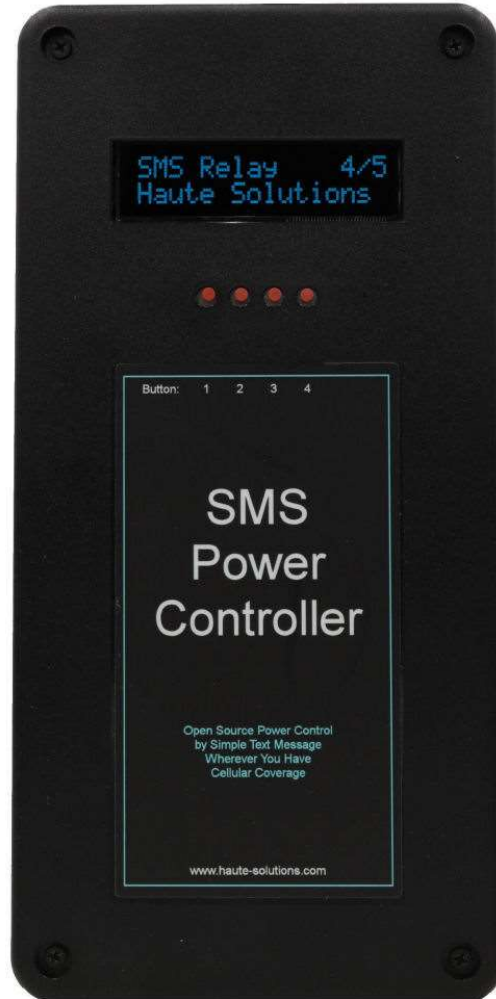


SMS Power Controller



User Documentation

V4.0– 21 Nov 2021
(Firmware 7.1)

www.haute-solutions.com

SMS Power Controller Introduction:

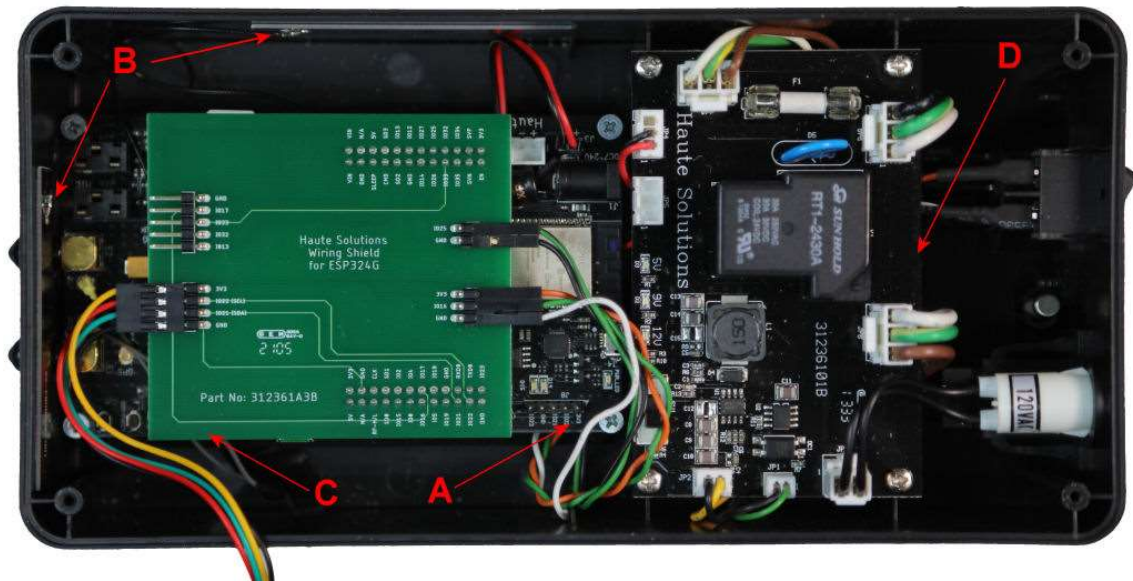
The SMS Power Controller can be used to remotely control, or schedule, power to a connected 120V appliance or circuit from virtually anywhere in the world!

