HITACHI

COFDM WIRELESS CAMERA SYSTEM v1.3

An Ultra-Low Delay Digital Wireless Camera System designed specifically as a 'plug & play' replacement for Hitachi SK-HD and Z-HD SMPTE Fibre or Triax enabled camera systems.

The system has been designed specifically to be used by regular camera operators, with no specialist RF training required.

CONTENTS

SUMMARY OF FEATURES

- Integrated camera unit with camera control
- Integrated base unit – Wireless CCU
- All transmit and receive parameters can be controlled via built-in control panels and OLED displays.
- Main A/V RF link 2000-2400MHz @ 100mW (other frequency bands to be an option)
- Camera control RF frequency 868-870MHz
- H.264 High Profile Encoding
- Low end-to-end delay ~1 frame
- RF spectrum compliant to ETSI EN 302 064-1 V1.1.2
- Comprehensive Web-browser GUI to control and display receiver metrics

The system is based around Cobham's award winning encoding and RF transmission technology. Used by major broadcasters worldwide, for both sports/events coverage and newsgathering, Cobham RF systems are considered the market leader for RF link robustness and reliability.

All electronic hardware and software engineering is carried out at the BWS facility in Southampton, UK, whilst the mechanical design and production is based at our sister company in Pennsylvania, USA. This combination enables us to produce rapid prototype units and quick turnaround of customer orders whilst maintaining the highest build quality.

Both UK and USA facilities carry spare parts for all the products we sell and have substantial maintenance capabilities. Additionally, our operation in Dubai, UAE carries spare equipment which can be substituted in the unlikely event of a failure.

SYSTEM DIAGRAMS

Basic System with ODU

Outdoor Unit (ODU)

Cameraback Unit

Hitachi RCP

Wireless CCU

Tally Signals
Genlock Signal
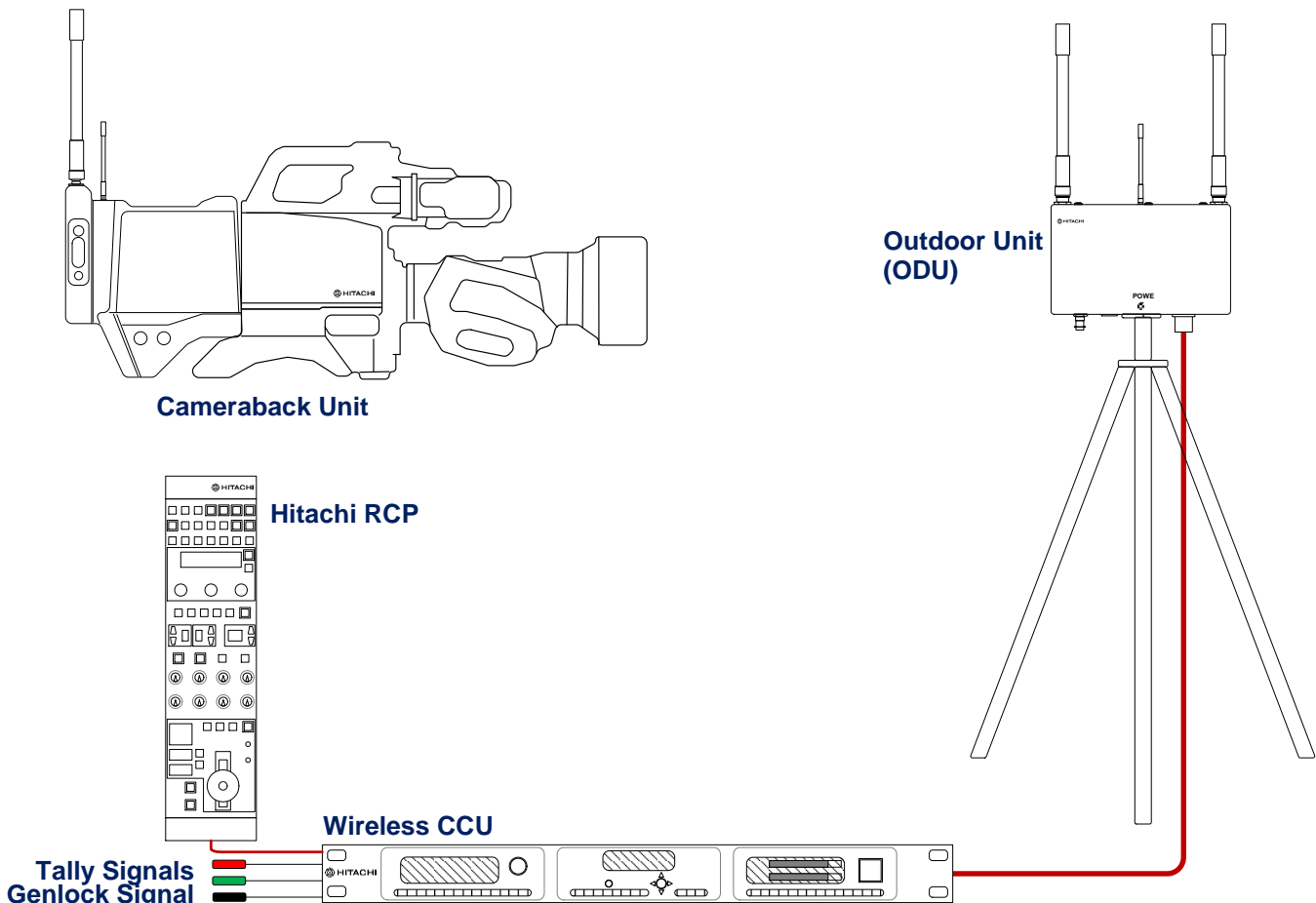
The basic system comprises of a Cameraback unit Wireless CCU and ODU.

Video and audio from the camera head or external audio inputs are fed into a H.264 high profile encoder and compressed to a typical bit rate of 10-18Mbps. This is then modulated using COFDM and transmitted in the 2.0-2.7GHz frequency band, at an RF power of 100mW. This gives a range of ~3Km in line-of-site conditions.

The ODU connects to the CCU via SMPTE hybrid fibre cable. 2x N-type antenna input connectors are mounted on top of the unit, spaced 200mm apart for optimum diversity reception. Internally, the UHF outputs of the Downconverters are fed into 2x RF-Fibre converters and the single-mode optical signals are then fed down the two fibre cores of the hybrid cable. Alternatively, external downconverters/LNBs can be deployed for remote antenna location, powered from the ODU via the co-axial cables.

The ODU is powered using the two power cores in the hybrid fibre cable and the RS422 control data is sent via the two data cores.
At the CCU, the optical signals are then converted back to RF and fed to the demodulator via RF change-over relays. These are controlled from the CCU front panel and enable the operator to switch between co-ax and fibre RF inputs.

Using this system, the antennas can be extended up to 1Km from the CCU – the distance is limited by the ability to remotely power the ODU via the hybrid cable. If the ODU is powered locally, then distances >10Km are possible, although it must be noted that the distance is also governed by the number connections in the fibre path, as these can cause reflections and distortions in the re-constructed RF signals.

At the CCU, the signal is demodulated and fed to the H.264 decoder and output as 2x HD-SDI video with embedded audio (1x 1080i, 1x 720p), AES/EBU digital audio or analogue audio. The CCU accepts B&B or Tri-Level genlock signals.

Control signals from the Hitachi RCP are fed to the CCU via the standard serial data cable or via an Ethernet connection and Setup Control Unit. The RF control data-path is uni-directional. This significantly increases reliability in comparison with bi-directional systems, which send return data from the camera via the video RF link. Although this appears desirable in theory, in practice, such systems suffer from poor reliability, as the closed-loop data path is broken every time there is a 'glitch' in the video RF signal and the system can take several seconds to re-lock. Instead, the BWS system 'spoofs' the presence of the return data path and ensures that both the RCP and the camera head receive constant streams of valid data. The absence of 'real' feedback from the camera head is deemed irrelevant, as the UHF data path will always out-perform the SHF COFDM video path. The RCP still displays valid data in its display windows, as if the camera is receiving the control data, it will match the settings on the RCP.

