RFD VideoLink Module Technical Datasheet

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1 Introduction

1.1 Key Features

- Selectable video resolutions up to 720p
- H.264 video compression
- Compatible with most USB Video Class (UVC) cameras
- Telemetry and video stream over MAVLink
- 5 km+ range depending on Line of Sight (LoS)
- Wireless device configuration using 2.4GHz Wi-Fi and a webpage GUI
- Hardware accelerated AES encryption with up to 256-bit key
- PPM or SBUS control signal passthrough
- Two 900MHz antenna ports with automatic diversity by default
- Two redundant power supply inputs with wide voltage range (6 to 55V)

1.2 Applications

- Video feed from Uncrewed Vehicles (UV) for:
  - Enhanced situational awareness
  - Search and Rescue
  - Surveillance
  - Field inspections
- Wireless remote surveillance
- Wireless industrial monitoring

2 Overview

The RFD VideoLink Module is designed to be installed in a UAV or at a remote monitoring station together with a USB camera to generate video data. It also supports telemetry links for MAVLink compatible vehicle controllers, such as the CubePilot Orange (also known as Pixhawk). The VideoLink encodes video from a USB camera and transmits it, along with, where applicable, telemetry and RC control signal data, as a real-time, or close to real-time, stream to the GCS.

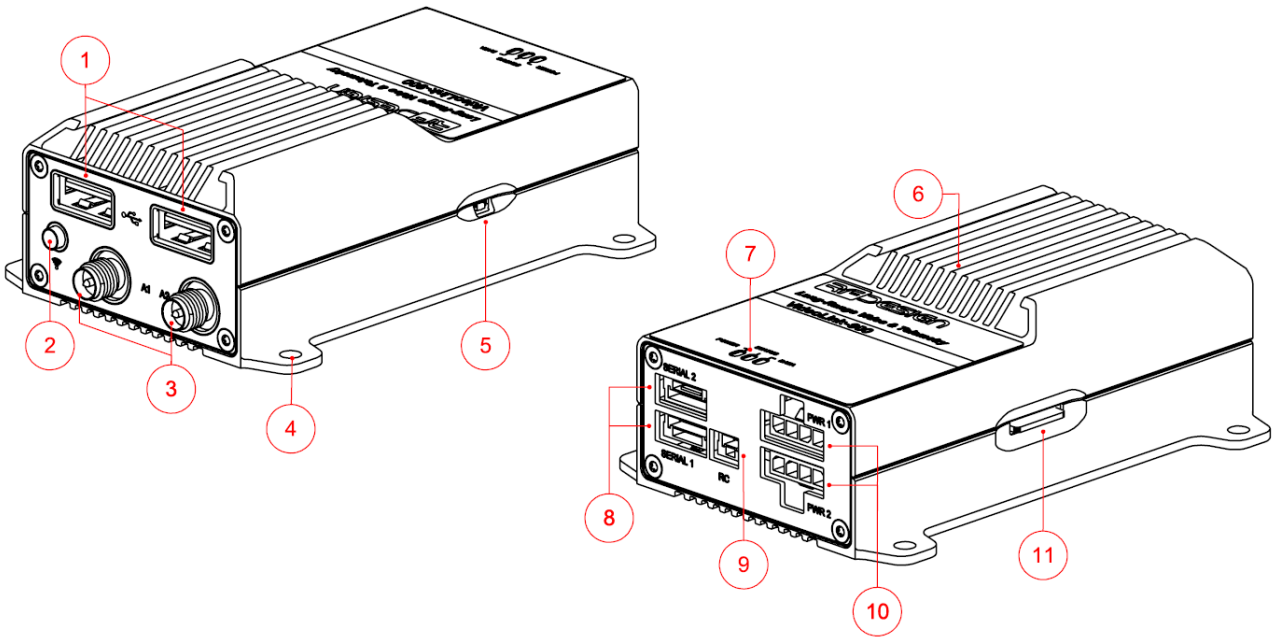


Figure 1: RFD VideoLink module feature diagram

#	Feature Description
1	USB Type A video connectors
2	2.4GHz Wi-Fi MMCX RF port
3	900MHZ RP-SMA RF ports
4	Mounting holes
5	Factory reset button

#	Feature Description
6	Integrated enclosure and heatsink
7	Indicator LEDs
8	Serial ports
9	RC port
10	Power ports
11	Micro SD card slot

2.1 USB Type A Ports

Two USB Type-A ports support USB devices up to version 2.0 speeds and are typically used to connect USB cameras for streaming video.

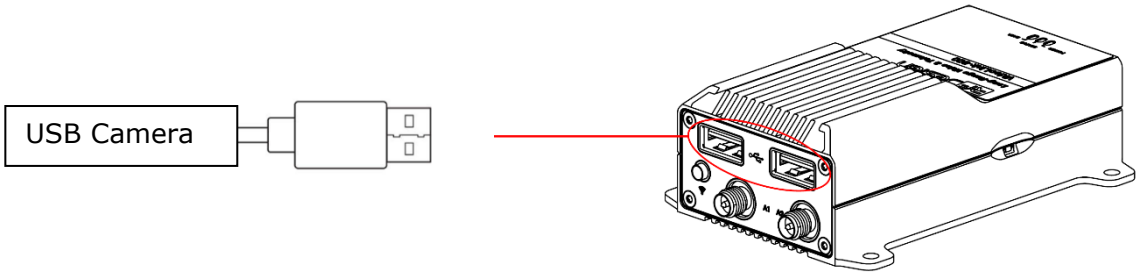


Figure 2: Connect the USB camera to the first USB port (LHS) or second USB port (RHS)

2.2 2.4GHz Wi-Fi MMCX RF Port

The RFD VideoLink offers Wi-Fi accessibility to enable easy product configuration. It features a micro-miniature coaxial (MMCX) connector for attaching a 50 Ω 2.4GHz antenna via a coaxial extension lead. Align the cable with the connector and press firmly until it clicks into place. The antenna can then be fitted to the RP-SMA connector at the other end of the extension.

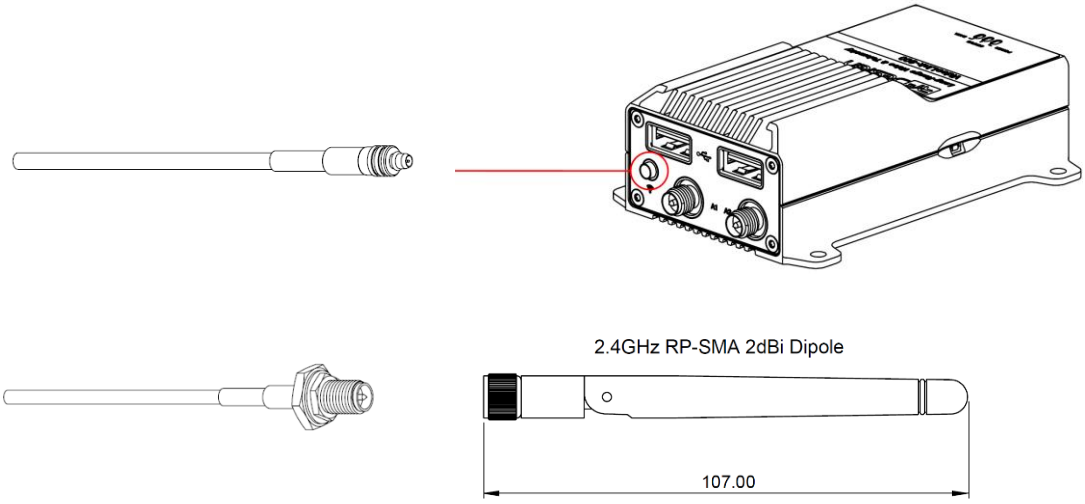


Figure 3: Fitting extension coaxial cable and antenna to MMCX port of VideoLink module

2.3 900MHZ RP-SMA RF connector

The RFD VideoLink module is fitted with two 50 Ω reverse polarity sub-miniature A (RP-SMA) connectors. These are designed to provide robust and repeatable connection to compatible antennas or RF coaxial extension leads.

