

# User Manual

## Aeronautical Reception Chain

### AT\_CRA



## User Manual

### Equipment: AT\_CRA

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**Revision history**

Date	Author	Revision	Changes
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## 1. Product conformity

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.

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

FCC ID : 2A88I-AT-CRA



The product complies with the applicable Union harmonization legislation:

- DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of February 26, 2014 dealing with electromagnetic compatibility.
- DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 relating to the safety of equipment.



## 2. Safety guide lines

The use of this product is reserved exclusively for measurement. Any other application is considered incompatible with the intended use of the equipment. To insure the safe operation of the device, it must be operated according to the instructions in the user manual. In addition, regulations and related safety information must be complied with.

### **WARNING:**

#### General risks in case of non-compliance with the safety instructions

This product complies with current state-of-the-art technologies. Residual hazards can occur if the device is used by unqualified personnel without the following safety instructions. It is mandatory that all persons in charge of the installation, commissioning, maintenance or repair of the device have read and understood the user manual, in particular the safety information.

#### Installation and location requirements

Keep the device away from humidity, and the weather conditions such as rain, snow, etc.

#### Maintenance

Always turn off power before plug or unplug the equipment.

Always remove the power plug before maintenance.

Never immerse in water or wet the equipment (use a damp cloth only).

Never use solvents.

#### Technical changes and modifications

Any design or safety changes to the product are not allowed without our express consent. Any change shall void our liability for any resulting damage.

It is forbidden to carry out repairs of any kind. Only original ATCOM Telemetry parts are authorized.

#### Qualified personnel

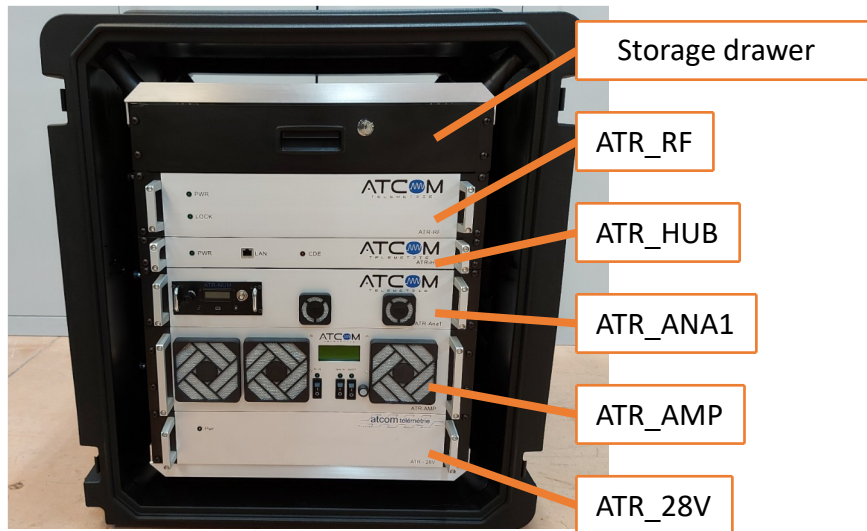
One who has received training in and has demonstrated skills and knowledge in the installation and operation of an ATCOM telemetry system.

Maintenance and repair work on the open device under voltage must be carried out by qualified personnel who are aware of the existing hazards.

This equipment must only be installed and operated only by qualified personnel in accordance with the technical characteristics and safety regulations described in this manual. Furthermore, each user must comply with the corresponding regulations and safety instructions. This also applies to the use of accessories.

### 3. General overview

The AT\_CRA bay is a set of 5 modules (19" racks) designed to power and communicate with a ATCOM aeronautical telemetry.



