AUREL WIRELESS NETWORK
868 MHZ

AUREL has developed a smart network in 868 MHz, single channel, targeting easy installation and maintenance.

A network designed for home and industrial automation application and it's based on:

- one or more key elements (Master) typically remote controls and/or a central unit (PC, gateway…).
- modules transceiver (Slaves) to be installed in actuators or even to use as repeaters.

Below an example of commands from master to the network:

- Opening or closing of a load
- Remote led driving
- Detection status of an actuator
- Broadcast signal to the network
- Data request from sensors.

When a node receives a signal, it routes data forward to the next elements. When the destination node is reached it performs the requested action and answer to the original sender properly.

Afterwards the master module can be switched-off during the period of inactivity, in order to reduce battery consumption.

Thanks to 7 dBm of output power the nodes of the network cover higher distance then a similar standard solution in 2,4 GHz.
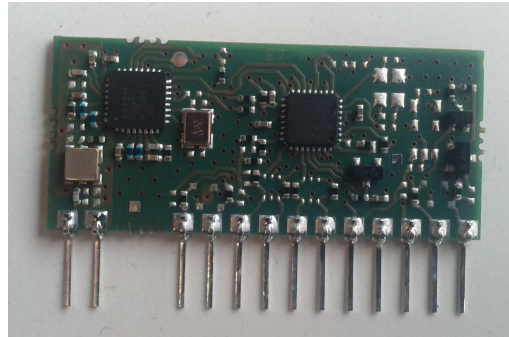
The image on the left could represent a remote control and the module on the right a transceiver to be used on actuator.

The main element of the network is the remote control and it can associate the several nodes. The learning procedure is as simple as possible and it is similar to HCS-like pairing for a unidirectional remote control. By repeating this procedure for each node the network is established. This simplifies the role of the installer and solves the complex problems related to the initial installation. Furthermore in order to modify the network simply adding a node it is just necessary to repeat the learning process. It is also supported the copy of the remote control, in order to simplify the replacement of the remote control itself, in case of loss or damage.

An UART interface is also provided in all nodes, except remote, in order to implement a more flexible and customizable network.
Each network is identified by a unique NetworkID 4-byte parameter, stored in NVM in each module or remote. Each remote is manufactured with a different NetworkID while every module has the same identifier and it is overwritten during network installation. For special applications it is possible to order a **serialized module**: it is able to establish the its own network with its identifier, thus replacing the remote control.

RFTide network is designed to cover areas like a mall or houses with many automated points. The nodes can be installed in air conditioners, sensors, gates, garage automations, automated blinds and any kind of accessories which you intend to drive by remote control.
Remote can communicate with the network from anywhere, as long as it reaches at least one node in the network and it later notifies the answer using an RGB feedback led. The data packet and the number of nodes, the jumps from one node to another, are fixed. Coexistence between close networks has been tested. They do not disturb each other because the nodes belonging to a network do not communicate with others belonging to different ones. Furthermore in order to increase the radio coverage if a slave is not directly reachable from the concentrator it is possible to add repeaters to the network. These ones should be always switched on, instead, in order to route correctly the packets.

Various profiles have been already implemented in RFTide modules in order to set-up some simple applications with no need for further complex component:

- **MOTOR profile**: a module can used to drive a bidirectional motor and a support for two limit switches. Thus it is possible to achieve information about the position of the motor

- **PWM profile**: in this case a module can drive a light source (e.g. a led) using a PWM modulation. In order to appreciate the different light levels the various steps are designed according to a exponential law. It is also possible to set a more accurate duty-cycle (minimal resolution 1/256) with a dedicated command

- **Wireless metering profile**: In this profile every node periodically sends data (e.g. room temperature, door opening information) to the concentrator, equipped with a dedicated module. Thus it is possible to make each slave node to sleep most of the time and they can be battery operated.

By default a node does not belong to any profile.

ELECTRICAL CHARACTERISTICS
(only for Modules)

| Characteristic	Min	Typ	Max	Unit
Frequency		868.3[*] 869.85[*]		MHz
RF bandwidth		60		kHz
Supply Voltage (+3V version)	2.7	3.3	3.6	V
Supply Voltage (+5V version)	3.3	5	5.5	
Supply current (TX mode)			33	mA
Supply current (RX mode)			10	mA
Supply current (Power down mode)	0.2		4	µA
Modulation		FSK		
Receiver sensitivity		-103		dBm
RF Power Out		7		dBm

Module could be provided in +3V or +5V version

[*] Different modules are available at the two indicated operating frequencies
Module is approved by CE and in particular satisfies the European ETSI *EN 300 220-2 V2.4.1* and *EN 301 489-1 V1.9.2* regulations. According to normative at 868.3MHz **1% duty cycle** is available for radiofrequency operations, while at 869.85MHz **100%** can be used.
Duty-cycle control is in charge of the user. Note that in optimal conditions 200ms is used from the first request to the answer returning. In some case more retry can be done at physical level.