- Control power to any 120V device using simple SMS text messages from your cell phone
- Does NOT require a smart phone application (iPhone/Android).
- Use ANY cell phone that supports SMS Messaging.
- Can be used anywhere 4G/3G Cell Phone coverage is available
- Does NOT require WiFi or Internet Service.
- Turn ON/OFF immediately (via SMS or at the device itself)
- Schedule ON/OFF times
- Receive SMS confirmation when scheduled events occur
- Request Device Status via SMS (On/Off and scheduled events)
- Provides a monthly “Heartbeat” status message to keep “Pay-as-you-go” cell services alive.
- Built-in 120V / 20A outlet and relay
- OLED Status Display (16x2 chars)
- Four Front Panel Command buttons
- One Manual Activation (on/off) button
- Table-top or wall-mount use
- Simple, easy to use, security prevents unauthorized access or control
- Up to 20 Cell Numbers can be authorized for SMS control
- The device is fully programmed and ready to use (no programming required)
- Software upgradable and programmable! The Open-Source Arduino-based firmware is available on our web site for customization. The capabilities and functionality of this device are fully customizable! Advanced users can change the behavior of the device!
- Hardware upgradeable and extendable! The extra-roomy enclosure was designed to support a wide range of microcontrollers and additional sensors (Temp, Light, Proximity, etc).

The Haute Solutions ESP324G in the SMS Relay uses a Simcom SIM7600A chipset to exchange SMS messages for control and reporting. The SIM7600A is designed for use in North American markets. It supports the following communications bands:

- 4G LTE FDD Band B2/B4/B12
- 3G UMTS/HSPA+ B2/B5

Hardware:



- A. Haute Solutions ESP324G (ESP32) Microcontroller Board
- B. Internal Patch Antennas (2)
- C. Haute Solutions Wiring Shield
- D. Power/Relay Circuit Board



- E. Power Indicator Light
- F. 120V Socket (For Device)
- G. Manual On/Off Toggle Switch
- H. Power Supply Socket (For Power Cable)



- I. Speaker Connector (Not Used)
- J. Microphone Connector (Not Used)
- K. Antenna Connector 1 (OPTIONAL – Not Required)
- L. Antenna Connector 2 (OPTIONAL – Not Required)
- M. Pull out tab for optional wall mounting

NOTE: The Haute Solutions ESP324G has all the capabilities of a cellular handset. However the SMS Relay does not use any of the audio or GPS capabilities. (As this device uses Open Source software and hardware, you could always modify the code if you wanted to add these features!)

NOTE: The antenna connections shown in the photo (K & L) are optional, NOT required, and must be manually enabled in order to use them. The 4G SMS Relay utilizes two internal patch antennas for reception. However, if reception is particularly challenging, an external antenna (or two) can be used to help improve signal quality. See the notes in the “*Improving Reception (Upgrading the Internal Antennas)*” section later in this document

Preparing for GSM/Cellular Functionality:

You will need to establish an account with a GSM Carrier and obtain a SIM card. Since the traffic requirements are very low for this device, we recommend a “Pay as you go” type cell service for the device. This device does NOT use any data services – only SMS Text Messaging. There are several Cellular providers which offer a very cost effective “Pay as you go” service without any monthly fee. The SIM7600A chipset in the ESP324G is designed for use in North American markets. It supports the following communications bands:

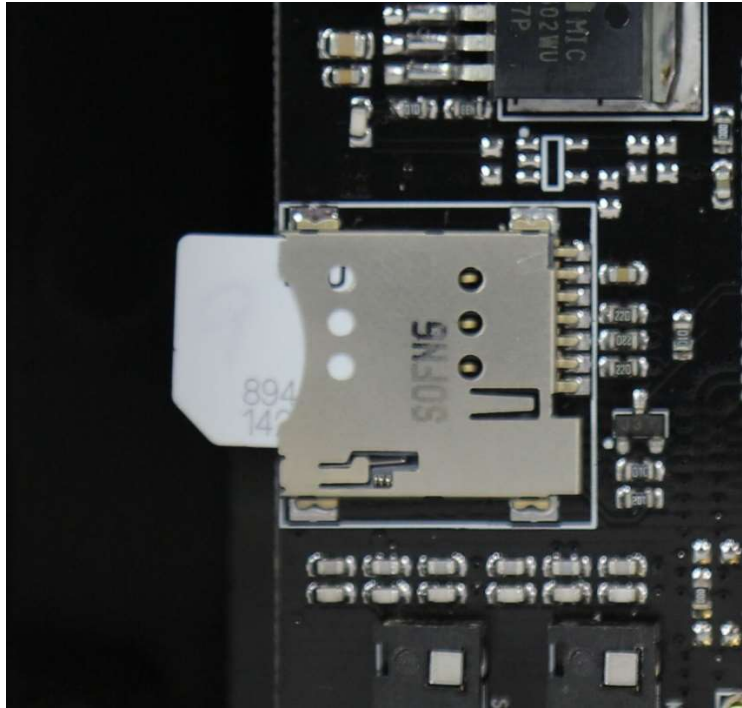
- 4G LTE FDD Band B2/B4/B12
- 3G UMTS/HSPA+ B2/B5