The main benefit of this system is minimal signal delay, meaning the system response is the same as with a triax or fibre connected camera.

The processed control data is then sent to the ODU via the SMPTE hybrid fibre cable. It is then converted to an RF signal in the 868-870MHz range and transmitted to the Cameraback Unit. Although the final frequency is determined by the Data TX, it is controlled via a control panel on the CCU.
At the camera head, the received signal is demodulated and fed to the camera head.
NB: The system is also capable of operating in the 403-473MHz range via a simple PCB change, however this frequency band is not available in Italy for this application.

Red and Green tally signals (contact closures) are fed into the CCU and are sent along with the Camera Control data. They will activate tally lights in the viewfinder and on the camera head. They are also available via a connector on the Cameraback Unit for driving external tally lights – commonly used on Steadicam rigs.
The ODU connects to the CCU via SMPTE hybrid fibre cable. 2x N-type antenna input connectors are mounted on top of the unit, spaced 200mm apart for optimum diversity reception. The UHF outputs of the Downconverters are fed into 2x RF-Fibre converters and the single-mode optical signals are then fed down the two fibre cores of the hybrid cable. Alternatively, external downconverters can be deployed for remote antenna location.

The ODU is powered using the two power cores in the hybrid fibre cable and the RS422 control data is sent via the two data cores.
At the CCU, the optical signals are then converted back to RF and fed to the demodulator via RF change-over relays. These are controlled from the CCU front panel and enable the operator to switch between co-ax and fibre RF inputs.

Dual ODU/Multi-Antenna

ODU 1

Cameraback Unit

Hitachi RCP

Wireless CCU

Fibre Extender

ODU 2
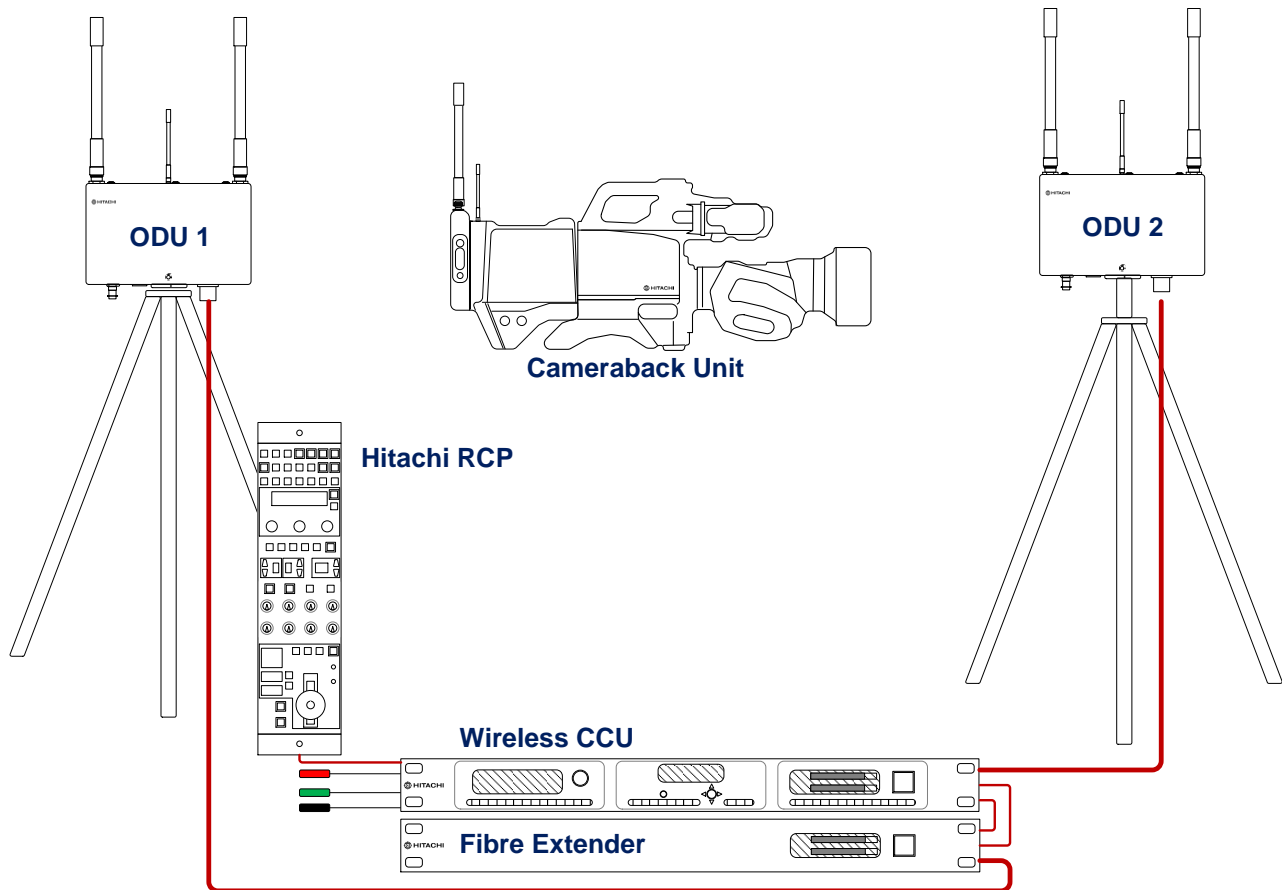
If additional receive antennas are required, a second ODU can be deployed as shown in the above diagram.

The operation of the system is similar to the Basic System with ODU previously described, except an additional ODU is deployed, enabling all antennas to be extended via fibre optic cable.

The 2nd ODU connectivity is provided by an additional Fibre Extender Unit which supplies power to the ODU via the hybrid cable and converts the optical signals back to RF. The signals are then fed to RF inputs 3 & 4 on the CCU, via short BNC cables.

The basic RF-CCU can be upgraded to 4, 6 or 8 antenna inputs if required.

