ModulAM

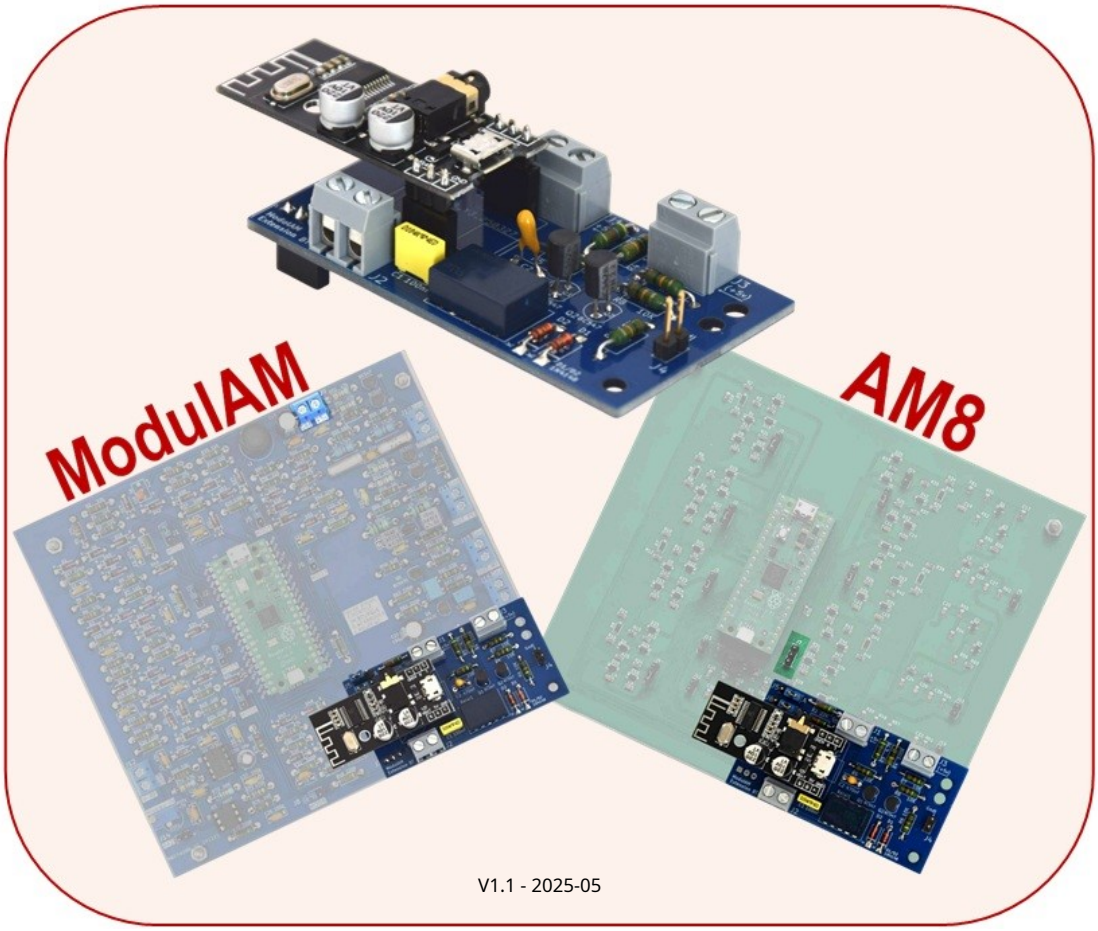
8-frequency AM modulator

Bluetooth option

Assembly instructions and

instructions for

ModulAM&AM8



V1.1 - 2025-05

https://modulam.retrotechnique.org/

Daniel Werbrouck – May 2025

This manual describes the creation and installation of an optional Bluetooth reception module, intended for the 8-frequency AM modulator type**ModulAM**Or**AM8**.

The writing has been designed to allow beginners to access this achievement in the best conditions, thanks to a step-by-step methodology and numerous illustrations.

System version affected by this notice:
ModulAM modulator card: v1.2.1 / v1.2.2
AM8 modulator card: v01

Perhaps before we begin, you'd like to know a little more about the nature of this project? Its designers and authors?
Its organization?
Its human-machine interface?

So, a visit to the website is essential as soon as possible:**htt ps: / /modu l am. retro t ec hn i c. o rg /**

This equipment is an achievement**Retro-engineering** .

I – BEFORE YOU BEGIN...

To successfully complete this project with ease, it is strongly recommended that you follow all the steps in this guide carefully.

To avoid pitfalls, the documents were carefully written in the clearest possible language, then reread, amended and validated by specialists as well as by non-specialists in order to limit ambiguities and increase clarity.

But the best of documents is only effective if it is followed with the necessary attention by the reader!

It's time to test this adage by starting the adventure with a preliminary step that is generic to all Retrotechnique projects: familiarizing yourself with the elements relating to the safety of people and materials, the tools and some advice for wiring.

THEvade-mecum of the enlightened amateur.

I – PREREQUISITES

The Bluetooth option covered by this manual is intended to allow an extension of the functionalities of the Rétrotechnique 8-frequency AM modulator system**ModulAM**whose printed circuit bears the reference v1.2.1.

However, the study was conducted in order to offer the same functionalities and an implementation compatible with the modulator**AM8**, whose printed circuit bears the reference v01.

The amateur will check that he has one of the versions of this equipment listed, in working order, before starting to assemble this option.

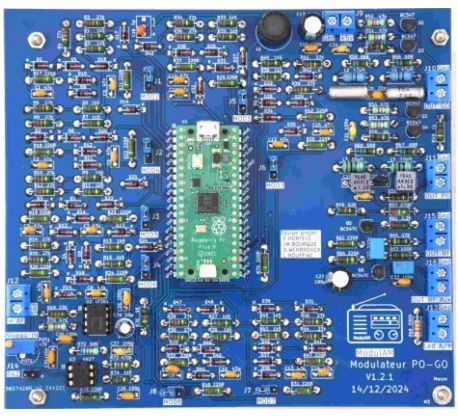


*Figure I-1: modulator**ModulAM**v1.2.1*

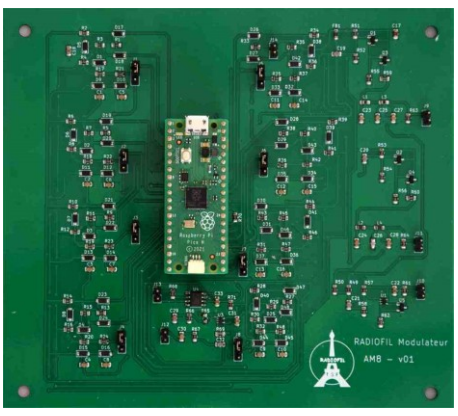


*Figure I-2: modulator**AM8**v01*

III – PRINCIPLE

This Bluetooth option allows you to assign a broadcast channel, among the 8 available within the AM modulator, to the broadcast of a sound source following a transmission using the Bluetooth protocol, coming from a Smartphone, a tablet or any system with this type of modem.
It then becomes possible to ensure the broadcasting of podcasts, playlists, replays of a radio program or any other compatible source, via the AM modulator.

This option was developed specifically for the AM modulator with the aim of achieving an optimized mechanical layout and minimal wire cabling.
Furthermore, no structural modifications to the existing AM modulator circuits are required for the integration of this optional module.

III. 1 – ELECTRONIC SCHEMA

The electronic diagram of the Bluetooth option is shown in figure III.1 below.

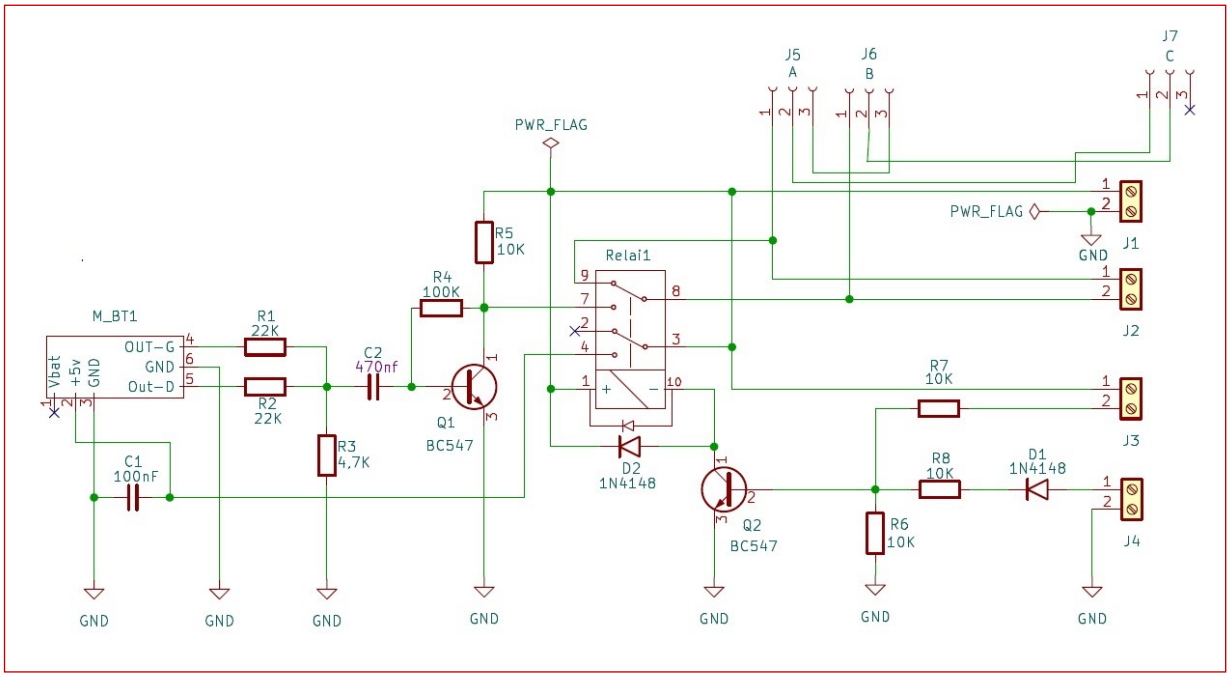


Figure III-1: Electronic diagram

Role of additional components:
Relay 1:two-circuit changeover relay (2 x RT).

- Circuit 1 allows you to switch the audio input of the modulator between the "standard" position (web/ mp3) and the Bluetooth position.
- Circuit 2 powers the Bluetooth modem subassembly when the function is enabled.

C1:power decoupling capability, at the input of the Bluetooth module.

R1 + R2 + R3:summing the stereo audio signal into a mono signal, with level fixing to obtain an AM modulation rate of 30%ccwith a source signal of approximately -9 dBFS.
C2:link capacity. Its value was calculated for an inflection point of -1 dB located around 100 Hz, thus guaranteeing good immunity to very low frequency noise.
Q1 + R4 + R5:modulation interface circuit setting the AF signal level and the offset level compatible with the diode modulator.
D1:protective diode of the OPZ output circuit in case of forced operation by the switch.

D2:Q2 protection diode against overvoltages caused by the relay coil.
R6 + R7 + R8:Bluetooth On/Off mode switching transistor control resistors. **Q2**:Bluetooth On/Off mode switching relay control transistor.
D5 + D6:jumper for selecting the type of modulator concerned by the option:**ModulAM**Or**AM8**.

IV – WIRING

IV. 1 – NOME NC LATURE

The nomenclature of components is presented in the table in Figure IV.1 below.

