

# Radio Modules

## RF-EMIP, RF-2400, RF-900

OPERATING MANUAL

April 6th, 2023 (2.0, English)



## Disclaimer

Before using the products, be sure to read and understand all respective instructions.

The products are available for commercial customers only.

For product specification changes since this manual was published, refer to the latest publications of ARRI data sheets or data books, etc., for the most up-to-date specifications. Not all products and/or types are available in every country. Please check with an ARRI sales representative for availability and additional information.

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Original version.

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# 1 About this Document

This operating manual is aimed at everyone involved in using the system and provides directions on how to operate it safely and as intended. To ensure safe and correct use, all users must read the operating manual before using the system for the first time.

This operating manual is an essential part of this product and must be easily accessible and in close proximity to the equipment so that users can use it as a reference anytime.

Keep the operating manual, the user manual and all other operating and assembly instructions belonging to the system in a safe place for future reference and possible subsequent owners.

## Additional Information

For useful information in addition to this operating manual please have a look at the [ARRI Learn & Help](#) section on the ARRI website.

## Strengthen Your Knowledge and Get Trained

The ARRI Academy courses provide unrivalled insights into the full possibilities of working with ARRI camera systems, lenses, lights and accessories.

Our Advanced Service Training courses are designed to transfer detailed knowledge about how to service and repair all types of ARRI products and give you permanent access to detailed Service instructions, special tools and spare-parts. To learn more, please visit [ARRI Academy](#) or contact [academy@arri.de](mailto:academy@arri.de).

For further details, refer to the ARRI website at <http://arri.com/radio-modules>

For Tech Tips, please visit the ARRI Youtube Channel at <https://youtube.com/user/arrichannel>:



## Document Revision History

Version	ID	Order #	Release	Date
01	D45 10005938	K5.0040006	F07640	2021-07-13
2.0			W01885	2023-04-06

## 2 About this Product

### 2.1 Introduction



With the introduction of the Hi-5 Hand Unit ARRI offers three different exchangeable radio modules for various shooting conditions and regions:

- RF-EMIP Radio Module 2400 MHz DSSS
- RF-2400 Radio Module 2400 MHz FHSS
- RF-900 Radio Module 900 MHz FHSS\*

\*Approved for use in USA & Canada only

#### Main features

##### RF-EMIP Radio Module:

- Certified regions: worldwide
- White radio module
- Fixed radio channels (14 channels)
- Compatible with existing ARRI hand units, cameras, motor controllers and the cforce mini RF motor containing ARRI's white-coded radio module
- Network mode: can pair with up to three hand units for split focus, iris and zoom operations to one camera/motor controller

##### RF-2400 Radio Module:

- Certified regions: worldwide
- 99 channels (= defined hopping schemes)

##### RF-900 Radio Module:

- Long-Range Solution
- Certified regions: USA and Canada
- 99 channels (= defined hopping schemes)
- Network mode: can pair with up to three hand units for split focus, iris and zoom operations

#### ADVICE

To tap the full potential of the device, have all connected units updated to the latest available firmware.

## 2.2 Intended use

### ATTENTION

All versions of the product are intended exclusively for professional use and may only be used by skilled personnel. Every user should read and understand the operating instructions and the user manual. Use the product only for the purpose described in this document. Always follow the instructions and system requirements for all equipment involved.

Only use the product as described in this operating manual. Any other use is considered improper and can result in property damage. ARRI assumes no liability for damages or changes that are caused by improper use.

The entire product may not be changed or converted.

## 2.3 Identification

### Product Label

The RF Module serial number is located on the product label on the rear side of the product.



The product number on the label consists of the product ident number (K2.003XXXX) followed by the serial number (in this case 1234).