You can obtain a SIM card from any 4G/3G cellular provider. The SMS Relay requires the medium size “Micro” SIM card. Not the larger “Mini” SIM or the smaller “Nano” SIM card (as used by some Apple devices).

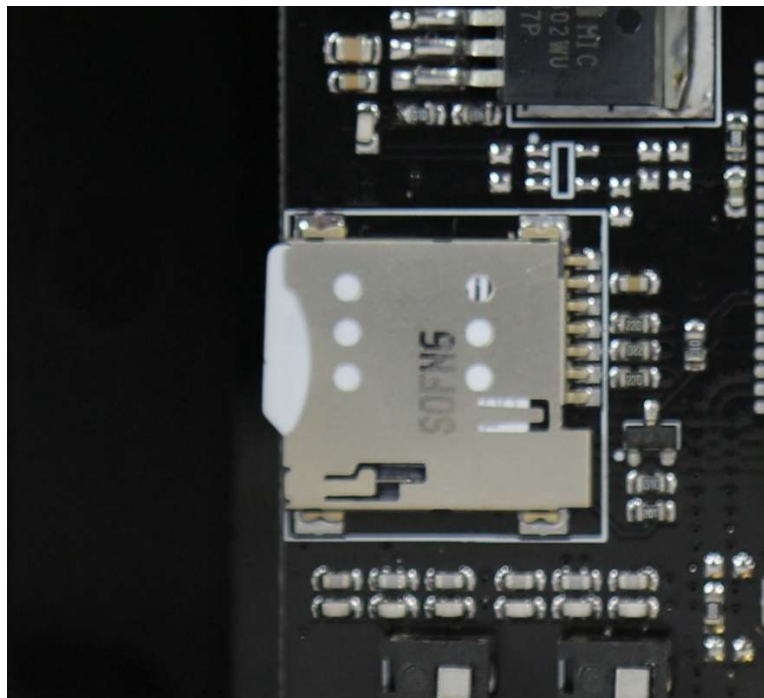
The registration process for each GSM carrier will be slightly different. However, you must register with your provider in order to obtain a SIM card and have a unique phone number associated with your SMS Relay.

If you have an unlocked GSM cell phone, you may wish to temporarily install your SIM card into your phone to ensure that service has been properly established by your provider prior to installing the SIM into the SMS Relay. Send/Receive a few SMS text messages to confirm SIM registration and activation if you have the opportunity to do this.

In order to install/replace the SIM card in the SMS Relay, you will need to remove the cover and carefully insert the SIM card in the proper orientation until it fully “clicks” into the slot. **ALWAYS FULLY DISCONNECT POWER BEFORE OPENING THE COVER OF THE ENCLOSURE.** The photos on the following page illustrate the proper orientation for the SIM card.



Note SIM Orientation Above (Not Fully Inserted)



SIM Fully Inserted

First Time Operation (Security and Authentication):

A password should be established at first operation to ensure only authorized cell phones can send SMS messages to control the device.