It.	Landmark plan	Designation	Format	Value	As to.	Link to supplier	Price indicative	Note
1	-	RT-ModulAM-BT Option	58 x 37 mm	v1.0.1	1	https://jlcpcb.com/fr/	3.00 €	
2	D1, D2	Switching diode	Axial - P = 7.62	1N4148	2	https://urls.fr/fxPPf3	0.04 €	
3	R1, R2	Resistance - 0.25W - 5%	Axial - P = 10.16	22 kΩ	2	https://urls.fr/FuqpAu	0.04 €	
4	R3	Resistance - 0.25W - 5%	Axial - P = 10.16	4.7 kΩ	1		0.02 €	
5	R4	Resistance - 0.25W - 5%	Axial - P = 10.16	100 kΩ	1		0.02 €	
6	R5 to R8	Resistance - 0.25W - 5%	Axial - P = 10.16	10 kΩ	4		0.08€	
7	C1	Ceramic capacitor	Radial - P = 5.08	100 nF	1	https://urls.fr/YDPJtw	0.15 €	
8	C2	Ceramic capacitor	Radial - P = 5.08	470 nF	1		0.15 €	
9	Q1, Q2	NPN transistor	TO92	BC547B	2	https://urls.fr/IYDzsx	0.60 €	
10	ST1, ST2	Male connector	1x03 P = 2.54	3 br Male	2	https://urls.fr/uSN0w3	0.12 €	
11	D5, D6	Male connector	1x03 P = 2.54	3 br Male	2			
12	D4	Male connector	1x02 P = 2.54	2 br Male	1	https://urls.fr/d5_vWs	0.02 €	
13	X1, X2	Female connector	1x03 P = 2.54	3 br Female	2	https://urls.fr/zQlBKx	0.24 €	
14	J7	Female connector	1x03 P = 2.54	3 br Female	1		0.12 €	HAS
15	CAV1, CAV2	Female jumper cap	P = 2.54	2 br Female	2	https://urls.fr/c-xn8D	0.06 €	
16	D1, D3	Screw terminal block	P = 5.08	2 Br	2	https://urls.fr/kYsfWW	0.28 €	
17	J2	Screw terminal block	P = 5.08	2 Br	1	https://urls.fr/kYsfWW	0.14 €	B
18	Relay1	2RT relay		TQ2-5V	1	https://urls.fr/1xsuz9	0.94 €	
19	-	DUPONT F/F 1 Br cord	Black - L=20cm		2	https://urls.fr/VUF_ns	0.26 €	C
20	-	DUPONT F/F 1 Br cord	Red - L=20cm		2		0.26 €	C
21	-	Single inverter	Miniature	1 circuit	1	https://urls.fr/ySNyfy	0.40 €	
22	-	Threaded spacer	H=12mm/20mm	M3	1	https://urls.fr/iBz2iB	0.30 €	D
23	RxBT	Bluetooth modem	Special	MH-MX28-C	1	https://urls.fr/AixcXW	1.80 €	

Figure IV-1: Nomenclature of components.

The column**"NOTE »**indicates some specificities, depending on the type of modulator:**ModulAM**Or**AM8**:

HAS:connector only required in the case of**ModulAM**. **B**:
terminal block only required in the case of**AM8**.
C:1 cord of each color needed for the**ModulAM**and 2 cords of each color needed for the**AM8**
.
D:spacer H = 12 mm for the**ModulAM**and H = 20 mm for the**AM8**.

The column**"Indicative price »**provides links to possible suppliers from whom the components used to create the module models and prototypes were sourced.
The prices mentioned are based on the quantity required to produce one copy of the Bluetooth module; they are purely indicative and determined on the day the prototypes are ordered.
According to this method of evaluation, the total price remains below
€10. The amateur will favor his usual suppliers.

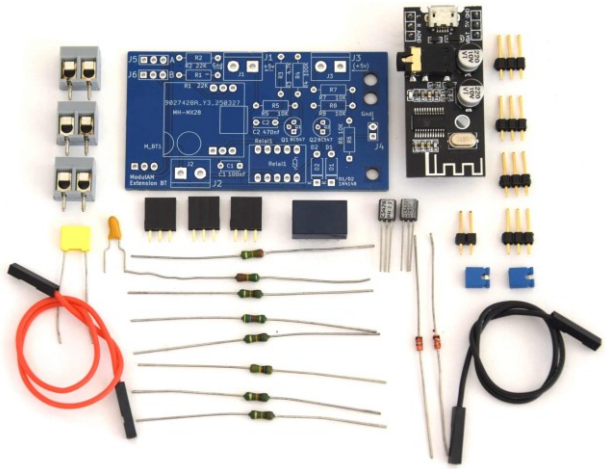


Figure IV-2: Photo of the complete kit.

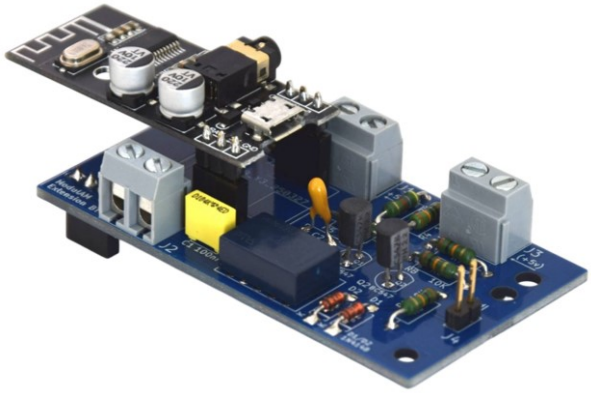


Figure IV-3: The module wired and assembled.

IV. 2 – CIR CU ITI MP RI MÉ

For the manufacture of the printed circuit, we propose the supplier who produced the prototype for this project accompanied by a complete manufacturing file in the form of a compressed file (*.zip format) which simply needs to be sent to them to validate the technical aspect of the order.

The manufacturing file (Gerber file) of the printed circuit ref:Option_BT_Gerber v1.0.1.zipand the ordering procedure from the supplier JLCPCB arefreely downloadable on this page .

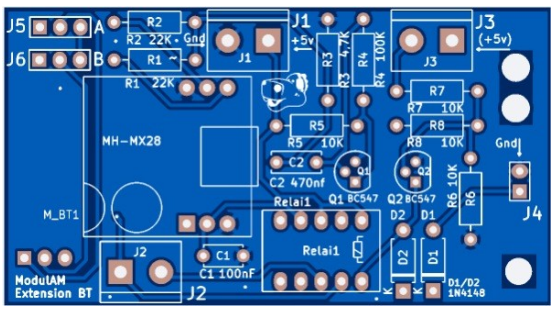


Figure IV-4: printed circuit, component side.

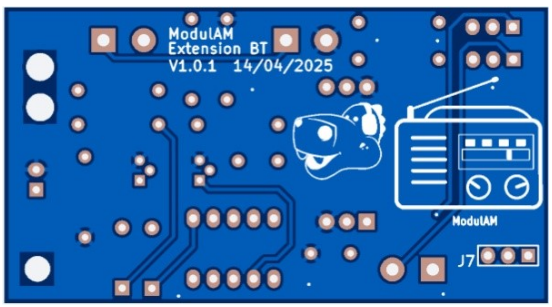


Figure IV-5: printed circuit, copper side.

The printed circuit board, measuring 68 x 37 mm, is double-sided and has metallized holes and full screen printing of the components indicating references and values.

IV. 3 – WIRING OF COMPONENTS

The order of placement and wiring of components on the printed circuit board is organized according to the height of the components.

After assembling all the components, start by positioning and soldering the low-profile components: diodes, ¼ W resistors, then the ceramic capacitors, etc., finishing with the connection terminals.

This method allows the printed circuit board to be placed, component side down, on a surface, such as foam, ensuring their retention during soldering operations, with the certainty that they will remain correctly applied against the PCB.

To avoid any errors or omissions, follow the procedure detailed below, step by step.

Attention:after soldering it, always cut the tail of the component by orienting it towards the outside**And** by holding it (with pliers for example). Otherwise, beware of the risk of splashes in the eyes!

-Step 1: connect the diodes

Gather and place the 2 1N4148 diodes (D1 and D2) on the printed circuit board (seenomenclature item 2), following the instructions below.

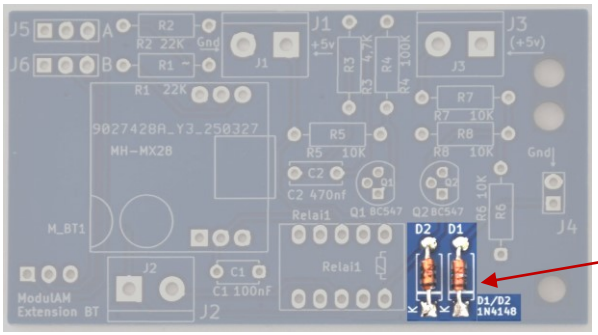


Figure IV.6

Using flat pliers, bend the legs of each diode to the size of the IC pitch.

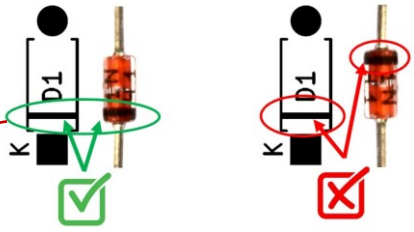


Figure IV.7

Attentionrespecting the mounting direction: the ring of each diode must be facing downwards (figure IV.7).

Insert each diode into its respective location, identified by the silkscreen printing visible on the printed circuit board (figure IV.6), then solder, copper side. Finish by cutting the diode tails.

-Step 2: wiring the resistors

Gather and place the 8 ¼ W resistors (R1 to R8) on the printed circuit board (seenomenclature item 3 to item 6), following the instructions below.

R1, R2 = 22 kΩ(Red, Red, Orange).
R3 = 4.7 kΩ(Yellow, Purple, Red).
R4 = 100 kΩ -(Brown, Black, Yellow).
R5, R6, R7, R8 = 10 kΩ(Brown, Black, Orange).

To facilitate later identification, check that the colored rings of each resistor are correctly oriented in the reading direction.

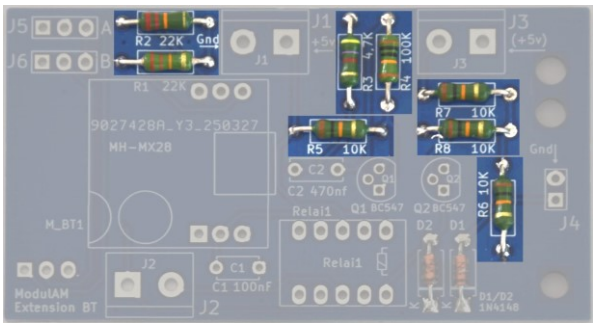


Figure IV.8

Using flat pliers, bend the legs of each resistor to the size of the PCB pitch.

Then insert each resistor into its respective location, identified by the silkscreen printing visible on the IC (figure IV.8), then solder, copper side. Finally, cut the tails of the resistors.

-Step 3: relay charging

Select and place the relay (Relay1) on the printed circuit board (seenomenclature item 18), following the instructions below.

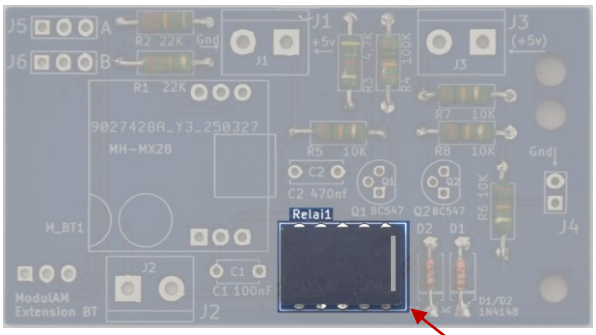


Figure IV.9

Attentionrespecting the assembly direction: the vertical line must be placed on the right (figure IV.10).

Figure IV.10

Then carefully insert the relay into its location marked by the silkscreen printing visible on the IC (figure IV.9); check the direction of placement one last time, then solder, copper side.

-Step 4: wiring the capacitors

Gather and place the 2 capacitors (C1, C2) on the printed circuit board (seenomenclature item 7 and item 8), following the instructions below.