## 2.4 Environmental Conditions

The product should only be used and stored under certain environmental conditions. Check the following conditions before commissioning and operation:

<b>Electrical Requirements</b>	Supply voltage: 3.3 V DC
<b>Operating Temperature</b>	-20° C to +50° C / -4° F to +122° F
<b>Storage Temperature</b>	-20° C to +50° C / -4° F to +122° F
<b>Humidity</b>	0-95% RH from -20° C to +45° C / -4° F to +113° F

## 2.5 Technical Data

### Electrical / General Data

#### RF-EMIP Radio Module

Supported Frequency	2.400 - 2.4835 GHz
Channel Spacing	5 MHz
Band	ISM 2400 MHz
Modulation Type	Direct Sequence Spread Spectrum
Operating Mode	Point-to-Multipoint
Transmit Power	Dep. on regions between 8.9 - 70.8 mW

#### RF-2400 Radio Module

Supported Frequency	2.400 - 2.4835 GHz
Band	ISM 2400 MHz
Modulation Type	Frequency Hopping Spread Spectrum
Operating Mode	Point-to-point
Transmit Power	100mW

#### RF-900 Radio Module

Supported Frequency	902 - 928 MHz
Band	ISM 900 MHz
Modulation Type	Frequency Hopping Spread Spectrum
Operating Mode	Point-to-Multipoint
Transmit Power	Standard Mode: 100 mW

### Connector

Interface	10pin IRISO
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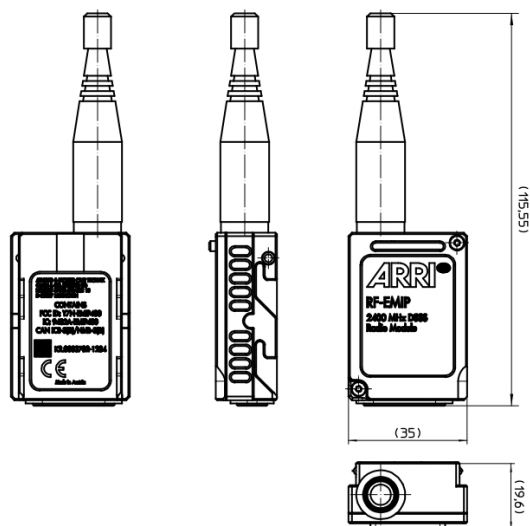
### Power Consumption

Power consumption depends on the different radio modules that are used. Using the Hi-5 hand unit with one of the modules results in different power requirements:

RF-EMIP	typ. 110mA @3.3V
RF-2400	typ. 330mA @ 3.3V
RF-900	@ 100mW: typ. 250mA @ 3.3V

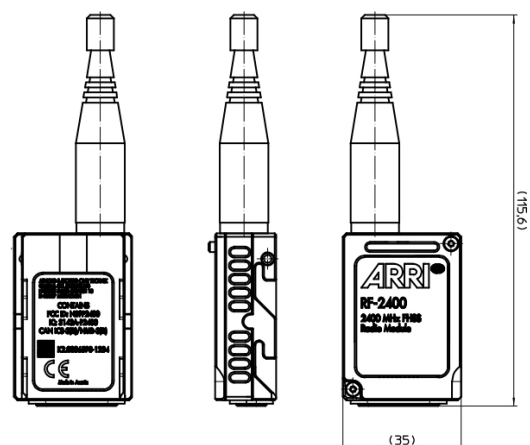
## 2.6 Dimensions and Weight

### RF-EMIP Radio Module



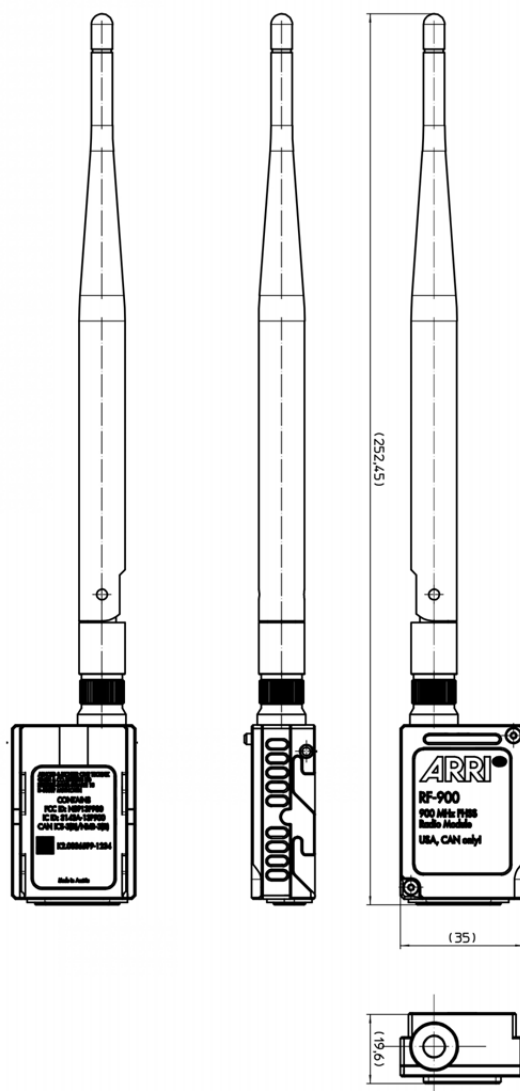
Weight of the RF-EMIP Radio Module: 52g/1,83oz (including antenna)

