

Manual

Agrónic Radio MAR 433 MHz module with IP box



Module for activating four 2-wire (or two 3-wire) latch solenoid valves, reading one analogue sensor and four digital sensors or metres, all remotely via radio on a 433 MHz open band.

The module is powered by an internal 2.4 Amp NiMH battery and is charged by a 5W solar panel or an external 12 V power supply.

The modules have a range of 99 possible configuration channels.

The maximum distance between the transmitter (EAR) and an MAR can be 1.2 km. An MAR can be configured as a repeater, reaching a distance of 2.4 km (depending on conditions).

Up to 60 MARs can be linked to an EAR, each with a different identity. Communication with all MARs is made in one minute.

The MAR base has an LED that indicates the radio signal emission and reception.

Different states of the module and also the battery level can be configured and queried through the Module Reader.

There is also an option to configure the valves to close automatically when an external signal is activated or due to loss of communication, as well as configuring a general output.

It has security programs and time bands if communication is lost in an Agrónic NET II link. This enables the MAR to have autonomy to comply with scheduled irrigation.

The MAR base is installed in a hermetically-sealed IP68 box with an opaque front cover. To maintain the tightness, leave the cover closed and ensure the cable glands are well adjusted.

Technical specifications

Power supply and average energy consumption

Power supply	Solar: 12V/5W → 3.6 V	High-temperature NiMh battery pack (2.4 Amp/7.2W).
Non-repeater MAR	2.7 mW	
Repeater MAR	2.7 + (4mW * repeated MAR No.)	

ATTENTION

When handling the battery, observe the following precautions: do not short circuit, do not disassemble or deform, do not heat or burn and do not place the battery near any flame.

Outputs		Inputs	Digital	Analogue
Number	4	Number	4	2 (10 bits)
Type	6 / 9 / 12 or 16 Vdc Trip time: 80 ms Capacitor charge: 3300 µA	Type	Potential free contact	4 - 20 mA

Environment		Weight and dimensions	
Temperature	-10°C to +70°C	Weight	1 kg. Battery included
Humidity	< 85%	High	150 mm
Altitude	2000 m	Width	150 mm
Pollution	Grade II	Depth	90 mm