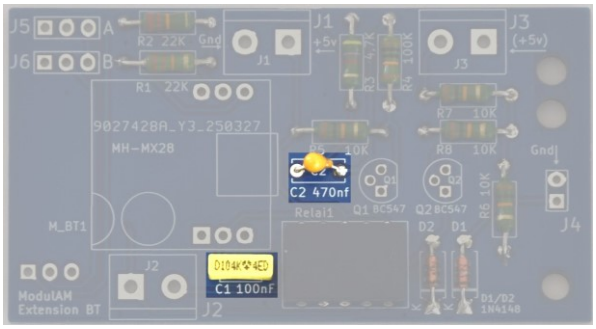


Figure IV.11

C1 = 100 nF
C2 = 470 nF

Insert each capacitor into its respective location, identified by the silkscreen printing visible on the printed circuit board (figure IV.11), then solder, copper side. Finally, cut the tails of the capacitors.

-Step 5: connect the transistors

Gather and place the 2 BC547 transistors (Q1, Q2) on the printed circuit board (seenomenclature item 9), following the instructions below.

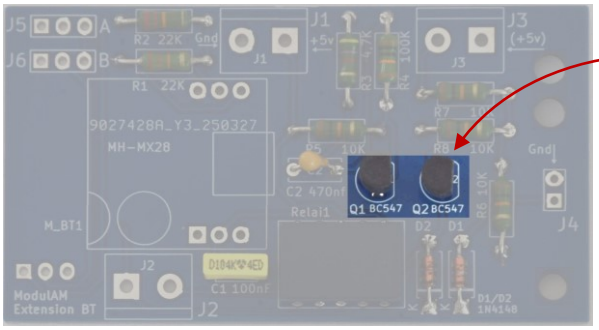


Figure IV.12

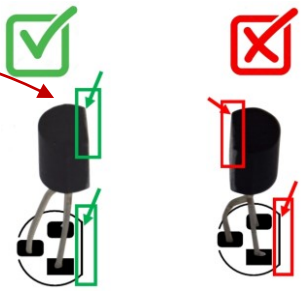


Figure IV.13

Attentionrespecting the assembly direction: the flat of each transistor must be placed on the right (figure IV.13).

Then carefully insert each transistor into its location marked by the silkscreen printing visible on the printed circuit board (figure IV.12); check the direction of placement one last time, then solder, copper side. Finally, cut the tails of each transistor electrode.

-Step 6: wire the connectors to them

Gather and place the 2 3-pin male connectors (**J5**,**J6**) and the 2-pin male connector (**D4**) on the printed circuit board (seenomenclature item 11 and item 12), following the instructions below.

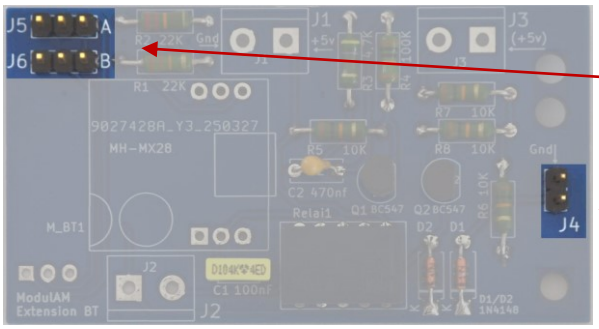


Figure IV.14

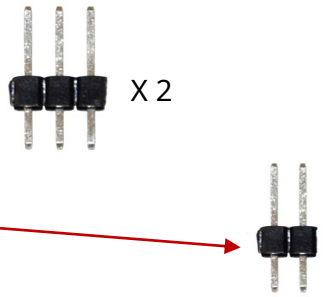


Figure IV.15

After identifying each type of connector (figure IV.15), insert each one into its location visible by the screen printing on the printed circuit (figure IV.14); ensure that each connector is kept vertical, then solder, copper side.

-Step 7: Wiring the female connectors

Gather and place the 2 3-pin female connectors on the printed circuit board (seenomenclature item 13), following the instructions below.

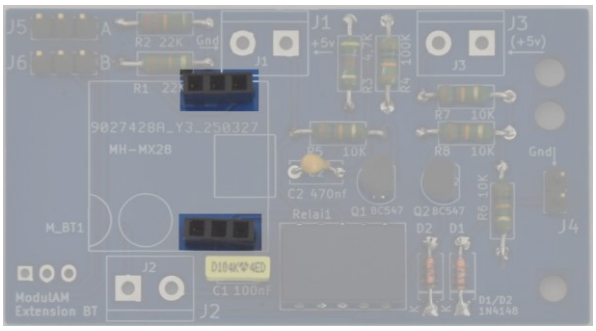


Figure IV.16

Insert each connector into its respective location (figure IV.16).
Ensure that each connector is vertical, then solder on the copper side.

-Step 8: wire the screw terminals

Gather and place the 2 or 3 3-pin female connectors on the printed circuit board (seenomenclature item 16 and item 17), following the instructions below.

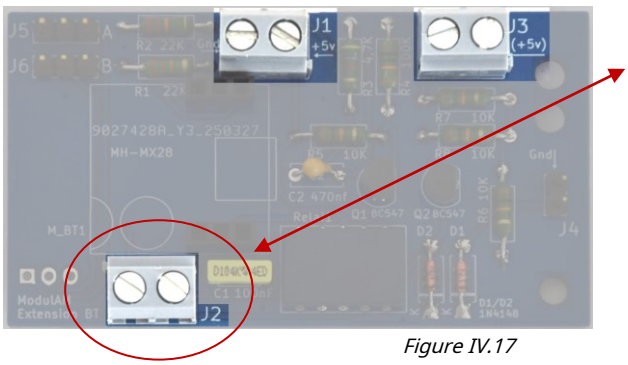


Figure IV.17

D1And**D3**:versions**ModulAM**And **AM8** **J2**:only on the version**AM8**

Insert each terminal block into its respective location, identified by the screen printing visible on the printed circuit (figure IV.17), then solder, copper side.

-Step 9: wiring the connector to itAM Module

This step only concerns the case of the option intended for the modulator**ModulAM**;for the modulator **AM8**, go directly to step 10.

Select and place the 3-pin female connector (**J7**), (seenomenclature item 14), on the printed circuit board **copper side**, following the instructions below.

Printed circuit board,**copper side.**

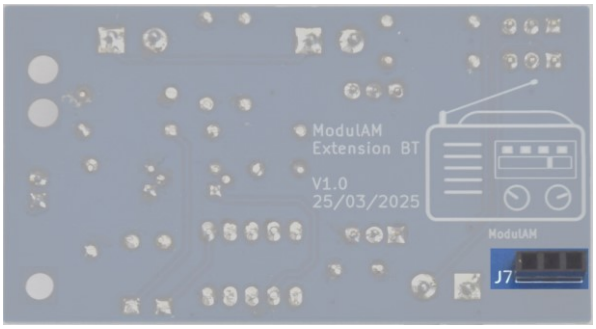
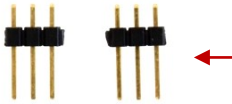


Figure IV.18

Attention:first position the printed circuit on the copper side, because this connector must be placed on this side.

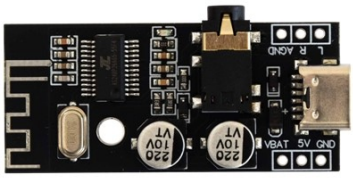
Insert the connector into its location marked by the silkscreen printing visible on the printed circuit (figure IV.18), then solder,component side.

-Step 1 0: preparation of the B luetooth modem



Gather :

- Two 3-pin male connectors ST1, ST2 (see nomenclature item 10),



- The MH-MX28-C Bluetooth modem module (seenomenclature item 23),

Figure IV.19

Figure IV.20

Position the Bluetooth module on the copper side, then insert the two 3-pin connectors (figure IV-20).

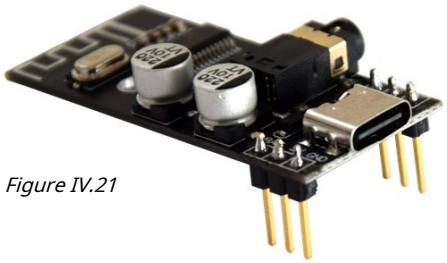


Figure IV.21

Ensure that each connector is vertical, then solder, component side(figure IV-21).

-Step 1 1: inserting the Bluetooth modem

Insert the Bluetooth modem as assembled in step 10, onto the two 3-pin female connectors on the printed circuit board as illustrated in figures IV.22 and IV.23 below.

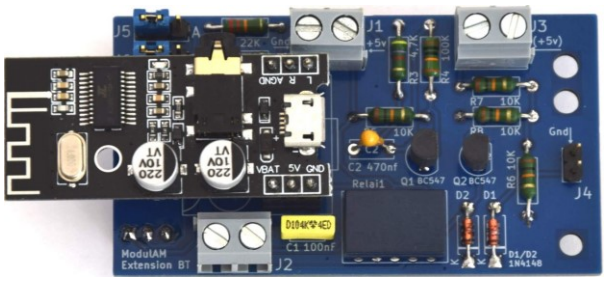


Figure IV.22

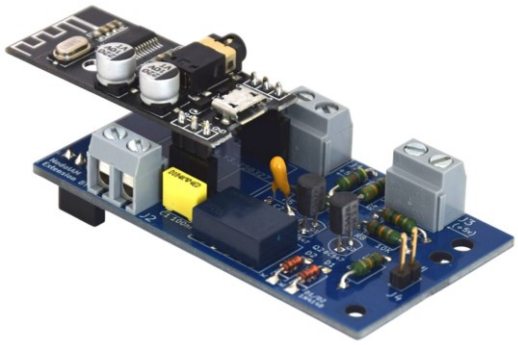


Figure IV.23

The wiring of the Bluetooth option module is now complete.
Before continuing, carry out a final visual check to ensure that no wiring steps have been omitted.

To facilitate the upcoming assembly with the circuit**ModulAM**Or**AM8**, remove the Bluetooth modem from the circuit board; it will be reinserted later.

-Locating the link connectors

The circuit to be assembled on the AM modulator is therefore presented in the form of figure IV.24 below, detailing the locations and roles of the input and output connection connectors.

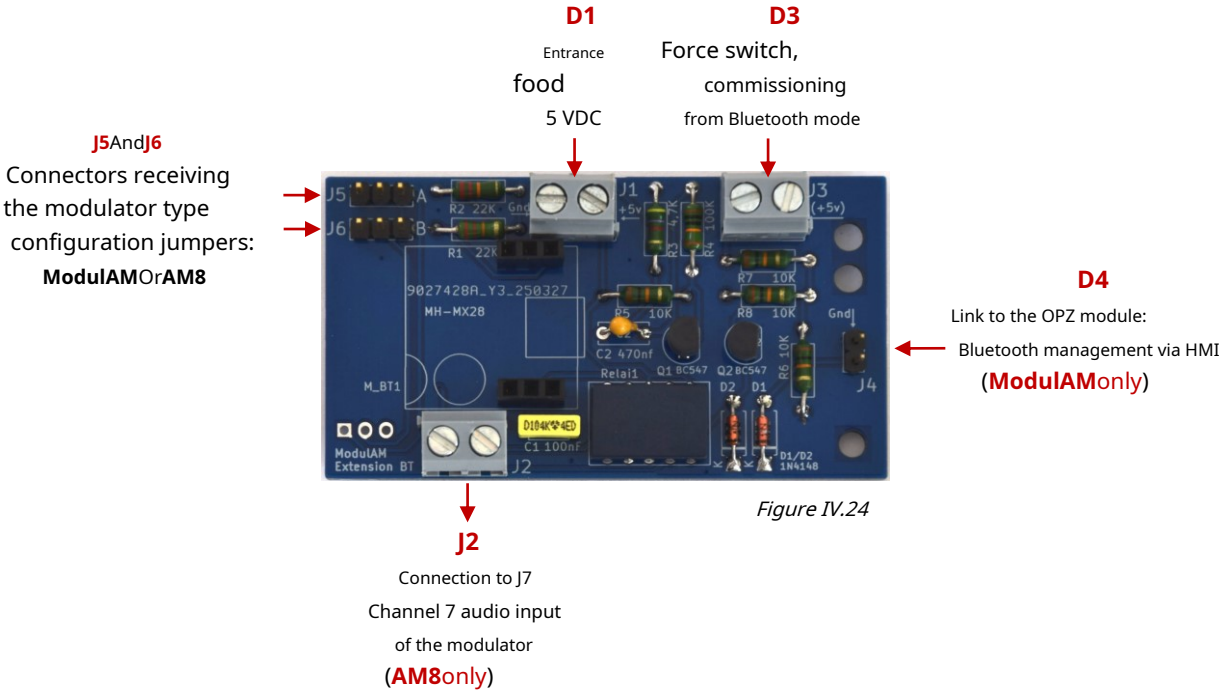


Figure IV.24

V – ASSEMBLY

This chapter is divided into two parts.