Co-axial Connection
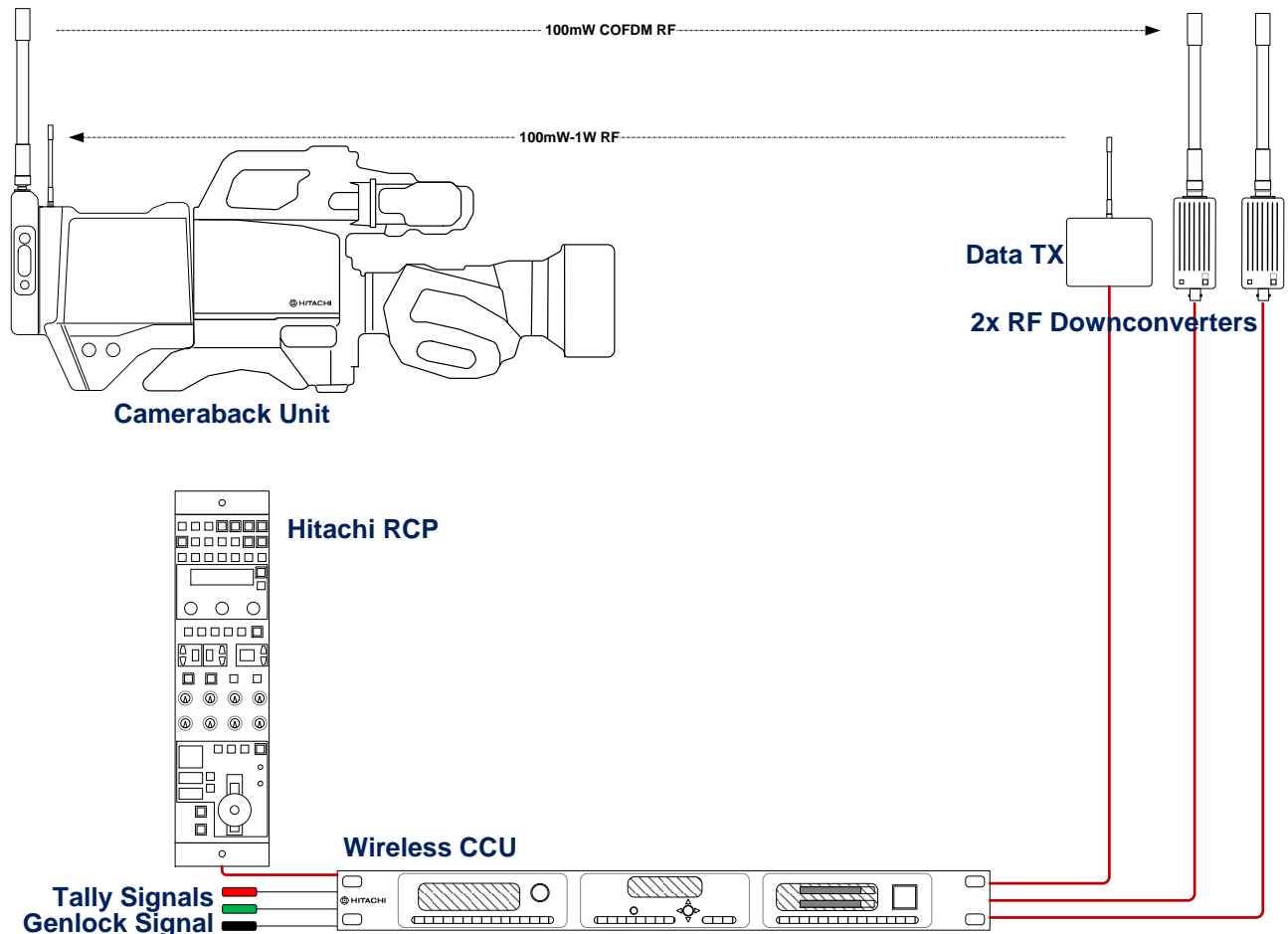
The system can also be connected using standard co-axial cables and external LNBs.

The received RF signal is immediately amplified and shifted down in frequency from the 2GHz band to the UHF band by the two RF downconverters, powered from the CCU via the co-ax cables. This enables the antennas to be mounted up to 100m from the receiver using standard HD video cable such as Belden 1694F.

The camera control data is then sent to the external Data TX via a Cat5 cable, which also uses PoE to provide remote power. It is then converted to an RF signal in the 868-870MHz range and transmitted to the Cameraback Unit. Although the final frequency is determined by the Data TX, it is controlled via a control panel on the CCU.

At the camera head, the received signal is demodulated and fed to the camera head.

SYSTEM COMPONENTS

Cameraback Unit

Description

The BWS INCAMTX-H Wireless Camera-back System, is designed to convert Hitachi SK-HD and Z-HD fibre or triax enabled broadcast cameras to wireless operation. It is a fully remote-controllable dock-able wireless video transmission system for use in high-end Broadcast applications. With its streamlined camera body design, light weight and low centre of gravity, hand-held shooting with a wireless camera has never been more comfortable. Operator safety is ensured by the low RF output power and transmit antenna design, ensuring all RF energy is radiated above the operators head.

The system can be fiited to an existing Triax or Fibre-enabled camera by simply removing 4 screws, removing the Triax/Fibre section and replacing it with the RF unit. The whole operation takes ~ 1 minute and can be carried out in the field.

Utilising class-leading Cobham RF technology and High Profile H.264 encoding, the transmitter offers Ultra Low Delay, low power consumption, exceptional range and 40% lower bit-rates compared to legacy MPEG2 systems. The encoding delay is fixed, irrespective of the RF parameters. This allows true HD transmission in a single 8MHz channel whilst using robust, lower order modulation.
The unit also offers a fully integrated Telemetry system which provides remote control of iris, black level, colour balance, tally and other control features, accessed from a standard Hitachi RCP.