In power down mode (ENABLE low) module is completely off and it can be switched on only raising ENABLE pin. When ENABLE pin is raised module requires about 50ms to come to full functionality

MODULE PINOUT
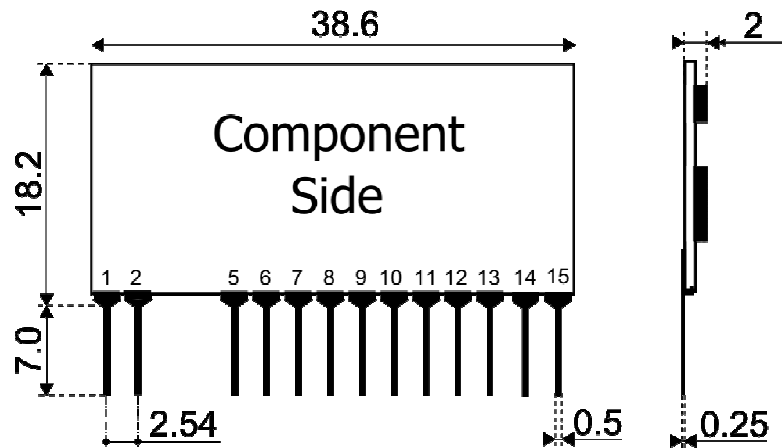
1.   **ANTENNA**
2.   **GND**
5.   **GPIN0 / ADC0 / LIMITSWITCH_OPEN**
6.   **GPOUT0 / MOTOR_UP / PWM**
7.   **LEARN** (Input for learning procedure, pull-up is already provided. A button towards GND should be used)
8.   **UART RX** (Input for module)
9.   **LED** (Output for learning confirm. A led towards GND with resistance should be used)
10.   **UART TX** (Output for module)
11.   **VCC** (+3V or +5V)
12.   **GND**
13.   **ENABLE** (High: ON – Low: OFF, with built-in pull-down resistor). This pin can be driven by an external microcontroller, with no need for dedicated regulators or transistors to break module power-supply
14.   **GPIN1 / ADC1 / LIMITSWITCH_CLOSE**
15.   **GPOUT1 / MOTOR_DOWN**

I/O STAGES

In +3V module I/O ports are connected to microcontroller pins through a 22R resistor. If a button is to be used take care to add a pull-up (or pull-down) resistor properly. Note that for LEARN pin pull-up is already built-in in module because it is intended to be used with a button.

In +5V module GP-OUT pins are implemented using an open-collector configuration with a 1k pull-up resistor as depicted
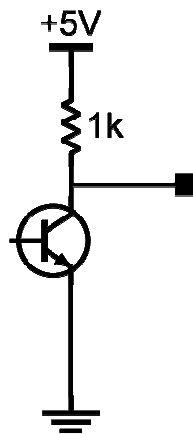
GP-IN pins are implemented using just a similar npn transistor, as depicted in the following picture.
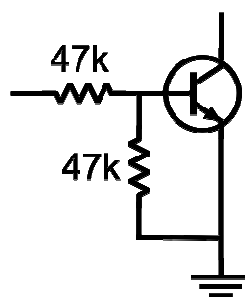
In order to reduce power consumption when the module is switched off take care of the input/output state at power-down, thus avoiding undesired current flow on the bias resistors. Similarly to +3V if a button is to be used add a pull-up (or pull-down) resistor properly.

LEARN, LED and UART pins are implemented with a Schmidt-trigger instead. As in +3V version LEARN pin is equipped with a pull-up resistor

RF CONSIDERATIONS

50 Ohm line:

1. It must be the shortest as possible.
2. 1.8 mm wide for 1 mm thick FR4 printed circuits and 2.9 mm wide for 1.6 mm thick FR4 printed circuits. It must be kept 2 mm away from the ground circuit on the same side.
3. On the opposite side a ground circuit area must be present.

Antenna connection:
1. It may be utilized as the direct connection point for the radiating whip antenna.
2. It can bear the connection of the central wire of a 50Ω coaxial cable. Be sure that the braid is welded to the ground in a close point.

Antenna
1. A whip antenna, 8.5 cm long and approximately 1 mm diameter, brass or copper wire made, must be connected to the RF output of the transmitter
2. The antenna body must be keep straight as much as possible and it must be free from other circuits or metal parts (5 cm minimum suggested distance.)
3. It can be utilized either vertically or horizontally, provided that a good ground plane surrounds the connection point between antenna and transmitter output.

NOTE: As an alternative to the above described antenna it is possible to fit the whip model manufactured by AUR°EL (see related Data Sheet and Application Notes). By fitting whips too different from the described ones, the CE Certification is not assured.

OPERATING PROCEDURES

ACTUATION:

With this procedure it possible to choose a remote slave and send it a specific command. It is also possible to send a command to all the slaves (broadcast):
- Select a channel in the remote control using the CH+ or CH- small buttons. If all leds on the left side are switched on the transmission is intended as a broadcast.
- Using UP, STOP, DOWN buttons at the center of the remote control it is possible to send correspondent commands for MOTOR application to nodes configured as belonging to MOTOR profile. If UP or DOWN command is sent to a motor MOTOR_READ request is issued periodically to request motor status continuously, until motor is stopped (for a reached LS or an explicit STOP command).
  If a jumper is inserted in the MODE strip on the remote correspondent commands for PWM to change duty cycle are issued. STOP button toggle PWM (cfr. PWM_ON and PWM_OFF command).
  Nodes not belonging to the selected profiles do not perform any action, just providing an empty answer.
- During the request the notification led on the remote is orange. A broadcast transmission do not require answer. The answer is notified in the feedback led on the front of the remote with the following meanings:

	Orange led	**Blue led**	**Red Led**	**Green led**
Motor Profile	Waiting for answer	Motor is moving and no Limit Switch has been reached	Close LS has been reached	Open LS has been reached
PWM profile	Waiting for answer	-	PWM is currently ON	PWM is currently OFF

All commands supported by remote are also made available through UART.
Reserved address for broadcast is 255 (0xff)

LEARNING:

