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## DM-108 User Manual



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## 1. Abbreviations

**UART** – A Universal Asynchronous Receiver/Transmitter is a type of “asynchronous receiver/transmitter,” a part of computer hardware that translates data between parallel and serial forms. UARTs are commonly used in conjunction with communication standards such as EIA RS-232, RS-422, or RS-485. Records (UARTx) on top of the enclosure are also used as the serial interface number.

**GND** – Ground wire contact.

**RS485** – A standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems. Published by the ANSI Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA), digital communications networks implementing the EIA-485 standard can be used effectively over long distances and in electrically noisy environments. Multiple receivers may be connected to such a network in a linear, multi-drop configuration. RS485 interfaces are prepared for the connection of peripheral devices (e.g., energy meters, devices, machines, etc.).

**A+** – Contact for the positive wire of the RS485 socket.

**B-** – Contact for the negative wire of the RS485 socket.

**USB** – Universal Serial Bus is an industry standard that defines the cables, connectors, and protocols used for connection, communication, and power supply between computers and electronic devices. The USB Type-B socket is prepared for connection to a PC (Personal Computer). The USB Type-A socket is prepared for connection to peripheral devices (e.g., memory sticks, etc.).

## 2. Preface

### 2.1 Symbols

International electrical symbol list. Some or all symbols can be used on device marking or in this user manual.

Symbol	Explanation
	With the <b>CE</b> marking on a product the manufacturer ensures that the product conforms with the essential requirements of the applicable <b>EC</b> directives.
	<b>DC</b> (Direct Current)
	Caution
	Grounding
	LED indicator
	Contact number on plug
	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2002/95/EC. Commonly referred to as the Restriction of Hazardous Substances Directive or <b>RoHS</b> )
	Waste Electrical and Electronic Equipment Directive

### 2.2 Safety instructions

To install and set up the device, special technical knowledge is required. Contact the seller or certified professionals to connect and set up the device!

#### Before connecting to the power supply, ensure that:

1. The device is not damaged (no cracks, melted, broken, or exposed areas).
2. The device is used with the correct cables of appropriate thickness.
3. The device and antenna are installed indoors.
4. The device is intended for supply from a Limited Power Source (LPS) with a current rating of over-current protective devices not greater than 2A.
5. The associated equipment (AE), such as the PC and PSU (LPS), shall comply with the requirements of Standard EN 60950-1.
6. The device is dry.
7. Ambient temperature and humidity are within the normal range.
8. Other types of devices (e.g., counters, etc.) are connected correctly according to the manufacturer's regulations.
9. The end of stranded conductors shall not be consolidated by soft soldering and must be terminated properly.
10. The device, PC, and other peripheral devices must be strictly connected through a double-pole breaker (with a current break less than 5A and a space between breaker contacts greater than 3mm). The pole breaker must be part of the building's wiring and located in an accessible place with proper markings.

**Don't use:**

- The device in open water (in the rain or if water is splashing on the device or connected devices).
- The device if the enclosure, connected cables, or other connected devices are damaged.



**Use the device according to the manufacturer's regulations; otherwise, you may damage the device or other devices, and in such a case, the manufacturer's warranty may not be valid.**



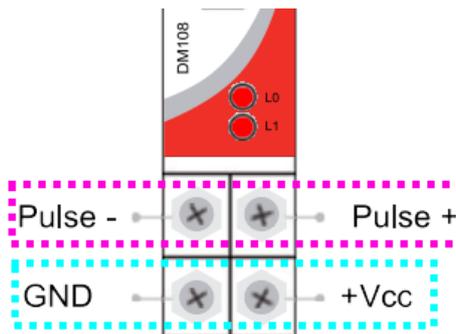
**If you suspect that the device is not operating correctly or has visible issues, please contact the manufacturer or your distributor for inspection or maintenance.**

### 2.3 DM-108 connections

**Power Supply.** It is powered between 9 and 30 Vdc. It is mandatory to follow the polarity of the connection to avoid damages in the device. The negative pole must be connected to GND terminal and the positive pole to VCC terminal.