Note that the mechanical strength of these ports is limited and that hanging excessively large antennas from these ports or subjecting them to repeated mechanical/vibrational stresses can damage the ports, solder joints and PCB of the modem.

It is not recommended to fit antennas directly to the RF connector. Instead, use RP-SMA extensions to connect the antennas to the VideoLink.

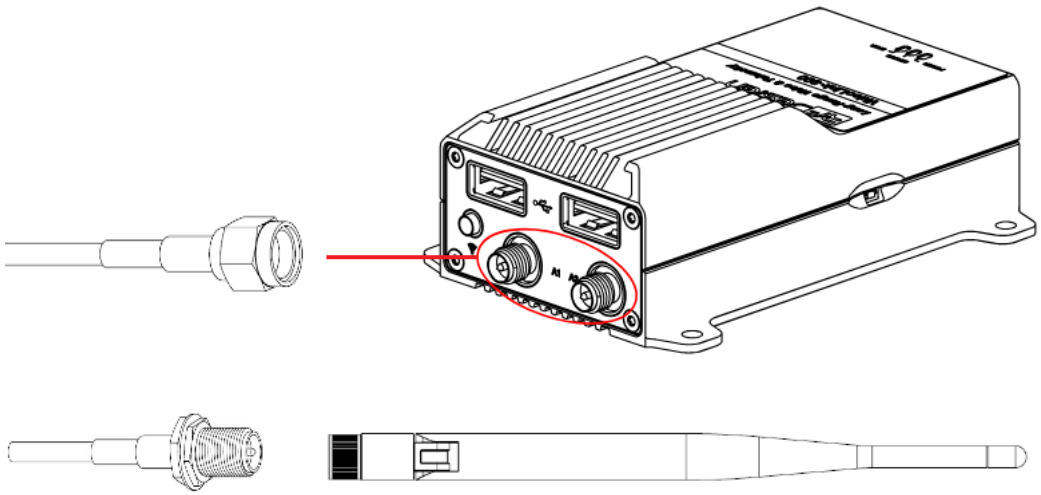


Figure 4: Coaxial extension cable and antenna fitting to 900MHz RP-SMA RF ports

2.4 Mounting Holes

The enclosure includes four 3.5 mm diameter mounting holes, suitable for M3 or 1/8" bolts.

2.5 Factory Reset Button

The factory reset button initiates a factory reset of the RFD VideoLink module. For details, refer to the VideoLink Factory Reset section of this document.

2.6 Integrated Enclosure and Heatsink

The VideoLink case acts as a heatsink. This enclosure provides passive cooling to keep the modem and processor within safe operating temperatures. Thermal performance may vary depending on RF output power, air data rate, and video encoding settings. The unit may become hot during extended operation, particularly in low-airflow environments.

If the temperature exceeds safe limits the VideoLink processor and/or the modem can throttle their output to protect the device. Since the system can generate substantial heat, particularly for high video resolutions and RF transmission power levels, adequate ventilation is critical. It is recommended to install the VideoLink unit in a location with consistent airflow to maintain optimal performance. Once the temperature returns to a safe level, normal operation will resume.

2.7 Indicator LEDs

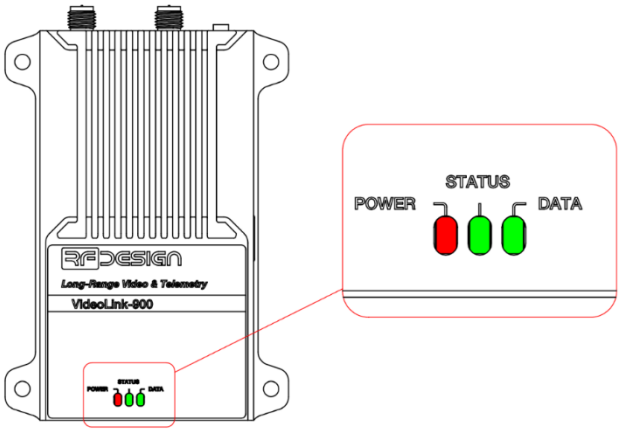


Figure 5: VideoLink LED Indicators

Power LED (Red)
Indicates the device power:

- A solid light indicates the VideoLink module has power.

STATUS LED (Green)
This LED indicates the status of the video input signal:

- Solid indicates the presence of a video signal on at least one USB port.
- Flashing indicates the absence of a video signal, an error with the data signal, or a target video bitrate set to 0.

DATA LED (Green)
Indicates the radio modem data link status:

- Solid indicates that the data link has been established.
- Flashing approximately every second indicates searching for a link.

2.8 Serial Ports

The VideoLink module features two serial UART ports accessible via 6-pin JST GH connectors.

Note that these ports have 3.3V logic levels

The serial ports have hardware flow control signals and are pin compatible with 'TELEM' ports on Orange Cube Carrier Boards.

2.9 RC Port

The RC port is accessed by the 2-pin JST GH connector. It can be configured as an input or output. Current firmware supports outputting SBUS and PPM, and PPM for input. This signal can be for control of the vehicle, or subsystems such as camera gimbles.

Alternatively, the RC port can be used for pin mirroring of trigger signals instead. For further information on this function see the MultiCom User Manual

Note that the system video, telemetry and RC signal latency are variable as such reliance on the VideoLink system for BVLOS or FPV operation and/or critical system control should only

be attempted if proper training, licensing and safety procedures are in place to mitigate risk in the case of signal loss or system failure.

2.10 Power Ports

The VideoLink features two redundant and individually protected power ports to ensure system reliability. The 4-pin power connectors are compatible with Molex Micro-Fit 3.0 series connectors.

2.11 Micro SD Card Slot

The system is supplied with an SD card preloaded with the required software image. The correct operation of the VideoLink module requires that an SD card with a valid software image is installed.

The latest image is available on the RF Design website. See the Quick Start Guide for details on updating the software image.

3 Pinout

The RFD VideoLink electrical connections are outlined in the following section.

3.1 Power Connector

VideoLink is equipped with two independent power connectors, supporting dual power input for redundancy and increased reliability. Only a single power connection is required for operation, and it can be connected to either port.

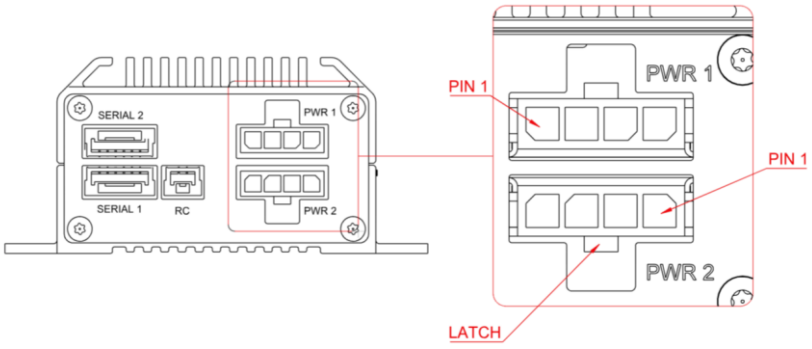


Figure 6: VideoLink power pinout

Pin #	Name	Direction	Description
1	VIN	Input	Power supply positive terminal
2	VIN		
3	GND	-	Power supply ground. Electrically connected to the VideoLink metallic enclosure
4	GND		

Note the power input connectors are not protected against reverse polarity connections. Reverse polarity connections have a high likelihood of damaging the VideoLink Module.