With this procedure it is possible to make a module to join the net, thus making it addressable from the remote control:
- Press almost for two seconds LEARN button on module
- Led switches on
- Within 15 seconds select desired address in the remote control and press the programming PROG1 button located under the front removable panel. If the jumper is

inserted the programmed node is configured as belonging to PWM profile, otherwise it is configured as belonging to MOTOR profile
- If the procedure has been successful the led on the module blinks for a few seconds. If the led switches off procedure has to be repeated. No answer is provided to remote

The same procedure can be done using a specific serialized module (same hardware, specific firmware) replacing the role of the remote control. This module is in charge to form the network using the dedicated PROGR_MESSAGE command issue via UART. (Note that address = 0 is reserved for keyfob devices)

REMOTE CLONING

With this procedure it is possible to copy data from a remote control to another one. Thus also this additional remote is able to communicate to all the nodes of the network:
- Turn on remote pressing CH+ or CH- button
- Press almost for two seconds PROG1 button on remote. All leds switch on
- Turn on remote control to be copied and press the programming button located under the front removable panel. Do not care about the selected channel
- If the procedure has been successful the leds on the remote blinks for a few seconds. If all leds switch off procedure has to be repeated

SENSOR

It is possible to program a module to send unsolicited commands to other modules (e.g.: A wind sensor should close all curtain around home):
- Press almost for two seconds LEARN button on module
- Led switches on
- Turn on remote pressing CH+ or CH- button
- Press PROG2 on the remote, thus sending PROGR_SENSOR_MESSAGE, in order to instruct the node as a sensor
- If the procedure has been successful the led on the device blinks for a few seconds. If the led switches off procedure has to be repeated. No answer is provided to remote
- Press again LEARN button and perform desired operation from the remote. The operation is actually executed for a visual check and it is stored in the sensor node. Only operations issued from the node who instructed the node as a sensor are considered valid. Note that all remotes have the same address (0x00)
- It is possible to store up to three different operations. All these operations are executed in case an event is triggered in the sensor.
- To trigger an event lower GPIN0 pin on module

Any sensor is learned with address 254 (0xfe)
To change the stored operations reset the device as follows, thus restoring the factory settings, and repeat the whole procedure. Remote could be replaced by any network module, controlled

via UART properly with dedicated commands

DEVICE RESET

With this procedure it is possible to restore any device to factory preset.
- Press almost for two seconds LEARN button on module (or PROG1 button on the remote control, after power up of remote itself by pressing CH+ or CH- button)
- After the button is released press it again for other two seconds within 15 seconds. Led blinks during this phase. When two seconds are elapsed led switches off
- If the procedure has been successful the led on the devices blinks for a few seconds. If led switches off procedure has to be repeated

A dedicated UART command is provided to perform the same operation

REPEATER

With this procedure it is possible to make a slave act just as a radio repeater, without any supported command. Thus it is possible to extend radio coverage of the network
- Press almost for two seconds LEARN button on module
- Led switch on
- Within 15 seconds select broadcast (all destination leds on) in the remote control and press the programming button located under the front removable panel
- If the procedure has been successful the led on the module blinks for a few seconds. If led switch off procedure has to be repeated

UART PROTOCOL

In order to control data exchange from an external microcontroller it is possible to send commands through a serial port using an external microcontroller or a PC.

- Baud Rate: 19200
- Bits: 8
- Parity: None
- Stop bits: 1

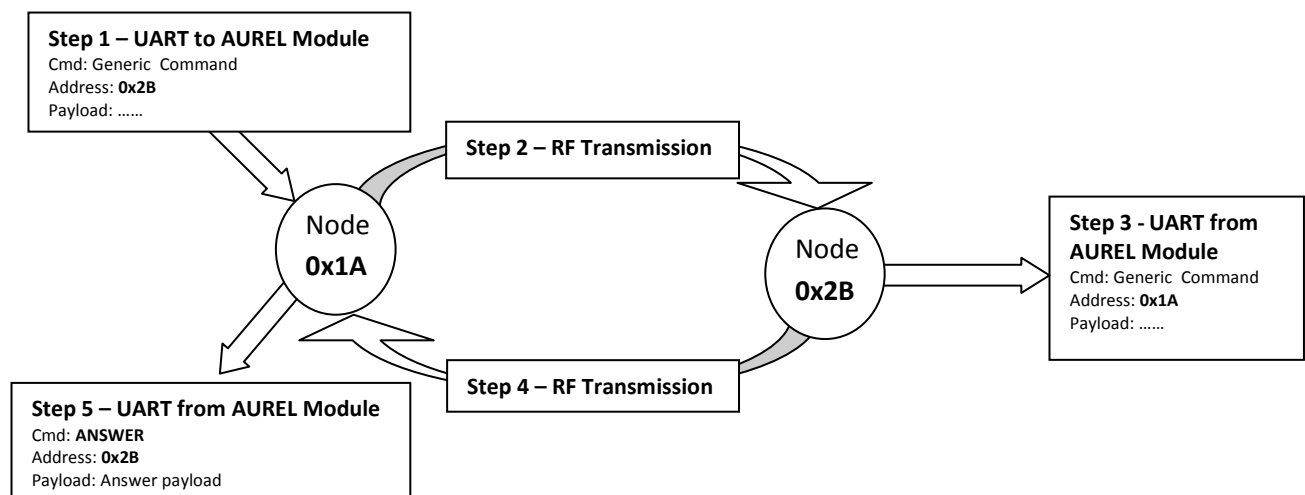Each command sent through serial port is composed as follows:

Cmd LSB	Cmd MSB	Address	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7

First two bytes indicate the command (**Cmd**) to be executed
Address indicate the address of the node, to which the command should be sent.
In case a packet is sent from Aurel module the **Address** field contains the address of the node which originated the communication
The following diagram shows the succession of the events for a standard communication:

Step 1 – UART to AUREL Module
Cmd: Generic Command
Address: **0x2B**
Payload: ......