- Chapter V.1 : assembly of the optional module on the AM modulator board type**ModulAM**.
- Chapter V.2 : assembly of the optional module on the AM modulator board type**AM8**.

Depending on the modulator available to him, the amateur will therefore go directly to the chapter concerning the type of equipment concerned by the assembly.

V. 1 – ASSEMBLY EMB L AG ES ON LAPLATINETYPEAM Module

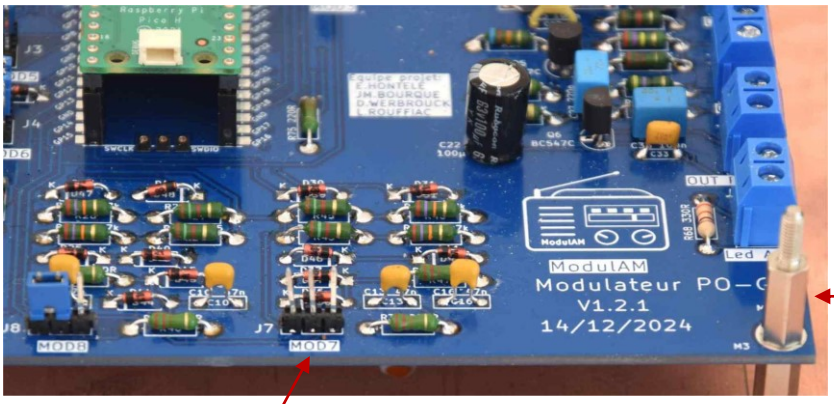
It is hereby admitted that the printed circuit of the**ModulAM**is already fixed on a plate or in a receiving box. This means that the modulator plate rests on columns or threaded spacers which are tightened by nuts, on the fixing points.

The optional Bluetooth circuit will be fixed via an additional spacer (figure V-1) of height 12 mm (seenomenclature item 22), placed between the right edge fixing of the modulator PCB and the fixing hole of the option PCB.

Figure V.1

-Preparation

- Remove the fixing nut from the right edge of the printed circuit board.**ModulAM**("Ground" mark on the printed circuit board screen printing).
- Screw the 12mm spacer in place of the nut.
- Remove the jumper located on the connector**J7**male (MOD7) of the printed circuit board**ModulAM**



Spacer
12 mm

Connector**J7**M
(MOD7)

Figure V.2

Figure V.2 shows the printed circuit board of the**ModulAM**, once prepared to receive the optional Bluetooth module.

Assembly

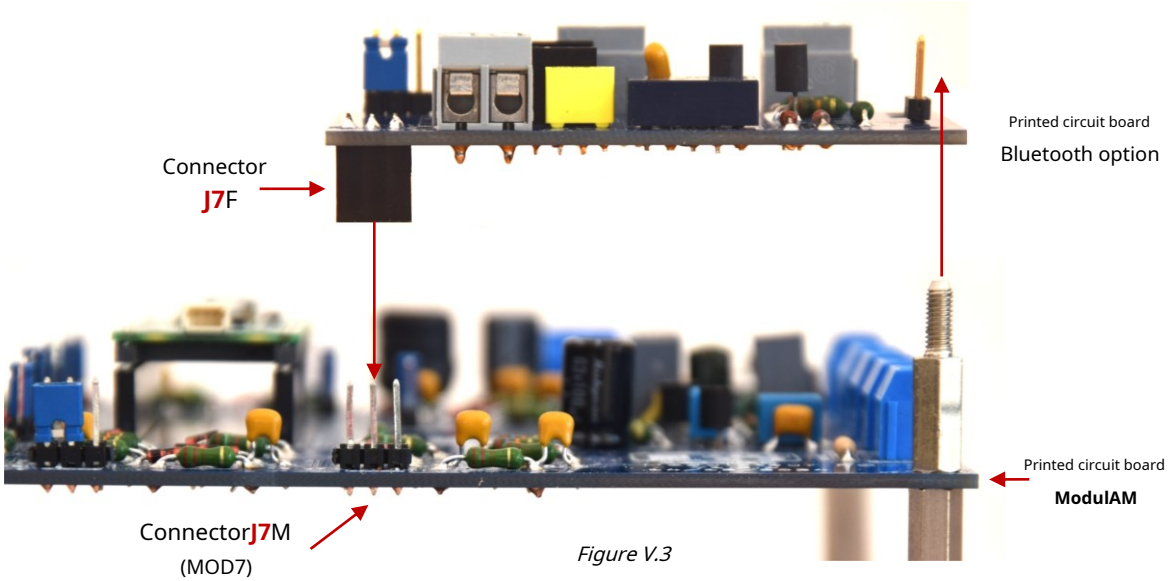


Figure V.3

Present the optional circuit above the circuit of the**ModulAM,**as shown in figure V.3 above, then gently insert the two connectors**J7**F /**J7**M while placing the thread of the spacer into the mounting hole of the Bluetooth module circuit board.

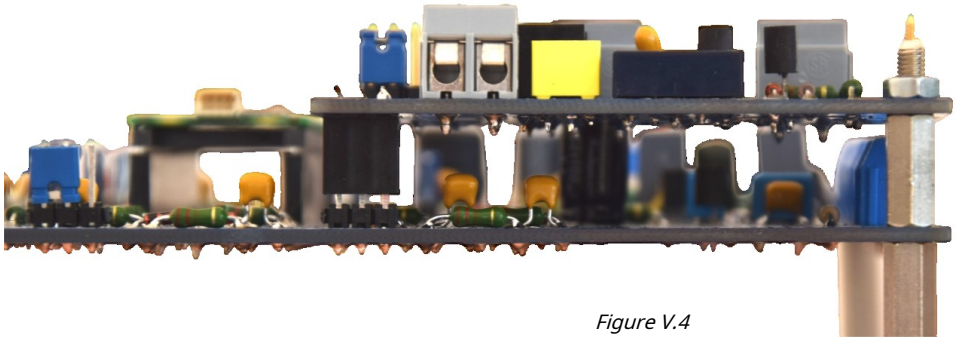


Figure V.4

Ensure the optional circuit is held in place by placing the nut on the thread of the spacer and tightening moderately, in order to obtain the assembly shown in figure V.4 above.

Attention:if the**ModulAM**was mounted in thereception box proposed, check that the spacers for fixing the modulator plate to the bottom of the box have a maximum height of 8 mm (ideal = 5 mm), otherwise there is a risk that the Bluetooth mode installed on the option will touch the front of this box.

-P lac eme ntconfi gurationjumpers

These jumpers allow you to configure the Bluetooth option according to the destination modulator type:**ModulAM**Or**AM8**.

Gather and place the 2 female riders (CAV1 and CAV2, seenomenclature item 15), on both male connectorsJ5AndJ6of the optional Bluetooth module circuit board, following the instructions below.

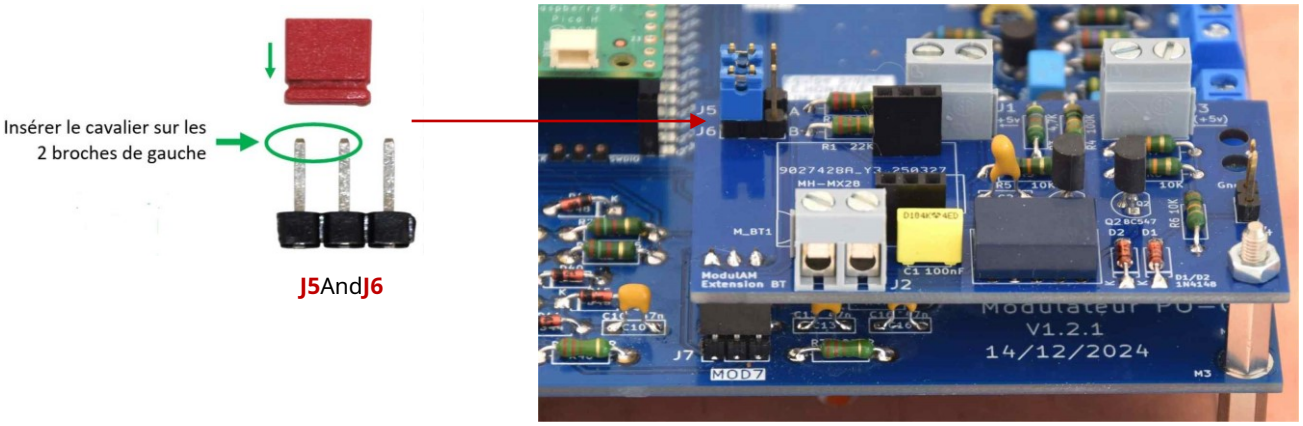


Figure V.5

Following figure V.5 above, place a jumper on the 2 left pins of the male connectorJ5. Then place the second jumper on the 2 left pins of the male connectorJ6.

-Connections

Figure V.6 below shows the few connections to be made to finalize the installation of the Bluetooth modem hardware option.

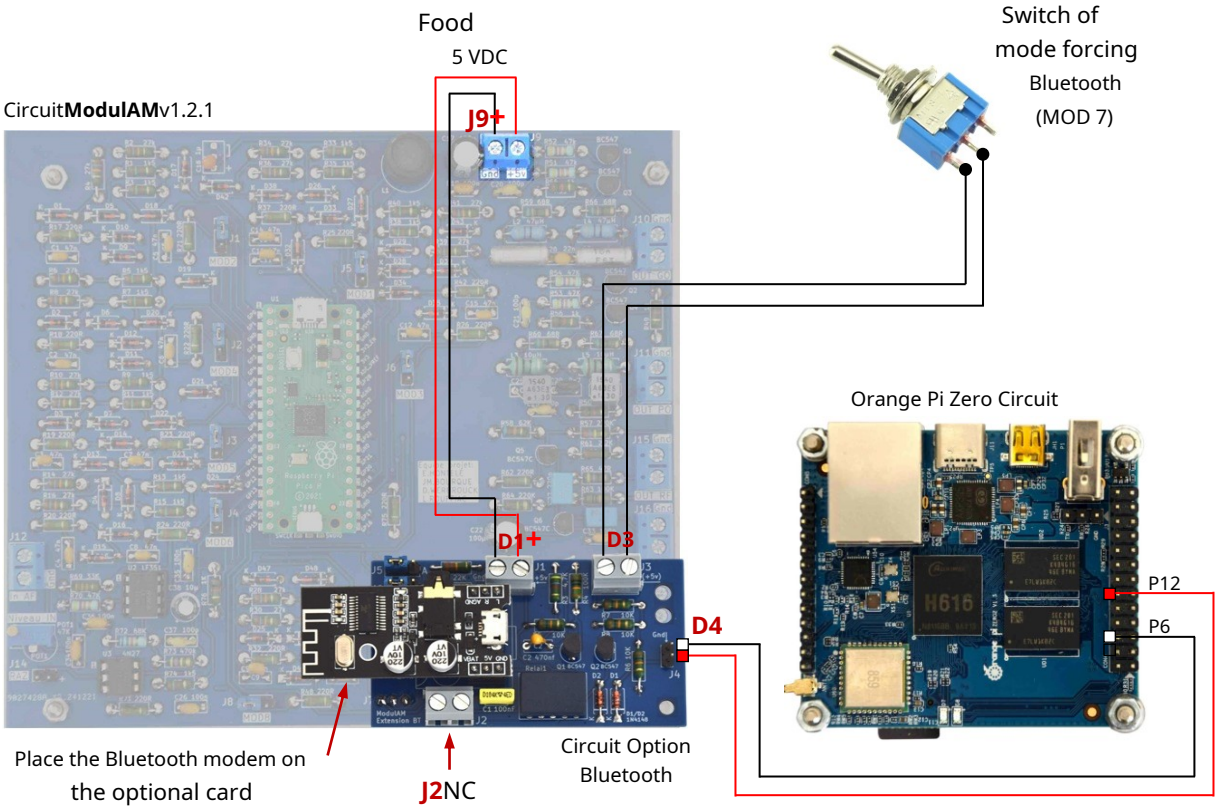


*Figure V.6: General diagram of the connections of the Bluetooth option with the modulator**ModulAM**.*

Power supply for the optional module

This involves connecting the output of the auxiliary 5 VDC power supply, available on the extension connector**J9** of the printed circuit board**ModulAM**, towards the connector**D1**of the Bluetooth module.