1. FULLY DISCONNECT POWER FROM THE ENCLOSURE

2. Remove the cover from the enclosure. (Be careful not to displace any wiring).
3. Insert your SIM card as shown above if not already done so. (You do not need to remove any boards or wires to do this if you are careful. Tweezers or small Needle Nose Pliers are helpful)
4. Reinstall the cover onto the enclosure.
5. Plug in the Enclosure.
6. Once the enclosure is plugged in, the initial power up sequence will begin. The display should report the start-up progress as follows:
 - Device Identification
 - Firmware Information
 - EEPROM Check
 - GSM Initialization (May take a minute or two)
 - GSM Chipset Info
 - SIM Check
 - Time Sync and Display
 - List of Authorized callers (Cell Numbers) – Note that this will be “none” on initial startup
 - Idle (Status) Screen – Note that this will indicate “Waiting for 1st Call!” on initial startup
7. If there is a critical failure during the boot process, you will be shown a “Fatal Error” message to indicate the problem. This could include failure of the GSM Chipset to initialize or a SIM not properly inserted. If “GSM Fails to Initialize”, try removing power from the SMS Relay, waiting a minute, and then plugging it back in. If your SIM Card is “Not Detected”, try reinserting the SIM card (see above).
8. It should be noted that the OLED Display will automatically turn off after 60 seconds of posting a message. This is done to preserve the life of the display. As the device is generally located in a remote area there is little point in keeping the display on for extended periods. It is primarily used for informational and diagnostic purposes. (You can “wake up” the display at any time by pressing Button 1 on the cover).

9. The very first time you start up your SMS Relay (or after a Factory Reset) it will NOT have any registered numbers in the authorized users list. The list of Authorized Callers will indicate “none” and the idle/status screen will say “Waiting for First Call!”. Note that when the device is in this state, the VERY FIRST cell phone to send an SMS will automatically be established as the Master Cell Phone! You want to be that sender!
10. Although any SMS message will work to establish the Master Cell Phone number, you might as well go ahead and set a Master Password as our first message. The Master Password is required so additional users can self-authorize to use the device. So please choose a Master Password for the device. (Only the MASTER Cell Phone can set/change the password).
11. Send a single SMS message to the device to set your desired password. For example, if you have chosen the word “secret” as your password (not a particularly good choice), you would send the following text message to the device: “PWD: secret”. (Note that there is a space between the colon and the actual password – and the quotes should not be included). Passwords are case sensitive.
12. Any time the SMS Relay receives a message it should indicate “SMS In From: {number}”. You should see your “inbound” message arrive shortly after you send it.
13. Any time the SMS Relay processes a command, it should almost immediately send back a reply. You should see an “SMS Out To: {number}” indicated on the display as the response(s) is/are sent out.
14. If you used the “PWD” command as your first command, you should receive TWO SMS response messages. The first will say “Authorized!” since you are the first caller. The second will confirm “Pwd Set!”. Since this is the very first time your SIM card has been deployed on the network, you may have to wait several minutes for the initial response(s) to come back.
15. If you do not get a response back within 5 minutes, you may want to unplug the device and start over. The device can also be Factory Reset as described below if you think it might be necessary. If a Factory Reset doesn’t resolve an initial communication issue, you may also want to use an “unlocked” 3G/4G GSM cell phone to confirm your SIM and cellular account/number has been properly provisioned.
16. Sometimes your cellular provider may send one or more “welcome” SMS messages when your SIM card first connects to the network. If this happens before you have a chance to register your cell phone, you would see the associated “SMS In From: {number}” message on the display. The Idle/Status screen will also now change to show the time and signal strength (as it just authorized your cellular provider!). Simply Factory RESET the device to start over and de-authorize your carrier. (Factory Reset method described below)

17. When the device is connected to the GSM Network, with at least one cell phone authorized, and operating normally, operating status should be reflected by the idle/status screen as follows:

Haute Solutions
SMS Relay 4/5

...where "4/5" (4 "bars" out of 5) would be replaced with your actual signal strength. If you are outside an area of signal reception. The display would indicate:

Poor Signal
No Service

In case of the above, you may want to try repositioning the device. You can do this while it is plugged in (it's a "Non-Fatal" error). If you are unable to obtain a suitable signal using the included antenna, you may want to consider a larger "3G/4G" GSM external/extension antenna (with "SMA" Connector) to improve your reception.