Step 2 – RF Transmission

Node **0x1A**

Node **0x2B**

Step 3 - UART from AUREL Module
Cmd: Generic Command
Address: **0x1A**
Payload: ......

Step 4 – RF Transmission

Step 5 – UART from AUREL Module
Cmd: **ANSWER**
Address: **0x2B**
Payload: Answer payload

A communication is started through the issue of a generic command through the UART from the external microcontroller to Aurel module. The packet is delivered through the network to the destination node and it is redirected to UART. Successively a answer packet (Command: **ANSWER,** with a specific answer payload) returns to the first node and it is also redirected to UART.

In case it is necessary to send a broadcast command the **0xFF** address should be used. In this case no return RF transmission and answer message is expected (steps 4 and 5).

COMMAND TABLES

System commands:

Command	Value	Payload	Description	Answer Payload
SEND_PACKET	0x0000	User data	Data are directly transferred to destination and redirected to UART with no further action	NC
LOCAL_STATUS	0x0001	NC	The local module answers with a payload No RF transmission is performed	- Byte 0: Address - Byte 4-1: Network ID - Byte 6-5: FW version - Byte 7: Current profile (0: No profile 1: Motor profile 2: PWM profile 3: Metering profile)
PING	0x0002	NC	The remote module answer with an empty payload, just to test RF communication	- Byte 6-5: FW version - Byte 7: Current profile (0: No profile 1: Motor profile 2: PWM profile 3: Metering profile)
PROGR_MESSAGE	0x0003	Byte 7: profile to be set in the programmed node (0: No profile 1: Motor profile 2: PWM profile 3: Metering profile)	Program the node with the desired address. Same as pressing PROG1 button on the remote. Use address 0xff to program a mere repeater	No answer from programmed node
ANSWER_MESSAGE	0x0004	Payload depending on specific request	The answer is generated from a module after each request	-
LEARN	0x0005	Start learn procedure (as Learn button has pressed for two seconds)	The local module answers with an empty payload No RF transmission is performed	NC

PROGR_SENSOR_MESSAGE	0x0006	NC	Program a node as a sensor. Afterwards it is possible to put the node in learn mode and, with the same master device, it is possible to instruct the sensor itself. 0xfe is address reserved for sensors[*]	No answer from programmed node
RESET_DEVICE	0x0007	NC	Restore factory settings. Same result as the procedure issued with the button. No RF transmission is performed	-
SET_LOCAL_OUTPUT_POWER	0x0008	Byte 0: New value (**0**: Max Output Power **1**: -3dBm **2**: -6dBm … **7**: -21dBm)	Set RF output power level just in local node[**] No RF transmission is performed	In byte 0 current RF output power level is reported
SET_REMOTE_ LOCAL_OUTPUT_POWER	0x0009	Same as SET_LOCAL_OUTPUT_POWER	Set RF output power level in remote node[**] **WARNING**: in case new RF output power is too low, radio connection can be lost and it could be not recoverable[***]	In byte 0 current RF output power level is reported
READ_LOCAL_OUTPUT_POWER	0x000A	NC	Just read current RF output power level[**] No RF transmission is performed	In byte 0 current RF output power level is reported
READ_REMOTE_ LOCAL_OUTPUT_POWER	0x000B	NC	Just read current RF output power level in the remote node[**]	In byte 0 current RF output power level is reported

[*]A sensor node instructed properly can store up to 3 commands and successively send them to the network, as a result of a negative edge on GPIN0
Any complex command, including data of the payload, can be taught to a sensor-instructed node (except PROGR_MESSAGE , PROGR_SENSOR_MESSAGE, ANSWER_MESSAGE)

[**]Default value is maximum output power for 868.3 products and it is reduced of -3dBm for 869.85. It is up to the user to set it properly not to violate current regulations, depending of the final design, antenna, enclosures…

[***]In this case it is possible to recover the link using a mobile node (e.g. an RFTide USB dongle connected to a notebook), to approach to the unreachable remote node, then sending a proper

command to set the output power to the correct level

I/O commands:

Command	Value	Payload	Description	Answer Payload
IO_SET	0x0010	- Byte 0 = 0: GPOUT0 - Byte 0 = 1: GPOUT1	Raise the indicated output pin[*]	NC
IO_RESET	0x0011	- Byte 0 = 0: GPOUT0 - Byte 0 = 1: GPOUT1	Lower the indicated output pin[*]	NC
IO_READ	0x0012	NC	Read all input and output status, intended as digital signals and also the two input as analog signals[**]	Byte 0: GPIN0 value Byte 1: GPIN1 value Byte 2: GPOUT0 value Byte 3: GPOUT1 value Byte 5-4: ADC 0 - (10 bits) Byte 7-6: ADC 1 - (10 bits)
VCC_READ	0x0013	NC	Read VCC value[***]	Byte 1-0: Value (10 bits) Byte 2: Module type (0: +3V Module, 1: +5V Module)

[*]IO_SET and IO_RESET are not performed if the node is configured for MOTOR_profile or PWM_profile

[**]ADC0 and ADC1 are available for +3V module version only. Reference for AD conversion is 1.1V (resolution is $1.1V/2^{10} \approx 1.07mV$). In order to measure a greater voltage a proper voltage divider has to be added in the application scheme

[***]To measure VCC reference is 4.01V (resolution ~3.92mV) for +3V version module and 6.09V (resolution ~5.94mV) for +5V version module.