Prepare two flexible wiring strands (one black and one red), each about 12 cm long. Strip and tin each end.

Prepare the two connection terminals**J9**(**ModulaAM**) And**D1**(Bluetooth module) by unscrewing the four clamping screws to allow passage for the end to be inserted of each of the wires.

Following the wiring diagram in Figure V.6, take the wirered, insert one of its ends into the right terminal (**+**) of the terminal block**J9**of the circuit of the**ModulAM**, then tighten the screw of this terminal.
Then insert the other end of the wireredon the right terminal (**+**) of the terminal block**D1**of the Bluetooth module, then tighten the screw of this terminal.

Still following the wiring diagram in figure V.6, take the black wire, insert one of its ends into the left terminal (**-**) of the terminal block**J9**of the circuit of the**ModulAM**, then tighten the screw on that terminal. Next, insert the other end of the black wire into the left terminal (**-**) of the terminal block**D1**of the Bluetooth module, then tighten the screw of this terminal.

Finally, check that the ends of each wire are secure by pulling lightly on each one to ensure that each terminal screw is properly tightened.

Bluetooth mode force switch

If the amateur usually exploits the**ModulAM**via a computer or a tablet/Smartphone, therefore through the HMI, the wiring of this switch is not essential; in fact the configuration and validation of the Bluetooth mode are provided in the HMI software (seeHMI Configuration).
But for more flexibility, or in the case of direct exploitation of the**ModulAM**without any additional computer tool, the force switch allows you to quickly and directly switch to Bluetooth mode on the broadcast frequency assigned to channel 7 of the modulator.

Prepare two flexible wiring strands (no need to differentiate them by color), each about 25 cm long.
Strip and tin each end.

Select the switching switch (or changeover switch) (seenomenclature item 21), tin the pins, then solder one end of the two wiring wires to each of them.

Prepare the connection terminal block**D3**of the Bluetooth modem, by unscrewing the two clamping screws to leave room for inserting the wires.

Following the wiring diagram in Figure V.6, insert the end of each of the two wires into the two terminals of the terminal block**D3**of the Bluetooth module, then tighten the screws of these two terminals.

Finally, check that the ends of each wire are secure by pulling lightly on each one to ensure that each of the terminal screws is correctly tightened.

Connecting the Bluetooth module control via the HMI

The operation of the optional Bluetooth module can be configured via the HMI software of the**ModulAM**To do this, the nano computer (Orange Pi Zero module – OPZ), which centralizes the modulator commands, uses one of its output ports to control the activation of the Bluetooth module.
This command must therefore be transmitted to the Bluetooth module. This is the role of the two wires to be connected to the connector**D4**of the Bluetooth module.

Bring together the two DUPONT Female/Female cords (one red and one black) with a length of 20 cm (see nomenclature items 19 and 20),

Orange Pi Zero module side connection

Using figure V.6 (general connection diagram) and figure V.7 below, connect the two DUPONT cords to the expansion connector of the Orange Pi Zero circuit.

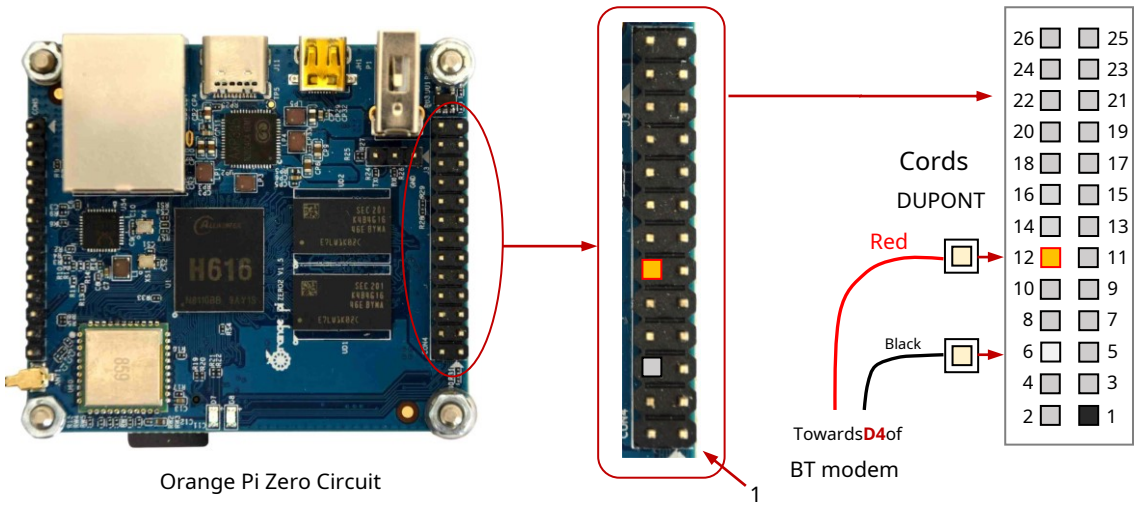


Figure V-7:connection of the two female DUPONT cords (red and black) on the pins 12 and 6 of the inner row of the OPZ circuit expansion connector.

Insert the female connector of the DUPONT cordred, in the male pin**12**from the OPZ module expansion connector.
Then insert the female connector of the black DUPONT cord into the male pin**6**from the OPZ module expansion connector.

Please note, there is no keying and no pin number marking on the OPZ circuit connector.

Connection on the Bluetooth module side

Using figure V.6 (general connection diagram) and figure V.8 below, connect the two DUPONT cords to the connector**D4**of the optional Bluetooth module.

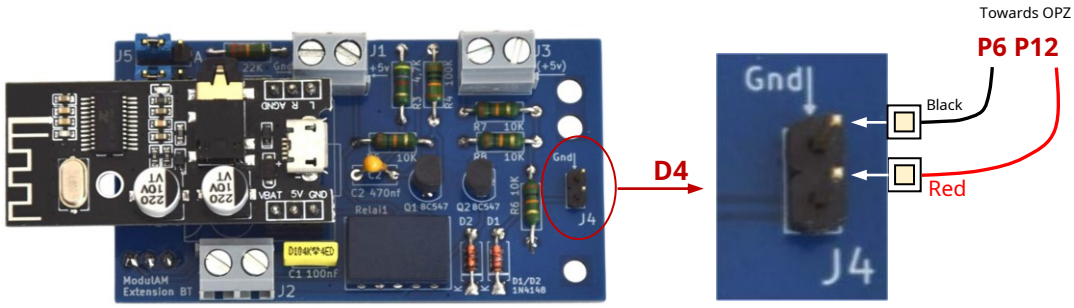


Figure V-8:connection of the two female DUPONT cords (red and black)
*on the connector**D4**of the Bluetooth module.*

Insert the female connector of the DUPONT cordred, in the male pin at the bottom of the connector**D4**of the Bluetooth module.
Then insert the female connector of the black DUPONT cord into the male pin at the top (marked "Gnd") of the connector**D4**of the Bluetooth module.

-C onfiguration of the HMI

After performing a final check of the wiring, place the system**ModulAM**powered on and connect to the modulator via the HMI as usual.

Check that the HMI software is up to date with the latest version, at least v2.0, the first version to support management of the Bluetooth modem hardware option. To perform an update, see the procedure withinthe general assembly instructions and instructions of**ModulAM**, (page 38).

Once this check (or update) has been carried out, go to the System menu by pressing the key**SYST** from the HMI screen.

A window similar to that of Figure V-9 opposite is then displayed.

Confirm the presence of the Bluetooth modem option by pressing the button "Bluetooth option»; the taking into account of the order is indicated by the color of the button changing from gray to blue (see opposite).

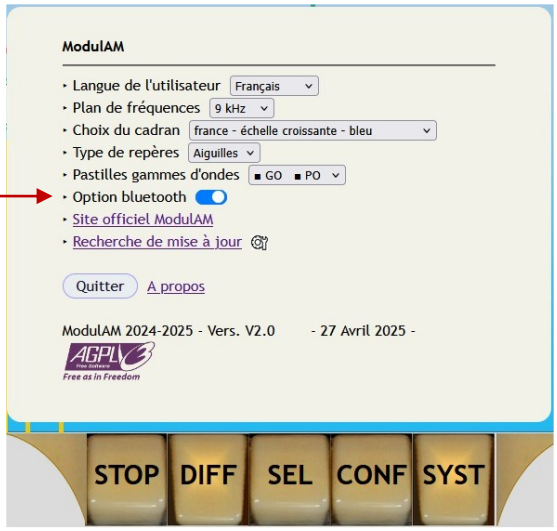


Figure V-9

All that remains is to create a broadcast list including the “Bluetooth Modem” station accessible in the list of stations proposed by the HMI. To configure a list of stations, see the procedure within the general assembly instructions and instructions of**ModulAM**, (page 36).

Figure V.10 opposite shows a broadcast list including the Bluetooth station on F = 234 kHz (in second position on the GO dial list).

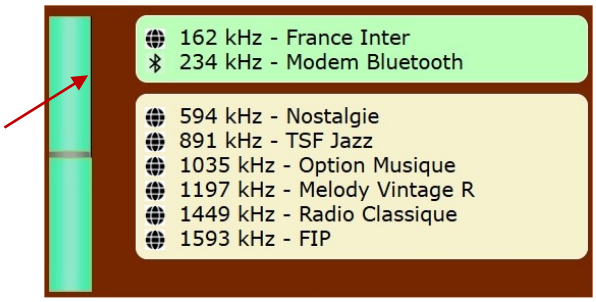


Figure V-10

*With the system**ModulAM**, two ways to activate the Bluetooth modem: 1 -*
From the HMI software, respecting the following two conditions:

- *That the button "Bluetooth modem", in the menu**SYST**, has been activated,*
- *That a mailing list including the station "Bluetooth modem» is currently being actively broadcast (key**DIFF**of the keyboard, lit).*

2 – By forcing the audio input of the broadcast list frequency assigned to channel 7 of the modulator to switch to the audio output of the Bluetooth module, via closing the “Bluetooth mode force” switch.