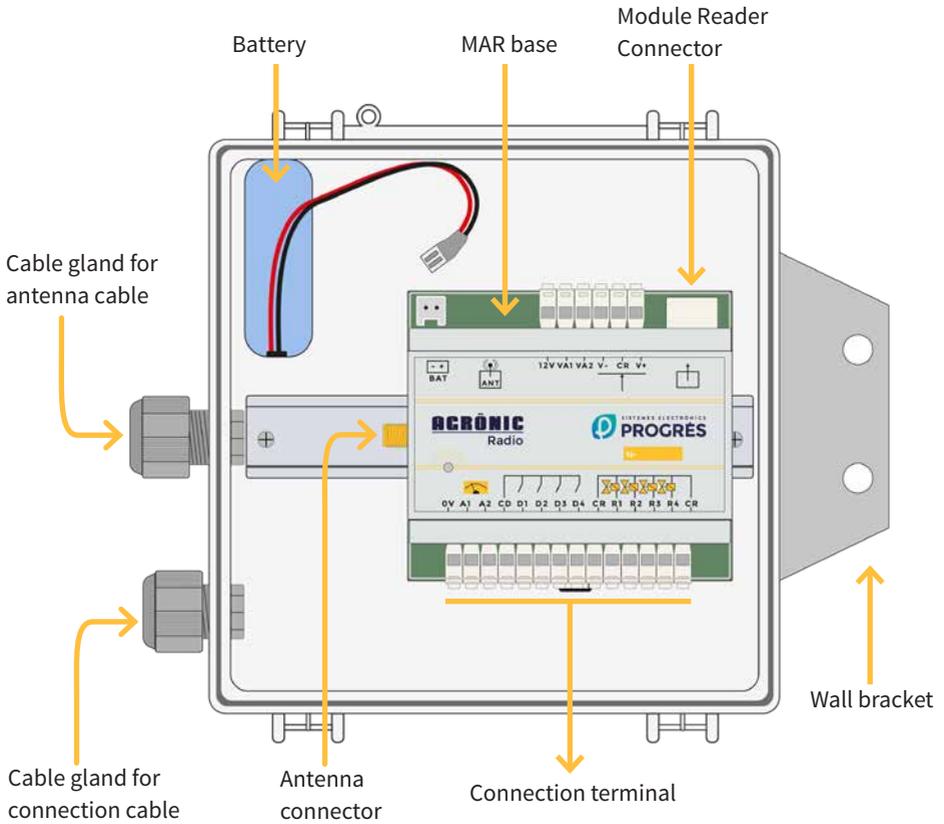
Statement of compliance

The system conforms to the standards and other regulatory documents listed below:



Electrical safety	UNE EN 60950-1:2007 + CORR:2007 + A11:2009	Information technology equipment. Safety. Part 1: General requirements
	UNE EN 60215:1995 + A2:1995	Safety rules for radio-electric emission equipment
EMC	ETSI EN 301 489-3 V1.4.1 (2002-08) based on ETSI EN 301 489-1 v1.7.1 ElectroMagnetic Compatibility and Radio spectrum Matters (ERM) Electro-magnetic Compatibility (EMC) standard for radio equipment and services Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz. <ul style="list-style-type: none"> • UNE-EN 55016-2-3:2007 • UNE-EN 61000-4-2:1995 + A1:1999 + A2:2001 • UNE-EN 61000-4-3:2007 + A1:2008 • UNE-EN 61000-4-4:2005 • UNE-EN 61000-4-5:2005 • UNE-EN 61000-4-6:2008 	
Radio-electric spectrum protection	ETSI EN 300 220-1 v1.1.1 ETSI EN 300 220-3 v1.1.1	

Parts of the MAR



Inputs and outputs

DIGITAL OUTPUTS

The MAR enables to work with 2- and 3-wire latch solenoids:

- 2-wire latch solenoids: The common of all solenoids is connected to the wire labelled **CR**. The other wire from the solenoid connects to the MAR wires labelled **R1** to **R4**.
- 3-wire latch solenoids: If this type of solenoid is selected, the number of solenoids that the MAR can control is half. The solenoid connection is the common one on the cable labelled **CR** and the start and stop cables according to the following table:

MAR configured in 3-wire latch		
Valve 1	Run on cable R1	Stop on cable R2
Valve 2	Run on cable R3	Stop on cable R4

The solenoid trip voltage is programmable and can be 6, 9, 12 or 16 Vdc.

To avoid jamming the solenoids, the following actions are carried out automatically:

- If an MAR is suspended, all the solenoids open and close every 12 days.
- If the output of an MAR is activated for five days in a row, it closes and reopens.

ANALOGUE INPUTS

The MAR has two analogue inputs for reading sensors that provide a 4-20 mA signal.

The sensors are powered at 12 Vdc supplied by the MAR. The sensors are only powered for the time that has been configured. The sensor readings may be modified when the battery level of the equipment is low (<3 V). There is a separate power supply for each sensor marked **VA1** and **VA2**. The cables where the sensors are connected correspond to **A1** and **A2**.

In this module, the analogue input **A2** is modified to be able to read the external supply voltage of the solar panel or a battery.

Its working format is 0-20 V / 0-3600 mV.