18. Once the Master Cell Phone has set a password, then other cell phones which authenticate to the device will automatically be added as an authorized caller. Up to 20 cell phones can be authorized (including the Master Cell Phone). In order to authorize a cell phone, simply send the password as a single word SMS message ("secret" in our example). The Master Cell Phone can send a command to Factory Reset the device at any time to clear the list of authorized callers (inc the Master Caller) and start over. The device can also be factory reset physically using Button Number 4 on the front cover.
19. Plug in the electrical device to be controlled.
20. Send an SMS "STATUS" message to the device to confirm it is operating properly. You should get an SMS reply which states the current time, device status (on/off), info indicating whether any on or off events have been scheduled, and the signal quality.
21. Send an SMS "ON" message to turn ON the device connected to the SMS Relay. Power should be supplied to the connected device and you should receive a "Status" message which indicates the same.
22. Send an SMS "OFF" message to turn OFF the device connected to the SMS Relay. Power should be removed from the connected device and you should receive a "Status" message which indicates the same.

Congratulations! Your SMS Relay is now set up and its operation has been confirmed!

How to Factory Reset the SMS Relay:

There are two methods which can be used to Factory Reset the device. A Factory Reset will clear all users (numbers) from the authorization list (including the Master Cell Phone). It will also clear the Authorization Password on the device. The device will effectively be in the same state as it was initially received.

- **Remote Reset:** If the Master Cell Phone has SMS connectivity with the device, you may simply issue the "RESET" SMS command to Factory Reset the Device.
- **Physical Reset:** If you have physical access to the device, you can press Button Number 4 and hold it for 5 seconds. A countdown will be displayed during this process.

Manual Control:

On/Off Switch:

You can manually control the status of the connected device by using the momentary toggle switch located on the side (bottom) of the unit. The momentary switch TOGGLES the status of the device. If the device is OFF, and you press the manual toggle switch, the device will be turned ON. Conversely, you can also turn OFF a device by using the manual toggle switch. You should only need to tap the switch (not hold it) to toggle the state of the relay. The power indication lamp on the side (bottom) of the unit will reflect the state of the device (ON or OFF).

Button 1: Wake Display

Wake up the display when it is turned off (sleeping). This will display the idle/status screen (Device Name, Number (if configured), and signal strength)

Button 2: Display Schedule

This will display any scheduled ON or OFF events.

Button 3: Display Authorized Callers

This will display a list of Authorized Callers (numbers)

Button 4: Factory Reset

Holding this button for 5 seconds will perform a Factory Reset. A notification and countdown will be displayed.

Operational Commands:

The device has several simple commands to control operation. All commands will send back an SMS status message to help confirm that the command was received and properly implemented. The following commands are supported by the device:

STATUS

Requests an SMS Status reply which indicates the current time, device status (ON/OFF), if any ON or OFF events are scheduled, and the signal quality.

ON

Turns the device ON immediately. A STATUS reply will be returned.

OFF

Turns the device OFF immediately. A STATUS reply will be returned.

ON @ YY/MM/DD,HH:MM

Schedules a time for the device to turn on: Time format is YY/MM/DD,HH:MM and is in 24 hr format. The command to schedule the device to turn on at May 20th 2021 at 2:35 PM would be sent as: "ON @ 21/05/20,14:35". A STATUS reply will be returned.

OFF @ YY/MM/DD,HH:MM

Schedules a time for the device to turn off: Time format is YY/MM/DD,HH:MM and is in 24 hr format. The command to schedule the device to turn off at May 21st 2021 at 8:30 AM would be sent as: "OFF @ 21/05/21,08:30". A STATUS reply will be returned.

{password}

Additional callers can "self-authorize" themselves as long as they know the device password. Callers can self-authorize by simply sending the password as a single word SMS message. In order to authorize a new cell phone, with the password set as "secret", simply send the SMS message "secret" (no quotes). You will get back a reply which states "Authorized!"

In the event that an unrecognized (malformed) SMS command is sent to the device by an authorized caller, a reply of "What?" will be returned to that caller.

Scheduled Event Notifications: Besides the standard SMS confirmation reply when a command is issued, a confirmation SMS message will also be sent to the scheduler's cell phone when a scheduled event actually occurs.

Unauthorized Caller Notification: If the device receives ANY message (other than "PWD") from ANY unauthorized caller, the contents of that message will be forwarded to the Master Caller along with the number of the sender. This will effectively forward any text messages from your cellular provider if they

send them to the device. This may be helpful if your cellular provider is trying to send you a message (maybe your pay-as-you-go account is low on funds?). It may also prove useful to see if someone is trying to gain unauthorized access.