Additional commands with the same syntax of the previous one to drive o read IO lines in the local module, thus performing no RF transmission:

Command	Value	Payload	Description	Answer Payload
LOCAL_IO_SET	0x0018		Same as IO_SET	
LOCAL_IO_RESET	0x0019		Same as IO_RESET	
LOCAL_IO_READ	0x001A		Same as IO_READ	
LOCAL_VCC_READ	0x001B		Same as VCC_READ	

Motor commands

Command	Value	Payload	Description	Answer Payload
MOTOR_UP	0x0020	NC	Turn motor up until the LIMITSWITCH_OPEN is reached. MOTOR_READ command is issued periodically until motor is going up	*
MOTOR_STOP	0x0021	NC	Stop the motor	*
MOTOR_DOWN	0x0022	NC	Turn motor down until the LIMITSWITCH_CLOSE is reached. MOTOR_READ command is issued periodically until motor is going down	*
MOTOR_READ	0x0023	NC	Just read information about motor status	*

*After any motor command an answer packet is returned with payload composed as following:
- Byte 0: LIMITSWITCH_OPEN (1: Active, 0: Inactive)
- Byte 1: LIMITSWITCH_CLOSE (1: Active, 0: Inactive)
- Byte 3-2: (00: Motor is stopped, 10: Motor is going down 01: Motor is going up)

Both LIMITSWITCH_OPEN and LIMITSWITCH_CLOSE pins are active low

PWM commands

Command	Value	Payload	Description	Answer Payload
SET_PWM	0x0030	Byte 0: **0**: 0% **1**: 0.4% (1/256) **2**: 1.6% (1/64) **3**: 6.25% (1/16) **4**: 25% (1/4) **5**: 100%	Set PWM at the desired value. PWM value is stored in NVM	*
PWM_UP	0x0031	NC	Increment PWM duty cycle. PWM value is stored in NVM	*
PWM_DOWN	0x0032	NC	Decrement PWM duty cycle. PWM value is stored in NVM	*
PWM_ON	0x0033	NC	Restore previous saved PWM value (default 6.25%)	*
PWM_OFF	0x0034	NC	Set PWM to 0% and leave in NVM previous value	*
PWM_READ	0x0035	NC	Do not change PWM but just read value currently performed	*
PWM_TOGGLE	0x0036	NC	PWN_OR of PWM_OFF depending on current status of the node	*
SET_FINE_PWM	0x0037	Byte 0 (0-256): **0**: 0% … **256**: 100% -	Set PWM duty-cycle using a more fine scale – This command does not save anything in NVM and just modify PWM modulation properly	Written value in Byte 0
READ_FINE_PWM	0x0038	NC	Read PWM duty-cycle if a SET_FINE_PWM command is issued	Value in Byte 0. If no SET_FINE_PWM command has been issued 0 is returned

*After any PWM (except FINE_PWM) command an answer packet is returned with payload composed as following:
- Byte 0: PWM current value
- Byte 1: PWM value stored in NVM, even if PWM is currently off

Metering commands

| Command	Value	Payload	Description	Answer Payload
METERING_CONFIG	0x0040	Byte 0: - 0: Do not care about GPIN0 - 1: Send data following a negative edge on GPIN0 Byte 2-1: - Periodical sending (resolution: 5 seconds). 0 means no periodical sending E.g. 10 minutes = 600 sec = 120 x 5sec should be represented with 120 = 0x78	Instruct the remote node with the principles to follow to send data packet autonomously to a concentrator node. The concentrator node is the sender of the METERING_CONFIG command	-
METERING_DATA	0x0041	NC	Node sends data to the concentrator node	-

In order to instruct a node to take part to a metering network following steps should be accomplished:
- Put the node in learn mode (using the learn pin or the correspondent UART command) and send PROGR_MESSAGE specifying the desired address for the node and also indicating METERING profile
- Send, from the concentrator, to the node a METERING_CONFIG command in order to specify the principles causing the packet to be sent to the concentrator node (this command could be sent as a broadcast)
- Afterwards any node belonging to the network sends periodically (and/or following a negative edge on GPIN0) to the concentrator a packet equal to the answer to IO_READ, containing following fields:

    o Byte 0: GPIN0 value

    o Byte 1: GPIN1 value

    o Byte 2: GPOUT0 value

    o Byte 3: GPOUT1 value

    o Byte 5-4: ADC 0 - (10 bits)

    o Byte 7-6: ADC 1 - (10 bits)

In order to reduce power consumption a node can be instructed just to send after GPIN0 negative edge, afterwards it can be switched off lowering EN pin. When a data should be sent raise EN and after at least 50 ms lower GPIN0 to send the packet to the concentrator. In order to reduce packet collision an initial time displacement depending on the address of the node is used. A blink on LED indicates the correct sending of the packet.