### RF-2400 Radio Module



Weight of the RF-2400 Radio Module: 52g/1,83oz (including antenna)

## RF-900 Radio Module



Weight of the RF-900 Radio Module: 55g/1,94oz (including antenna)

## 2.7 Radio Types

### RF-EMIP Radio Module

A white-colored ring at the base of the antenna socket identifies the white-coded radio module. There are 14 channels to choose from:

Channel	Frequency	ZigBee IEEE 802.15.4 Channel
0	2.410 GHz	12
1	2.415 GHz	13
2	2.430 GHz	16
3	2.435 GHz	17
4	2.450 GHz	20
5	2.455 GHz	21
6	2.470 GHz	24
7	2.475 GHz	25
8	2.420 GHz	14
9	2.425 GHz	15
10	2.440 GHz	18
11	2.445 GHz	19
12	2.460 GHz	22
13	2.465 GHz	23

### RF-2400 Radio Module

An orange-colored ring at the base of the antenna socket identifies the RF-2400 radio module.

ADVICE
<p>The RF-EMIP radio module and the RF-2400 radio module cannot be mixed at the same radio network of the camera and its hand units. However, both systems can be used parallel in different radio networks.</p> <p>The RF-2400 radio module uses 100 channel frequency-hopping spread spectrum (FHSS) technology to ensure secure transmission.</p>

### RF-900 Radio Module

A grey-colored ring at the base of the antenna socket identifies the RF-900 radio module.

ATTENTION
<p>Please ensure that the region is configured correctly, as it may be illegal to use the RF-EMIP, RF-2400, RF-900 in a region other than specified in the setting. All settings are compliant to FCC and IC regulations.</p> <p>The RF-900 radio module uses 100 channel frequency-hopping spread spectrum (FHSS) technology to ensure secure transmission.</p>

## 2.8 Scope of Delivery and Warranty

### ATTENTION

The packaging consists of recyclable materials. For the sake of the environment, dispose of the packaging material at a suitable disposal site. Always store, ship and dispose according to local regulations. ARRI is not liable for consequences from inadequate storage, shipment or disposal.

On delivery, please check that the package and content are intact. Never accept a damaged or incomplete delivery.

#### **KK.0039986 RF-900 Radio Module 900 MHz FHSS Set**

A complete delivery includes:

- 2 x K2.0036599 Radio Module 900 MHz FHSS
- 2 x K2.0041437 2dB 900 MHz Antenna RPSMA

#### **KK.0039984 RF-2400 Radio Module 2400 MHz FHSS Set**

A complete delivery includes:

- 2 x K2.0036598 Radio Module 2400 MHz FHSS
- 2 x K2.0002007 Outdoor Antenna (Straight)

#### **KK.0039985 RF-EMIP Module 2400 MHz DSSS Radio Set**

A complete delivery includes:

- 2 x K2.0033702 RF-EMIP Radio Module 2400 MHz DSSS
- 2 x K2.0002007 Outdoor Antenna (Straight)

#### **Warranty**

For scope of warranty, please ask your local ARRI Service Partner. ARRI is not liable for consequences from inadequate shipment, improper use or use of third-party products.

## 2.9 Certifications and Safety Standards

### EU Declaration of Conformity



Brand Name: ARRI  
Product Description: RF module 2.4 GHz: RF-EMIP / RF-2400

#### RF module 2.4 GHz: RF-EMIP / RF-2400

The designated products conform to the specifications of the following European directives:

- 1 Directive 2014/53/EU of the European Parliament and the Council of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive - OJ L 153, 22.5.2014, S. 62–106.
- 2 Directive 2011/65/EU of the European Parliament and the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment - OJ L 174, 1.7.2011, S. 88–110.

