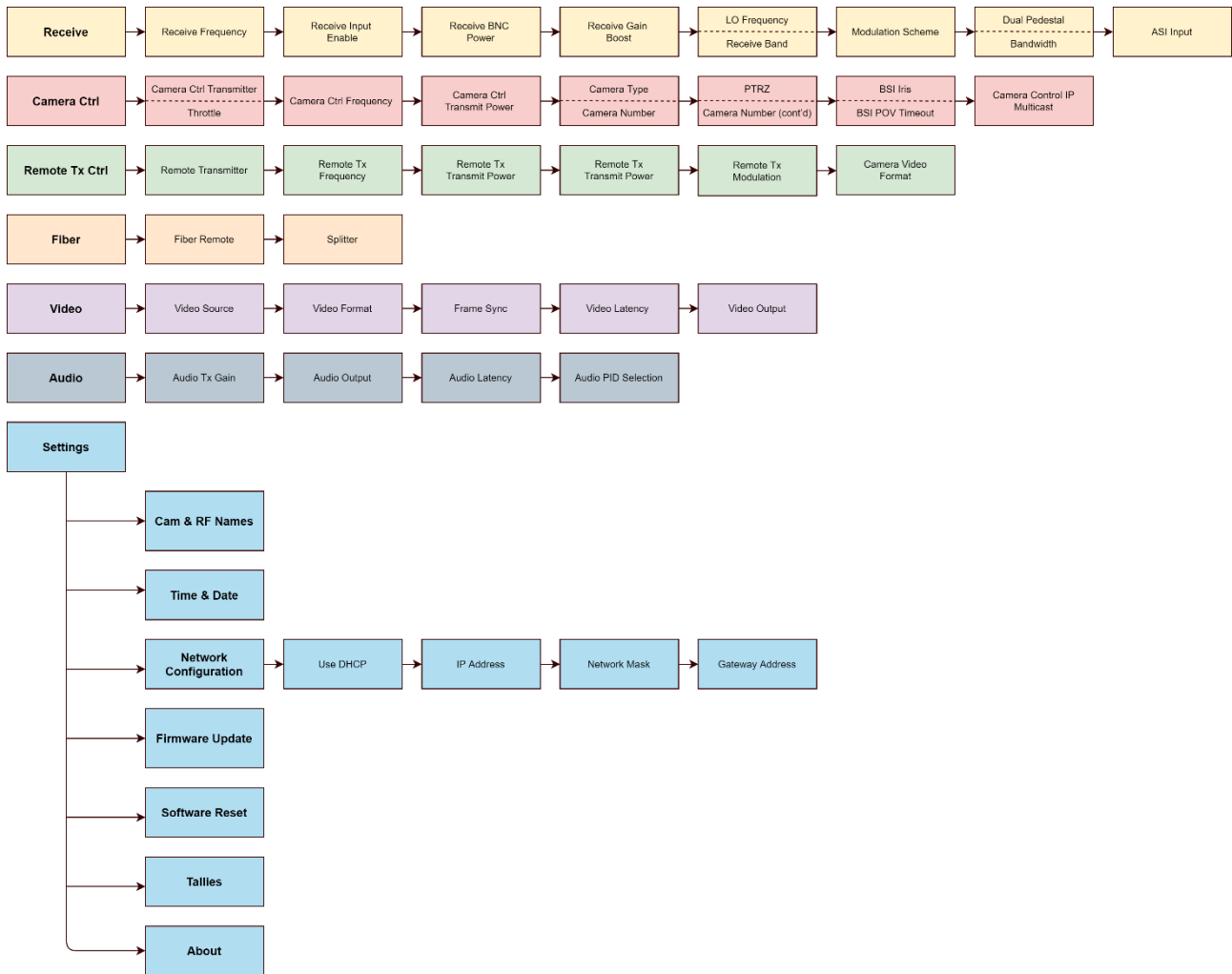


Figure 11: Receiver configuration menus

## Accessories and spares

The accessories and fuses for the Real Freedom Receiver.

### Accessories

The following table lists accessories for the Real Freedom Receiver.