Figure 7: Power cable

The 4-pin power connectors are compatible with Molex Micro-Fit 3.0 series connectors. Some compatible mating connectors, pre-crimped wires and crimps available from established suppliers include:

- Molex Micro-Fit 3.0 Crimps – Molex 0430300001
- Pre-crimped Micro-Fit Wire (black) – Molex 0430300001-12-B0-D
- Pre-crimped Micro-Fit Wire (red) – Molex 0430300001-12-R0-D
- 4-pin Molex Micro-Fit 3.0 Connector (Polyester) – Molex 0436450400
- 4-pin Molex Micro-Fit 3.0 Connector (Polyamide and Nylon) – Molex 0436450408

3.2 Serial Ports

The VideoLink module features two serial UART ports with hardware flow control, accessible via 6-pin JST-GH connectors. SERIAL 1 is reserved for future features. SERIAL 2 is intended for connection to vehicle controller telemetry ports.

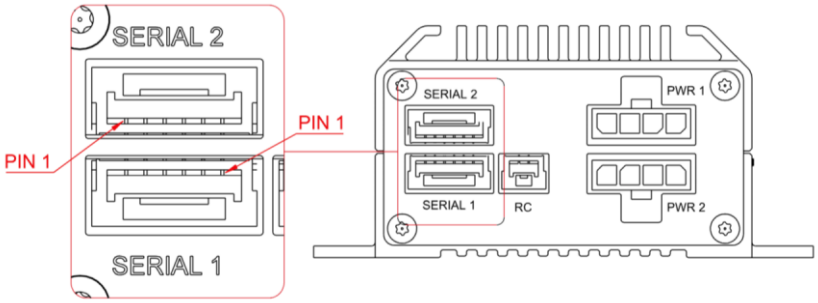


Figure 8: VideoLink serial pinouts

Serial 1

Pin #	Name	Direction	Description
1	5V	Output	5V
2	RXD	Input	Receive (RX) VideoLink Module
3	TXD	Output	Transmit (TX) VideoLink Module
4	RTS	Output	Request to Send (RTS) VideoLink Module
5	CTS	Input	Clear to Send (CTS) VideoLink Module
6	GND	-	Ground

Serial 2

Pin #	Name	Direction	Description
1	5V	Output	5V
2	AUX RX	Input	Receive (RX) Telemetry
3	AUX TX	Output	Transmit (TX) Telemetry
4	AUX RTS	Output	Request to Send (RTS) Telemetry
5	AUX CTS	Input	Clear to Send (CTS) Telemetry
6	GND	-	Ground

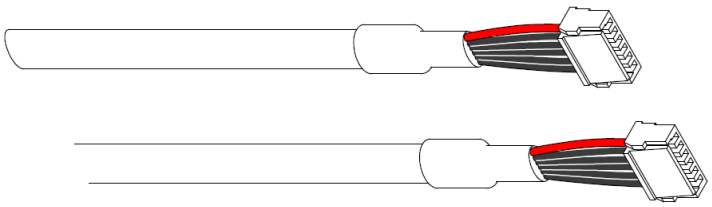


Figure 9: TELEM Cable

Many flight controller manufacturers will supply a TELEM cable with compatible pinout. Some compatible mating connectors, pre-crimped wires and crimps available from established suppliers include:

- JST GH Crimps – SSHL-002T-P0.2
- Pre-crimped JST GH wire (black) – JST AGHGH28K152
- 6-pin JST GH connector – GHR-06V-S

3.3 RC Passthrough

The RC port on the VideoLink is a two pin JST-GH connector used to connect an SBUS or PPM control signal to the flight controller, for example the CubePilot autopilot.

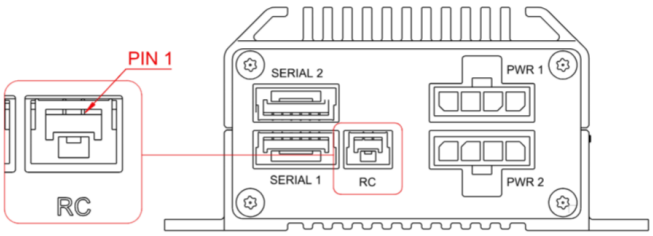


Figure 10: VideoLink RC pinout

Pin #	Name	Direction	Description
1	GPIO1	Output	SBUS/PPM input/output or pin mirror depending on user configuration.
2	GND	-	Ground

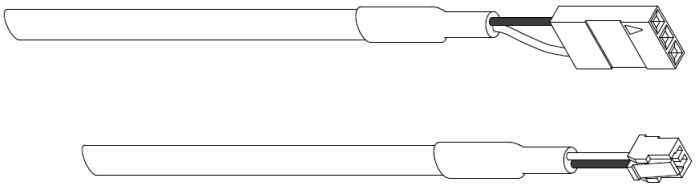


Figure 11: PPM Cable

The connector is part of the JST GH connector series. Some compatible mating connectors, pre-crimped wires and crimps available from established suppliers include:

- JST GH Crimps – SSHL-002T-P0.2
- Pre-crimped JST GH wire (black) – JST AGHGH28K152
- 2-pin JST GH Connector – GHR-02V-S

3.4 USB ports

Two USB Type-A ports support USB devices up to version 2.0 speeds and are typically used to connect USB cameras for streaming video.

These ports feature over-current protection. If the protection is triggered, the module must be reset before the output will be enabled again. If a connected load causes the protection to engage, it should be removed and checked for electrical shorts.

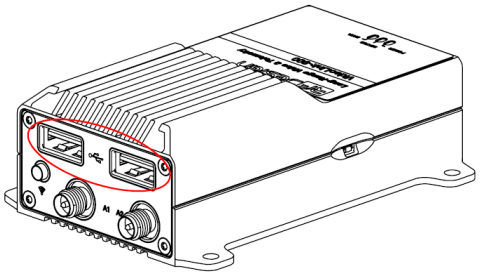


Figure 12: VideoLink USB camera input

3.5 Dual 900 MHz RF Connectors

VideoLink provides two 50 Ω reverse polarity sub-miniature A (RP-SMA) female antenna connectors for the long-range RF signal.

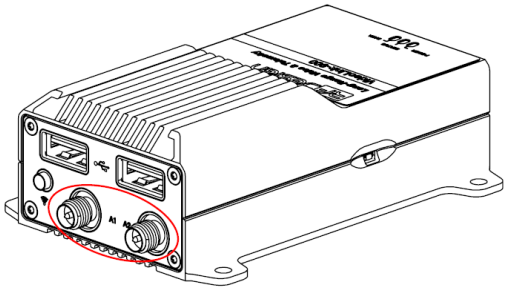


Figure 13: Long range RF Antenna Ports

Only one antenna is required for operation and can be attached to either port. If both are attached, it is best if they are mounted perpendicular to each other to provide polarisation separation increasing the effectiveness of the antenna diversity operation of the system.

We do not recommend fitting antennas directly to the RF connector. Instead, use RP-SMA extensions to connect the antennas to VideoLink.

Note that the device can safely operate without antennas attached to these ports.

Note that the mechanical strength of these ports is limited and hanging excessively large antennas from these ports or subjecting them to repeated mechanical/vibrational stresses can damage the ports.

Recommended RP-SMA extension cables (available from RF Design):

- RPSMA(M)-RPSMA(F) 100cm Extension – RF Design
- RPSMA(M)-RPSMA(F) 50cm – RF Design
- RPSMA(M)-RPSMA(F) 15cm – RF Design
- RPSMA(M)R/A-RPSMA(F)R/A 15cm Extension – RF Design

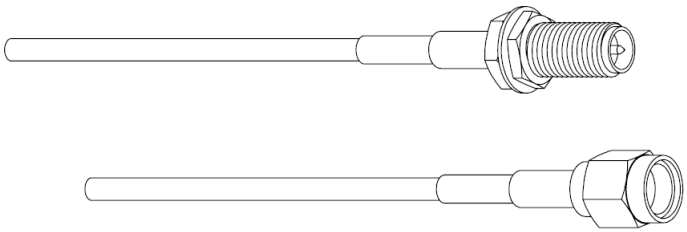


Figure 14: RP-SMA Extension cable

3.6 Wi-Fi 2.4GHz RF Connector

The RFD VideoLink features Wi-Fi accessibility to enable easy product configuration. This requires the fitting of an external antenna. The antenna should be attached to a coaxial extension cable and plugged in to the 50 Ω micro-miniature coaxial (MMCX) connector.