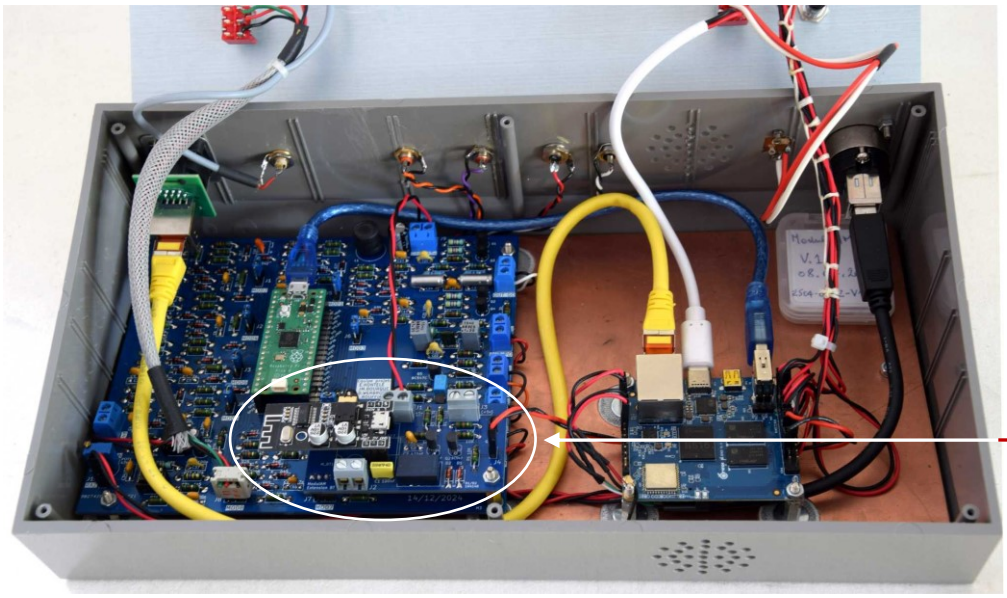


Figure V-11

*Integration example of**ModulAM**complete with the Bluetooth hardware option.*

Module Bluetooth.

Installing, setting up and activating the Bluetooth hardware option for the**ModulAM**, are now complete.

It remains to associate the**ModulAM**with a smartphone, tablet, computer or MP3 player with a Bluetooth connection.

See the procedure for pairing Bluetooth terminals, atChapter VI.I .

V. 2 – ASSEMBLY EMB L AG ES ON LAPLATINETYPE AM8

It is assumed here that the modulator circuit board**AM8**is already fixed on a plate or in a reception box.
This means that the modulator plate rests on columns or threaded spacers which are tightened by nuts at the fixing points.

The optional Bluetooth circuit will be fixed via an additional spacer (figure V-12) of height 20 mm (seenomenclature item 22), placed between the right edge mounting of the modulator PCB and the mounting hole of the option PCB. This height is necessary to allow the passage of the RF output cord connected to the J10 connector.

Figure V.12

-Preparation

- Remove the fixing nut from the right edge of the modulator circuit board**AM8**(next to the screen printingAM8 – v01on the circuit board). Screw the 20 mm spacer in place of the nut.
-
- Remove the jumper located on the connector**J7**male of the printed circuit board**AM8**(located next to the right edge of the pico module).

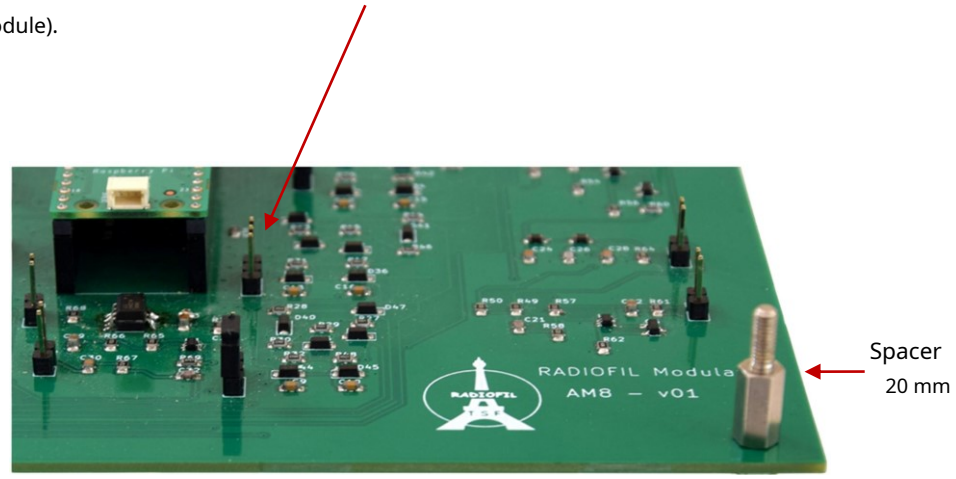


Figure V.13

Figure V.13 shows the printed circuit board of the**AM8**, once prepared to receive the optional Bluetooth module.

Assembly

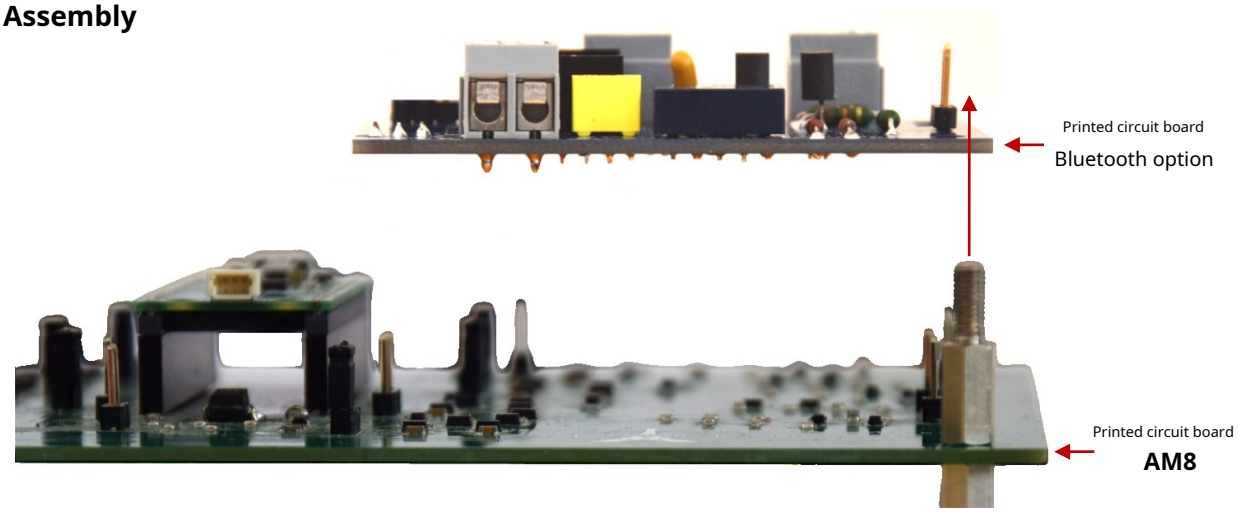


Figure V.14

Present the optional circuit above the circuit**AM8,**as shown in figure V.14 above, by placing the thread of the spacer in the fixing hole of the Bluetooth module printed circuit board and keeping the edges of the two circuits parallel.

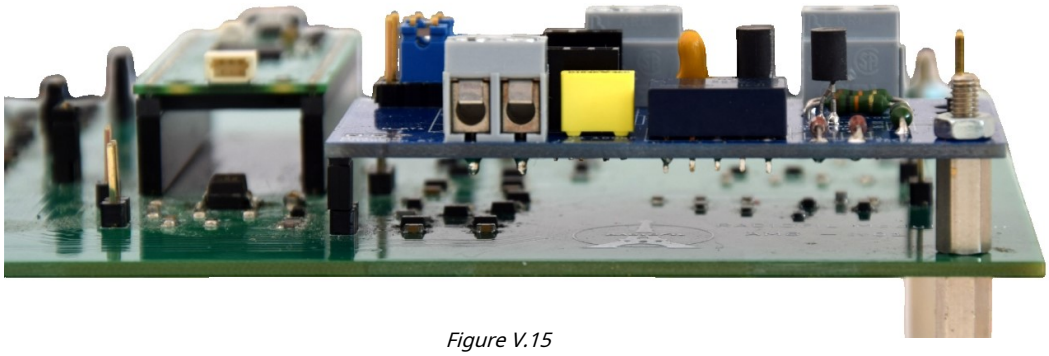


Figure V.15

Ensure the optional circuit is held in place by placing the nut on the thread of the spacer and tightening moderately, in order to obtain the assembly shown in figure V.15 above.

Attention:if the**AM8**has been mounted in the proposed reception box, check that the spacers for fixing the modulator plate on the bottom of the box have a maximum height of 5 mm, otherwise there is a risk that the Bluetooth mode installed on the option will touch the front of this box.

-P lac eme ntconfi gurationjumpers

These jumpers allow you to configure the Bluetooth option according to the destination modulator type:**ModulAM**Or**AM8**.

Gather and place the 2 female riders (CAV1 and CAV2, seenomenclature item 15), on both male connectorsJ5AndJ6of the Bluetooth module circuit board, following the instructions below.

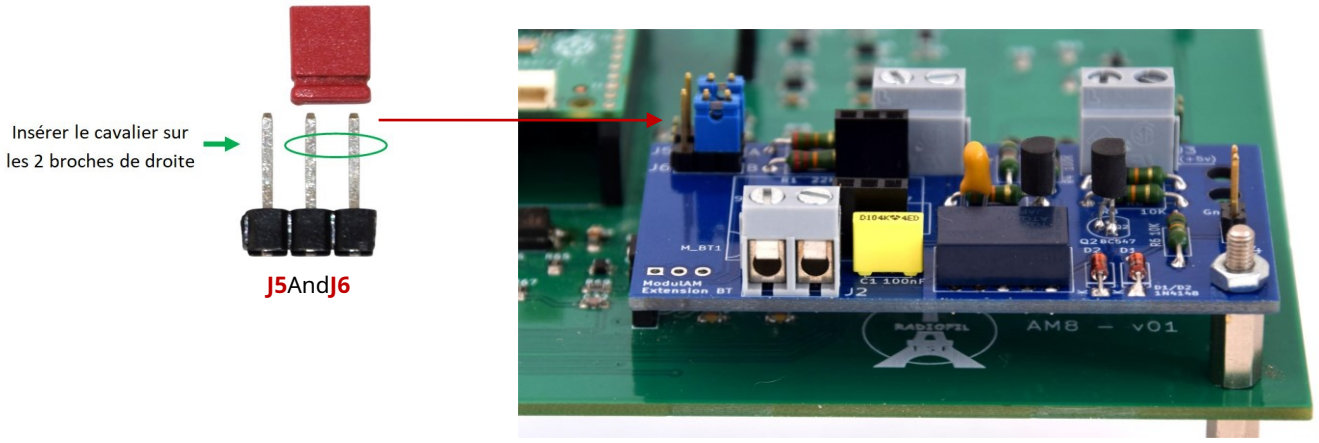


Figure V.16

Following figure V.16 above, place a jumper on the 2 right pins of the male connectorJ5. Then place the second jumper on the 2 right pins of the male connectorJ6.

-Connections

Figure V.17 below shows the few connections to be made to finalize the installation of the Bluetooth modem hardware option.