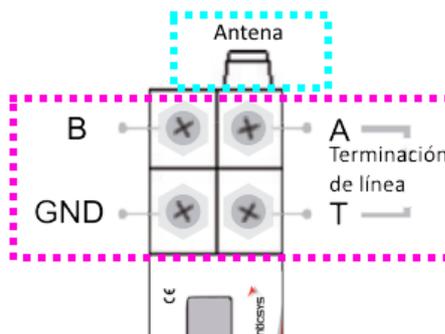
**Important:** In idle state, the DM-108 consumes around 170 mW. When the radio is transmitting there will be peaks of 700mW, so the power supply must be within these limits for a correct performance.

**Pulse input.** The positive pole will be connected to *Pulse+* terminal, and the negative to *Pulse-* terminal.



**RS485 bus.** The A line is connected to terminal A, and the B line to terminal B. If it is necessary to use the line termination of 120 Ω, the terminal T should be connected to terminal A with a wire. Additionally, if it is necessary to connect the GND of the RS485 line, it should be connected to terminal GND, which is beside the terminal T.

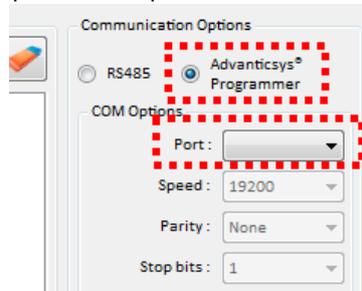
**Antenna.** In the SMA connector of the DM-108 any antenna compatible with the chosen band could be connected.



### 3. Configuration tool software

#### 3.1 Connection and scanning

Once the USB driver is installed, run the device configuration tool software. Select the connection type Advanticsys Programmer and the appropriate COM port.



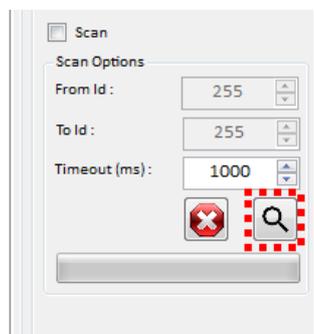
Press *Connect* button to establish communication with the device. If the COM port is not busy, the button text changes to DISCONNECT and the back-colour to pink.



Once the software is connected to the device, you can access the DM108's information in two ways:

- **Scan unchecked.**

If the **Scan** option is not selected and you press the button  , the tool sends a broadcast command.

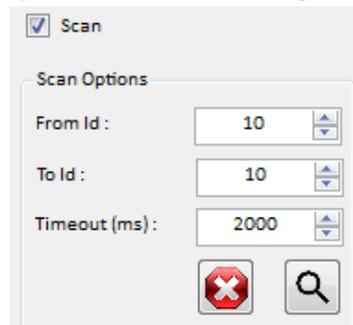


- If a Coordinator is connected to the PC, most DM108 devices connected to the Coordinator will respond to the command. The **WM Config Tool** will display the configuration of each responding DM108 in separate tabs.
- If an endpoint device is connected to the PC instead of a Coordinator, only that specific endpoint will respond to the broadcast command.

**Note: Not all DM108 devices will appear in the tool. When using broadcast commands, multiple devices respond simultaneously, which may cause the application to miss some responses. To ensure all DM108 devices are visible, it is recommended to use their specific IDs. For this scenario, use the Scan option, as explained below.**

- **Scan checked.**

When the **Scan** option is selected, you can search for a range of Modbus IDs.



- To view a specific device, enter its Modbus ID in both the **From ID** and **To ID** fields.
- To search for all possible Modbus devices on the network, set the range from 1 to 247. Keep in mind that this may take considerable time, depending on the Modbus timeout setting.

Press the button starts the search. to start the search. If you need to stop the search at any time, press the button. The **Timeout** field (in milliseconds) specifies how long the application will wait for Modbus responses to configuration requests.

### 3.2 DM-108 parameters configuration

Any configuration changes will take effect after clicking the **UPDATE** button. However, there are three values which will be updated only by clicking on the button: *Seconds of inactivity*, *TX Delay* and *Num ACKs to send*.

### 1. Modbus ID

- This is the identification number for Modbus network communications.
- Each DM108 or Modbus device on the same network must have a unique ID (1-247).
- IDs 0 and 248-255 are reserved and cannot be used.

### 2. Radio ID

- This is the radio identification used for wireless communication.
- By default, it is internally generated using the UID of the RTC chip, and changes are not recommended.
- The Coordinator’s Radio ID is always 257, which cannot be assigned to an endpoint.
- The valid range for Radio IDs is 257 to 65279.