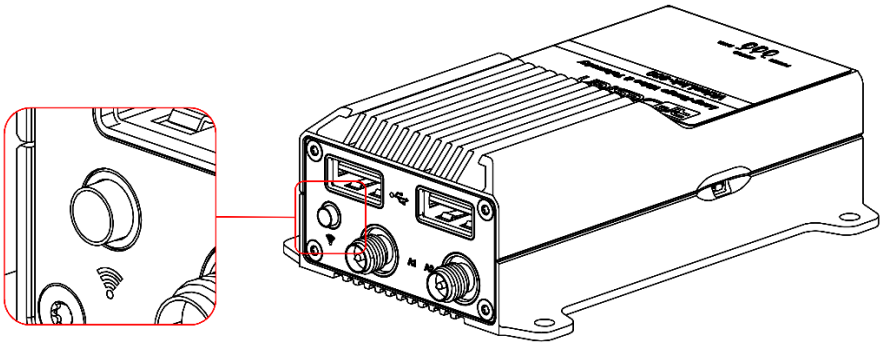


Figure 15: WiFi antenna port

Note that the mechanical strength of this port is limited and hanging excessively large antennas from the port or subjecting it to repeated mechanical/vibrational stresses can damage the port.

The micro-miniature coaxial connector allows connecting an RP-SMA to MMCX coaxial extension cable to a 50 Ω 2.4GHz antenna.

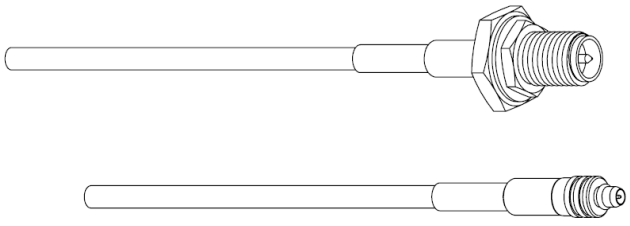


Figure 16: RP-SMA to MMCX coaxial extension cable

3.7 GCS Modem

Pinout information for the RFD900x GCS modem can be found in RFD X Series Radio Data Modem Technical Datasheet.

3.8 VideoLink Connections

The diagram below illustrates a block diagram overview of the basic connections of the VideoLink system integration. It illustrates key components such as power input, video source, RF antenna connections, and data interfaces.

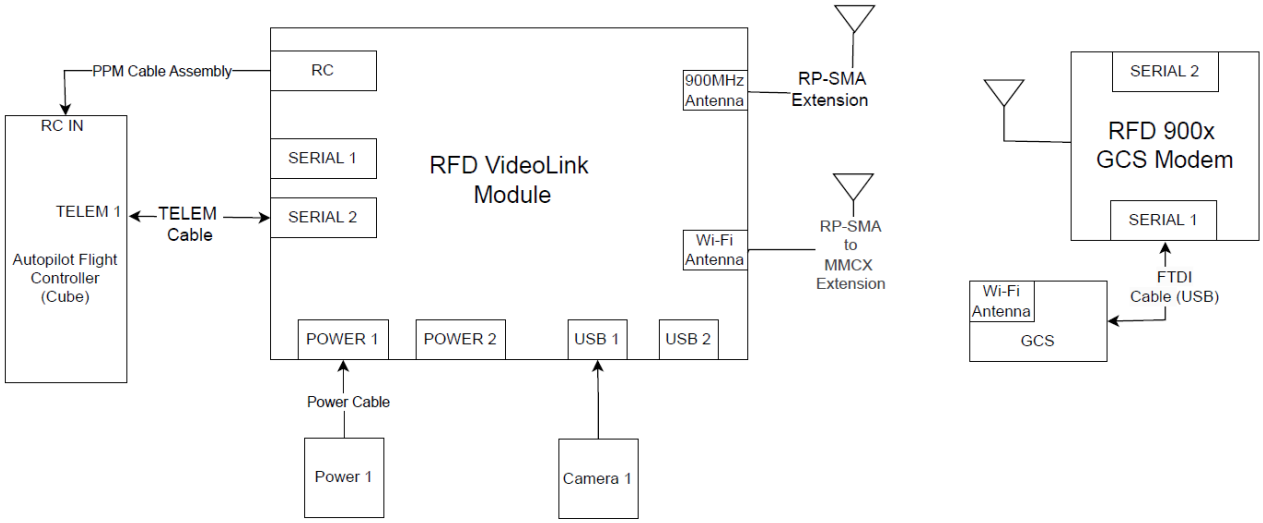


Figure 17: Basic VideoLink system connections

4 Compliance and Acceptance

The RFD 900x modems and variants are designed for conformity to:

- FCC 15.247
- AS4268:2012
- NZ GURL 2017
- RSS-247 Issue2
- RoHS 2011/65/EU

The onboard Wi-Fi module is designed for conformity to:

- RCM compliance
- FCC Part 15, Subpart B, Class B Digital Device
- EN 301 489-1 / EN 301 489-17 Ver. 3.1.1 (assessed in conjunction with ITE standards EN 55032 and EN 55024 as Class B equipment)
- EN 300 328 Ver 2.1.1, EN 301 893 V2.1.1
- IEC EN 62368-1:2018
- BS EN 62311:2008
- RoHS Compliance: IEC EN 63000:2018

Note that only the region locked versions of the modems are represented to be compliant in their respective regions. The VideoLink module is not available in a region locked variant but may be configured to interoperate with region locked receiver modems.

Note that pairing with a region locked modem does not convey a representation of regional compliance to the VideoLink module itself.

4.1 Selecting the Operating Region

The VideoLink must be configured with the correct operating region during setup to ensure regulatory compliance and proper communication with the GCS modem.

By default, the GCS modem included with VideoLink is pre-configured at the factory to operate in the Unlocked / Australia (AU) region — using the 915–928 MHz band with 25 channels.

If your region supports this band and configuration, on first boot, simply select “Unlocked” or “Australia” during setup in the Web Configuration Tool. No further configuration of the GCS modem is required in this case.

Note that this region selection is not permanent. You can repeat the process at any time by performing a factory reset.

4.2 If Operating Outside the Unlocked / AU Region

If your region does not use the 915–928 MHz band with 25 channels, you will need to configure both the VideoLink internal modem and the GCS modem to operate with appropriate regional settings. To do this:

- In the Web Configuration Tool, select the appropriate region during the Region Selection step. This sets the internal modem to the correct frequencies, bandwidth, and power settings for your region.
- Go to Advanced, then click Save To GCS File.
- Open RFDTools, connect to the GCS modem and load the saved file.
- Click Write All to apply the settings.
- Reboot the GCS modem to complete the configuration. It will now operate with region-appropriate settings that match the internal modem.

If the internal modem is not configured correctly the device can be factory reset, or the internal modem can be manually configured using the Web Configuration Tool.

Note that locked modem variants may impose restrictions to the parameters/settings that can be modified or the values to which those parameters may be set and this in turn may limit the maximum practical settings for video quality and frame rate.

Note that only the region locked versions of the modems are represented to be compliant in their respective regions. Interoperable configuration does not convey regional compliance for an unlocked modem.

Note that ultimately it is up to the user to identify the radio frequency regulations applicable to their areas of operation and ensure their modems' parameters are set correctly.