The compliance with the requirements of the European Directives was proved by the application of the following standards:

Essential requirements regarding No 1

- Art. 3.1 a following 2014/35/EU: EN 62479:2010; EN IEC 62368-1:2020 + A11:2020
- Art. 3.1 b following 2014/30/EU: EN 301 489-1 V2.2.3; EN 301 489-17 V3.2.2
- Art. 3.2: EN 300 328 V2.1.1; EN 300 328 V2.2.2

Essential requirements regarding No 2

- EN 50581:2012;

To evaluate the respective information we used:

[http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/index\\_en.htm](http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/index_en.htm)

### UK Declaration of Conformity



Brand Name: ARRI  
Product Description: RF module 2.4 GHz: RF-EMIP / RF-2400

#### RF module 2.4 GHz: RF-EMIP / RF-2400

The designated products conform to the specifications of the following United Kingdom regulations:

- 1 The Electrical Equipment (Safety) Regulations 2016
- 2 The Electromagnetic Compatibility Regulations 2016
- 3 The Radio Equipment Regulations 2017
- 4 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The compliance with the requirements of the United Kingdom regulations was proved by the application of the following standards:

- 1 IEC 62368-1:2020; EN 62479:2010
- 2 ETSI EN 301 489-1 V1.9.2
- 3 EN 300 328 V2.1.1; EN 300 328 V2.2.2
- 4 EN IEC 63000:2018

The manufacturer bears sole responsibility for issuing this declaration of conformity.

**FCC Class A Statement: RF-EMIP / RF-2400 / RF-900**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1 This device may not cause harmful interference, and
- 2 this device must accept any interference received, including interference that may cause undesired operation.

**NOTE:** 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.

**Warning:** Changes or modifications not expressly approved by ARRI could void the user's authority to operate the equipment.

Radiation Exposure Statement:

To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 23 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna being used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

**FCC Radio Frequency Exposure: RF-900**

The RF-900 Radio Module has been tested and meets applicable limits for radio frequency (RF) exposure. The unit of measurement for RF exposure is Specific Absorption Rate (SAR).

**WARNING:** The device radiates radio frequency energy at a level below the United States FCC radio frequency exposure limits. Nevertheless, this device should be used in such a manner that the potential for human contact during normal operation is minimized. For body worn operation, this device has been evaluated and meets FCC RF exposure guidelines when used with an accessory that contains no metal and that positions the device a minimum of 5 cm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

Cases and accessories with metal parts may change the RF performance of the device, including its compliance with RF exposure guidelines, in a manner that has not been tested or certified.

**Industry Canada Statement: RF-EMIP / RF-2400 / RF-900**

CAN ICES-3 (A)/NMB-3(A)

This device complies with ISED's licence exempt RSSs. Operation is subject to the following two conditions:

- 1 This device may not cause interference, and
- 2 this device must accept any interference, including interference that may cause undesired operation of this device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen so that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Radiation Exposure Statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 23 cm between the radiator & your body.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- 1 le dispositif ne doit pas produire de brouillage préjudiciable, et

- 2 ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radio électrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 23 cm entre le radiateur et votre corps.

### Japan MIC Statement: RF-EMIP / RF-2400

Complies with Ministry of Internal Affairs and Communications notification Article 88, Annex 43.



#### ADVICE

It may not be legal to operate the Radio Modules in a country/region other than the country/region selected in the Hi-5 Hand Unit or Radio Interface Adapter RIA-1 region menu.

### Radio Modules

The **RF-EMIP Radio Module** contains the following radio module:

FCC ID: Y7N-EMIP400

IC: 9482A-EMIP400

CMIT ID: 2017DJ7863C(M)

MIC ID: 020-180030

NCC: CCAH18LP0660T0

KC: R-CRM-ARg-EMIP400

EMIP400s: ETA:1385/2018/ERLO

The **RF-2400 Radio Module** contains the following radio module:

FCC ID: NS9P2400

IC: 3143A-P2400

R210-114971 (Japan)

The **RF-900 Radio Module** contains the following radio module:

FCC ID: NS913P900

IC ID: 3143A-13P900

The RF-900 Radio Module has been tested and complies with the applicable limit values for protection against high-frequency energy (RF energy)

### 3 Safety Instructions

This safety information is in addition to the product specific operating instructions in general and must be strictly observed for safety reasons. Read and understand all safety and operating instructions before you operate or install the system. Retain all safety and operating instructions for future reference. Always follow the instructions in this and all documents supplied with the device to avoid injury to yourself or others and damage to the system or other objects.

