



Available Models

EM-38AM: no internal relays.
 EM-38AMR: 8 relays for simple control.
 EM-38AMX: 8 relays for complex control.

Technical Specifications

Firmware Version

9.3

Control Interface

Modbus

Operation Mode

Audio playback with optional relay outputs

Sound File Format

MP3 (ISO 11172-3 up to 44.1KHz)

Max. Number of Sound Files

1000

Memory Card Type/Capacity

SD/SDHC up to 2GB/32GB

Max. Total Audio Time

16.5 hours/GB @ 128 kbps

Supply Voltage

12 ~ 30 VDC

Typical Standby Current

60 mA

Audio Output

(30V supply, 8 Ohm load, 10% THD+N)

High efficiency class D

Stereo: 15W per channel

Mono: 55W bridge tied load (BTL)

Relay Rating (EM-38AMR & EM-38AMX)

15A @ 125 VAC

10A @ 250 VAC

6A @ 28 VDC

Physical Dimensions

EM-38AM: 5.3" x 4" x 1.35"

EM-38AMR & EM-38AMX: 5.3" x 6.7" x 1.35"

Inputs, Outputs & Controls

Power Light (PWR)

The power light is turned on when power is applied.

Trigger Inputs Terminals: T1 - T8, GD

Unused.

Reset Input Terminal: RS

Pull this input down to the ground momentarily to reset the unit. Min. duration is 100 ms.

Busy Output Terminal: BY

This open collector output is automatically turned on while playing audio, with a maximum sink current of 200 mA.

Power Input Terminals: V+, GD

Use a well regulated DC power supply to obtain the best sound quality. Power can also be supplied via the 2.1mm center positive coaxial jack.

Line Output (LINE): 1/8" Stereo Phone Jack

This jack provides single ended line output.

Balance Knob (BAL)

This knob adjusts the output balance between the two channels. It should be set at the middle (center detent) if the unit is configured for BTL (bridge tied load) mono out.

Volume Knob (VOL)

This is the hardware volume control. Turn this knob clockwise to increase the audio volume. It affects both the speaker and the line out.

The Modbus protocol also provides software based volume control. The audio level goes through the software control first, then the hardware control.

Serial Port (DB9 Female)

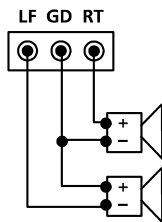
The serial port supports both RS232-MODBUS (default) and 2W-MODBUS interfaces. To select 2W-MODBUS, the internal jumper JP1 must be moved to the "485" setting.

Relay Output Terminals (EM-38AMR & EM-38AMX only)

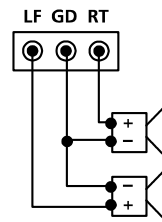
Three terminals are provided for each relay output: NC (Normally Closed), NO (Normally Open) and Common. The contact is rated at 12A/120VAC or 10A/24VDC.

Speaker Connections

Regular Stereo

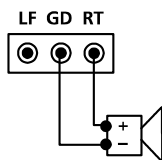


Virtual Surround Stereo

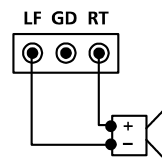


The left channel is internally inverted therefore the left speaker must be connected backwards for regular stereo output. The inversion can be disabled if needed - see System Configuration File.

Regular Mono



BTL Mono (4X Output Booster)



BTL mono is used to boost output at low supply voltage - don't use speakers lower than 8 Ohms to avoid overloading the power amp.

Modbus Interface

EM-38AM is a Modbus slave and supports both RS232-MODBUS (default) and 2W-MODBUS interfaces. To select 2W-MODBUS, the internal jumper JP1 must be moved to the "485" setting.