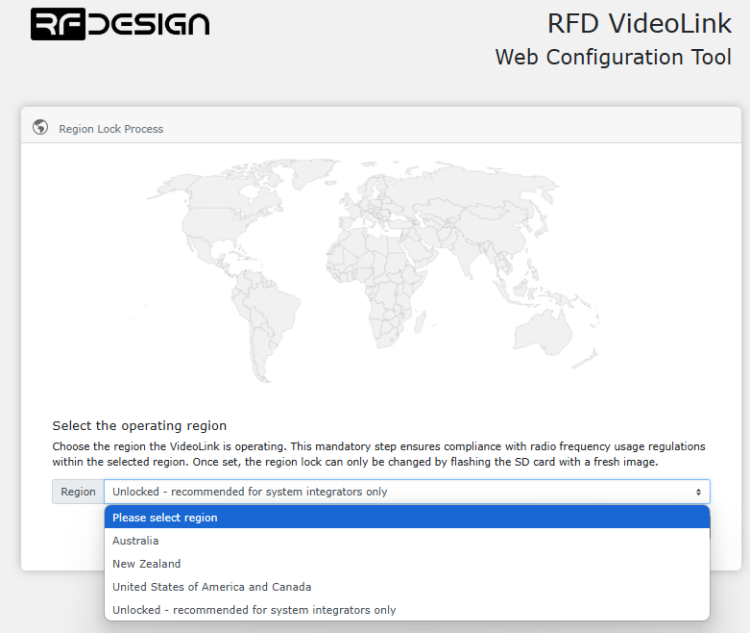


Figure 18: Screenshot of Web Configuration Tool region selection screen

4.3 Compatibility with Regional Variants

It is possible to interface the RFD VideoLink with a region-locked RFD900X modem. Modems that feature a product code with a dash and letter code, e.g., RFD900x-AU, are region-locked variants. The letters after the dash indicate the region to which that modem is locked.

Note that locked modem variants may impose restrictions to the parameters/settings that can be modified or the values to which those parameters may be set and this in turn may limit the maximum practical settings for video quality and frame rate.

Figure 19: Example of Australia region-locked modem label

These codes are:

- AU: Restricted settings and compliance for Australia
- NZ: Restricted settings and compliance for New Zealand
- US: Restricted settings and compliance for United States of America and Canada

Pairing with such modems requires that certain parameters of the VideoLink module be made to match with the restricted/locked settings of the region locked receiving modem.

These settings are:

- Minimum Frequency
- Maximum Frequency
- Number of Channels

Note that regional variants may satisfy regulations in other areas, for instance the US modem is also compliant with regulations in Canada.

Note that ultimately it is up to the user to identify the radio frequency regulations applicable to their areas of operation and ensure their modems' parameters are set correctly.

Note that only the region-locked versions of the modems are represented to be compliant in their respective regions. Interoperable configuration does not convey regional compliance for an unlocked modem.

Modems without these country codes are fully user configurable and are often referred to as open or unlocked.

5 Firmware Management

The VideoLink module relies on two firmware components: the processor firmware and the internal modem firmware. New VideoLink processor firmware must first be flashed to an SD Card. A link to the VideoLink firmware page can be found in the "Useful links" section of this manual. The process for updating the modem firmware is covered separately in section 5.2.

Note that installing new VideoLink firmware or performing a factory reset will trigger the Region Selection process again, which installs default modem settings for the selected region. To avoid losing your current modem configuration, it is recommended to first save the current settings using the VideoLink Web Config Tool.

5.1 Updating VideoLink Firmware

The process for updating the VideoLink firmware is as follows:

1. Open VideoLink Web Config Tool, select the Advanced tab, and click Save To File. This will generate an `.ini` file containing the internal modem settings, which you can save to a location of your choice.
2. Turn off the VideoLink and Remove the SD card.
3. Insert the SD card into a computer's micro-SD card slot.
4. Download the latest SD card image from the RFD website.
5. Flash the downloaded image onto an SD card using a flash tool, following the instructions provided by the tool. For Windows, Win32DiskImager or Rufus is suggested. For Linux, balenaEtcher is suggested.

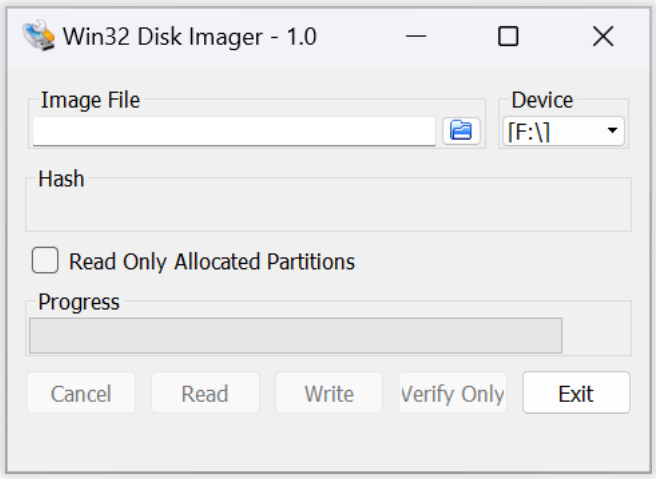


Figure 20: Screenshot of Win32 Disk Imager

6. Insert the SD card into the RFD VideoLink SD card slot and power it on.

Figure 21: Inserting SD card into slot

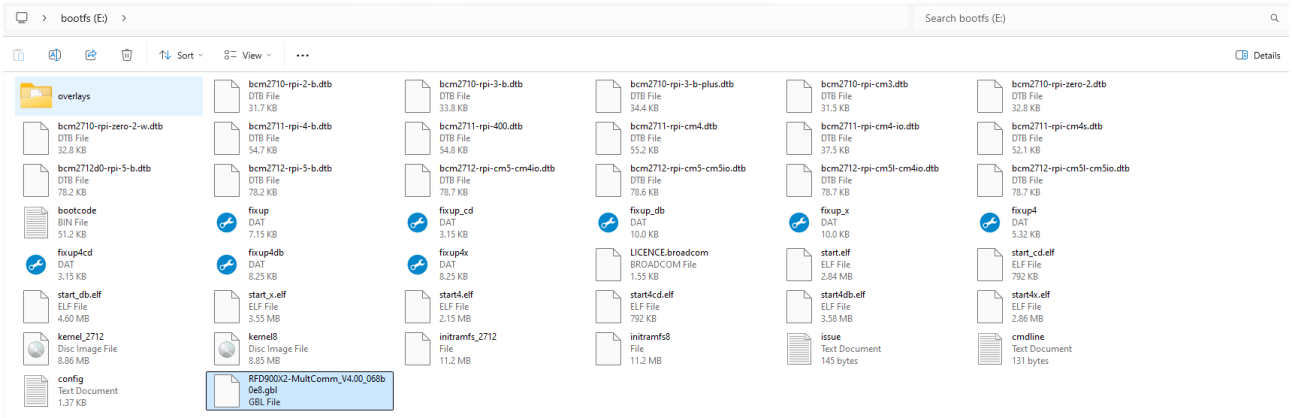
7. Connect to the VideoLink's Wi-Fi.
8. On first boot, the device may take up to 60 seconds to validate the product license. During this time, "Validating license" will appear next to the version number. Once validation is complete, the Region selection screen will appear. Select the appropriate operating region.
9. **Important!** After the firmware update is complete, the air data rate and slot size at either end may become misaligned. To restore these settings, load the `.ini` file saved earlier using the Web Config Tool; go to Advanced, click Load From File, find the correct file, and click Apply Changes.

   Alternatively, manually reconfigure key parameters such as air data rate and slot size. RFDTools can be used to check these values for the local (GCS) modem. These parameters must match on both ends of the link. A complete list of internal modem settings for the "Balanced 430kbps" preset is provided in Appendix A.
10. Reboot both modems and observe that a connection is established.