Assembly and operation should only be carried out by trained staff familiar with the system. Only use the tools, materials and procedures recommended in this document. For the correct use of other equipment, see the manufacturer's instructions.

#### 3.1 Safety Conventions and Product Labels

##### Structure of Safety and Warning Messages

These instructions use safety instructions, warning symbols and signal words to draw your attention to different levels of risk:

⚠ WARNING
<p><b>WARNING</b> indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury.</p> <p>► Always follow the recommended measures to avoid this hazardous situation.</p>
⚠ CAUTION
<p><b>CAUTION</b> indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.</p> <p>► Always follow the recommended measures to avoid this hazardous situation.</p>
ADVICE
<p><b>NOTICE</b> signifies a potentially hazardous situation which can result in damage to property.</p> <p>► Always follow the recommended measures to avoid this hazardous situation.</p>
ATTENTION
<p>Not relevant to safety, <b>INFO</b> provides additional information to clarify or simplify a procedure.</p>

##### Warning Symbols and Product Labels



General warning sign



Warning of electrical voltage



Warning of the risk of crushing



Please read all instructions carefully before using the product for the first time.



Direct Current symbol found on electronics requiring or producing DC power

## 3.2 General Safety Instructions

### ⚠ WARNING



#### Operation of the Electronic Control System in Case of Obvious Damage

Risk of electric shock and fire hazard caused by short circuit.

- ▶ Do not use the system if electrical lines or housing are visibly damaged.
- ▶ Operate the system using only the type of power source indicated in the manual.
- ▶ Do not operate the system in areas with humidity above operating levels or expose it to water or moisture.
- ▶ Do not get the system wet.
- ▶ Do not remove or deactivate any safety measures from the system (incl. warning stickers or paint marked screws).
- ▶ Repairs may only be carried out by authorized ARRI service partners.

### ⚠ CAUTION



#### Falling System Parts

If the system is inadequately assembled, it can fall down and cause serious injuries and damage to the system or property.

- ▶ Installation and operation may only be carried out by trained personnel who are familiar with the system. Observe accident prevention regulations.
- ▶ Do not place the electronic control system on an unstable trolley or hand truck, stand, tripod, bracket, table or any other unstable support device.
- ▶ Always place the system on dedicated support devices.
- ▶ Secure the system against falling and tipping over. Observe the general and local safety regulations.

### ⚠ CAUTION



#### Using the System in a Humid Environment and with Condensation

When moving the system from a cool to a warm location or when the system is used in a damp environment, condensation may form inside the system and on internal or external electrical connections. Operating the system while condensation is present bears risk of electric shock and/or fire caused by a short circuit.

- ▶ Never operate the device when condensation occurs.
- ▶ After moving the device from a cool to a warm environment, wait for some time for the system to warm up.
- ▶ To reduce the risk of condensation, find a warmer storage location.

## 4 RF Radio Modules Overview

### 4.1 Layout

#### RF-900 Radio Module 900 MHz FHSS



**RF-2400 Radio Module 2400 MHz FHSS**

**RF-EMIP Radio Module 2400 MHz DSSS**

## 5 Mounting and Assembly

### 5.1 Compatibility

The RF-EMIP, RF-2400 and RF-900 Radio Modules interface are currently compatible with the Hi-5 Hand Unit, the Radio Interface Adapter RIA-1 and the ZMU-4.