The pin assignment on the female DB9 connector is:

RS232-MODBUS Pin Assignment

Pin 2 = RX
Pin 3 = TX
Pin 5 = Ground

2W-MODBUS Pin Assignment

Pin 1 = D1 (D-)
Pin 9 = D0 (D+)
Pin 5 = Ground

Note that the 2W-MODBUS pin assignment is not Modbus compliant. This can be remedied, if necessary, by using the optional *DB9 Breakout Board* that converts DB9 to screw terminals.

Communication Protocol & Parameters

Protocol = RTU, TCP (if equipped with Ethernet converter)
Baud Rate = 19200 (default) or 9600/14400/28800/38400/57600
Data Bit = 8
Parity = None
Stop Bit = 1
Flow Control = None

Supported Commands

Read Holding Registers (0x03)
* Only single register read is supported.
Write Single Register (0x06)

Device Address Assignment

Each device must be assigned with a unique address ranging from 1 to 247. To make the assignment, simply create a text file named MODE on the SD card and put in it the 3-digit decimal address such as 007 or 168. The device reads this information every time it powers up. If MODE is missing or contains invalid data, the default address (1) will be used.

Baud Rate Configuration

Add the baud rate to the MODE file in the following manner:

device_id,baud_rate

For example: 007,57600

Baud rate configuration is optional. The default value is 19200.

Sound Files & Playlist

For identification purposes, each sound file must be assigned with a unique 3-digit decimal number ranging from 000 to 999. To make the assignment, simply add the file number at the beginning of the filename such as "001 original_filename".

In order to maximize the number of files that can be stored on the SD card, the filename should contain:

- 8 characters or less (including the file number)
- only numbers and capital letters

The audio playback is playlist-based instead of file-based. A playlist, containing one or more consecutively numbered files, is defined by the first file number and the last file number. The first file number should always be equal to or smaller than the last file number. These two file numbers should be the same if there is only one file in the playlist.

Holding Registers

Register R1 - Playback Control (R/W)

Write to issue a command. Read 0 after command execution. Be sure to load registers R2 & R3 before issuing Start Play command.

Bit 15 ~ 8: Unused
Bit 7 ~ 4: Play Count (for Start Play only)
0 = Forever
1 = 1 time
.....
15 = 15 times
Bit 3 ~ 0: Command
0 = None
1 = Start Play
2 = Stop Play
3 = Pause Play
4 = Resume Play
5 ~ 15 = unused

Register R2 - First File Number (R/W)

Read/write to get/set the playlist's first file number. Can also be used to play a single file (instead of a playlist) immediately.

Bit 15 ~ 12: Play Count
0 = load R2 without playing
1 = start playing file 1 time
.....
9 = start playing file 9 times
10 = start playing file forever
11 ~ 15 = Unused
Bit 11 ~ 0 = file number (0 ~ 999)
* R3 will also be written with this value automatically if Play Count is 1 ~ 10. R3 will not be affected if Play Count is 0.

Register R3 - Last File Number (R/W)

Read/write to get/set the playlist's last file number.

Bit 15 ~ 0 = file number in binary form (0 ~ 999)

Register R4 - Volume (R/W)

Read/write to get/set the software output volume.

Bit 15 ~ 8: Right Channel, 0 (silent) ~ 255 (loudest)
Bit 7 ~ 0: Left Channel, 0 (silent) ~ 255 (loudest)

The actual output volume is a combination of this value and the physical volume knob.

Register R5 - Relay (R/W)

Read/write to get/set relay states.

Bit 15 ~ 8: Unused
Bit 7 ~ 0: Relay State
Bit 0 = relay #1 (0: OFF, 1: ON)
.....
Bit 7 = relay #8 (0: OFF, 1: ON)

Register R6 - Playback Status (R/O)

Read to get the playback status.

Bit 15 ~ 8: Unused
Bit 7 ~ 0: Playback Status
0 = idle
1 = playing
2 = paused

Register R7 - Current File Number (R/O)

Read to get the file number of the file currently playing or pausing.

Bit 15 ~ 0 = file number (0 ~ 999)

Modbus Command Examples

* Numbers preceded with 0x are in hex format.