5.2 Updating VideoLink Internal Modem Firmware

The internal VideoLink modem is an unlocked RFD 900x with V2 hardware, configured with MultiComm firmware. For proper operation, the internal modem and the GCS modem must have matching firmware versions. To update the firmware on the internal modem, follow these steps:

1. A firmware version containing major firmware updates will cause the modem settings to return to default values. To avoid losing your configuration it is recommended to first save the current settings using the VideoLink Web Config Tool. Select the Advanced tab and click Save To File. This will generate an `.ini` file containing the internal modem settings, which you can save to a location of your choice.
2. Turn off the VideoLink and Remove the SD card.
3. Insert the SD card into a computer's micro-SD card slot.
4. Download the latest RFD900X2 MultiComm Firmware `.gbl` file from the RFDesign Support page and save it to the root directory (i.e., the top level) of the SD card.



5. Re-insert the SD card into the VideoLink and power it on.
6. Connect to the VideoLink's Wi-Fi.
7. The firmware will be automatically installed. **Do not interrupt or remove power until the process is complete.** The progress of the modem firmware update can be followed on the VideoLink Web Configuration Tool page.

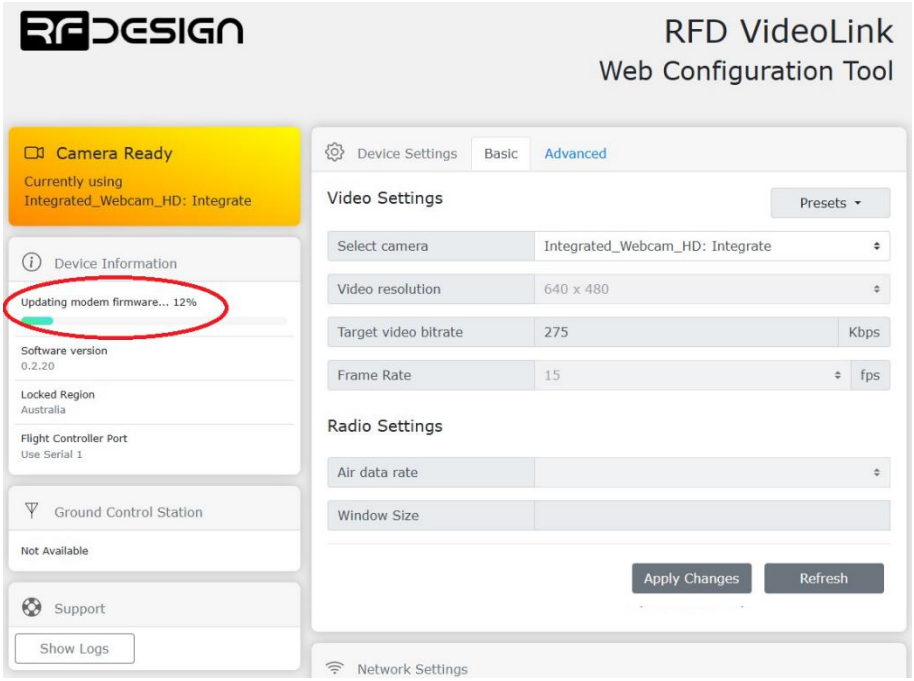


Figure 22: Progress of modem firmware update in VideoLink Web Configuration Tool

8. **Important!** After the firmware update is complete, the air data rate and slot size at either end may become misaligned. To restore these settings, open RFDTools and load the `.ini` file saved earlier using the Web Config Tool; go to Advanced, click Load From File, find the correct file, and click Apply Changes.

   Alternatively, manually reconfigure key parameters such as air data rate and slot size. RFDTools can be used to check these values for the local (GCS) modem. These parameters must match on both ends of the link. A complete list of internal modem settings for the "Balanced 430kbps" preset is provided in Appendix A.

9. Reboot both modems and observe that a connection is established.

5.3 Updating GCS Modem Firmware

The GCS modem is an unlocked RFD 900x with V2 hardware, configured with MultiComm firmware. It is set up in the factory to behave like a Region-unlocked / AU region modem operating in the 915-928 MHz band with 25 channels. To update the firmware on the GCS modem, use the same version of RFD900X2 MultiComm Firmware `.gbl` file used for the Videolink internal modem and follow these steps:

1. A firmware version containing major firmware updates will cause the modem settings to return to default values. To avoid losing your configuration it is recommended to first save the current modem settings using the VideoLink Web Config Tool. Select the Advanced tab and click Save To GCS File. This will generate an `.ini` file containing the GCS modem settings, which you can save to a location of your choice.
2. RFD modems feature a boot loader to facilitate field upgrade of the modem firmware via the serial port. Connect to the modem serial port with an FTDI cable and run the latest version of RFDTools. A link to this software can be found in the "Useful links" section of this manual. In RFDTools, click "Firmware", select the correct `.gbl` file, and click "Flash Firmware."
3. **Important!** After the firmware update is complete, the air data rate and slot size at either end may become misaligned. To restore these settings, load the `.ini` file saved earlier using the Web Config Tool; open RFDTools, click on Import, find the correct file, and click Write All.

   Alternatively, manually reconfigure key parameters such as air data rate and slot size. Web Config Tool can be used to check these values for the internal modem. These parameters must match on both ends of the link. A complete list of internal modem settings for the "Balanced 430kbps" preset is provided in Appendix A.

5.4 VideoLink Factory Reset

A factory reset will initiate the region selection process, which installs region-specific settings on the internal modem and restores the default video and Wi-Fi settings. The default password is "rfdvideo" (without quotation marks).

To reset VideoLink to factory settings, apply power and press and hold the side button for at least 10 seconds. A pen or small screwdriver can be used to gently press the button. Do not turn off power to the device while resetting. Do not turn off power to the device while it is resetting. A popup window displaying "Factory reset completed" confirms the reset. After the reset, disconnect and then reconnect the power to the device.

Note that this operation will not reset the groundside modem configuration, so the link may be lost during the process.

> Note that installing new VideoLink firmware or performing a factory reset will trigger the Region Selection process again, which installs default modem settings based on the selected region. To avoid losing your modem configuration, it is recommended to first save the current settings using the VideoLink Web Config Tool.

Figure 23: Resetting VideoLink via the reset button

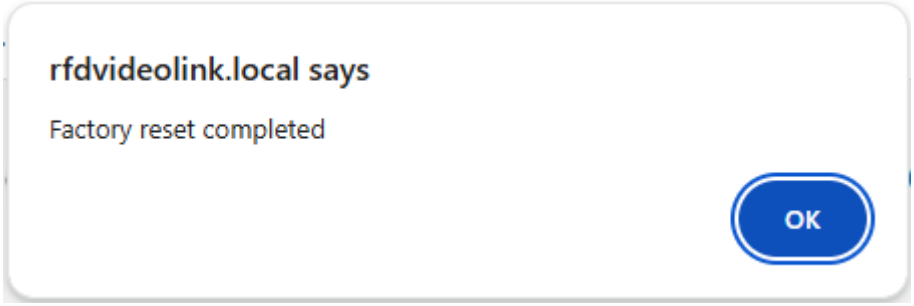


Figure 24: Web configuration tool popup confirming successful factory reset

Note do not turn off power to the device while it is resetting.

6 Accessories

6.1 Antennas

General notes on the antenna systems of the VideoLink Module:

- VideoLink is designed for 50 Ω impedance RF connections.
- VideoLink is fitted with reverse pole sub-miniature A (RP-SMA) connectors on both antenna long range antenna ports.
- Operating without any antennas fitted will not damage the internal RF systems.
- Only a single antenna is required for long range operation.
- Different antenna modes available include:
  - Automatic diversity (Default operation)
  - Single port (Antenna port 1 or 2 depending on parameter setting)
  - Dedicated TX and RX ports
- Settings will vary depending on the firmware installed.
- The Wi-Fi port in the VideoLink may be used to connect a 2.4 GHz 50 Ω antenna.
- The connector may be left disconnected if Wi-Fi is not being used.

Note that the antenna ports should not be terminated with short circuits or RF loads, other than appropriate antennas, as this can cause RF signal problems and incorrect operation of the diversity feature.

Note that the mechanical strength of these ports is limited and hanging excessively large antennas from these ports or subjecting them to repeated mechanical/vibrational stresses can damage the ports.