Technical feature	Value	Unit
Power-supply voltage	90 – 260	VAC
Power-supply frequency	47 – 63	Hz
Power consumption	500	W
Dimensions	711 x 723 x 762	mm
Weight	73	Kg

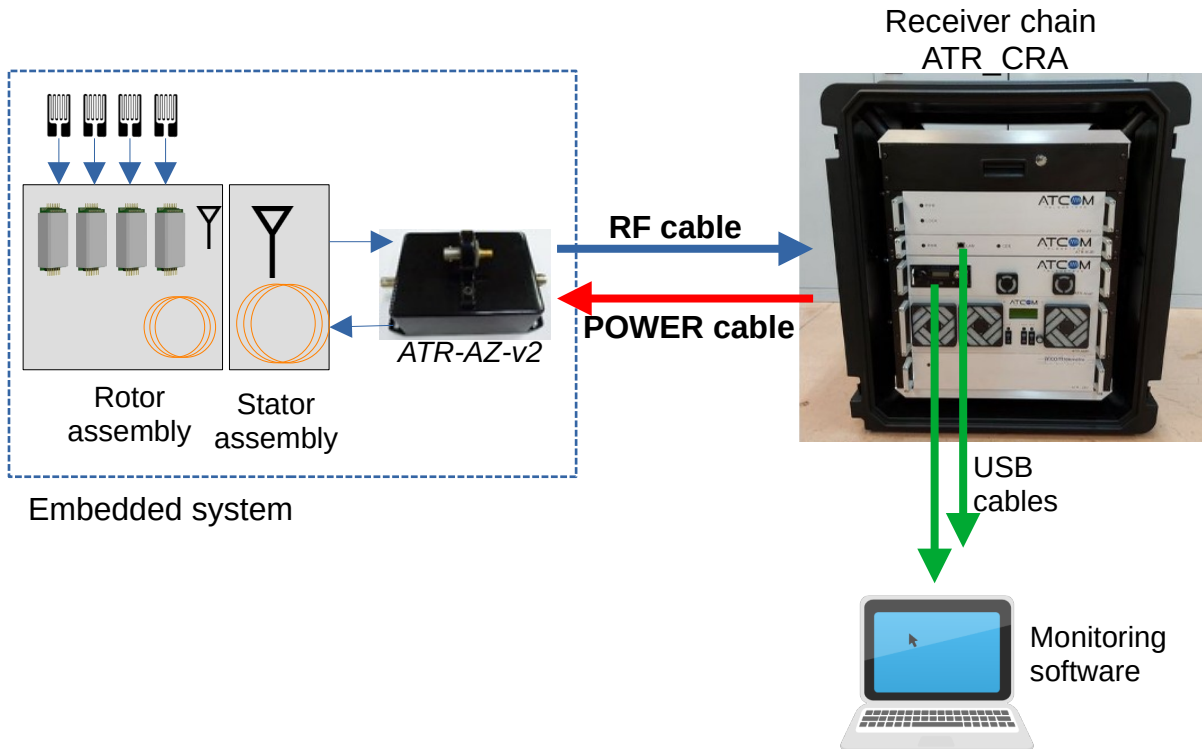
All modules are compatible with onboard aircraft 28V power supplies.

### 3.1. Aeronautical telemetry

ATCOM aeronautics telemetry systems are mainly composed of:

- **An embedded system**, divided into the subsystems rotor set and stator set (usually embedded in an aircraft engine or test bed),
- **A receive chain ATR\_CRA**, which includes a power supply module,

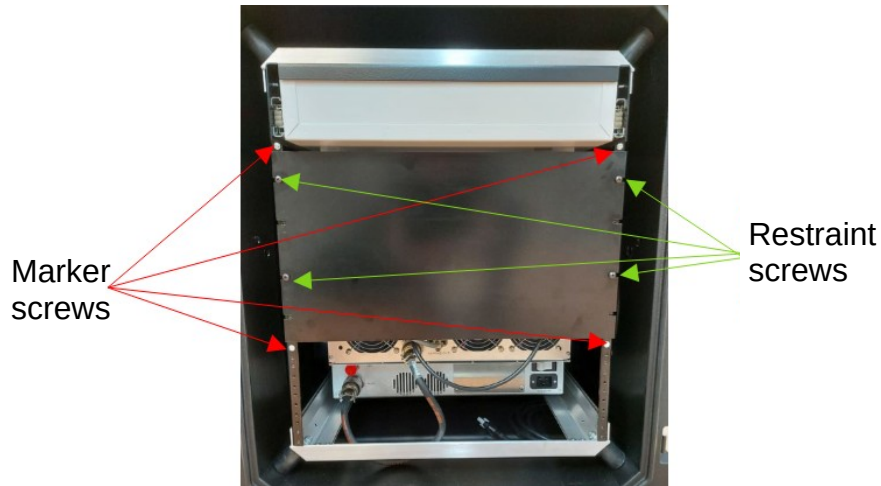
The ATR\_CRA is connected to the embedded system through the RF and POWER coaxial cables and to the host computer through the USB and RJ45 supplied cables.