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10

RF CONTROL

11

CAMERA/
TELEMETRY
CONTROL

12

13

HD-SDI OUT   EXT VF IN
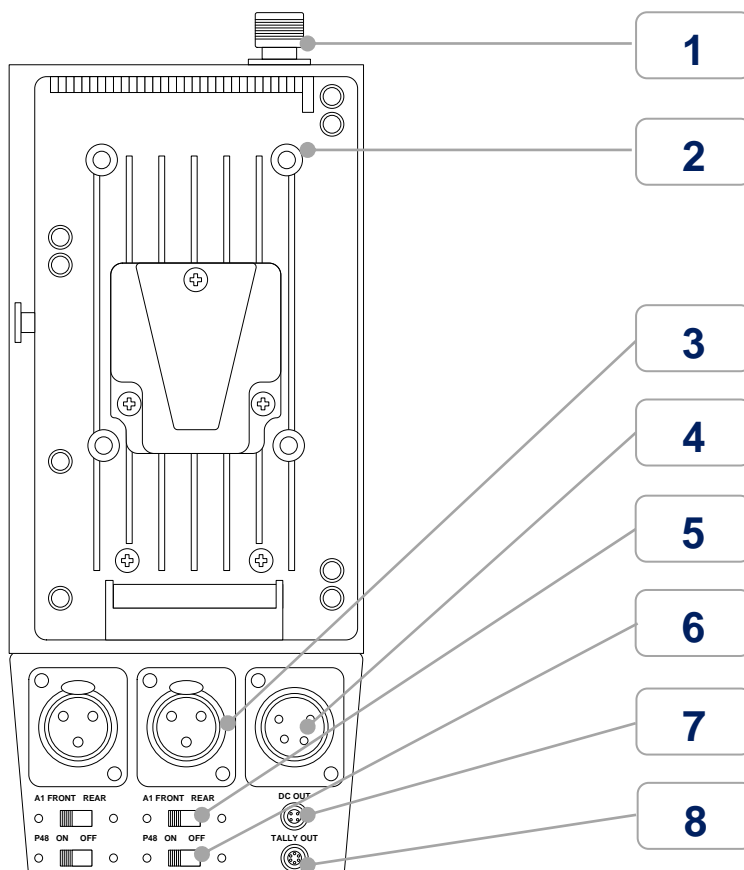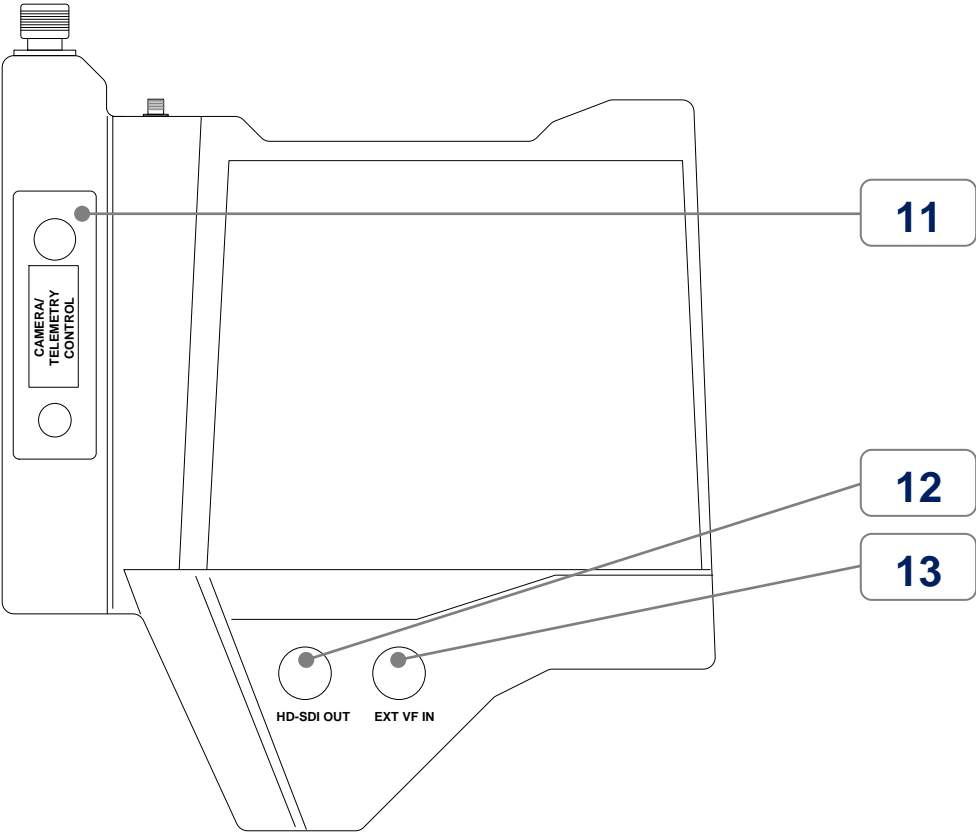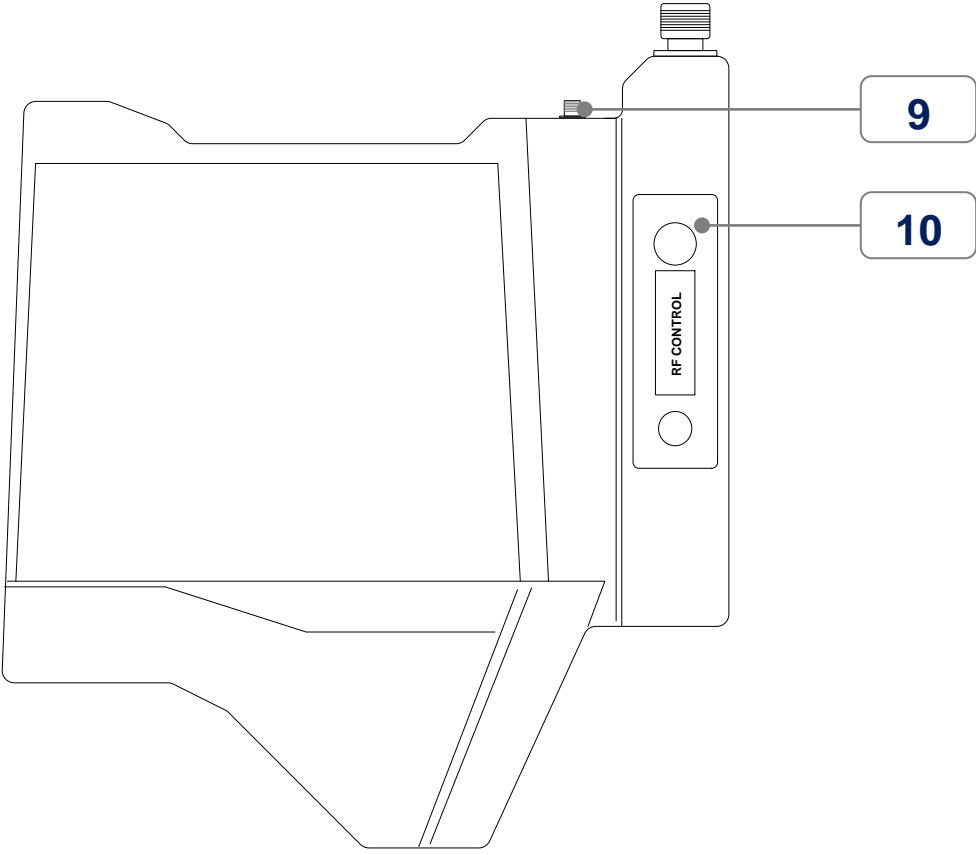
Key Features:

1. **RF Output**
   - N-type Male connector 50Ω
   - 100mW RF power
   - +12VDC phantom power for in-line 1W booster amplifier
   - Available frequency bands from 340MHz to 8.6GHz (in bands)

The RF output is presented on an N-type female connector. This is the standard connector used by broadcasters for signals in the 1.0-14.0GHz range.

In order to meet the ETSI EN 302 064-1 V1.1.2 RF spectrum specification, power is limited to a maximum of 100mW. Higher power outputs can be achieved by fitting a BWS barrel booster in-line amplifier (see Appendix A – Accessories)

The RF section is mounted on a separate PCB from the encoder, meaning the unit can be configured to any frequency band within the 340-8600MHz range, prior to sale.

2. **Battery Plate**
Can be V-lok or Anton Bauer Q-mount as required

3. **External Audio Inputs**
   - XLR Female 3-pin connectors (industry standard)
   - Mic or Line level
   - +48VDC phantom power for broadcast microphones
   - Switchable between rear connector or internal front gun mic

4. **External Power Input**
   - Uses industry-standard XLR Male 4-pin connector
   - For use on Steadicam rigs and with external battery belts
   - Automatically switches away from battery connector when in use

5. **Front/Rear Audio Source Select Switches**

6. **P48 Microphone Powering Select switches**

7. **External Power Output/ Data Input**
+12V DC output for radio mic receivers and other low-power accessories. Also used to receive RS232 data for transmission via the video RF link (typically used for GPS)

8. **External Tally Outputs**
Red and Green tally signals for use with external viewfinders and Steadicam rigs
(open collector)

9. **Camera Control/Telemetry RF Input**
   - Uses industry standard SMA female connector
   - Frequency range 868-870MHz (403-473MHz also available but not legal in Italy)

Receives the control signals from the camera control/telemetry data transmitter, which are then converted to Hitachi protocol and sent to the camera head. Includes red and green tally signals

10. **Main RF Link Control Panel**
   - Controls all functions of the main (video & audio) RF link

- Daylight readable OLED display
- 16 preset configurations
- Menus can be limited to Basic/Advanced/Engineering complexity

11. Camera Control/Telemetry RF Link Control Panel
- Controls all functions of the Camera Control/Telemetry RF link
- Daylight readable OLED display

12. Video Output
- HD-SDI with Embedded Audio
- 3G capability for 1080p50/59 operation

13. External Viewfinder Input
- HD-SDI format
- Can be used with BWS Miniature receiver
- Option for built-in return video receiver

Specifications

Connectors

RF out (video/audio)	N(f)
RF in (telemetry)	SMA(f)
Audio Inputs (Line/Mic))	XLR3(f) x2
Video Out	BNC(f)
Ext ViewFinder Input	BNC(f)
External DC input	XLR4(m)
External Tally Out	Hirose 6-pin
External DC Out/Data In	Hirose 4-pin

RF

Frequency Bands	340MHz to 8.6GHz (in bands)
Tuning Step Size	250kHz
O/P Power	100mW

DVB-T Modulation

DVB-T Bandwidth	8MHz, 7MHz and 6MHz modes
DVB-T Guard	1/32, 1/16, 1/8, 1/4
DVB-T FEC	1/2, 2/3, 3/4, 5/6, 7/8
DVB-T Modulation	QPSK, 16QAM, 64QAM
DVB-T Bit-rates	3.6Mbps to 32Mbps

Video

Video Input	HD-SDI direct from camera
Compression Type	AVC/H.264/MPEG-4 Part 10
Coding Mode	High profile level 4.1, I/IP 4:2:0 (4:2:2 available Q4/2015) Progressive or Interlaced (MBAFF) Horizontal down-sampling of 3/4, 2/3, ½

Audio

Analogue Audio Inputs	Balanced stereo pair +10dBu Max input level (up to 66dB gain)
Digital Audio Input	SD/HD-SDI 2 digital stereo pairs
Sample Rate	32kHz, 48kHz
Coding Modes	4 channels stereo or mono MPEG Audio Layer 1 64-448kbps MPEG Audio Layer 2 32-384kbps

Encryption

Type	Proprietary ABS 32bit

Telemetry

Frequency	868-870MHz
Channel BW	12.5/20/25KHz
Modulation	4PSK, GMSK
RX Sensitivity	-114dBm @ 12.5KHz
	-111dBm @ 25KHz
Data	19200bps @ 25KHz
BW	
	9600bps @ 12.5KHz

Control

TX	Integrated Controller Joystick Buttons and
OLED Screen	
Telemetry	Integrated Controller Joystick Buttons and
OLED Screen	

Power

DC Input	6 to 17V direct from camera battery or DC input
Power Consumption	HD encoding - 9.0W + Camera Head worse case with 100mW RF

Environment

Temperature Range	-10 to +50 °C
Sealing	Splash Proof

RF-CCU

Description

The RF-CCU from Broadcast Wireless Systems is a designed as a plug-in replacement for a standard cable CCU for customers wishing to convert their SMPTE fibre or Triax enabled camera systems to wireless operation.