	Real value	Logical value
Point 1	0 V	0 mV
Point 2	20 V	3600 mV

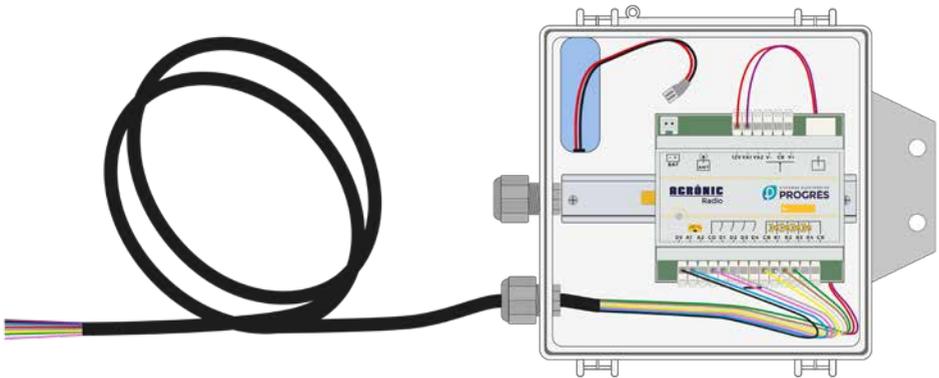
DIGITAL INPUTS

There are up to four digital inputs that can function as digital input or counter input. When the input is connected to a counter, the minimum time between pulses is configurable.

The common of the digital inputs is connected to the cable that corresponds to **CD**. The inputs are connected to the corresponding cables from **D1** to **D4**.

CONNECTED

The MAR is supplied with a 1.5 metre multi-wire cable that is internally connected to the module. Below is the colour legend and its functionality.



Wire colour		Functionality
	White	R1
	Brown	R2
	Green	R3
	Yellow	CR
	Grey	D1
	Pink	CD
	Blue	A1
	Red	12 V
	Black	0 V
	Violet	VA 1
	Grey/pink	D2
	Red/Blue	-

MAR configuration

The MAR is configured through the Module Reader, which has a screen and four keys and is connected to the MAR through the extension connector. There is no need to turn off the MAR to connect.

After connecting the Module Reader, a key must be pressed so that the screen shows the query. Each key has a specific function:

- Press the key  to go to the configuration menu and validate the changes.
- Press the  and  keys and to change the option within a menu.
- Press the  key to enter a menu or change the question.



The menu has the following options:

- COMMUNICATIONS QUERY (**consulta. com**)
 - Product name, program version and module number.
 - Time and date that is configured in the module.
 - Battery level (expressed in millivolts).
 - Status of MAR communications:
 - **Syncr:no.** It is not in sync with the EAR, there is no communication.
 - **Syncr:--.** It is attempting to sync with the EAR, it is in reception waiting to receive.
 - **Syncr:si.** It is synchronised with the EAR, the communication is correct.
 - **Suspendido.** The MAR is in very low power mode and there is no communication.
 - **Error.** An internal error has occurred in the MAR.
 - Last communication received from the EAR:
 - **Correcta.** Last correct communication received.
 - **Error to.** Nothing was received in the last communication.
 - **Error chk.** The last communication was received with erroneous data.
 - **Error red.** The last communication received is from another Agrónic.
 - Status of the last eight communications: the communications that were erroneous are marked with 0 and those that were correct with 1. The number on the right of the screen indicates the time lag between EAR and MAR. Time is represented in milliseconds and must be between 100 and 140.
 - RSSI level: Radio signal level received by the MAR. From 0 to 99.
 - Next reception: the first number indicates the time, in seconds, until the next reception. The second number is the MAR number to which the last information received was destined. The other numbers are settings for internal use.

- QUERY OF INPUTS AND OUTPUTS (**consulta e/s**).
 - Status of valves 1 to 8.
 - Status of valves 9 to 16.
 - Status of digital inputs 1 to 8.
 - Status of digital inputs 9 to 16.
 - Accumulated pulses stored in the MAR pending sending (value on the left) and pulses in the process of being sent to the EAR (value on the right). 16 screens, one per counter.
 - Instantaneous flow (time between counter pulses, expressed in seconds). There are eight screens where each screen shows two counters.
 - Reading of the two analogue sensors in millivolts. The value on the left corresponds to sensor 1 and the one on the right to sensor 2.
 - Latch voltage: shows the trip voltage to the valve to activate or deactivate it. The voltage level is displayed in millivolts.