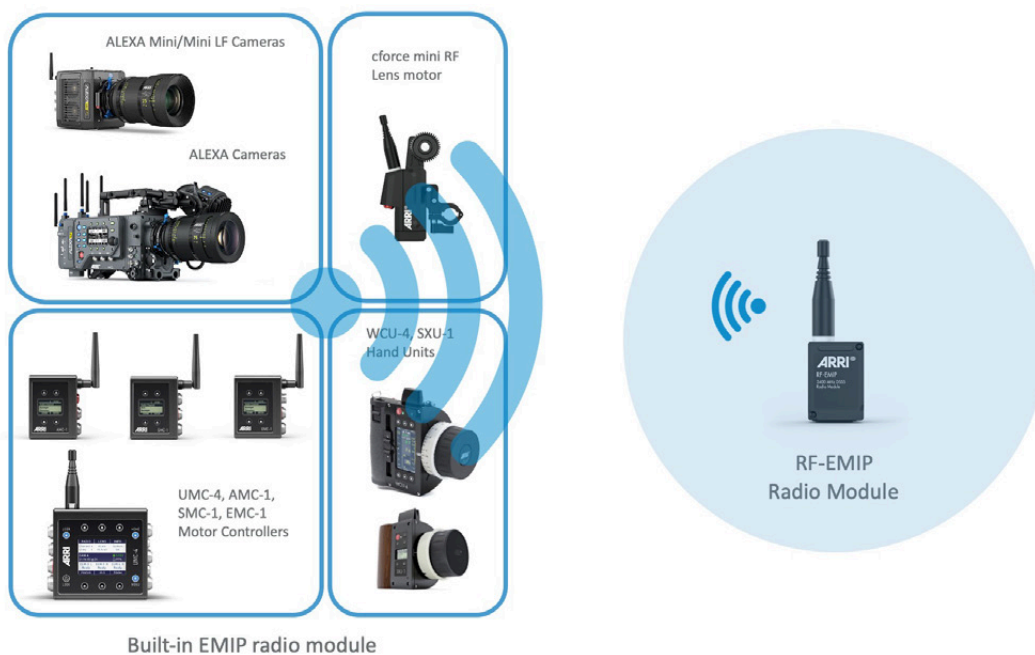


#### ATTENTION

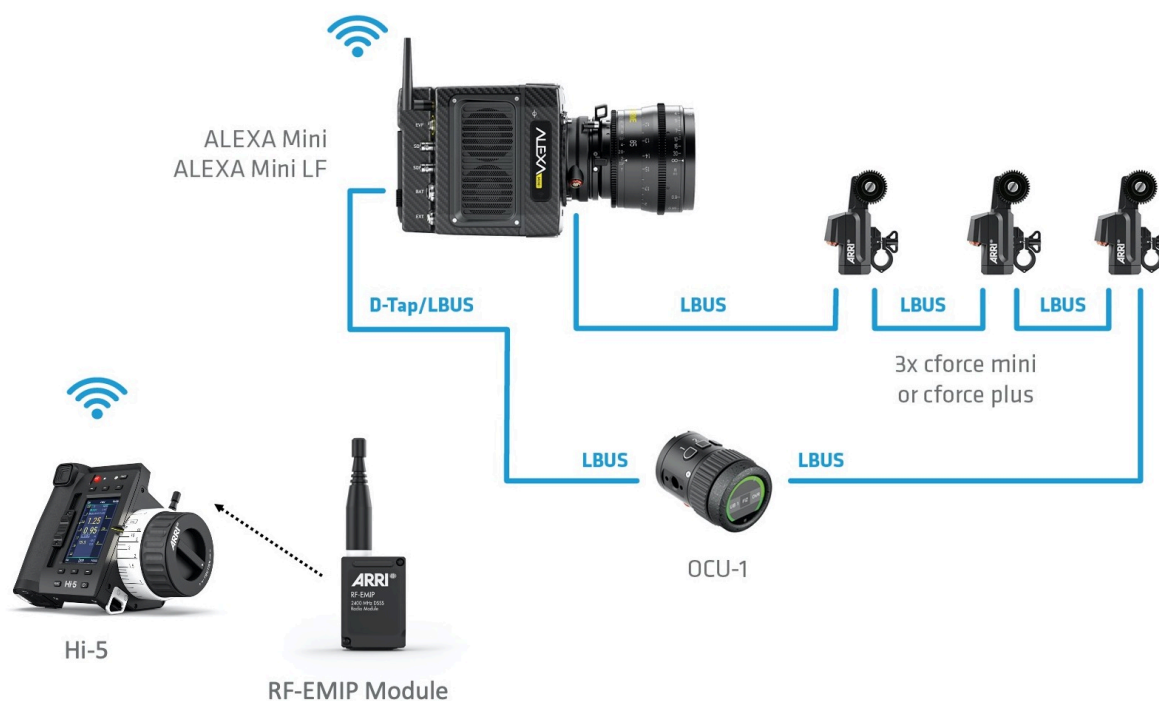
When removing the radio modules from the hosting units (Hi-5 Hand Unit, Radio Interface Adapter RIA-1, Zoom Main Unit ZMU-4), please check the temperature of the radio modules first. If they are hot, please wait until they have cooled down.