Notes on Power Outages (or unplugging the device): The password, list of authorized callers, and scheduled events are stored in non-volatile memory and will remain in effect if the device is turned off (or Factory Reset). However, if a scheduled event is timed to trigger when the SMS Power Control is unplugged or without power, the event will NOT be processed when power returns, but will automatically be discarded.

Configuration Commands:

The device has several simple commands to allow extended configuration. Only the Master Cell Phone (first caller) can issue Configuration Commands. The following Configuration Commands are supported by the device:

PWD: {password}

Set the device password so addition cell phones (users) can operate the device. Up to 20 cell phones can be authorized (including the Master Cell Phone). To set the Password “secret”, the following command would be sent: “PWD: secret”. (Note the space between the colon and the password). You will get back a reply which states “PWD Set!”).

RESET

This command will Factory Reset the device. A Factory Reset will clear all users (numbers) from the authorization list (including the Master Cell Phone). It will also clear the Authorization Password

REBOOT

This command will cause the device to reboot. (Troubleshooting)

AUTHLIST

Request a listing of all Authorized Callers registered on the device. (Only the Master Caller can issue this command as it could expose sensitive information).

DEVNUM: {cell number}

This command will change the Idle/Status display such that the specified phone number will be shown. (Not all SIM cards have their actual phone number embedded). This is helpful if you want to be able to see the device’s phone number on the display itself. The default display (without DEVNUM being set) would look like:

**Haute Solutions
SMS Relay 4/5**

Once you issue the DEVNUM Command (i.e. “DEVNUM: 555-123-4567”), the Idle/Status screen would change to:

**SMS Relay 4/5
555-123-4567**

This change will remain in effect until a Factory Reset

HBTIME: {DD,HH:MM}

This command will change (or disable) the monthly “Heartbeat” message sent by the device to the Master Caller. The monthly heartbeat will not only help keep your cellular service alive, it will also give you regular assurance that the device is up and functioning properly. Many cellular providers will automatically de-provision a cellular account if they believe it isn’t in use any longer. This is particularly true for “Pay-as-you-go” accounts.

The format for the time specified to the HBTIME command is “DD,HH:MM”. By default, it is factory set to “01,12:00” and you will get a “Heartbeat” message on the first day of every month at 12:00 noon (local to the SMS Relay). You may alter this day and time to your choosing. You may also completely disable the monthly heartbeat message (not recommended) by simply leaving the field blank (i.e. “HBTIME: “).

BOOTNOTIFY: {ON | OFF}

This command will allow you to turn on/off the status message which will automatically be sent any time the SMS Relay is booted. This status is helpful to ensure the device is working properly and also will notify you if a power outage has caused it to reboot. The Factory default has this feature enabled. You may turn off the notification by issuing “BOOTNOTIFY: OFF” and enable it with “BOOTNOTIFY: ON”.

POLLSMS: {ON | OFF}

By default POLLSMS is enabled on the SMS Relay. The POLLSMS command is generally only used with high speed devices which use the SMSDEV library (Our SleeperCell or SuperCell alarms for example). While polling the GSM chip for SMS messages is generally more reliable it is also time consuming (in microcontroller time). It is much faster to simply ask the GSM Chip to notify us if/when an SMS message arrives. This setting is generally used for diagnostic purposes and it is highly recommended that you do not disable it unless directed to do so by tech support.

CFGINFO

This command will request a report of the current system configuration. While the STATUS command reports more dynamic properties (like the state of the device), CFGINFO reports information which remains relatively static. The reply will include settings for DEVNUM, HBTIME, BOOTNOTIFY, and POLLSMS. An additional field, DEVNAME, will also be reported. But it is not used for the SMS Relay. (You can set it via a “DEVNAME: {name}” command but it serves no particular use for this device).

Diagnostic Commands:

The device has several simple commands to return more detailed information regarding its operational status. The following Diagnostic Commands are supported by the device:

SIMINFO

This command will return information about your SIM card. This includes ICCID, IMSI, Service Provider, and Subscriber Number (if encoded).

HWINFO

This command will return information about the GSM hardware in the SMS Relay. This includes the GSM Chipset and its IMEI.