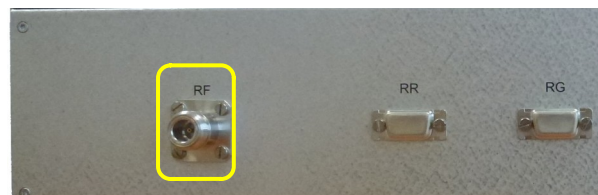
## 4. Operation

At the rear of the AT\_CRA bay is an electromagnetic shield plate. To access the modules rear panels, remove the 4 restraint screws. **Do not unscrew the marker screws.**



### 4.1. Installation

1. Connect the RF cable from the embedded system to the RF connector of the ATR\_RF module.
2. Connect the POWER cable from the embedded system to the ALIM RF OUT connector on the ATR\_AMP module.
3. Use this panel (at the ATR\_Ana1) to interface with your analog inputs.
4. Connect the Ethernet cable from the host computer to the ATR\_HUB module.
5. Connect the USB cable from the host computer to the ATR\_NUM in the ATR\_Ana1 module.



## 4.2. Start-up sequence

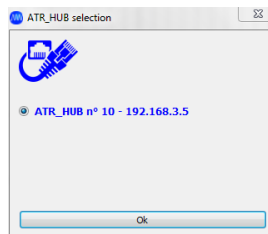
Use this configuration only if the embedded system is not reconfigured.

**Before launching the startup sequence, make sure that all switches of the ATR\_AMP and the main switch of the ATR\_28V, are OFF.**

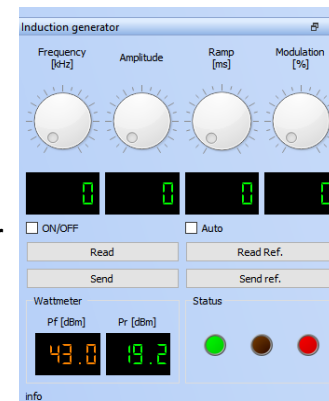
1. Plug the **ATR\_28V** (110/230VIN) into the AC outlet.
2. Switch on the **ATR\_28V** power supply module with the **ON/OFF** switch.  
The PWR light turns ON.



3. Launch the **ATS-Aero-RTS** application, turn on the ATR\_modules with switch **ON/OFF**, turn on the generator with switch **GEN ON** and wait for the reception chain to be detected by the host computer.  
The ATR\_HUB module may take a few minutes depending on the network configuration.



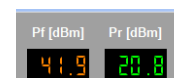
4. Set the generator using the parameters provided with the telemetry (frequency, amplitude, etc.).
5. Launch a reading of parameters.  
The ON/OFF must be unchecked (meaning embedded system off)



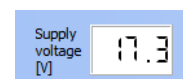
**CAUTION: an incorrect setting of the induction generator can lead to the destruction of the embedded system. Carefully read the generator parameters.**

6. On the **ATR\_AMP** module, turn on the **PA ON** switch.
7. Turn on the induction generator by checking the ON/OFF box and pressing the **Submit** button.

8. Check the forward and reverse powers,  $|Pr - Pf|$ :  
 $\leq 15$  dBm  $\rightarrow$  Bad input impedance matching. Follow the procedure **Full impedance matching procedure** in **Help VisuAdaptZ**.  
 $> 15$  dBm  $\rightarrow$  Acceptable for the power supply.