### 3. Node Role

- If the **Coordinator** checkbox is selected, the DM108 is assigned the role of Coordinator, making it the primary node of the network.
- Each network or group can only have one Coordinator.
- If the checkbox is deselected, the DM108 assumes the role of an Endpoint.
- Selecting the **Coordinator** checkbox automatically sets the Radio ID to 257.

### 4. Group ID

- This ID assigns DM108 devices to different network groups on the same radio channel.
- Each group must have its own Coordinator.

5. Radio Channel

- Specifies the physical radio channel in the chosen band.
- Each channel has a separation of 150 kHz.
- Valid channels range from 0 to 9.

6. TX Power

- Sets the transmission power of the DM108 radio.
- Options range from -2 dBm to +26 dBm.
- Maximum power is recommended for distances greater than 50 meters.

The screenshot shows the configuration interface for the DM108 device. It includes fields for Type (DM108), Firmware Version (0.0), Serial Number, Modbus Id, and Seconds of inactivity before RESET. The RS485 section includes Baud rate, Parity, Stop bits, and TX Delay (ms). On the right, there are buttons for 'Update' and 'Set Default Values'. A diagram of the 'Panel2' is shown on the far right, with labels for Antenna, RS485.A, RS485.B, Programmer Connector, and Pulse+/- connections to GND and Vcc.

7. AES Encryption Enabled

- Enables or disables 128-bit AES encryption for wireless messages.
- Enabling this option reduces communication speed.
- All devices in the network must have the same AES encryption setting to prevent critical errors in the wireless network.

8. ACK Enabled

- Enables or disables message acknowledgment for wireless communication.
- Includes the following sub-options:
  - **ACK Timeout:** Specifies the time (in milliseconds) to consider a wireless message lost before retrying transmission.
  - **ACK Retries:** Sets the number of transmission retries after ACK timeouts.

9. Routing Retries

- Available only for the Coordinator.
- Specifies the number of retries along a communication route before searching for an alternative route.

This screenshot is similar to the one above but highlights the 'AES Encryption Enabled', 'ACK Enabled', and 'Routing Retries' options with a red dashed box. The 'Routing Retries' value is set to 3. The 'ACK Enabled' checkbox is unchecked. The 'AES Encryption Enabled' checkbox is also unchecked. The rest of the interface, including the RS485 settings and the 'Panel2' diagram, remains the same.

## 10. RS485 Configuration

- The RS485 port can be configured with the following options:
  - **Baud Rate:** Selectable between 2400 and 19200 bps.
  - **Parity:** Options include None, Odd, or Even.
  - **Data Bits:** Choose between 7 or 8 bits.
  - **Stop Bits:** Choose 1 or 2 stop bits.