Basic operation is provided by 2x receive antennas connected via standard co-axial cable (up to 100m), allowing the user to seamlessly move between multiple locations and further extending coverage area.

In conjunction with the fibre ODU, multiple deployment options are offered, connected via standard SMPTE hybrid fibre cable. 2 or 4 antennas can be extended up to 1000m from the CCU using this system.

In addition to front panel operation, the RF-CCU features a GUI offering a comprehensive suite of monitoring and management tools. Each antenna input can be monitored for RF level and signal quality, plus a spectrum analyser function is provided to assist with interference avoidance.

The unit also offers a full Telemetry system which provides remote control of iris, black level, colour balance and other control features, accessed from a standard camera manufacturers RCP (not included).

The system has been designed specifically to be used by regular camera operators, with no specialist RF training required.
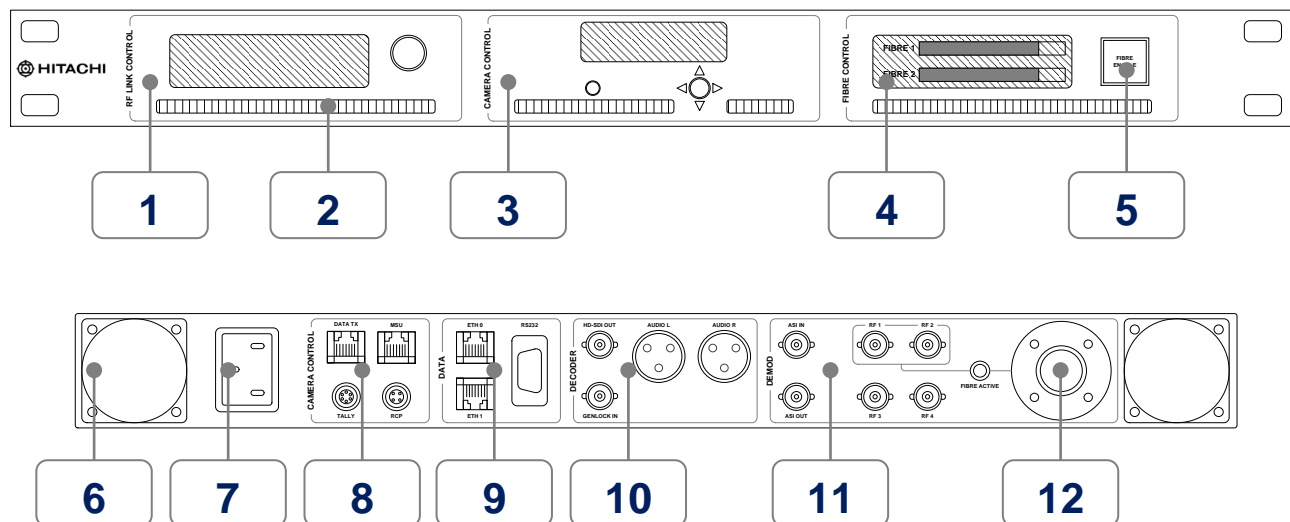
Key Features:

1. **Main COFDM Video Link Control Panel**
   ▪ Multi-function OLED display
   ▪ Rotary/Joystick controller

   This section controls all receiver functions associated with the main Video RF path and advanced decoder functions such as service selection and genlock timing.

2. **Air Intake**

Cooling is front-to-rear, with waste air exhausted at the rear.

3. Camera Control/Telemetry Control Panel
▪ Multi-function OLED display
▪ Joystick controller plus 'Escape' button

This section controls all functions associated with the Camera Control system.

4. Fibre Level Display

The OLED display indicates the optical receive level for each fibre core using a bargraph format.

5. Fibre Enable Button

The 'Fibre Enable' button operates the change-over system which selects which signals are routed to inputs 1&2 of the demodulator. When the 'Fibre Enable' button is pressed, the co-ax RF 1&2 inputs are disconnected and the signals from the fibre system connected instead.

6. Fan

There are two powerful extraction fans on the rear panel.

7. Mains Power Inlet
   – IEC C14 connector
8. Camera Control Connectors
   – Data TX: RJ45
     Serial Data connection to Data TX, includes remote powering
   – SCU: RJ45
     Ethernet connection to Hitachi Setup Control Unit (SCU)
   – Tally: Hirose 6-pin
     Red and Green tally inputs from vision switcher (contact closures)
   – RCP: Hirose 4-pin
     Serial data connection to Hitachi Remote Control Panel (RCP)

9. Data Connectors
   – ETH1: RJ45
     Web-browser control of all unit functions + Streaming video output (option)
   – ETH0: RJ45
   – Web-browser control of all unit functions + Streaming video output (option)
   – RS232: 9-way D-type female
     Serial data control of receiver functions and output of wayside RS232 data channel (typically used for GPS data)

10. Decoder Connectors
   – HD-SDI Out (1080i): BNC
     Received Video Output (includes embedded audio channels)
   – HD-SDI Out (720p): BNC
   – Genlock In: BNC
     B&B or Tri-Level sync
   – Audio L : XLR3 Male
   – Left hand audio channel analogue output, line level balanced or AES/EBU digital Audio
   – Audio R : XLR3 Male

Right hand audio channel analogue output, line level balanced

11. Demodulator Connectors
- ASI In: BNC
  Allows decoding of an external transport stream
- ASI Out: BNC
  Output of received transport stream to allow external processing, such as ASI diversity switching
- RF 1&2: BNC
  Co-axial input from external downconverter (NB: *RF 1&2 not active if Fibre Connection is enabled)*
- RF 3&4: BNC
  Co-axial input from external downconverter

12. Hybrid Fibre Connector
- Lemo FXW

Specifications

COFDM RX:

Inputs

Power	IEC C14
RF	4x BNC (50-850MHz)
IP Streaming/Control	RJ45
ASI In (option)	BNC
Genlock	BNC
RS232 Control	9-pin D-type - A

Output

1x SDI/HD-SDI Video	BNC
ASI Out	BNC
IP Streaming/Control	RJ45
2x Line Level Audio	XLR3M
RS232 Data	9-pin D-type - B

Ethernet

Mode	2x 10/100/1G Ethernet Ports with PoE support
Function	Remote Control via web-browser

Video

Line Standard (SD)	PAL/NTSC
Resolution (HD)	720p50, 720p59, 720p60, 1080i50, 1080i59, 1080i60, 1080p23, 1080p24, 1080p25,1080p29,1080p30, 1080psf23,1080psf24,1080psf25, 1080psf29,1080psf30,1080p50, 1080p60
Decoding Mode	H.264 SD/HD 4:2:0/4:2:2
	MPEG2 SD/HD 4:2:0/4:2:2
Delay	From 15ms end-to-end (mode dependant)