9. Check the supply voltage:  
 $Us \leq 20$  V  $\rightarrow$  Induction generator amplitude, too low.  
 Follow the procedure in chapter: **New embedded telemetry configuration**.  
 $Us > 20$  V  $\rightarrow$  Telemetry on and running.  
 $Us > 28$  V  $\rightarrow$  Risk of damage.



### 4.3. New embedded telemetry configuration

The embedded system will not boot if the power supply is not correctly configured. Which means that we will only have a first reading of the supply voltage when the system is already powered. For this reason, the embedded system supply voltage must be regulated by successive approximations, avoiding voltage overshoot.

Through the amplitude parameter we can adjust the power supply of the embedded system so that it always turns on safely. The number of modules and their type have a big impact on the power supply.

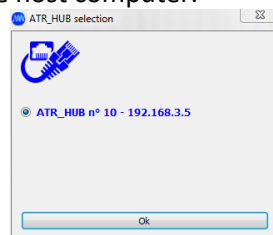
Follow this start-up sequence whenever changing the embedded system configuration.

**Before launching the startup sequence, make sure that all switches of the ATR\_AMP and the main switch of the ATR\_28V, are OFF.**

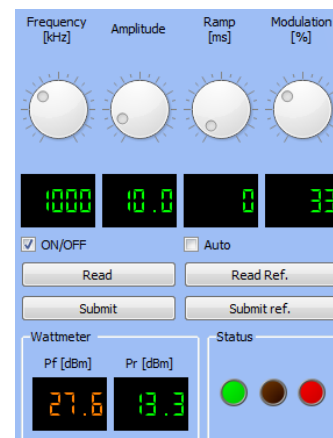
1. Plug the **ATR\_28V** (110/230VIN) into the AC outlet.
2. Switch on the **ATR\_28V** power supply module.  
The PWR light turns ON.



3. Launch the **ATS-Aero-RTS** application turn on the ATR\_modules with switch **ON/OFF**, turn on the generator with switch **GEN ON** and wait for the reception chain to be detected by the host computer.



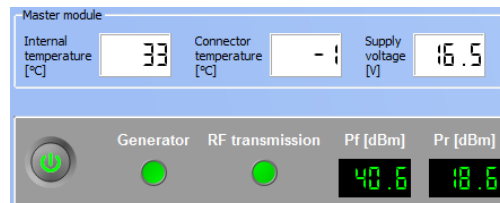
4. Enable in ATS-Aero-RTS, the **Induction generator** view and launch a reading.
5. Set in the **Induction generator** panel:
  - Frequency = 1000 kHz
  - Amplitude = 10
  - Ramp = 0 ms
  - Modulation = 33 %
  - Check the ON/OFF
 and submit.



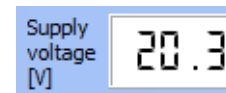
6. Enable the ATR\_AMP amplifier with the **PA ON** switch.



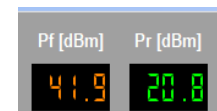
7. Set in the **Induction generator** panel:  
 ○ Amplitude = 50  
 and submit.



8. Check the supply voltage:  
 $U_s \leq 20\text{ V}$  → Induction generator amplitude, too low.  
 $U_s > 20\text{ V}$  → Telemetry on and running normally.  
 $U_s > 28\text{ V}$  → Risk of damage.



9. Check the forward and reverse powers,  $|Pr - Pf|$  :  
 $\leq 15\text{ dBm}$  → Bad input impedance matching.  
 Follow the procedure **Full impedance matching procedure** in **Help VisuAdaptZ**.  
 $> 15\text{ dBm}$  → Acceptable for the power supply.



10. Turn off the embedded system and wait 20 seconds before restarting it.



#### 4.4. Shutdown sequence



1. Turn off the embedded system using the software.
2. On the **ATR\_AMP** module turn off the induction output with **PA ON**.
3. Turn off the generator with **GEN ON**.
4. Turn off all reception chain modules with **ON/OFF**.
5. On the **ATR\_28V** module, turn off the source power with **ON/OFF** main switch.