AVAILABLE PRODUCTS

Modules
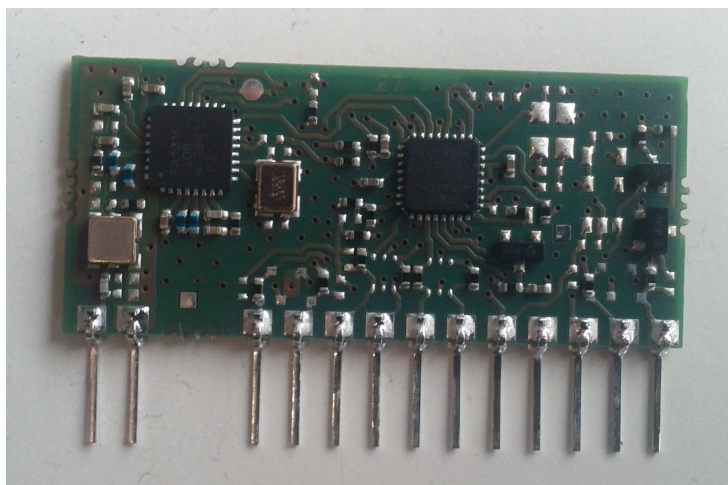


Modules can be provided in the following variants:
- Ordering Code: **650201276G**   AUR.EL RFT-868-3V
- Ordering Code: **650201274G**   AUR.EL RFT-868-3V 869.85
- Ordering Code: **650201275G**   AUR.EL RFT-868-3V Serialized
- Ordering Code: **650201273G**   AUR.EL RFT-868-3V Serialized 869.85
- Ordering Code: **650201280G**   AUR.EL RFT-868-5V
- Ordering Code: **650201278G**   AUR.EL RFT-868-5V 869.85
- Ordering Code: **650201279G**   AUR.EL RFT-868-5V Serialized
- Ordering Code: **650201277G**   AUR.EL RFT-868-5V Serialized 869.85

Pinout and electrical characteristics have been described in the previous pages

Remember that all modules belonging to the same network must have the same operating frequency, while it is possible to use 3V and 5V modules in the same network.

All modules are provided with address **0x0** and not serialized modules are provided with default Network ID equal to **0x00000000**

Module Demoboard
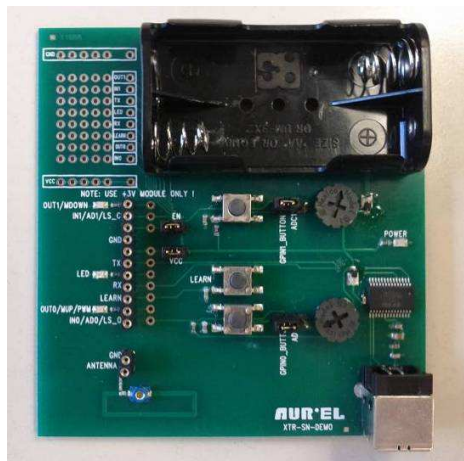
  − Ordering Code: **650201268G**   AUR.EL RFT-868-DEMO

In order to speed-up prototyping of a network a demo board can be provided. It must be used only with a 3V module and allows a simple access to all the pin of the module.

A red led is connected to LED pin to check the correctness of the learning procedure and two yellow leds indicate the status of the GPOUT pins. With a button it is also possible to pilot LEARN input pin to start learn procedure.

The board is also equipped with following jumpers:

- **EN**: to connect board 3V to EN pin of the module
- **VCC**: to connect board 3V to VCC pin of the module
- **GPIN1_BUTTON/ADC1**: to connect to GPIN1 module pin a pull-up equipped button or a resistive trimmer. To select between two options put the jumper to connect the central pole of the 3-pole strip to one of the lateral pole
- **GPIN0_BUTTON/ADC0**: to connect to GPIN0 module pin a pull-up equipped button or a resistive trimmer. To select between two options put the jumper to connect the central pole of the 3-pole strip to one of the lateral pole

Therefore it is possible to check motor profile working visualizing led for motor working and using buttons to emulate limit-switches. It is also possible to dimmer GPOUT0 led using PWM profile properly. Note that resistive trimmers sweep from 0 to 3V while ADC measurement are referenced to 1.1V

The board can be powered either with two AA batteries or through a USB B-type and a power led is present. Two diodes ensure there is no risk of electrical conflicts. Through USB it is possible to send and receive commands towards a PC. In this case a virtual COM port is added to PC peripherals and, if needed, drivers are available at *http://www.ftdichip.com/Drivers/VCP.htm*.

Remote control

- Ordering Code: **650201283G**   AUR.EL RFT-868-5CH
- Ordering Code: **650201284G**   AUR.EL RFT-868-5CH 869.85

Remote control is equipped with following resources:

On the front panel:
- **CH+**, **CH-** buttons to browse among five different channels (0÷4) and broadcast (CH+ and CH- are also used to switch on remote)
- **UP**, **STOP**, **DOWN** buttons to send commands to node, according to selected profile:
    - In MOTOR profile: MOTOR_UP, MOTOR_STOP, MOTOR_DOWN commands are issued
    - In PWM profile: PWM_UP, PWM_OFF, MOTOR_DOWN commands are issued
- **5 Yellow leds**, indicating the current channel to be addressed. If all leds are on a broadcast request is to be performed
- **RGB feedback led:** meaning of assumed colour depends on the current request, according to the table depicted in the chapter of operating procedures

Under the front removable panel:
- **PROG1** button to program a node in learning mode or to put the remote itself in learning mode
- **PROG2** button to instruct anode to act as a sensor
  (cfr. PROGR_SENSOR_MESSAGE command)
- **MODE** jumper to select MOTOR or PWM profile (PWM is selected if jumper is inserted, otherwise MOTOR profile is used)

Under the rear removable panel:
- **CR2032** battery

Note that remote can be turned on pressing **CH+** or **CH-** button
Size: **120.5 x 53 x 18 mm**

USB Dongle

- – Ordering Code: **650201271G**   AUR.EL RFT-868-USB
- – Ordering Code: **650201272G**   AUR.EL RFT-868-USB 869.85

The USB dongle is equipped with a RFTide serialized module (address 0x0 and unique Network ID) and allows the module itself to be used with PC with no need for further components.
In this case a virtual COM port is added to PC peripherals and, if needed, drivers are available at *http://www.ftdichip.com/Drivers/VCP.htm*.