Audio

Analogue Output	1 Stereo Pair +18dBm (on 600 ohm)
AES/EBU	1 Stereo Balanced Pair (110 ohm)
Sample Rate	48KHz
Format	MPEG Audio 384Kb/s to 64Kb/s Mono or Stereo

ASI

Mode	Byte or packet mode

Data Interfaces
RS232 Data Output 1K2 to 115K2 baud switchable

Control

Remote Control	Network Web Browser control interface RS232 Control from PC GUI Application
Local Control	Front Panel OLED display with navigation keys
On Screen Display	Spectrum, RX SNR, RX Power

Camera Control:

RF

Frequency	403-473MHz
Channel BW	12.5/20/25KHz
Modulation	4PSK, GMSK
TX Power	100/200/500/1000mW
RX Sensitivity	-114dBm @ 12.5KHz
	-111dBm @ 25KHz

Data

TX Data	19200bps @ 25KHz BW
	9600bps @ 12.5KHz
Control Data (IDU-ODU)	300-38400bps
IDU-ODU Interface	RS422 via twisted pair audio cable

Control

Camera Unit navigation	Front Panel OLED display with keys
IDU navigation	Front Panel OLED display with keys
	Web-browser interface (optional)
Data TX	Controlled via IDU

Fibre:

Optical Section

Type	Single Mode
Laser type	DFB
Optical Wavelength	Input 1: 1550nm (+/-20nm)
	Input 2: 1310nm (+/-20nm)
Optical Power Output	4.5dBm (nominal)

RF Section

Frequency Range	100-860MHz
Gain Flatness	+/- 0.25dB (typical)
	+/- 0.5dB (max)
VSWR	<1:5:1
Maximum Input Power	+15dBm (without damage)
Gain Stability	0.25dB over 24 hours
RF Link Gain	0dB (assumes 0dB optical loss)
Input P1dB	3dBm
Noise Figure	23dB

General:

Physical

Dimension	W 483mm, D 320 mm, H 44mm
Weight	5.4 kg

Power

AC Input	90-255V 47-63Hz (auto sensing)
Power Consumption	37-59W (downconverter dependant)

Environment

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Temperature Range	-20 to +50°C

Outdoor Unit (ODU)

Description

The RF-ODU allows plug-and-play operation via a single SMPTE hybrid fibre cable. All facilities required at the remote receive location are contained within the ODU and it will power via the SMPTE cable for distances up to 1000m. Longer distances are possible, but local power must be provided via the external DC input.

The tripod mounting system assists with easy deployment. All the operator is required to do is connect the antennas and plug in the SMPTE cable. Antenna direction can be adjusted via the tripod mount and/or the antenna connectors.

If remote antenna operation is required, the antennas can be extended, using external down-converters, with standard BNC cables, up to 100m from the ODU.

Dual ODU operation is achieved by adding a Fibre Base Station, which connects to the wireless CCU RF inputs via short BNC link cables.
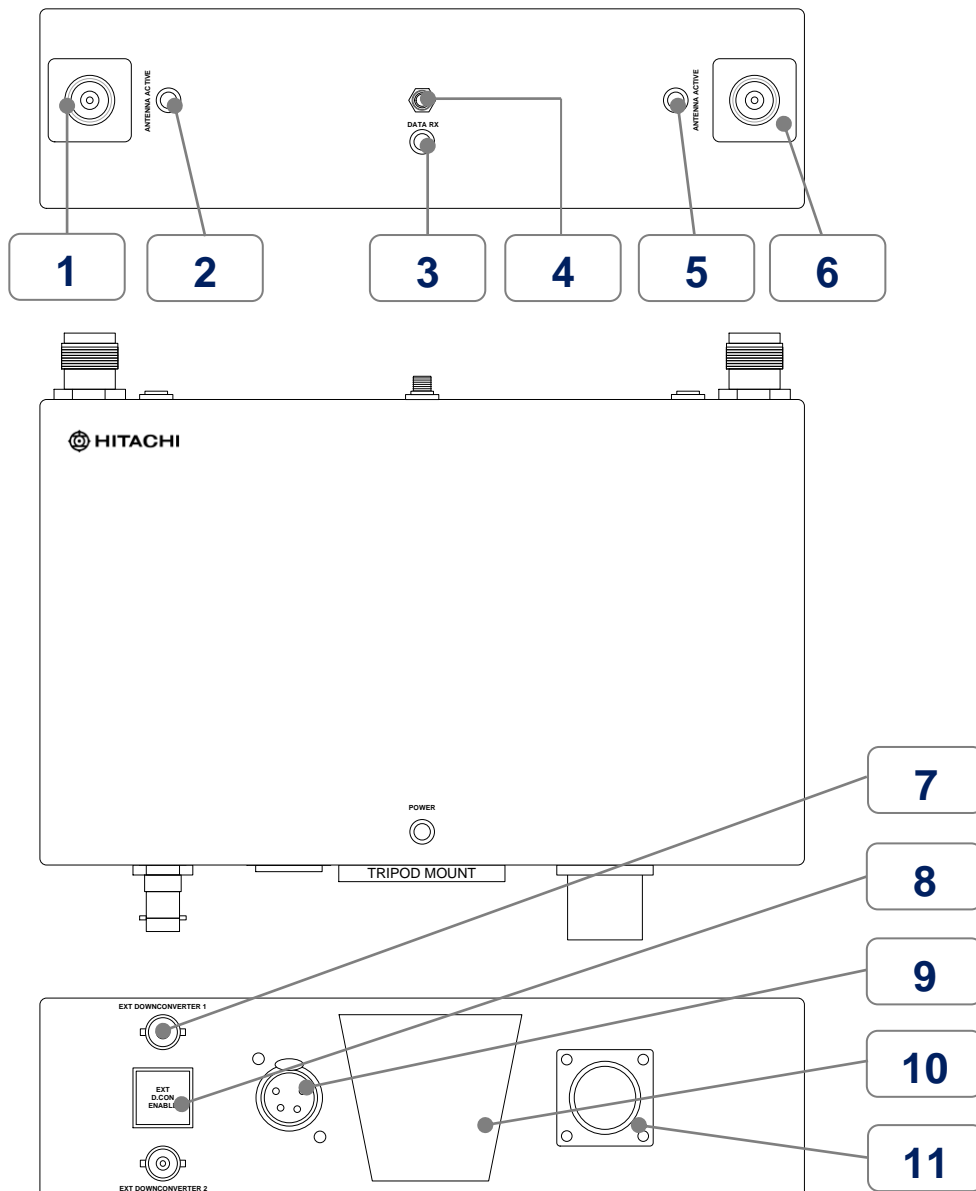
Key Features:

1. **RX Antenna Input 1**
    - N-type female

    Connects to the RF input of internal downconverter 1. 2000-2700MHz

2. **Antenna Active LED**
    - Green 5mm LED

    Indicates that the ODU is selected to use internal downconverters/direct antenna connection

3. **Data RX LED**
    - Green 5mm LED

    Flashes to indicate data traffic from the Data TX

4. **Data TX Output**
    - SMA female

    RF output from Data TX (camera Control/Telemetry). 100mW-1W 403-473MHz

5. **Antenna Active LED**
    - Green 5mm LED

    Indicates that the ODU is selected to use internal downconverters/direct antenna connection

6. **RX Antenna Input 2**
    - N-type female

    Connects to the RF input of internal downconverter 1. 2000-2700MHz

7. **External Downconverter Inputs**
    - BNC female (x2)

    Enables connection of external downconverters for remote antenna mounting. Provides +12VDC downconverter power. 200-900MHz

8. **External Downconverter Select Switch**
    - Red Push Button with finger guard (illuminated)

    Disables the antenna inputs and routes signals from external downconverters to the RF-Fibre cards.