6.2 Important Performance Considerations for Antennas

Optimal antenna setup is critical to achieving reliable and long-range performance. The following factors should be considered:

- **Line of Sight (LOS)**:
  The VideoLink module and receiving modem are LOS devices with limited capability to penetrate or refract around obstacles. Maximum range is achieved when there are minimal obstructions, such as terrain, buildings or vegetation between the transmitter and receiver.
- **Antenna polarity**:
  Matching antenna polarisation at both ends of the link is essential to minimise signal loss. The antennas supplied are linearly polarised, and vertical orientation typically provides the best range in standard use cases. Mismatched or misaligned polarisation can significantly degrade performance.
- **Diversity Mode and Antenna Orientation**:
  When the orientation of antennas is likely to vary, for example on moving or manoeuvring aircraft, enabling modem diversity can improve link reliability. For optimal results, install the two antennas at 90° to each other to provide polarisation diversity. In diversity mode the system will automatically select the antenna with the strongest signal.
- **Elevation**:
  As the radios are LOS devices, the elevation of the antennas at both ends affects the radio horizon distance and therefore the operational range that can be achieved. Elevation can also help mitigate problems caused by obstructions and reduce the effects of multipath interference.

- **Antenna Placement**:
  Where practical position antennas away from conductive materials such as metal or carbon fibre. Proximity to these materials can alter antenna tuning, reduce gain, distort the radiation pattern, or block the signal altogether
- **Separation from Other RF Sources:**
  Maintain adequate spatial separation between antennas and nearby RF transmitters to prevent interference or receiver desensitisation. For example, with 3 dBi antennas operating at 30 dBm, a minimum separation of 3 m is recommended for co-polarised antennas. This distance can be reduced if antennas are cross-polarised, as orthogonal polarisation provides natural isolation.

6.3 Supplied Antennas and RP-SMA Extensions

3dBi 900MHz Dipole A half wave 900 MHz dipole antenna with a male RP-SMA connector. It has a flexible joint at the base that allows for right angle mounting if required. This is the recommended antenna for most applications of VideoLink. This antenna must not be mounted directly to VideoLink. Instead, use an RP-SMA extension to mount the antenna to reduce strain on the RF ports.

2dBi 2.4GHz Dipole The 2.4GHz dipole antenna with a male RP-SMA connector also has a flexible joint at the base that allows for right angle mounting if required. It is only required when configuring the VideoLink, and its use during operation is optional. The antenna is connected to the MMCX port in VideoLink with the supplied extension.

Figure 25: 3dBi 900 MHz dipole Antenna.

Figure 26: 2dBi 2.4GHz dipole Antenna

Extension coaxial cables help position the antennas away from potential interference sources, and reduce strain on the RF ports. These cables must be compatible with RP-SMA connectors. A selection of compatible extension leads is available from the RFD online store. Refer to Section 3.5 for part numbers.

7 Setup and Configuration

VideoLink can be set up and configured in several ways depending on user preference and system requirements. For a comprehensive guide, please refer to the VideoLink User Manual.

7.1 Web Configuration Tool

To simplify configuration, RFD VideoLink includes a web configuration tool as an embedded webpage accessible via a web browser over Wi-Fi. This tool allows users to adjust video settings, radio parameters, and Wi-Fi configurations for the RFD VideoLink module.

7.2 RFDTools

Although VideoLink internal modem settings can be changed via the web configuration tool, RFDTools may also be used at the GCS end to remotely set modem parameters if the modems are synchronised.

7.3 AT & RT Commands

AT commands provide direct control of the modem for advanced configuration. To enter AT command mode on the GCS modem, send +++ via a serial terminal at the correct baud rate. RFDTools includes a Terminal window that supports issuing AT and RT commands for modem configuration and diagnostics. Further information can be found in the modem firmware manual.

8 Electrical Characteristics

8.1 Absolute Maximum Ratings

Parameter	Rating
Supply Voltage	-0.3 (Negative) +60V (Positive)
Input RF power on Antenna ports A1 and A2	+20 dBm
Ambient temperature	-20 to +45°C (without active cooling) -20 to +65°C (with active cooling)

8.2 Electrical Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Supply Voltage (V_s)		+6	—	+52	V
Supply Current	V_s = 6 V	—	2.17	5.88	A
	V_s = 12 V	—	1.08	2.94	A
	V_s = 55 V	—	0.24	0.59	A
Ambient Temperature (Full encoding load)		-20	—	+45	°C
USB Ports					
Output Voltage		5.00	5.29	—	V
Output Current Limit		0.5	0.7	0.9	A
RC and Serial port I/O pins					
Voltage	Referenced to connector GND	-0.3	—	+3.6	V
Input Voltage Low		-0.3	—	+0.825	V
Input Voltage High		+2.5	—	+3.6	V
Output Voltage Low	Sinking 5 mA	—	—	+0.33	V
Output Voltage High	Sourcing 5 mA	+2.65	—	3.6	V
Supply DC current		—	—	12	mA
Pull-up/down resistance		40	—	65	kΩ
PPM and SBUS					
SBUS/SBUS2 channels		10	—	18	Channels
PPM channels		2	—	16	Channels
PPM Frame Length		—	—	36	ms

Parameter	Conditions	Min	Typ	Max	Unit
PPM/SBUS control signal latency	Default modem settings	—	45	80	ms
PWM/PPM Channel levels		1000 (1ms)	—	2000 (2ms)	Counts
Long-range RF					
900MHz output power		+0	—	+30	dBm
900MHz input power		—	—	+20	dBm
900MHz port impedance		—	50	—	Ω
900MHz connector torque		0.3	—	0.5	Nm
900MHz connector rated number of connections		—	—	500	Cycles
Wi-Fi					
2.4 GHz output power		+4.77	—	+15.4	dBm
2.4 GHz port impedance		—	50	—	Ω
MMCX connector rated number of connections		—	—	500	Cycles

9 Performance Characteristics

9.1 RFD x Series Modem

<table>
<tr><th>Feature</th><th colspan="3">Implementation or Performance</th></tr>
<tr><td>RF Data Rates</td><td colspan="3">12, 56, 64, 72, 100, 125, 188, 200, 430, 1000 kbits/sec</td></tr>
<tr><td>Obstructed Line of Sight Range</td><td colspan="3">0.5 – 1 km (depending on antennas and settings)</td></tr>
<tr><td>Line of Sight Range</td><td colspan="3">5+km (depending on antennas and settings)</td></tr>
<tr><td>Serial Interface Data Rate</td><td colspan="3">9600, 57600, 115200, 230400, 460800, 1000000, 1200000 and 1500000 baud</td></tr>
<tr><td>Modulation</td><td colspan="3">2GFSK/4GFSK (dependent on air data rate)</td></tr>
<tr><td rowspan="5">Interference Mitigation</td><td colspan="3">Frequency Hopping Spread Spectrum, FHSS</td></tr>
<tr><td>Modem Variant</td><td>Frequency Band/s</td><td>Number of Channels</td></tr>
<tr><td>RFD900X Unlocked</td><td>902 – 928 MHz</td><td>User settable (51 Max)</td></tr>
<tr><td>RFD900X-AU locked</td><td>915 – 921MHz and
922 – 928MHz</td><td>23</td></tr>
<tr><td>RFD900X-NZ locked</td><td>920.75 – 927.25 MHz</td><td>25</td></tr>
<tr><td>RFD900X-US locked</td><td>902 – 915MHz and
915 – 928MHz</td><td>51</td></tr>
<tr><td rowspan="6">Receiver sensitivity</td><td colspan="3"></td></tr>
<tr><td colspan="2">Air data rate</td><td>Sensitivity @ 10-5 BER</td></tr>
<tr><td colspan="2">64 kbits/s</td><td>-101 dBm</td></tr>
<tr><td colspan="2">125 kbits/s</td><td>-99 dBm</td></tr>
<tr><td colspan="2">200 kbits/s</td><td>-94 dBm</td></tr>
<tr><td colspan="2">430 kbits/s</td><td>-92 dBm</td></tr>
<tr><td colspan="2">1000 kbits/s</td><td>-79 dBm</td></tr>
<tr><td>Encryption</td><td colspan="3">Hardware accelerated advanced encryption standard, AES, up to 256-bit user settable key</td></tr>
<tr><td>Error detection</td><td colspan="3">Cyclic redundancy check, CRC</td></tr>
</table>

9.2 Thermal Management

Proper thermal management is essential for reliable operation of VideoLink. It is recommended to install the unit in a location with continuous airflow and minimal exposure to heat from surrounding components.