## Radio Compatibility

The RF-EMIP is compatible with all devices which have a built-in EMIP100, EMIP200, EMIP300, EMIP400 or EMIP400s white-coded radio module as follows:



## Sample Configuration:



**Compatibilities with White-coded Radio-integrated Devices**

<b>Compatibility to cameras</b>	<ul style="list-style-type: none"><li>– ALEXA Mini</li><li>– ALEXA Mini LF</li><li>– ALEXA Plus cameras (ALEXA LF, Plus, XT, SXT, 65)</li></ul>
<b>Compatibility to hand units</b> (in Network Mode)	<ul style="list-style-type: none"><li>– WCU-4</li><li>– SXU-1</li></ul>
<b>Compatibility to motor controller</b>	<ul style="list-style-type: none"><li>– UMC-4</li><li>– AMC-1</li><li>– SMC-1</li><li>– EMC-1</li></ul>
<b>Compatibility to lens motor</b>	<ul style="list-style-type: none"><li>– cforce mini RF</li></ul>

## 5.2 Antenna

The radio connection is established via the antenna mounted to the antenna connector. The radio module inside could be damaged by electrostatic discharge via the open connector. We recommend using the originally supplied antenna only.

## 6 Cleaning and Repair

### 6.1 Cleaning

#### ADVICE



##### **Improper Cleaning Procedure**

Risk of damage of surfaces.

- ▶ Only use the cleaning agents specified in this chapter.
- ▶ Do not use any strong or aggressive cleaning detergents like Methanol, Acetone, Benzine or acids. These chemicals may dissolve the paint on the product, damage highly polished surfaces.
- ▶ Do not moisten connectors when cleaning the product.
- ▶ Compressed air should not be used on the product.

### 6.2 Repair

#### ⚠ WARNING



##### **Repairs carried out by Untrained Personnel**

Risk of electric shock and fire caused by short circuit.

- ▶ Do not try to repair the device yourself. Repairs may only be carried out by authorized ARRI service partners.

For repairs and maintenance work on the camera system, please contact [service@arri.com](mailto:service@arri.com).

### 6.3 Software update

To keep your Radio Modules up-to-date, you may need to update its firmware. Please check ARRI's website or install ARRI's new ECS App on you iphone to stay informed for the latest firmware package.

The RF-900, RF-2400 and RF-EMIP Radio Modules can be updated from external devices.

The following devices provide update functionalities for the Radio Modules:

- Radio Interface Adapter RIA-1
- Hi-5 Hand Unit


Please refer to the respective user manuals for further information.

#### ⚠ WARNING

Do not switch off power during the update as this may damage the Radio Module!

## 7 Transportation, Storage and Disposal

### Transportation and Storage

ADVICE	
	<p><b>Improper Packing and Transportation of the product.</b> Risk of damage to the electronic camera accessory.</p> <ul style="list-style-type: none"><li>▶ Follow the specified environmental conditions.</li><li>▶ Only transport the product and accessories in suitable cases.</li><li>▶ Follow the instructions for transport and storage in this chapter.</li></ul>

The product can be damaged if not transported and stored properly. Please take note of the following guidelines.


#### Transportation Guidelines:

- Always transport the product in a suitable case.
- Do not expose the product to severe shocks.

#### Storage Guidelines:

- Remove the antenna from the product.
- Always store the product in a suitable case.
- Do not store the product outside of the specified ambient temperature range.
- Do not store the product in places where it may be subject to extreme temperatures, direct sunlight, high humidity, severe vibration, dust or strong magnetic fields.

### Disposal

ATTENTION	
<p>The product can be returned to the manufacturer.</p> <p>When disposing of accessories, please observe the relevant manufacturer's instructions.</p>	
	<p>This product falls within the scope of Directive 2012/19 / EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of June 4, 2012 on waste electrical and electronic equipment (WEEE II).</p> <p>Accordingly, this product must not be disposed of with household waste. There are the respective country-specific disposal rules that must be observed.</p>

## 8 ARRI Service Contacts

Please see the current list of service partners at  
[Service contacts](#)



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