Size: **78 x 22.5 x 15 mm**

Wall repeater

- − Ordering Code: **650201281G**   AUR.EL RFT-868-REP
- − Ordering Code: **650201282G**   AUR.EL RFT-868-REP 869.85

Wall repeater is a specific device intended for extend network coverage. It should be powered with 220VAC and it is provided in a small enclosure fitting in every electrical mounting box. 220VAC wires should be using screwed terminals.

In order to reduce hazards due to 220VAC no button is provided and the module enters autonomously in learn mode at startup and every time 220VAC is re-connected. Afterwards the node can be instructed only to act as a repeater. If no procedure is carried out device maintains old settings. A yellow led is visible from outside the enclosure in order to check the correctness of the learning procedure. During normal working the correct repeating action on the device is indicated with blinking of the led.
It is also equipped with a back-up battery able to power the module for some hours.

DANGER
Danger of electrocution!
All works on the device may be performed only by a qualified and licensed electrician. Observe national regulations. Any works introducing changes into the configuration must be always performed with disconnected voltage

Comply with European **EN 55015** and **EN 60669-2-1** regulations
Current consumption: Imax = **12mA** (except for learning phase with led on)
Size: **43.8 x 43.8 x 25 mm**

Gateway

- Ordering Code: **650201269G** AUR.EL RFT-868-GATEWAY
- Ordering Code: **650201270G** AUR.EL RFT-868-GATEWAY 869.85

In order to provide a more extensible network interface for supported profiles a gateway is available to control PWM and MOTOR profile in a RFTide network through a web server. The gateway must be accompanied with a standard USB dongle at the desired frequency. In this way a user-friendly graphical interface is accessible via a standard PC with no need for complex software installation.
Furthermore if a standard Wi-Fi infrastructure is available all the functionalities can be accessed through a smartphone or a tablet.
Finally, if a internet access is provided, also remote commands could be used to control RFTide with a minimal configuration effort.

Size: **100.6 x 73.5 x 26.5 mm**

Evaluation Kits

- Ordering Code: **650201285G** AUR.EL RFT-868-EVKIT
- Ordering Code: **650201286G** AUR.EL RFT-868-EVKIT 869.85

Each evaluation kit is composed as follows:
- o A remote control
- o A USB dongle
- o Four 3V standard modules
- o Four demo boards

In this way it is possible to setup a network very fast with no need for dedicated hardware or software, thus evaluating all the benefits of the network and starting the development of the custom application. Note that USB dongle and remote control are equipped with different Network ID and in case they must be used in the same network a learning procedure must be carried out.

RFTide SOFTWARE
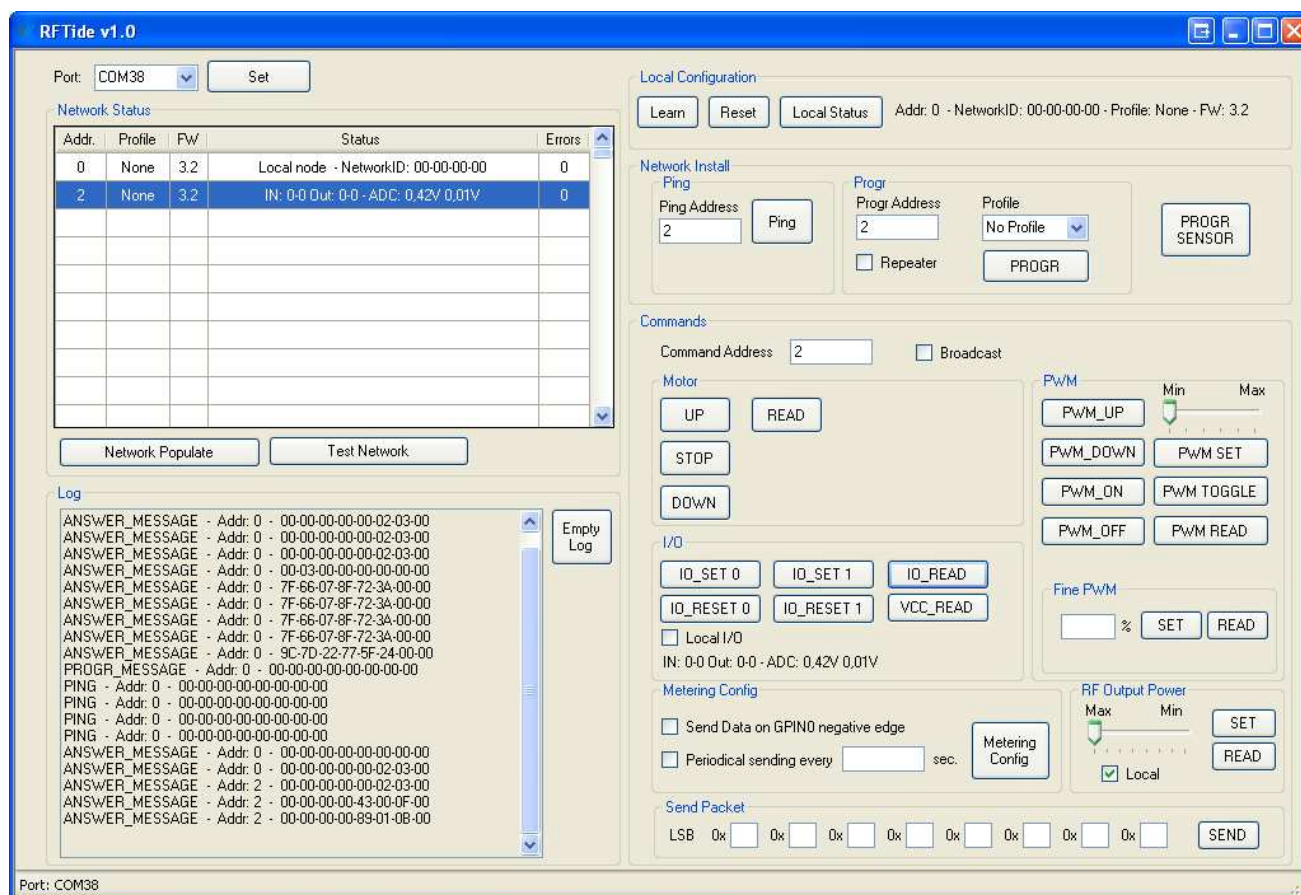
From website *www.rftide.com* it is possible to download an evaluation software for Windows PC. If used in conjunction with an *RFT-868-USB* dongle or a *RFT-868-DEMO* allows the network to be fully controlled via a Windows PC.