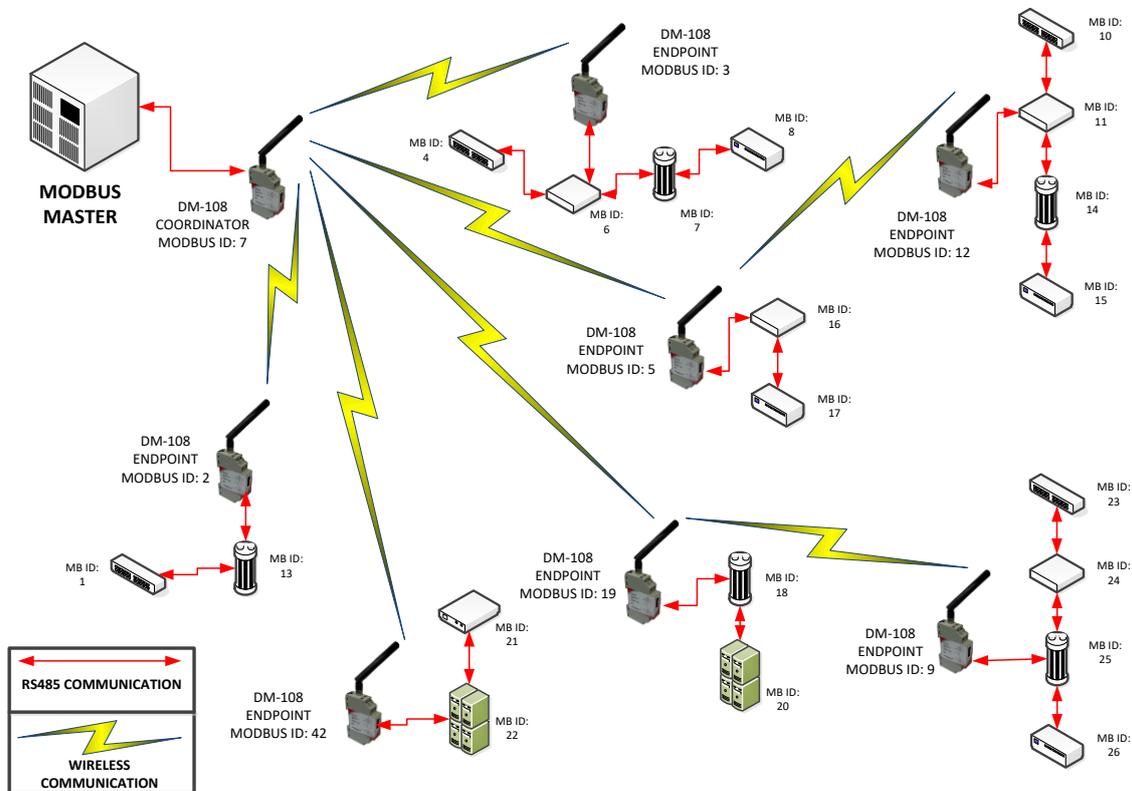
Type : DM108 Firmware Version : 0.0 Serial Number : <input type="text" value="1"/> <input type="button" value="Q"/> <input type="button" value="✎"/> Modbus Id : <input type="text" value="1"/> Seconds of inactivity before RESET : <input type="text" value="1"/> <input type="button" value="Q"/> <input type="button" value="✎"/>	<b>RS485 :</b> · Baud rate : <input type="text"/> · Parity : <input type="text"/> · Stop bits : <input type="text"/> · TX Delay (ms) : <input type="text" value="0"/> <input type="button" value="Q"/> <input type="button" value="✎"/>	<input type="button" value="Update"/>  <input type="button" value="Set Default Values"/>	
Freq. Band (MHz): <input type="checkbox"/> 865-867 <input checked="" type="checkbox"/> 868-869 <input type="button" value="Set Freq. Band"/> Radio Id : <input type="text" value="4444"/> RoI DM108 : <input type="checkbox"/> Coordinator Group Id : <input type="text" value="1"/> Radio Channel : <input type="text"/> TX Power (dBm) : <input type="text"/> Rssi Table : <input type="button" value="Q"/> <input type="button" value="✎"/>	AES Encryption Enabled: <input type="checkbox"/> ACK Enabled : <input type="checkbox"/> · ACK Timeout (ms) : <input type="text" value="10"/> · ACK Retries : <input type="text" value="1"/> · Num ACKs to Send : <input type="text" value="1"/> <input type="button" value="Q"/> <input type="button" value="✎"/> Routing Retries : <input type="text" value="3"/>	Pulse Counter : <input type="text" value="0"/> <input type="button" value="Q"/> <input type="button" value="✎"/> Pulse Type : <input type="text"/> Output Mode : <input type="text"/> · Pulse Width (ms) : <input type="text" value="10"/> <input type="button" value="Q"/> <input type="button" value="✎"/> · PWM ON Width (ms) : <input type="text" value="10"/> <input type="button" value="Q"/> <input type="button" value="✎"/> · PWM OFF Width (ms) : <input type="text" value="10"/> <input type="button" value="Q"/> <input type="button" value="✎"/>	<input type="button" value="OUTPUT OFF"/>  PWM Output

### Note:

- For security reasons, it is recommended to always enable **AES Encryption**. By default, leave this option checked.
- When enabling **ACKs**, it is recommended to configure the following values for optimal performance:
  - **ACK Timeout:** 70 to 100 ms
  - **ACK Retries:** 1 to 3
  - **Num ACKs to Send:** 2 to 4
- If the DM108 is a **Coordinator**, it can configure **Routing Retries**. The Coordinator stores the routing paths for each endpoint. If a path fails, it uses the configured retries to attempt communication via the same path. Exceeding the retries removes the path, prompting the Coordinator to discover a new route.
- Ensure that parameters such as ACK timeouts and retries are configured with consideration of the Modbus master's timeouts and retries to maintain smooth communication and prevent conflicts.