- QUERY OF PROGRAMS (**consulta pro.**)
 - The first screen shows the program number, the days of the week that it operates and whether the time or volume that is discounting is active. The second line shows whether it is a program (P) or a time band (F), the start time and the end time (if it is a time band) or the time or total volume to discount and whether it is by time or volume (if it is a program).
 - The second screen shows the valves that are activated (with an asterisk).

- COMMUNICATION QUERY (**config. com.**)
 - **Numero MAR:** it is a value from 1 to 60 that is used to distinguish the 60 possible modules that can be connected to an EAR.
 - **Canal** indicates which frequencies the MAR will use. There are 99 different channels, from 1 to 99. The channel has to be the same for all MARs connected to an EAR.
 - **Prioridad:** if "si", the MAR communicates with the EAR every 10 seconds instead of every minute. For example, if it is configured in MAR 01, modules 11, 21, 31, 41 and 51 are used.
 - **Nivel 2:** It must be marked "si" whenever the MAR has to receive the signal from a repeater. An MAR with this configuration will never be able to receive a signal from the EAR.
 - **Acción error:** Action to be carried out by the MAR if communication is not received from the Agrónic:
 - **Num. Red:** the network number must be the same for all MARs connected to an Agrónic and it will be the number set in the Agrónic. This number is used to detect whether the information received by an MAR comes from the Agrónic or from another nearby.
 - **Repetidor de:** if the MAR performs the functions of repeater, numbers of the modules of which it is a repeater are shown here, with a maximum of 30 MAR.
 - If the MAR is a repeater, it asks whether there is any repeater MAR that is a priority.

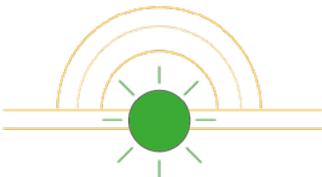
- INPUT AND OUTPUT CONFIGURATION (**config. e/s**)

- **Válvula 3H:** entering "no" indicates that it will work with 2-wire latch valves, with "si" it will work with 3-wire latch valves.
- **T. Latch:** latch trip voltage. It can be 6, 9, 12 or 16V.
- **T. Sensor:** indicates, in minutes, the reading frequency of the sensors. If they are set to 0, they will not be read. The maximum time between readings is 200 minutes.
- **T. Sen 1:** is the time that sensor 1 needs to be powered for it to give a correct reading (with a value of 0, the sensor does not read). The unit of time is 0.01 seconds, where 200 (2 seconds) is the maximum time allowed. The power supply is 12 V and is delivered through the **VA1** terminal.
- **T. Sen 2:** The time that sensor 2 needs to be powered for it to give a correct reading (with a value of 0, the sensor does not read). The unit of time is 0.01 seconds, where 200 (2 seconds) is the maximum time allowed. The power supply is 12 V and is delivered through the **VA2** terminal.
- **Retraso c.:** The minimum time that the counter pulse needs to be active for the accumulated value to increase. A pulse lower than this time does not increase the accumulated. The time is shown in tenths of a second. By default it is 10 (1 second)".
- **D1 cont. gen.:** Entering "si" indicates that input D1 is the counter input for any valve or program that activates the MAR.
- **R1 sal. gen.:** Entering "si" indicates that output R1 must be activated whenever any of the other outputs are activated.
- **Entrada paro:** when the digital input indicated here is activated, it will stop the valves configured below. When the input is deactivated, the valves are activated again. The digital input can be from 1 to 4. Leaving at 0 does not use this option.
- **Retraso:** the time, in seconds, that the previous entry needs to be activated to consider it valid. This time applies to activation as well as deactivation.
- **Parar salida:** indicates the output number that will stop when the stop input is activated. This question is repeated as long as the number of outputs is entered. When it is left at 0, it goes to the first question on the menu.
- **Con batería:** Set to "si" when the MAR runs on battery and "no" when it runs on battery.
- **AntiEncas:** If a valve spends more than five days activated, it closes for one second and then reopens. It is used to prevent the valve from jamming. Enter "si" to do this manoeuvre.