For more information, check the ATS-Aéro-RTS and telemetry manuals.



## 5. Receiver station description

### 5.1. ATR\_AMP : Induction power source module

The ATR\_AMP module is an induction generator designed to wireless power the embedded system.

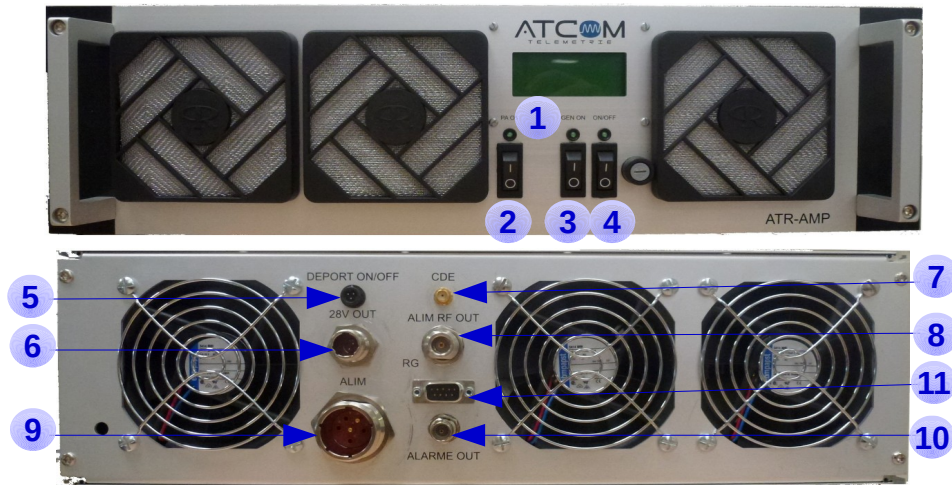
This module is composed of a frequency generator programmable by port RS422 connection, a power amplifier, a two-way power meter and an internal power supply designed to meet aeronautical military specifications:

- MIL-STD-461E CE101, CE102, CS101, CS114, CS115, CS116
- MIL-STD-704A/E/F
- MIL-STD-1275A/B/D

The software ATS-Aero-RTS allows you to configure this module through frequency and amplitude parameters.

Parameters	MIN	TYP	MAX	Units
Supply voltage	16		32	V (dc)
<b>Outputs</b>				
DC output voltage		28		V
Operating frequency of induction	10		3000	kHz
Current			10	A
Generator power <sup>1</sup>		75		W
<b>Dimensions</b>				
Rack 3U		19		"

<sup>1</sup>With a load of 50Ω



	Name	Type	Function
1	--	LCD	Shows the power configuration
2	PA ON	Switch	Enable/disable the power amplifier
3	GENE ON	Switch	Enable/disable the frequency generator
4	ON/OFF	Switch	Power main switch
5	DEPORT ON/OFF	Connector	Remote power main switch
6	28V OUT	DC connector	28V output power connector to supply the other modules
7	CDE	Connector	Not used
8	ALIM RF OUT	Connector	Output power signal connector for the embedded system
9	ALIM	DC connector	28V input power connector
10	ALARME OUT	Connector	Power overshoot alarm output connector
11	RG	DB9 connector	RS422 port to configure the ATR_AMP module

## 5.2. ATR\_RF : Radio module

The ATR\_RF is the radio telemetry receiver that prepares the transmitted data to be later decoded in the ATR\_Ana1 module.