## 4. Wireless Modbus network topology

To set up a wireless MODBUS network using the DM-108, you must configure one DM-108 as the **Coordinator** and the others as **Endpoints**. The MODBUS Master should be connected to the Coordinator, which serves as a wireless bridge to the other Modbus slaves connected to the Endpoints.



### Key Features of the Wireless MODBUS Network

- **Network Capacity:** Each wireless MODBUS network can support up to 64 Modbus devices although in high-frequency networks, reducing that number is recommended.
- **Topology:** The network follows a star topology, with all wireless communications converging at the DM-108 Coordinator.
  - The Coordinator translates all Modbus frames from the Modbus Master to the Endpoints.
  - If the Coordinator lacks a direct wireless link to a specific Endpoint, it automatically uses intermediate hops to reach the targeted DM-108 connected to the Modbus slave via its RS485 bus.

### Communication Considerations

- **Latency:** Wireless communications require security mechanisms and acknowledgments to maintain network stability. This results in slower Modbus request-response times compared to wired connections.
  - **Minimum Time Between Requests:** To avoid errors, the time between Modbus requests should be at least **1 second**. For networks with additional wireless hops, the delay will be even greater, so adhering to this guideline is critical for ensuring stability.
  - **Erratic Performance:** Requests issued at intervals shorter than 1 second may cause the network to behave unpredictably.

### Modbus ID Management

Each DM-108 has its own Modbus ID. To prevent ID conflicts:

- Ensure all Modbus slaves connected to the DM-108 Endpoints have unique IDs.
- For example, in a network with 64 DM-108 Endpoints plus one Coordinator, the remaining Modbus IDs available for slave devices are: **247 - 65 = 182 IDs**.

### Expanding the Network

For installations requiring multiple networks, you can configure them in two ways based on your needs:

1. **Using Different Radio Channels:**

- Configure each network on a unique radio channel.
- The DM-108 supports **10 physical channels**, enabling up to 10 independent networks.

2. **Using Group IDs:**

- Assign a unique Group ID to each network.
- Devices with different Group IDs will not communicate, even if they share the same radio channel.
- This method allows for up to **256 networks** in the same installation.

Once the network is established, communication between the Modbus Master and the Modbus Slaves will be completely transparent. This means that the DM-108 devices act as intermediaries, seamlessly relaying Modbus requests and responses between the Master and the connected Slaves without requiring any specific intervention or additional configuration.

There is no need to send any direct Modbus requests to the DM-108 devices themselves, as their primary function is to facilitate communication within the network. The Coordinator automatically handles routing and any necessary wireless hops, ensuring that the Modbus Master interacts with the Slaves as if they were directly connected via a wired network.

This transparent communication simplifies the setup and operation of the network, allowing standard Modbus tools and protocols to work without modification, while the DM-108 devices handle all the underlying complexity of wireless communication.

## 5. Manufacturer's warranty

ADVANTICSYS guarantees that all its products are free from defects in materials and workmanship under normal use and service for a period of two years from the date of shipment. This warranty excludes any damage resulting from accidents, misuse, or unauthorized modifications to the product.

This warranty supersedes all other warranties, whether expressed or implied, including implied warranties of merchantability or fitness for a particular purpose, whether arising by law, custom, or conduct. The remedies provided under this warranty are exclusive and replace any other rights or remedies. ADVANTIC SISTEMAS Y SERVICIOS S.L. shall not, under any circumstances, be held liable for any consequential or incidental damages. If you believe your product is defective and still under warranty, please contact ADVANTICSYS at [info@advanticsys.com](mailto:info@advanticsys.com) or by phone at +34 914221023. After confirmation from our support team that the product is defective, we will issue a Return Merchandise Authorization (RMA) number and arrange for the replacement of your product.

This warranty covers the cost of repair, including labor and materials, for any manufacturing defect that impedes the proper operation of the product. Replacement of any component or equipment does not extend the original warranty period. If, upon inspection by ADVANTICSYS, the product is found to be defective, we will cover the shipping costs to return the product to the customer, as well as all costs associated with the inspection. If the product is found not to be defective, the customer will be responsible for the return shipping costs.

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