- WATER HAMMER CONFIGURATION (**config. golpe**)
 - **R1 sal. Gen.:** The R1 output works as a general output. Whenever any of the other R1 outputs is activated, it will be activated automatically. In order for the water hammer control to be carried out, it must be set to "si".
 - **Ret. Inicio:** (from 0 to 250") the delay between activating the first valve and activating the generator (R1).
 - **Ret. Sector:** (from 0 to 250") the overlap between closing one valve and activating another. The valve that closes is the one that lengthens the time. The valve that closes is the one that lengthens the time.
 - **Ret. Final:** (from 0 to 250") the delay between closing the general valve (R1) and closing the last valve.
- MANUAL (**manual**)
 - Valves are activated manually in this menu option. This menu option cannot be exited if there is a manually activated valve.

On the cover of the MAR base, there is one green LED light that represents communication with the EAR. Depending on whether it lights up, it has one meaning or another.

RADIO



- Two or more flashes every one minute indicates that it is communicating correctly with the EAR or with the repeater module.
- Two or more flashes every 10 seconds indicates that it is communicating correctly with the EAR or with the repeater module and is in "priority" mode.
- If the LED remains permanently activated, it indicates that the internal transmitter is searching for a signal.
- If the LED does not light up for one minute, it indicates that there is a problem with the power supply or that the internal transmitter is damaged.

BATTERY LEVELS AND RADIO SIGNAL

In the Agrónic where the MAR is connected, information about the status of the MAR's battery and the level of the radio signal it is receiving is displayed.

- Battery level: It indicates the voltage the battery is supplying to the circuit.
- Signal level: the radio signal level that the module is receiving is shown in %. A reading below 35% indicates the need to increase the height of the mast, which is too far away or has poor visibility with the emitter.

PROGRAMS (ONLY IN AGRÓNIC NET II)

Each MAR can have up to 20 safety programs or time bands. The programs come into operation when the communication between the EAR and the MAR malfunctions and the MAR has configured that safety is by programs. The programs cannot be modified by the user and are automatically generated by the Agrónic Net II program in order to continue the scheduled irrigation for the MAR valves in the event of a communication malfunction.

Irrigation by volume: if irrigating by volume, the physical output of the valve must be associated with the physical input of the meter. In other words, if a program activates output R1, it will deduct the pulses that arrive through input D1 from the program. If input D1 is configured as a general counter (see configuration of inputs and outputs), the pulses that arrive through input D1 to all the programs that are irrigating by volume will be deducted.

General Output: if output R1 is configured as general (see input and output configuration), this output will be activated whenever a program is activated.

ESTIMATED BATTERY LIFE

	MAR (non-repeater)	MAR (repeater of 5 MARs)
Battery 2.4 Amp NiMh	3 months	25 days

The battery duration is approximate since there are several factors that can affect consumption. Frequent sensor reading shortens the duration. "Suspending" the Agrónic Radio during the periods that it is not used considerably lengthens its duration.

It is recommended that level 2 MARs (those that communicate through a repeater) are powered by a battery and solar panel, since in the event of communication loss (for example due to disconnection of the EAR), their consumption increases and could deplete the batteries in days.