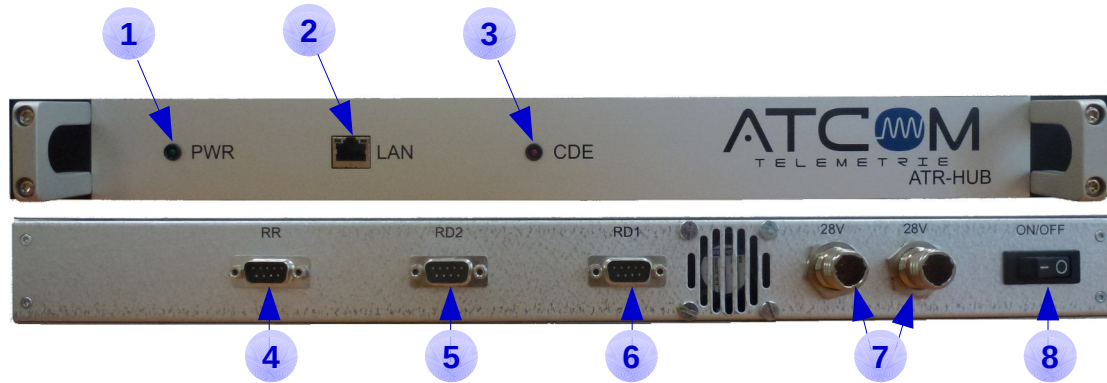
	Name	Type	Function
1	PWR	Light indicator	Power ON/standby indicator
2	LOCK	Light indicator	RF signal status indicator
3	RF	N 75Ω connector	RF signal port
4	ANTENNE	BNC connector	Antenna hookup
5	28V	DC connector	28V output power connector to supply the other modules
6	ON/OFF	Switch	Module power switch



### 5.3. ATR\_HUB : Ethernet module

The ATR\_HUB module (or Ethernet module) connects all reception chain modules in a single interface. With ATS-Aero-RTS software, the user can set up the reception chain, monitor the embedded system and read incoming data.

Connectable through a DHCP server that supports the host PC or directly to the host PC (set as static IP address ex. 192.168.3.10) using its fixed IP **192.168.3.5** and the RJ45 supplied cable.



	Name	Type	Function
1	PWR	Light indicator	Power ON/standby indicator
2	LAN	RJ45 connector	Host computer hookup
3	CDE	Light indicator	Upstream signal status
4	RR	DB9 connector	ATR_AMP module configuration port
5	RD2	DB9 connector	Not used
6	RD1	DB9 connector	ATR_Ana1 module configuration port
7	28V	DC connector	28V output power connector to supply the other modules
8	ON/OFF	Switch	Module power switch

## 5.4. ATR\_Ana1 : Main analog module

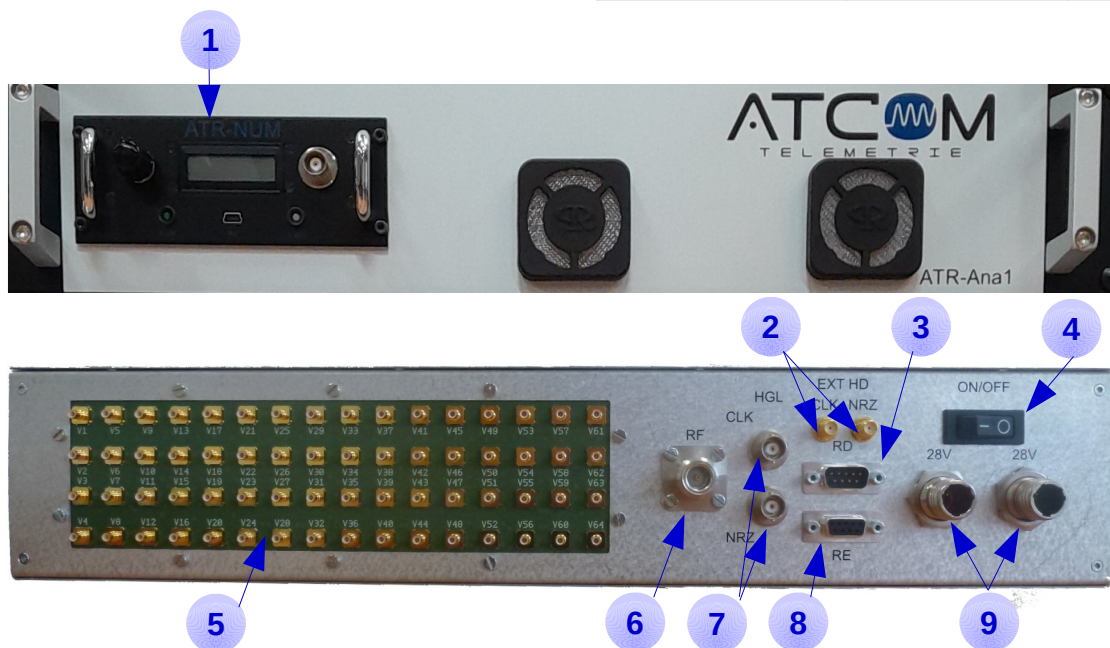
The ATR\_Ana1 module is the main incoming data decoder and an analog restore signal that embeds up to 64 independent digital-to-analog converters.