Table 25: Accessories and part numbers

Description	Part number
Rack mount kit	BRK-0005-00
Receiver joining kit	BRK-0006-00
Downconverter, 2.0–2.7 GHz	IDC-2027-30
Downconverter, 3.2–3.9 GHz	IDC-3239-30
Downconverter, 6.4 –7.5 GHz	IDC-6475-30
UHF cable (5 m)	CAB-1855-05
UHF cable (10 m)	CAB-1855-10
Data transmitter	IDT-4349-3U
Active UHF splitter	ISP-3261-30
Fiber base unit (SMPTE)	IFB-3211-01
Fiber base unit (Twin)	IFB-3212-02
Fiber remote unit (SMPTE)	IFR-3211-01
Fiber remote unit (Twin)	IFR-3212-02
User manual	20001-1-004

### Replacement fuses

The following table lists the specifications for the receiver's AC and DC fuses.

Table 26: Fuse specifications

Specification	AC fuse	DC fuse
Size	5 x 20 mm	5 x 20 mm
Type	T5AH250V	T10AL250V
Description	5 Amp, 250 Volt, Slow Blow	10 Amp, 250 Volt, Slow Blow

Technical drawings, specifications, and connector pinouts for the Real Freedom Receiver.

## Dimensions

The following drawings show the dimensions of the Real Freedom Receiver and the positions of the holes used to rack mount the unit.