A minimal 1024x768 screen resolution and .NET Framework 4.0 are required.
Framework can be downloaded from:

- *http://www.microsoft.com/en-us/download/details.aspx?id=17718* (Standalone Installer)

- *http://www.microsoft.com/en-us/download/details.aspx?id=17851* (Web Installer)

Step-by-step instructions

Insert USB dongle (or connect RFT-868-DEMO) with a 3V module
To discover current COM port open "Device Manager" from Control Panel and check newly added
COM Port. If the port is not correctly recognized download drivers from
http://www.ftdichip.com/Drivers/VCP.htm.
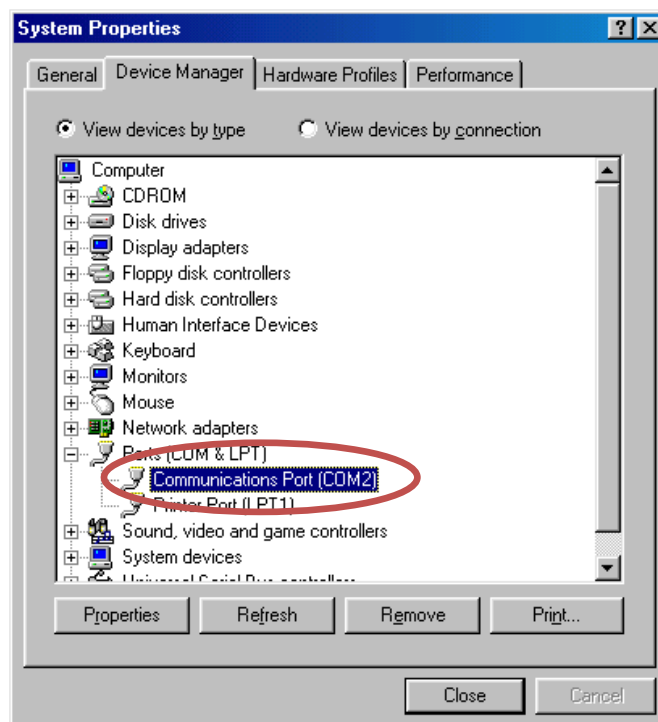
Open RFTide software, select correct COM port and press **Set** button. Next time the software is
executed it tries to use the last used COM port if available. In the status bar in the lower part of the
windows the current status is displayed (Current COM port or no active connection)

On the right side of the window it is possible to send every command described in the "UART
PROTOCOL" section of this user guide. As a first step, to check correctness of the communication, it
is possible to press **Local Status** and verify the received packet with properties about the node
connected to PC (Address, Network ID, firmware version and profile). Furthermore with **Learn** or
Reset buttons it is possible to send just to the local node correspondent commands.

In **Network Install** box you can see all the commands to be used to configure a network (**PROGR**,
PROGR SENSOR and **Ping** with correspondent parameters). Note that if a Ping request returns an
answer from remote node retrieved data it is displayed under the button.
In **Commands** box all the supported commands to be sent through RFTide network during normal
working are available and the expected answer are displayed in the same box of the issued command
as soon as it is collected from the network. Note that for this commands it is necessary to indicate

whether a broadcast is required, otherwise a specific recipient must be provided. For correspondent local I/O commands (LOCAL_IO_SET, ...) a tick in **Local I/O** check box must be provided.

Every received packet is added to log box and a *RFTide.log* file is created in the same folder of the executed with the same data. Using **Empty Log** button it is possible to empty both the log box and the file. When the file is 100000-line long it is not updated anymore, in order to avoid to create a too large file.

Furthermore every packet from any node contribute to update the Network Status table properly. It is also possible to populate the table by pressing **Network Populate** button, performing a ping for each possible address, then displaying in the table the detected nodes. The procedure can be stopped at any time by the user.

It is finally possible to test network performances by pressing **Test Network** which starts an infinite loop pinging all the node of the table. Any error is reported in log and a counter is provided for each node in order to identify critical parts of the network.

A *Resume.log* file is create reporting for each node the number of the performed requests and the number of the detected errors .

User Guide Revision History

Release date	User Guide Version	Correspondent FW versions	Correspondent Software version	Description
-	v.1.6 - v.1.7	-	-	Preliminary versions
09/11/212	v. 1.8	Until 3.1	-	First Public Release
19/12/2012	v. 1.9	3.2	1.0	Local I/O commands added Commands to set RF output power Information about module in VCC_READ command PC software added