Designed to interface 2 other ATR\_Ana modules (each one also with 64 analog outputs), this module combined with the 2 slaves can restore up to 192 analog channels in a single telemetry system.

- **The analog outputs:**

Thanks to the software, it is possible to store the gain and offset of each analog output in an internal memory, thus maintaining a ready-to-go configuration at power up.

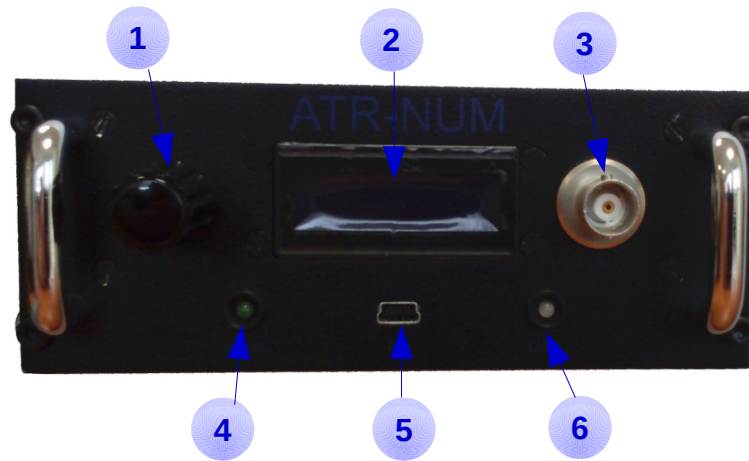
Parametres	MIN	TYP	MAX	Unité
Supply voltage		28		V
<b>Outputs</b>				
Range	0		10	V
Offset		5		V
Impedance		100		$\Omega$
<b>Dimensions</b>				
Rack 2U		19		"



	Name	Type	Function
1	ATR_NUM	Sub-module	Telemetry digital data decoding module
2	EXT HD	SMA connector	Analog output expansion Ana2 module.
3	RD	RS422 connector	ATR_Ana1 module configuration port
4	ON/OFF	Switch	Module power switch
5	V1... V64	SMB connectors	Analog data outputs from channel 1 to channel64
6	RF	RF connector	Incoming data
7	HGL	BNC connectors	Reserved
8	RE	RS422 connector	ATR_Ana2 module configuration port
9	28V	DC connector	28V output power supply port.

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- **The sub-module ATR\_NUM:**



	Type	Function
1	Selector knob	Selects the analog channel at the BNC connector (3)
2	Display	Shows the analog channel at the BNC connector (3)
3	BNC connector	Analog output
4	Light indicator	Power ON/standby indicator
5	Mini USB	Host computer hookup
6	Light indicator	RF signal status indicator: Red→ radio signal failure Green→ radio signal OK

## 5.5. ATR-28V

The ATR-28V is the telemetry's main power source. It is a 600W voltage supply, 230V/50Hz and 110V/60Hz compatible (AC cord supplied) that supplies a maximum output voltage of 28V DC. This power supply is equipped with a 16A circuit breaker.



	Name	Type	Function
1	PWR	Light indicator	Power ON/standby indicator
2	ALIM	DC connector	28V output power connector for the ATR_AMP module
3	28V	DC connector	28V output power connector to supply the other modules
4	110/230VIN	AC connector	AC input (110/230Vac)
5	ON/OFF	Switch	Main power switch/breaker 16A