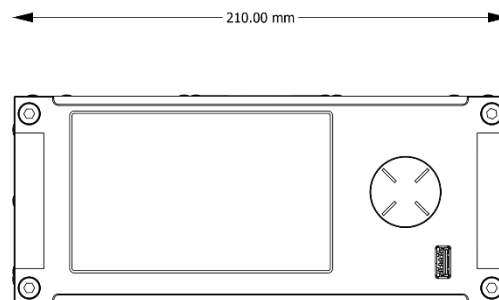


Figure 12: Receiver – front

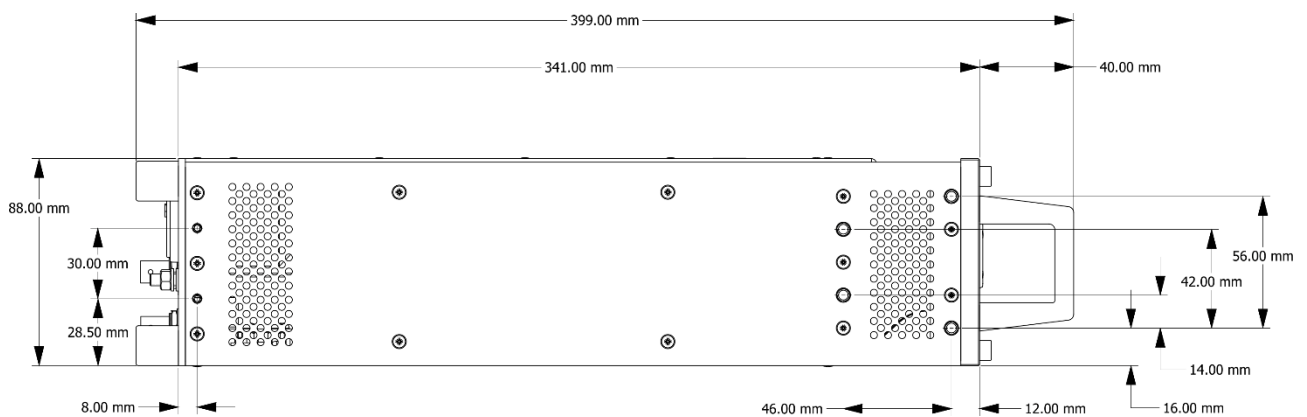


Figure 13: Receiver - left side

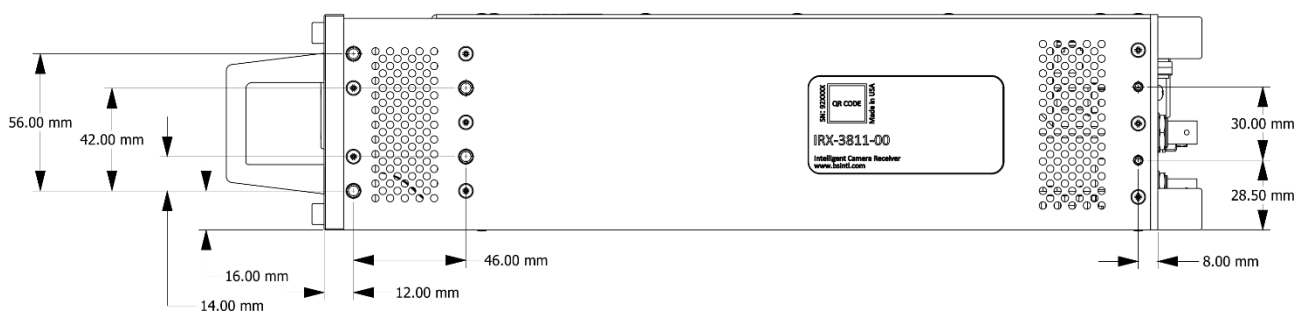


Figure 14: Receiver - right side

## Specifications

The following tables contain the specifications for the Real Freedom Receiver.

### Audio compression

Table 27: Audio compression specifications

Parameter	Specification
Audio channels	8 (maximum) divided among all inputs
Standard	LPCM, MPEG-2 layer I & II
Optional	Dolby AC3

### Audio outputs

Table 28: Audio output specifications

Parameter	Specification
AES out	Format: Balanced and unbalanced
	Channels: 8 Connector: XLR3 (M), BNC (F)
Analog out	Format: Line level, balanced
	Channels: 2 Connector: XLR3 (M) x2
Embedded out	Format: SDI embedded audio
	Channels: 8 Connector: BNC (F)

### Camera control (with optional data transmitter)

Table 29: Camera control specifications

Parameter	Specification
RCP/OCP support	Sony HD & 3D, Panasonic HD & 3D, LDK, Ikegami, Hitachi, Grass Valley
RCP/OCP connector	RJ45 (1000 Base-T)
RCPs / receiver	2 (maximum)
Networked RCPs	6 (maximum per single channel data transmitter)
Tallies / receiver	2 wet, 2 dry
Tally inputs	2
Tally	Red, Green
Tally inputs connector	9-way D-Type (F)

### Compliance

Table 30: Compliance information

Parameter	Specification
ETSI	EN300113, EN301489
FCC	Parts 15 & 90

## Control

Table 31: Control specifications

Parameter	Specification
Local control	Color LCD and control pad
Remote control	Built in HTTP web server
	USB (wired configuration connects to Tx), bi-directional comms (RF I/Ps)
Connectors	RJ45 (1000 Base-T), USB (type A), BNC (F)

## Demodulation

Table 32: Demodulation specifications

Parameter	Specification
Scheme	DVB-T2, DVB-T
Carriers	1K, 2K, 4K, 8K
Constellations (Modes)	QPSK, 16-QAM, 64-QAM, 256-QAM
Bandwidth	1.7, 5, 6, 7, 8, 10 MHz
Dual pedestal	3.4, 10, 12, 14, 16, 20 MHz
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/128, 1/32, 1/16, 1/8, 1/4

## Environmental

Table 33: Operating and storage environment

Parameter	Specification
Temperature	14° to 140°F / -10° to +60°C
Humidity	95% non-condensing

## Framelock

Table 34: Framelock specifications

Parameter	Specification
Type	Black & Burst, Tri-Level
Connector	BNC (F) x1 (Single F/Lock all video outputs)

## IP video

Table 35: IP video specifications

Parameter	Specification
Format	ASI
Connectors	RJ45, BNC (F)

## Physical

Table 36: Size and weight

Parameter	Specification
Size (W x H x D)	8.27" x 3.46" x 13.39" / 210 x 88 x 340 mm (½ width 2RU)

Weight	8.16 lb. / 3.7 kg
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## Power supply

Table 37: AC and DC power specifications

Parameter	Specification
AC supply	100–240 V AC, 50/60 Hz
AC supply connector	IEC 60320, C14
DC supply	10–36 V DC, 10 A
DC supply connector	XLR-4 (M)

## RF inputs

Table 38: RF input specifications

Parameter	Specification
Inputs	4 or 8 (8 allows dual-receive capability)
Impedance	75 Ohm
Tuning range	50–850 MHz
Tuning step	250 kHz
Connector	BNC (F)
Downconverter	External (various bands)
Output power	10 to 36 V DC, 2 Amp per port, 6 Amp total across all ports