9. **External DC Input**
    - XLR4 male

    Enables local powering when fibre cable runs >1Km are required

10. **Tripod Mount**

11. **Hybrid Fibre Connector**
    - Lemo EDW

3dBi Omni Antenna

Specification
Mechanical

Connector	N(m)
Dimensions	100xØ18mm
Weight	80g
Colour	White or Black
Mounting Method	Direct to connector
Ground Plane Requirement	Ground Plane Independent

Electrical

Frequency Ranges	2000-2700MHz
VSWR	<1:3:1
Nominal input impedance	50Ω
Feed Power Handling	10W
Gain (typical)	3dBi
Beam-width (V)	78°
Polarisation	Vertical
VSWR	1:3:1

Environmental:

Wind Survival	N/A
Temperature Operational	-20 to +50°C
Water and Dust resistance	IP66

9dBi Micro Sector Antenna

Specification
Mechanical

Connector	N(m)
Height	100mm
Width	135mm
Depth	60mm
Weight	300g
Colour	White
Mounting Method	Direct to connector
Ground Plane Requirement	Ground Pane Independent

Electrical

Frequency Ranges	2000-2700MHz
VSWR	<1:3:1
Nominal input impedance	50Ω
Feed Power Handling	10W
Gain (typical)	9dBi
Beamwidth (H&V)	78°
Polarisation	Vertical
Cross Polar	15dB typical

Environmental:

|	
Wind Survival	N/A
Temperature Operational	-20 to +50°C
Water and Dust resistance	IP66

3G/UMTS Filters

Wireless camera systems operating in the 2000-2700MHz frequency band can be affected by very high power signals from 3G Cellular base stations which transmit at 2112-2170MHz. BWS recommends the use of a band-stop filter. This filter has a 'notch' response which simply removes the unwanted signals at 2112-2170MHz.
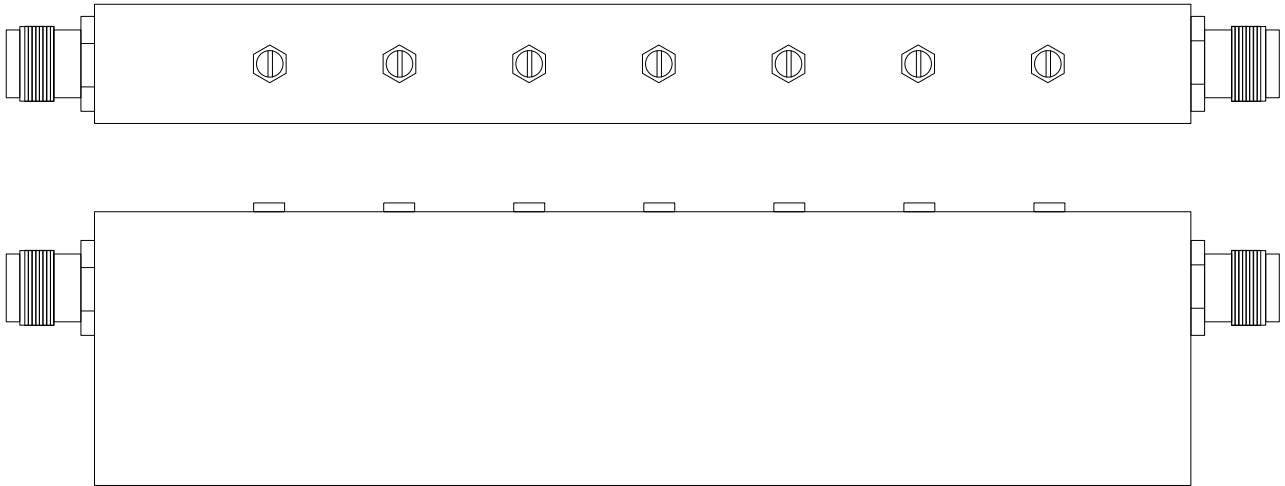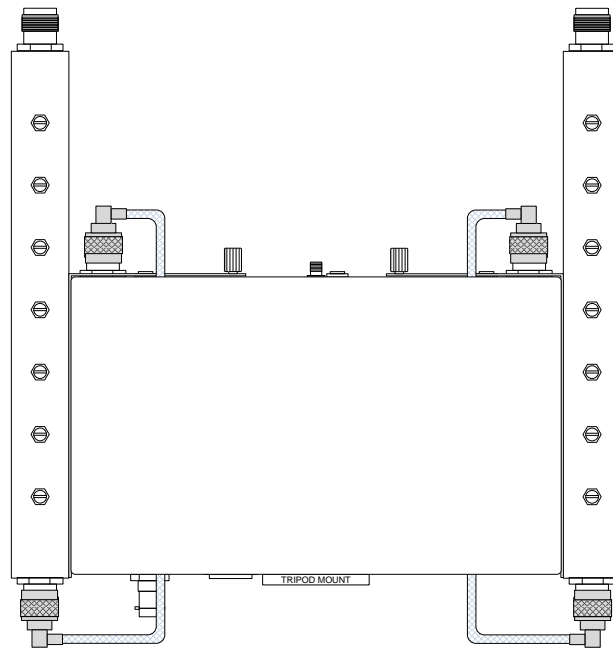
Specifications

Passband 1:	DC-2100MHz
Passband 2:	2200-5000MHz
Insertion Loss:	1.2dB (typ)
Return Loss:	>12dB
Impedance:	50Ω
Stopband Rejection:	>30dB @ 2112MHz
	>40dB @ 2120-2170MHz
Dimensions:	248x62x27mm
Connectors:	N(f)

Each filter is supplied with a bracket and connecting cable enabling it to be securely attached to the ODU. The antenna is mounted directly on the filter.
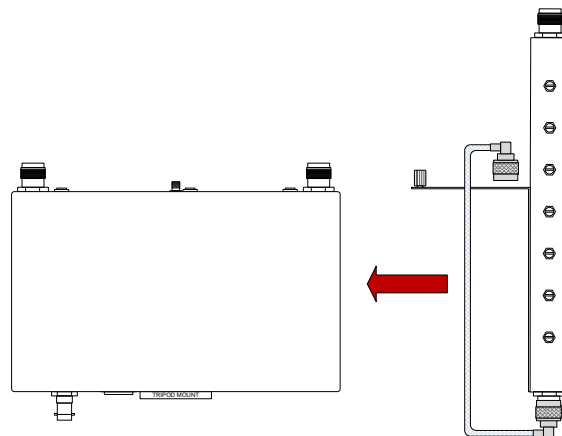
The completed assembly looks like this:
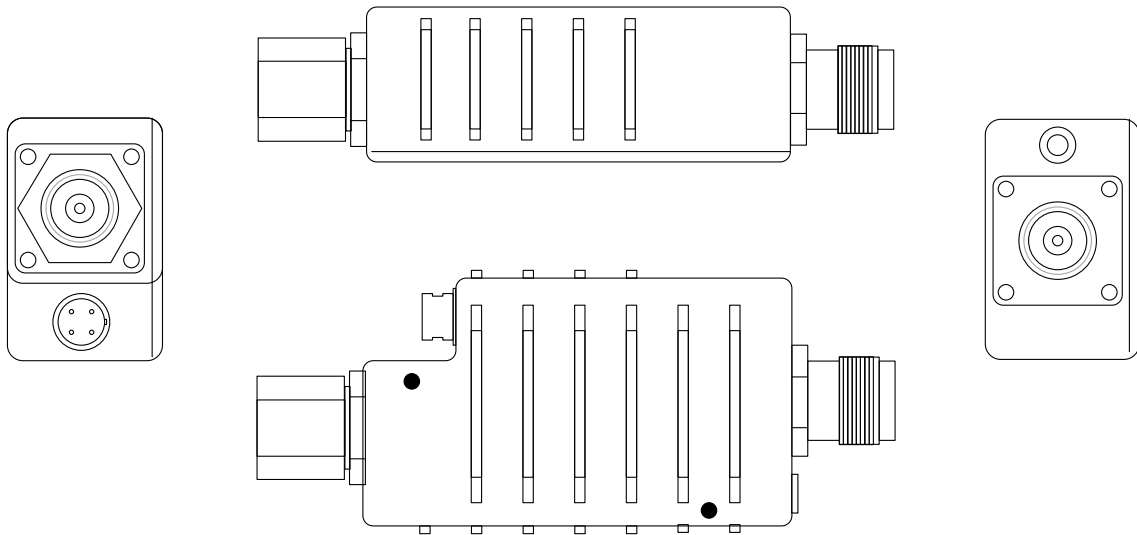