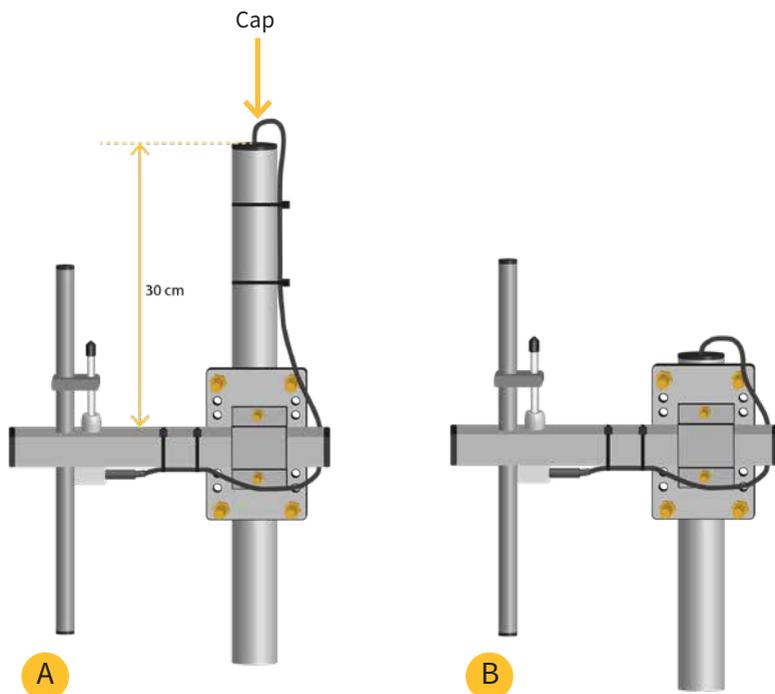
IMPORTANT

During periods when the Agrónic is not in use and you want to disconnect it, it is very important to "suspend" the Agrónic Radio for at least two hours before disconnecting it. If this is not done, the consumption of the MAR batteries will increase significantly.

Antenna installation

A five-metre cable is delivered together with the equipment. This antenna must be installed as high as possible on a mast. This should have a diameter of 40 mm.

- Assemble the two mast support parts on the antenna, placing the small part between the two position marks shown on the antenna.
- Place the antenna plus the support on the mast using the clamps supplied.
- A plug with a hole is also supplied to be placed at the top of the mast to pass the antenna cable through.
- The antenna should be connected to the equipment last, when the antenna has been installed in the correct position.
- The antenna is installed differently depending on whether or not the MAR is a repeater module.
 - When the MAR is not a repeater, its antenna is located 30 cm from top of the mast. **A**
 - When the MAR is a repeater, its antenna is located at the very top of the mast. **B**



Installation tips

For good radio communication, it is very important to position the antenna well. It must be placed at the minimum recommended height based on the coverage study generated by Progrés (normally 4.5 metres above the ground). The antenna must have direct visibility with the antenna on the equipment that sends the information (whether another MAR or the EAR).

To improve coverage, the best option is to raise the antenna higher.

The antenna installed with the MAR must be the one supplied with the equipment, it cannot be swapped for another type of antenna.

The MAR should only be powered when the antenna is connected, otherwise its circuit could be damaged. Therefore, the antenna should also not be disconnected without first removing the power from the MAR.

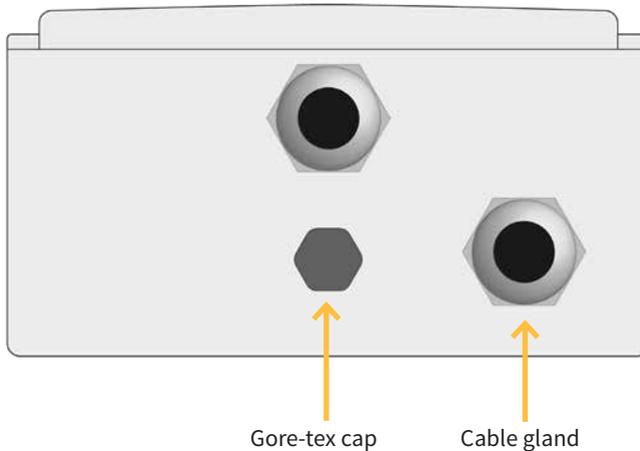
The equipment must be installed in a place where it is protected against sunlight and rain.

The equipment is housed in a hermetically-sealed box with an opaque front cover.

IMPORTANT

To maintain the water-tightness, the cover must always be closed and the cable glands well adjusted.

The Goretex cap should not be covered or plugged so that it can do its job.



NOTE

The MAR should only be powered by the battery when the radio antenna is connected, otherwise its circuit could be damaged.

Sistemes Electrònics Progrés, S.A.

Polígon Industrial, C/ de la Coma, 2 | 25243 El Palau d'Anglesola | Lleida | España

Tel. 973 32 04 29 | info@progres.es | www.progres.es

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