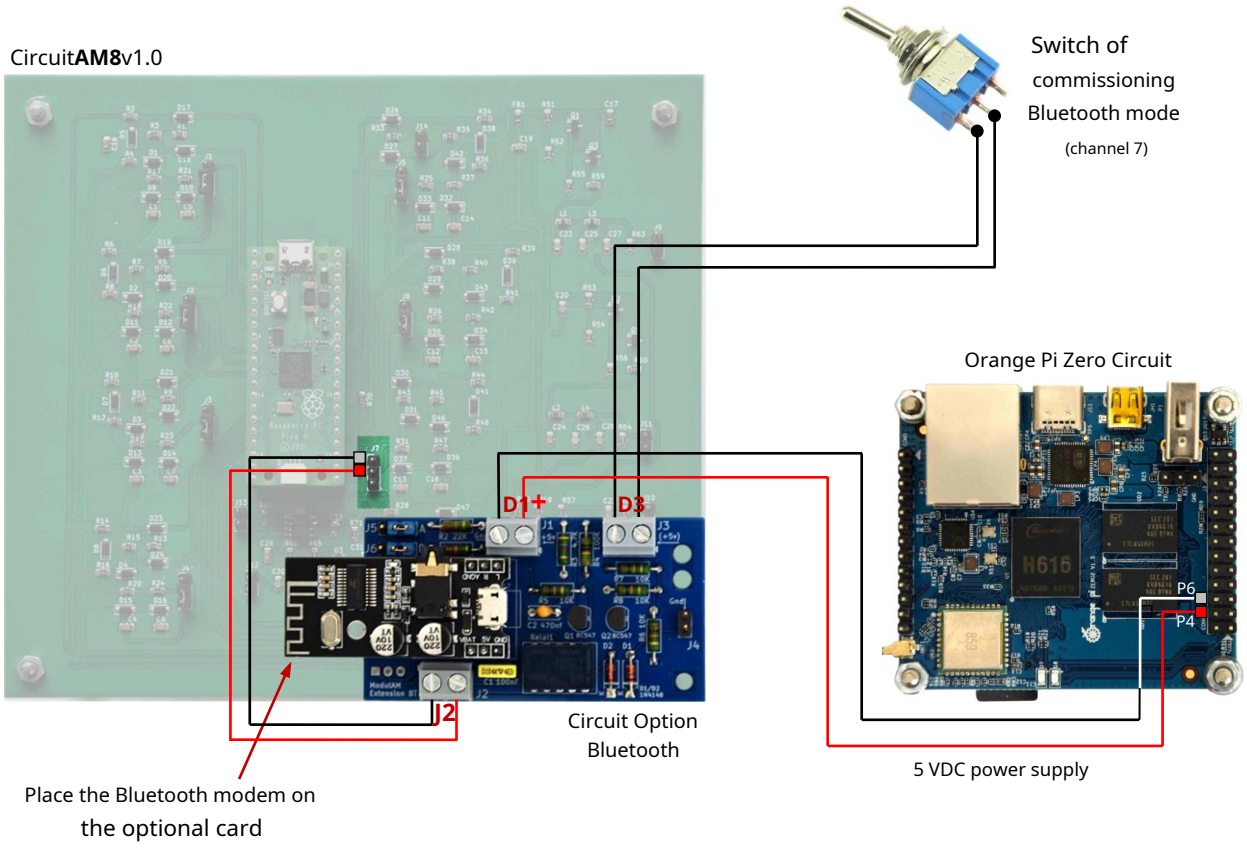


Figure V.17: general diagram of the connections of the Bluetooth option with the modulator.

Power supply for the optional module

The Orange Pi Zero board has a 5 VDC output on one of its expansion connectors. We'll use this to power the Bluetooth modem via the connector.**D1**.

Gather the first two DUPONT Female/Female cords (one red and one black) with a length of 20 cm (see nomenclature items 19 and 20).

On each of them, cut one of the connectors to obtain two cords of approximately 20 cm, of which end 1 is made up of a DUPONT Female connector and end 2 is a bare wire.

Strip and tin the cut ends.

Orange Pi Zero module side connection

Using figure V.17 (general connection diagram) and figure V.18 below, connect these two DUPONT cords to the expansion connector of the Orange Pi Zero circuit with two rows of pins, addressing the inner row.

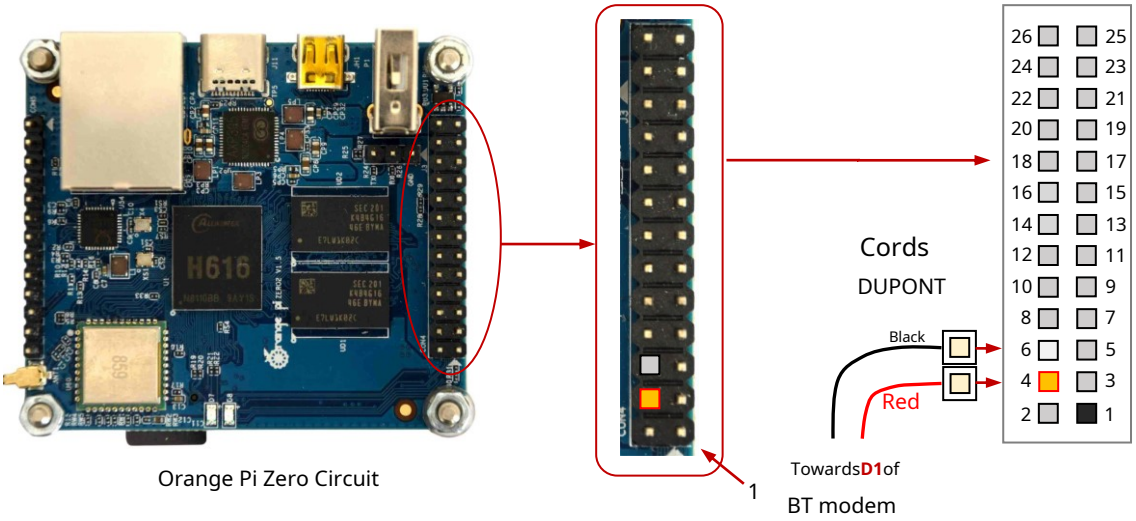


Figure V-18: connection of the two female DUPONT cords (red and black) to the OPZ circuit extension connector (inner row), for the 5 VDC power supply of the Bluetooth option.

Insert the female connector of the DUPONT cordred, in the male pin**4**(inner row) of the OPZ module expansion connector.
Then insert the female connector of the black DUPONT cord into the male pin**6**(inner row) of the OPZ module expansion connector.

Attention, no keying and no pin number marking on the OPZ circuit connector.

Bluetooth modem side connection

Still following the wiring diagram in figure V.17 and figure V.19 below, take the tinned end of the black DUPOND cord and insert it into the left terminal (**-**) of the terminal block**D1**of the Bluetooth module circuit, then tighten the screw of this terminal.

Then insert the tinned end of the DUPONT cordredon the right terminal (**+**) of the terminal block**D1**of the Bluetooth module, then tighten the screw of this terminal.

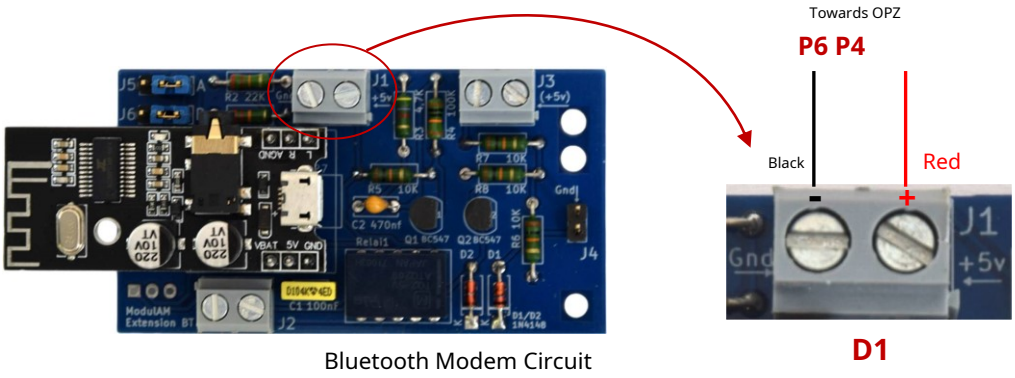


*Figure V-19:connection of the two tinned ends of the cords (red and black) DUPONT females on the power connector**D1**of the Bluetooth module.*

Finally, check that the ends of each wire are secure by pulling lightly on each one to ensure that each terminal screw is properly tightened.

Bluetooth mode activation switch

The HMI of the**AM8**not having a software setting for the Bluetooth function, this option is activated via this switch which allows you to quickly and directly switch to Bluetooth mode on the broadcast frequency assigned to channel 7 of the modulator.

Prepare two flexible wiring strands (no need to differentiate them by color), each about 25 cm long.
Strip and tin each end.

Select the switching switch (or changeover switch) (seenomenclature item 21), tin the pins, then solder one end of the two wiring wires to each of them.

Prepare the connection terminal block**D3**of the Bluetooth modem, by unscrewing the two clamping screws to leave room for inserting the wires.

Following the wiring diagram in Figure V.17 and Figure V.20 below, insert the end of each of the two wires into the two terminals of the terminal block**D3**of the Bluetooth module, then tighten the screws of these two terminals.

Finally, check that the ends of each wire are secure by pulling lightly on each one to ensure that each of the terminal screws is correctly tightened.

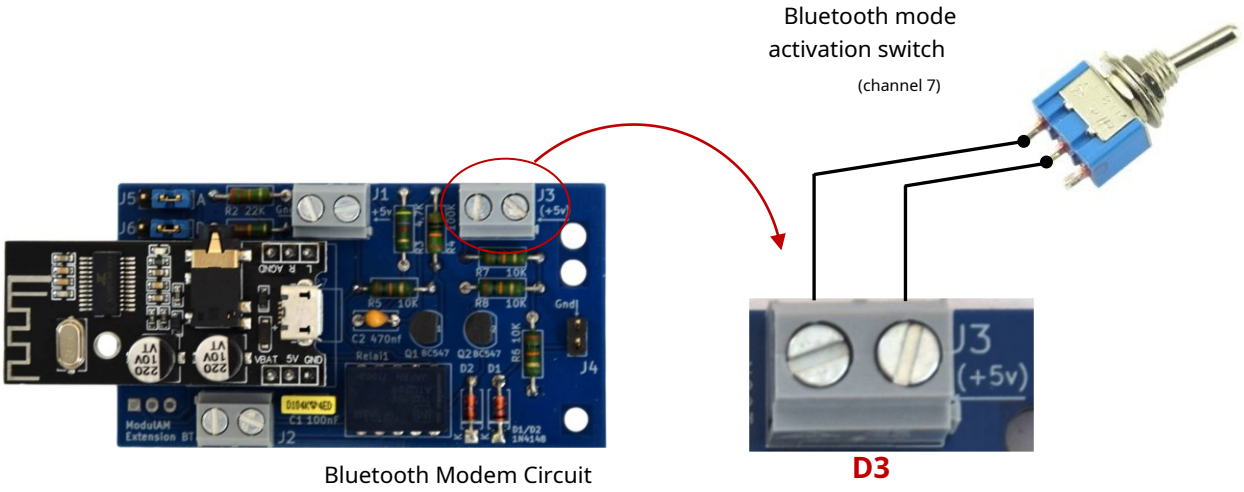


*Figure V-20: connecting the Bluetooth modem activation switch on the connector **D3** of the optional module.*

Switched audio output from Bluetooth modem

The audio signal output from the Bluetooth module must be connected to the modulation input of channel 7 of the modulator **AM8**.

The optional module is responsible for switching the signal between the stream from the web (or an mp3 signal) and the signal from the Bluetooth modem's audio decoder.

Preparation

Gather the last two DUPONT Female/Female cords (one red and one black) with a length of 20 cm (see nomenclature items 19 and 20).

On each of them, cut one of the connectors to obtain two cords of approximately 20 cm, of which end 1 is made up of a DUPONT Female connector and end 2 is a bare wire.

Strip and tin the cut ends.

*Connection on the modulator side **AM8***

If this has not already been done, remove the jumper on the connector **J7** of the AM8 plate, according to the marking indicated in figure V.21 below.

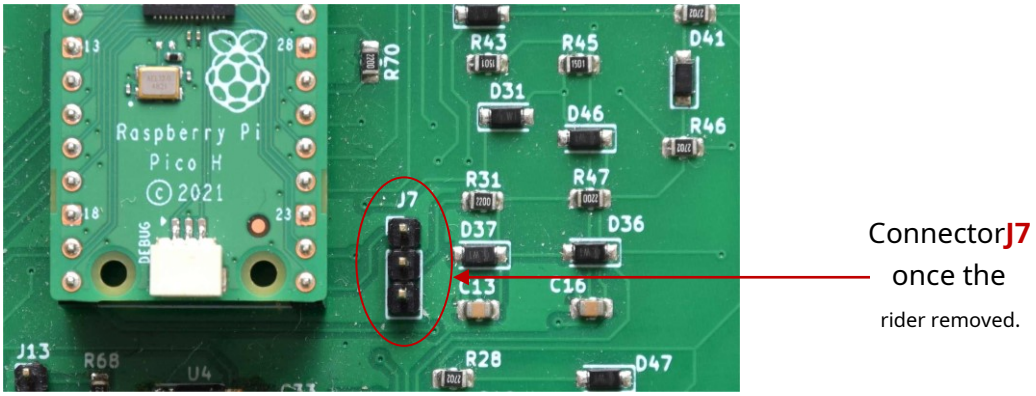


Figure V-21

Using the instructions in figure V-22 below, connect the female connector of the DUPONT cord redon the central pin of the male connectorJ7from the modulator boardAM8.