Telemetry Antenna

Specifications

Frequency Range:	840-890MHz
VSWR (Typical):	< 2:1
Gain: Isotropic:	2dBi
Impedance:	50Ω
Max Input Power:	50W
Dimensions:	140x16
Connector Type:	SMA Plug

APPENDIX A - ACCESSORIES

1W In-Line Booster Amplifier

The device mounts between the RF out connector and the antenna and provides up to 1W RF output. Powering is directly via the N-connector, or an external cable can be used if off-camera mounting is required.

Specifications

Connectors

RF out	N(f)
RF in	N(m)
Power in	Hirose HR10 4-way or via RF in connector
Indicator LED	Green

Output Power
30dBm/1W

Input Power
20dBm/100mW

Gain
10dB

Powering

Supply Voltage	6-18VDC
Power Consumption	4W @ 1W
	3W @ 500mW

Physical

|	
Dimensions	130x50x30mm (preliminary)
Weight	190g (preliminary)
Operating Temperature	-10-+50°C
IP Rating	IP54

LNB-S

Description

The LNB-S gain selectable barrel down converter has optimum performance in all situations. It is easy to mount with magnetic, cable-tie and screw-hole fixings for maximum flexibility.
The down converter has excellent adjacent channel rejection capabilities. An LED indicator is provided for power on/off and switchable high/low gain. It is powered from RF-CCU via co-axial cable or via the fibre RF-ODU.
The LNB-S covers the 2025-2550MHz frequency band. Other frequency bands from 340MHz to 8.6GHz are available on request.

N-Type RF Input　　　　　　　　　　　*Support Bracket*
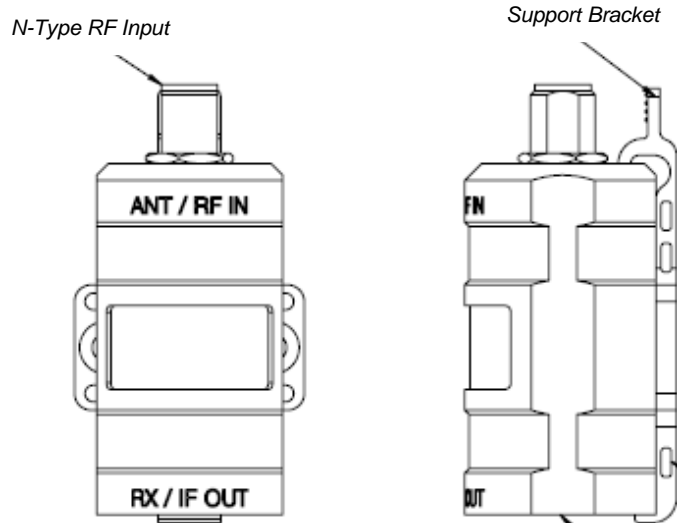
Band-pass Filter

This filter only allows signals in the 2200-2400MHz frequency range. Although this may appear limiting, it is the most commonly used frequency band for Wireless Camera Systemsin Europe and removes interference from 2G/3G/4G cellular systems, WiFi, Bluetooth and equipment operating in the un-licenced frequency band.

Specifications

Passband:	2200-2400MHz
Insertion Loss:	0.7dB (typ)
Return Loss:	>15dB
Impedance:	50Ω
Stopband Rejection:	>40dBc @ 2170MHz
	>40dB @ 21MHz
Dimensions:	170x35x16mm
Connectors:	N(f)

**BWS can offer bespoke filters to any specification on request**

RF-CCU Additional Inputs

The standard RF CCU is supplied with 2x antenna inputs. The unit can easily be upgraded to offer 4x RF inputs via a software key.

Further upgrades to 6 or 8 RF inputs are also possible, but require a modified rear connector panel (return to factory).

RF-FEU Fibre Extender Unit

The device provides additional fibre connectivity between the RF-CCU and an additional RF-ODU
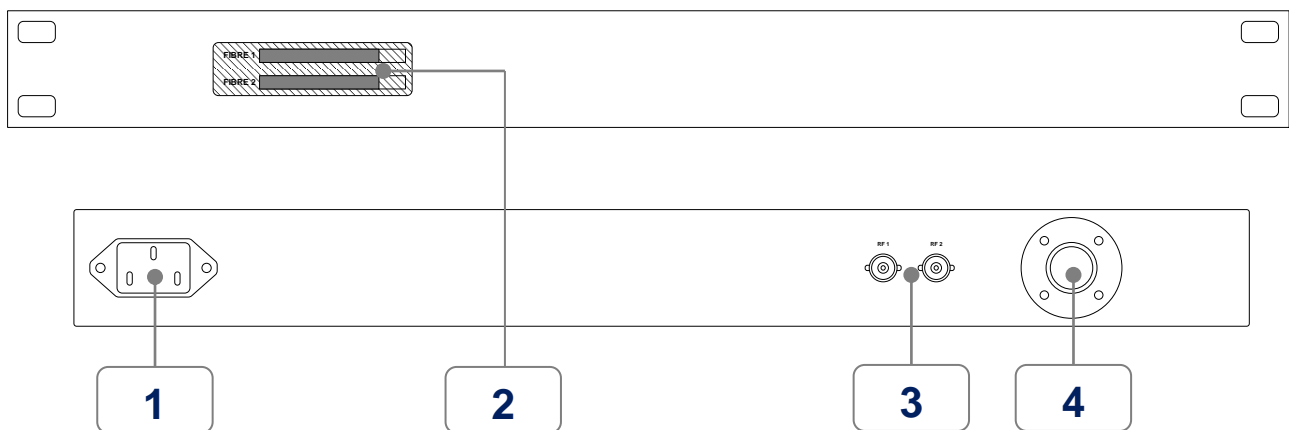
Key Features

1. **Mains Power Inlet**
   – IEC C14 connector

2. **Fibre Level Display**

The OLED display indicates the optical receive level for each fibre core using a bargraph format.

3. **RF outputs**
   – BNC Female x2

Outputs the RF signals from the 2nd ODU for connection to CCU demodulator inputs 3&4 (via BNC link cables)

4. **Hybrid Fibre Connector**
   – Lemo FXW

Spectrum Analyser

- Essential tool for link troubleshooting
- Ideal for confidence monitoring of RF channels
- Perfect aid for installation and maintenance of antenna systems
- Industry leading -105 dBm receiver sensitivity
- Intuitive control and interactive GUI with instant On/Off functionality
- Resistive LCD touchscreen allows working with gloves on

Frequency range	**2000-8000MHz**
Input power range	-105 dBm to -40 dBm
Max input power	0 dBm
RBW (Resolution bandwidth)	1 MHz
Span	100 MHz to full bandwidth
Sweep speed	0.5s @ 100 MHz Span
Guaranteed accuracy	+/- 3 dB
Input	50 ohm SMA (f)
Interface	mini USB 2.0 (1.1)
LED indication	when charging
Battery	2380 mAh Polymer Lithium-ion
Battery life	up to 4h
Operating temp	-15ºC to +40ºC
Dimensions	128 x 81 x 24 mm
Weight	0.3 kg