## Video decompression

Table 39: Video decompression specifications

Parameter	Specification
Standards	Single H.264 or MPEG-2 decoders
Profile	H.264 Hi422P & MPEG-2 high profile (HP)
Resolution	480i, 576i, 576p, 720p, 1080i, 1080p
Frame rates	23.976, 24, 29.97, 30, 50, 59.94, 60 Hz
Latency	Less than one frame end-to-end
Chroma	4:2:0 / 4:2:2 (Note 4:2:2 is not supported in 1080p50, 59.94 or 60)
Sample depth	8-bit

## Video output

Table 40: Video output specifications

Parameter	Specification
Outputs	2 x SDI, 1 x ASI
Format (auto select)	SD-SDI (SMPTE -259M), HD-SDI (SMPTE-292M), 3G-SDI (SMPTE-424M), 3D (dual SDI), ASI
Connectors	BNC (F) 75 Ohm

## Connector pinout assignments

Pinouts for connectors on the Real Freedom Receiver.

### AES audio output (balanced)

Provides balanced mono audio output, which is less susceptible to noise and interference. Note that balanced AES has a shorter transmission distance (up to 150 m) than the unbalanced version over coaxial cable.

Connector: XLR-3 male

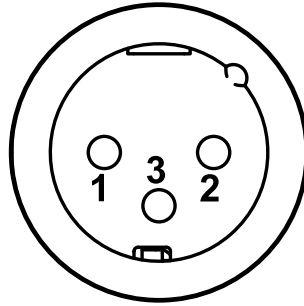


Figure 15: Front face of XLR-3 (M) connector

Pin	Purpose
1	Ground
2	Audio +
3	Audio -
Case	Shield

### AES audio output (unbalanced/single ended)

ASI (compressed video) output.

Connector: BNC female

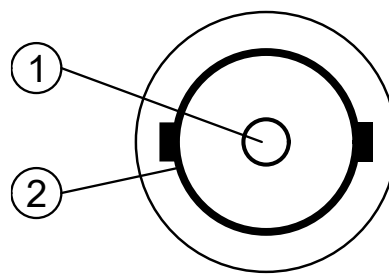


Figure 16: Front face of BNC (F) connector

Pin	Purpose
1	Audio output
2	Ground/Shield

## Analog audio output

Provides analog stereo audio output to client-supplied equipment.

Connector: XLR-3 male

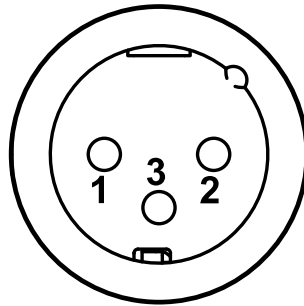


Figure 17: Front face of XLR-3 (M) connector

Pin	Purpose
1	Ground
2	Audio +
3	Audio -
Case	Shield

## ASI input

ASI (compressed video) input.

Connector: BNC female

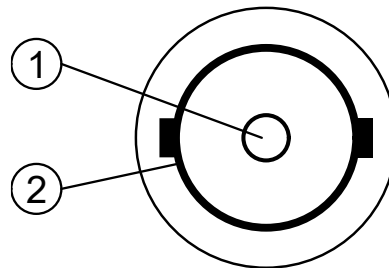


Figure 18: Front face of BNC (F) connector

Pin	Purpose
1	ASI input
2	Ground/Shield



## DC power input

Use to connect the receiver to a DC power source.

Connector: XLR-4 male

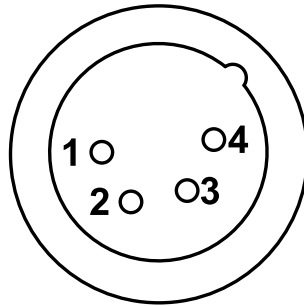


Figure 19: Front face of DC power connector

Pin	Purpose
1	Ground
2	No connection
3	No connection
4	+10 to 36 VDC
Case	Shield

## Ethernet port

Camera control. Use to connect the receiver to a camera control panel either directly or via a network switch. Or use to stream or receive IP video through an Ethernet network connection.