Connect by following the female connector of the black DUPONT cord to the top pin of the male connectorJ7 from the modulator boardAM8.

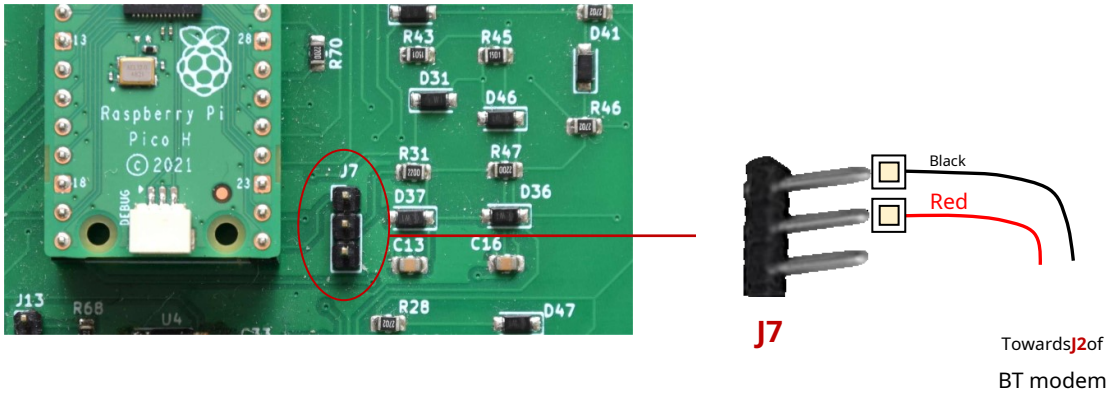


Figure V-22:connecting the switched audio output of the Bluetooth modem to the connectorJ7of the modulatorAM8.

Bluetooth modem side connection

Still following the wiring diagram in figure V.17 and figure V.23 below, take the tinned end of the black DUPONT cord and insert it into the left terminal of the terminal blockJ2of the circuit of theModulAM, then tighten the screw of this terminal.

Then insert the tinned end of the DUPONT cordredon the right terminal of the terminal blockJ2of the Bluetooth module, then tighten the screw of this terminal.

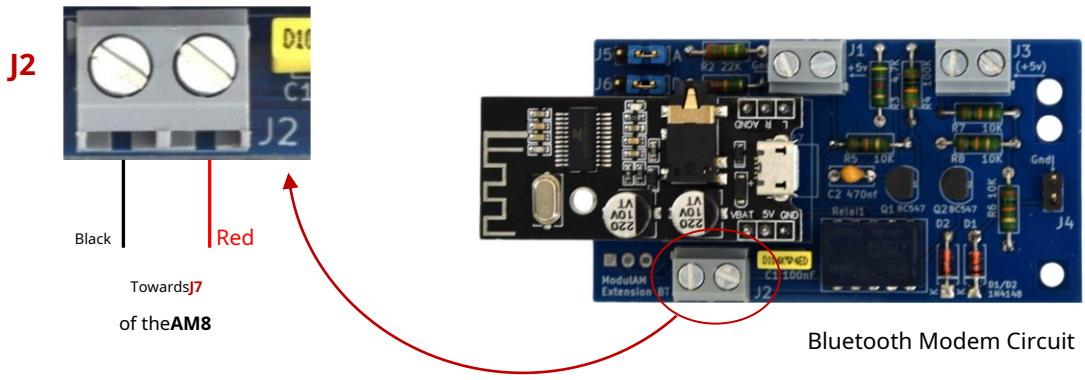


Figure V-23:connecting the switched audio output on the connectorJ2of the Bluetooth modem.

Finally, check that the ends of each wire are secure by pulling lightly on each one to ensure that each of the terminal screws is correctly tightened.

Installing the Bluetooth hardware option for the modulator**AM8**is now over.

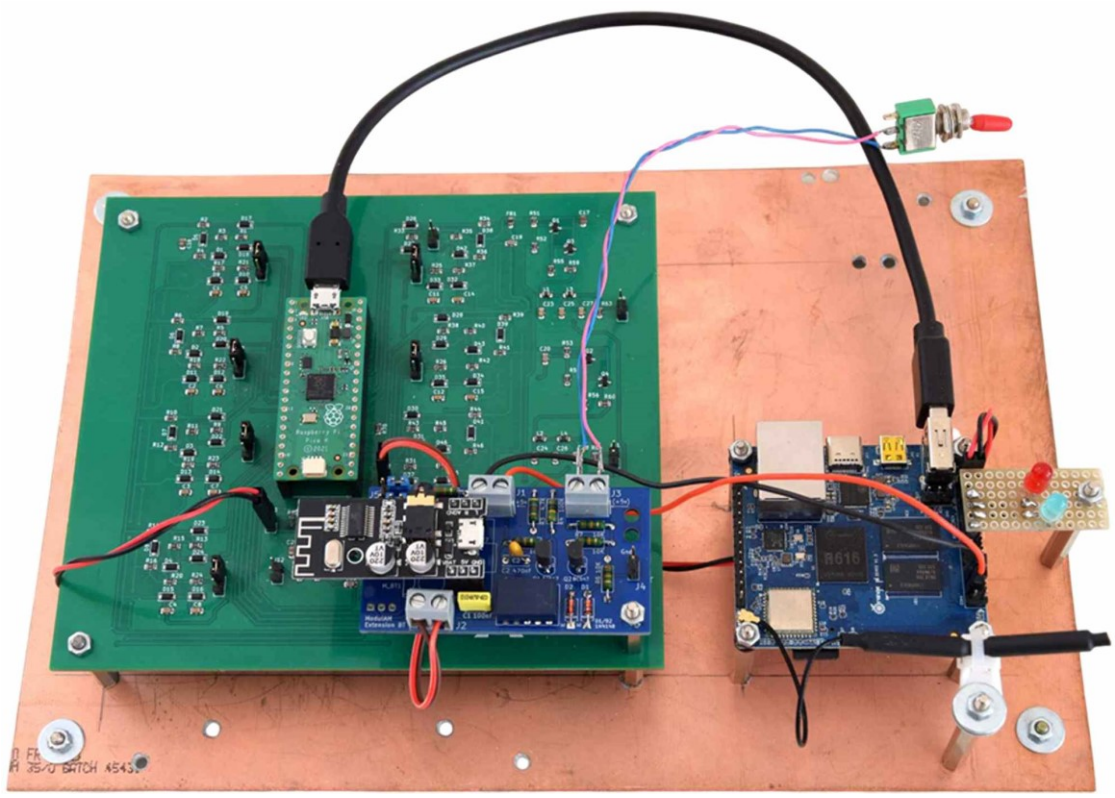


*Figure V-24**:view of the mounting plate of a**AM8**with its Bluetooth hardware option.*

It remains to associate the**AM8**with a smartphone, tablet or MP3 player with a Bluetooth connection.
See the procedure for pairing Bluetooth terminals in the next chapter.

VI – EXPLOITATION

Before broadcasting the sound source from the Bluetooth modem, it is necessary to pair it with the terminal responsible for generating the audio signal.

VI. 1 – ASS OC IATI ON (PAIRING) OF EMS MODES

Using the optional Bluetooth module requires an association (pairing, twinning) between the device containing the audio file and the Bluetooth modem equipping the modulator.

The association procedure is identical for the**ModulAM**and the**AM8**.

-Preparation

- Activate the modulator with any playlist.
- Using a receiver, check that the modulator's programs are being broadcast correctly. Select the
- device (smartphone, tablet, computer, etc.) that must be paired with the modulator's Bluetooth option.

-Association

- Activate the Bluetooth modem activation/force switch.
- Check that the blue LED indicator on the Bluetooth module flashes regularly (identification of this LED indicator in figure VI.1 below).

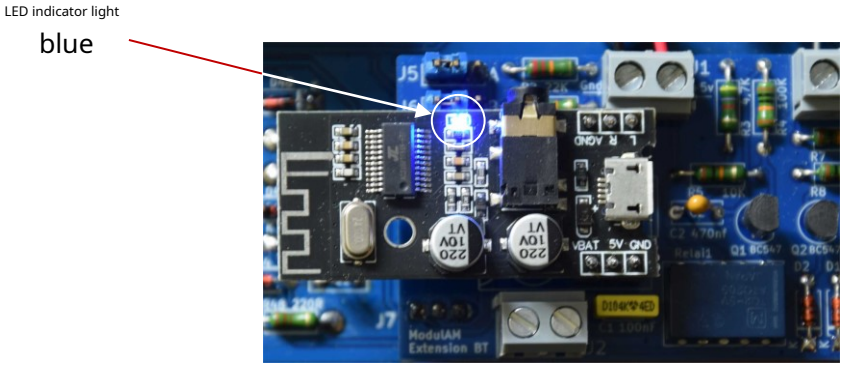


Figure VI-1:locating the blue LED indicator of the Bluetooth modem.

- Place the terminal to be paired in the Bluetooth device search position.
- The terminal detects a device named "**MH-M28**".
- Accept the invitation and confirm the association with the modem on the terminal.
- The blue LED on the Bluetooth modem is now lit steadily. The devices have
- been paired; the connection is established.

VI. 2 – BROADCAST OF A SOUND PROGRAM

- On the terminal, select a sound source to broadcast, then play the file by setting the volume control to halfway.
- On the receiver, tune to the frequency chosen for the station "Bluetooth modem» in the mailing list (for the**ModulAM**) and on the frequency corresponding to channel 7 for the modulator **AM8**.

- Adjust the volume to match the other stations being broadcast, using the volume control available on the terminal supporting the sound signal.
- To break the Bluetooth connection with the terminal, place the option's force/activation switch in the Off position.

*In the case of the**ModulAM**, simply stopping the broadcast (key**DIFF**off) or change the broadcast list, automatically turns off the power to the Bluetooth modem.*
Therefore, there is no need to operate the Bluetooth mode force switch.

*To re-establish the Bluetooth connection between the terminal and the modulator, simply validate again the broadcast of a list containing the station"Bluetooth modem» (case of the **ModulAM)**, or to activate the Bluetooth modem force/activation switch (action valid for both types of modulator).*

If no order to break the pairing of the equipment has been given to the terminal, the association will be carried out again automatically, the terminal immediately detecting the presence of the modem of the Bluetooth option of the modulator.

Table of Contents

To report an error:reports@retrotechnique.org

Find all the radio and audiovisual technology
old on our Retrotechnique portal.
https://retrotechnique.org/

This equipment is an achievement**Retro-engineering** .

Design and writing of the notice: Daniel Werbrouck (DWK)

Version tracking:
V0.1 to V0.5: drafts – 03/2025 to 04/2025.
V1.0: finalized version for review and corrections – 05/2025 V1.1:
stabilized version – 05/2025 – Published on May 15, 2025

Notice attached to the Retrotechnique Bluetooth v1.01 hardware option intended for the equipment**ModulAM**having the following hardware and software versions:
Modulation deck hardware version: v1.2.1 or v1.2.2 RPI
processor software version: ModulAMv1.uf2
OPZ2 software package version: ModulAM-V2-0 (or higher).
Bluetooth module compatible with the equipment**AM8**of hardware version v01.

Photo and illustration credits All
figures and illustrations: DWK

End of notice.