Note avoid placing VideoLink near heat sources or in enclosures where heat from adjacent components could accumulate and elevate its operating temperature.

During extended operation, especially in environments with limited airflow, the device may become hot to the touch. Under some conditions, the external surface temperature may exceed 65ºC. Use caution when handling the unit after prolonged use.

Higher video streaming resolutions and RF transmit power levels will increase heat generation.

CAUTION **Do not attempt to rapidly cool the device** using water, alcohol, freeze sprays or similar agents. Sudden thermal shock can damage solder joints and internal components.

10 Physical dimensions

Note all dimensions have a +/- 0.5mm tolerance.

Parameter	Rating
Maximum Dimensions	94.8 x 65.0 x 30.0 mm (±0.5mm)
Weight	150g ± 10g (not including cables or antennas)

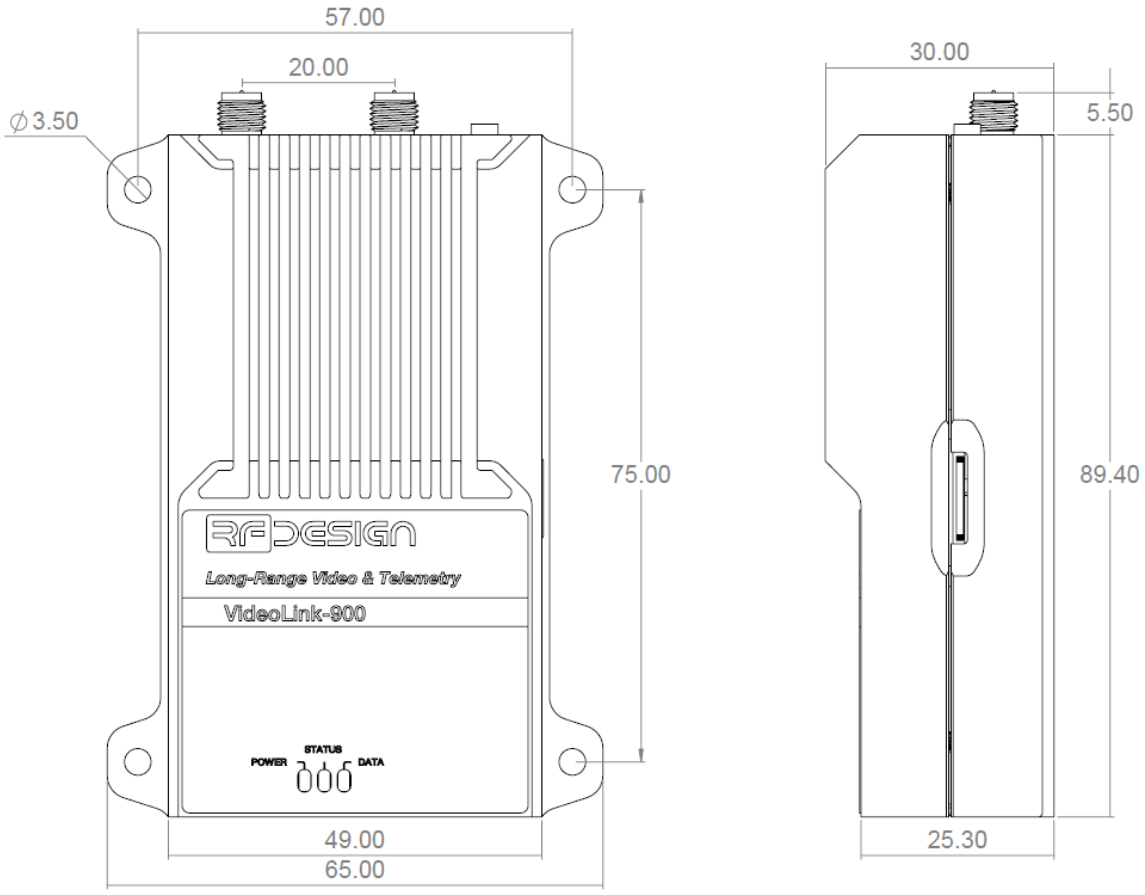


Figure 27: VideoLink dimensions in millimetres

11 Reference

11.1 Useful Links

VideoLink Firmware and Documentation

https://rfdx.atlassian.net/wiki/spaces/TS/pages/689831937/RFD+VideoLink

RFD 900x Modem Firmware and Documentation

https://rfdx.atlassian.net/servicedesk/customer/portal/1/article/452231169

RFDTools

https://rfdx.atlassian.net/servicedesk/customer/portal/1/article/242712577

RFD Store

https://store.rfdesign.com.au

FTDI VCP Driver (Windows)

https://ftdichip.com/drivers/vcp-drivers/

11.2 Glossary

AES: Advanced Encryption Standard. A data encryption protocol meeting the specifications established in the ISO/IEC 18033-3 standard.
Baud: Unit of measurement of symbol rate. This is an indication of data transfer speed of serial/UART connections.
CTS: Clear to Send. UART hardware flow control flag.
FTDI: Future Technology Devices International, a supplier of electronic components synonymous with their UART to USB converter chips and the cables which use such components.
GPIO: General Purpose Input Output. A microcontroller pin that can be configured for various input and output functions.
LED: Light Emitting Diode. A semiconductor device that converts electrical power to light.
LoS (aka LOS): Line of Sight. This refers to the distance that a radio signal can reach uninterrupted by obstructions or the radio horizon.
MAVLink: Micro Air Vehicle Link. A protocol for telemetry data exchange between compatible ground control software and autonomous vehicle controllers.
PPM: Pulse Position Modulation. This is an encoding standard used by radio controllers to send data about the position of multiple servo motors.
RF: Radio Frequency. A term used to describe a portion of the electromagnetic spectrum. Commonly encompassing frequencies between a few tens of kilohertz and a couple of hundred gigahertz.
RFD: RFDesign. The Australian company who design, build and support the x series modems among other products.
RFDTools: An RFDesign utility for configuring RFD900 series modems, updating firmware, and performing diagnostics over serial links.
RP-SMA: Reverse Polarity Sub-miniature type A. A common form of RF connector on consumer electronics. It offers a reasonable compromise between overall size and rated connection cycles.
RTS: Request to Send. UART hardware flow control flag.
RX: Receive.
SBUS: Serial Bus protocol created by Futaba. This is an encoding standard used by radio controllers to send data about the position of multiple servo motors.
Serial: A synonym of UART, a protocol for sending and receiving data in a sequential manner.
TX: Transmit.
UART: Universal Asynchronous Receive Transmit. Hardware that manages serial data transfer between connected devices.
USB: Universal Serial Bus. An industry standard for data communication and power delivery between devices. Most commonly found in type A and C connectors.
UVC: USB Video Class (UVC). A type of USB standard that allows devices like webcams, camcorders, and video converters to stream video over a USB connection.
UV: Uncrewed Vehicle a vehicle system that is remotely or autonomously operated without human crew or controllers physically on board.
UAV: Uncrewed Autonomous Vehicle a vehicle system that is remotely or autonomously operated without human crew or controllers physically on board.

11.3 Revision History

Version	Date	Changes
1.0	04/07/2025	Initial release document