Play file 020.mp3 one time

R2 Write = 0x1014

OR

R2 Write = 0x0014

R3 Write = 0x0014

R1 Write = 0x0101

Loop file 020.mp3 ~ 026.mp3 forever

R2 Write = 0x0014

R3 Write = 0x001A

R1 Write = 0x0001

Stop playback

R1 Write = 0x0002

Pause playback

R1 Write = 0x0003

Resume playback

R1 Write = 0x0004

Set volume to 0xD2 (left) and 0xE3 (right)

R4 Write = 0xE3D2

This sets the software volume only. There is also a physical knob that sets the hardware volume. The actual output volume is a multiplication of both volumes.

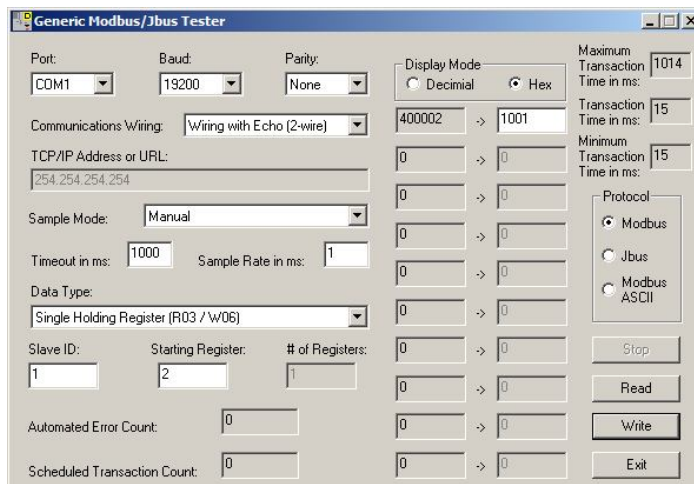
Set relay #1 & #3 on, others off

R5 Write = 0x0005

Modbus Tester Example

The following screen shot shows how a typical Modbus tester program is used to test the unit. This particular program is a third party app which can be downloaded freely from the web.

The SD card in the test unit must contain an audio file named 001.mp3, while the configuration file (MODE.txt) is not required as the **Slave ID** on the app is set to **1** (the device default). Configure the settings accordingly and enter **1011** as the hex value for writing and click the **Write** button. The unit should play the 001 file once.



Relay Controls

EM-38AMR & EM-38AMX are equipped with internal relays that can be used to control electrical devices such as solenoids, lamps, and motors. Note the relays do not output power for the devices, they switch power instead. Therefore one relay can be used for switching a 110V AC lamp while another for switching a 24V DC solenoid. Power being switched must be provided externally.

Each relay has three terminals for connection: NO (normally open), NC (normally closed), and COM (common).

When the relay is OFF:

NC and COM are connected via the relay.

NO is open.

When the relay is ON:

NO and COM are connected via the relay.

NC is open.

EM-38AMR (basic control)

The basic control allows internal relays to be set/reset at any time, although it is very hard to precisely synchronize the relay states to the audio.

EM-38AMX (advanced control)

The advanced control allows internal relays to synchronize to the audio precisely. Instead of being controlled via Modbus in real time, the relay cues are pre-programmed into the audio file by using the Windows based QSAplay software. When the pre-programmed audio file plays back, the relays will toggle automatically without any Modbus control.

Trouble Shooting Guide

1. Communications error.

- Device address is not assigned properly in MODE.TXT.
- Device address conflicts with another device on the same bus.
- Incorrect communications parameters such as baud rate.
- Incorrect and/or loose wiring.
- The system would not work if the SD card is inserted when the power is on. Re-insert the SD card with the power off.

2. No communications error but cannot play any file.

- File numbers are not assigned properly.
- Playlist is not set up properly.
- The software and/or hardware volume may be too low.

3. Noisy playback.

The speed of the flash card is too slow. Use a faster flash card or convert the file to a lower bit rate.