Connector: RJ45 Ethernet

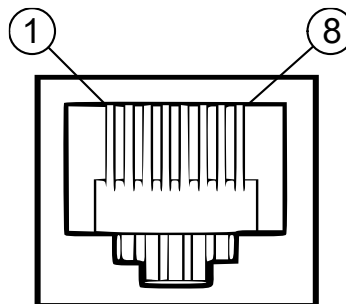


Figure 20: Front face of RJ45 connector

Pin	Purpose
1	Pair A+
2	Pair A-
3	Pair B
4	Pair C+
5	Pair C-
6	Pair B-
7	Pair D+
8	Pair D-

## SDI outputs (clean and overlaid)

SDI video outputs. Clean video outputs for production use.

Connector: BNC female

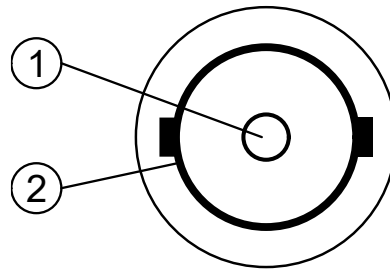


Figure 21: Front face of BNC (F) connector

Pin	Purpose
1	SDI output
2	Ground/Shield

## Signalling

Provides RS232 control, dry red and green tally closure, and auxiliary controls to client equipment via a DB9 connector. Also allows the connection of BSI accessories, for example, a PTRZ joystick.

Connector: 9-pin D-sub female (DE-9F)

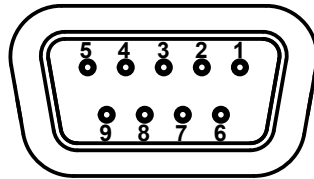


Figure 22: Front face of DE-9F connector

Pin	Purpose
1	Red tally in
2	Rx data
3	Tx data
4	Logic output 1
5	Ground
6	Green tally in
7	12 V out
8	N/C
9	Logic output 2
Shell	Ground

## UHF input

RF input ports. The Real Freedom Receiver is available with up to eight RF input ports. Each port can be connected to a Real Freedom Downconverter using a standard coaxial cable.

Connector: BNC female

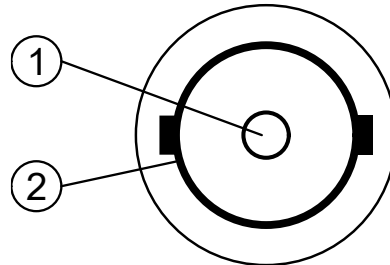


Figure 23: Front face of BNC (F) connector

Pin	Purpose
1	UHF input (50 to 850 MHz)
2	Ground/Shield

# Safety and regulatory compliance

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Important safety and electromagnetic compatibility information.

## Safety notice

It is extremely important to read and understand all safety information and instructions before using a Real Freedom Receiver. Specific warnings and cautions are found throughout this product manual, and you should follow this guidance during the routine use of a Real Freedom Receiver.

## Hazard warning labels

The following hazard warning labels are fixed to the Real Freedom Receiver for your information and safety.



## Electromagnetic compatibility – Class A

Information about the Real Freedom Receiver's electromagnetic compatibility.

### Compliance statement (United States)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions, however, set forth in Section 15.5 of the FCC Rules: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

Changes or modifications not expressly approved by Broadcast Sports International could void the user's authority to operate the equipment.

### CE Declaration of Conformity (European Union)

This product meets the requirements of the following directives and carries the CE marking accordingly: 2014/35/EU Low Voltage Directive, 2014/30/EU EMC Directive.

## Disposal and recycling – European Union

This product is required to comply with the European Union's Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC and 2012/19/EU) and is marked with the following symbol:



This symbol indicates that this product is not to be disposed of with household waste, according to the WEEE Directive and your national law. This product should be handed over to a designated collection point or to an authorized collection site for recycling waste Electrical and Electronic Equipment (EEE).

Improper handling of this type of waste could have a possible negative impact on the environment and human health due to potentially hazardous substances that are generally associated with EEE and products of this type. At the same time, your cooperation in the correct disposal of this product will contribute to the effective usage of natural resources. For more information about recycling this product, please contact BSI.