CELLINFO

This command will return information about the cellular connection with which you are connected. This includes the Band, Signal Quality, Network Operator, Network Mode, and Service Center.

OPERATORS

This command will return a list of the cellular operators offering service from the cell tower to which you are currently connected. Note that this command may take some time to complete or even fail completely.

Improving Reception (Upgrading the Internal Antennas):

The 4G SMS Relay utilizes two internal 3G/4G Patch antennas for reception. Just like a cell phone, it normally should not require any external antennas. However, if desired, it is possible to configure the SMS Relay to use external antennas in situations where signal reception might be more challenging. This includes larger antennas mounted directly to the external SMA threaded connectors as well as remotely located antennas.

Two jumper cables (provided) are required to route signals between the onboard female SMA Threaded Barrel connectors and the associated U.FL (IPEX) connections on the PCB. Normally, the two internal patch antennas are connected directly to “4G Main” (J12) and “4G Aux” (J16) on the PCB.

In order to use external antennas, the internal antennas must be disconnected from these U.FL (IPEX) snap connectors and the jumper cables used to route signals to/from the threaded SMA connectors:

1. Carefully unsnap internal patch antennas from “4G Main” (J12) and “4G Aux” (J16)
2. Carefully snap one of the included jumper cables between SMA connector J17 and J12 (4G Main)
3. Carefully snap the other included jumper cable between SMA connector J13 and J16 (4G Aux)

Note that 4G typically uses TWO identical antennas for optimum reception. When sourcing alternate antennas be sure to select for 3G/4G compatibility as required and terminating in an “SMA Male” connector (**NOT** “RP-SMA Male”)

Advanced Operation (Programming and Modification):

Programming the SMS Relay:

Although programming it is not required, advanced users may wish to modify the capabilities or behavior of the device. This is easily supported, even encouraged, and the code has been made publicly available for download and modification. If you come up with an interesting modification, please upload the code so that other users may take advantage of the enhancements!

SOFTWARE Installation (Arduino IDE and GSM Library):

1. Download the latest Arduino development environment (*.EXE):
<http://arduino.cc/en/Main/Software>
2. Install the Arduino Development Environment (*.EXE)
3. Add ESP32 support to the Arduino IDE. Detailed information can be found here:
<https://www.makerguides.com/how-to-install-the-esp32-arduino-core-in-the-arduino/>
4. Download the latest "SMSDEV", "GSMSMS", and "OLED_SSD1311" Libraries from the Haute Solutions web site (*.ZIP): <http://www.haute-solutions.com/software.html>
5. Extract the contents of each library archive (*.ZIP) to your "Documents\Arduino\Libraries" folder. You should have a folder named the same as the first part of each associated ZIP archive for EACH library. (Every Arduino library MUST be located in its own dedicated folder under "Documents\Arduino\Libraries").
6. Download the latest OLED Relay firmware (OLEDRELAY.ZIP) from the Haute Solutions Web Site:
<http://www.haute-solutions.com/software.html>

(Note that there are two versions of the SMS Relay. The older version, without OLED display, uses firmware found in SMSRELAY.ZIP)
7. Create a folder named "OLEDRelay" under "Documents\Arduino".
8. Extract the contents of the OLEDRELAY.ZIP archive to the "Documents\Arduino\OLEDRelay" folder you just created. (Every Arduino sketch/program (*.ino) MUST be located in its own dedicated folder which has the EXACT same name as the sketch itself).
9. Double click on the OLEDRELAY.INO file which was just extracted and it should load automatically into the Arduino Development Environment
10. Open the Tools Menu in the Arduino Development Environment, select the "Board" option, and choose "ESP32 Dev Module".

11. Click on the VERIFY toolbar icon (check button) in the Arduino IDE and confirm that the program will compile properly
12. If the program does NOT Verify (compile) properly check to ensure all libraries identified in Step 3 (above) are properly installed (as indicated in Step 4).
13. If the program Verifies (compiles) without error, all software, libraries, and code should now be properly installed!

Programming the HARDWARE (ESP324G):

1. You must remove the ESP324G from the enclosure (or tilt it up slightly) in order to access the mini USB connector for programming. **ALWAYS FULLY DISCONNECT POWER BEFORE OPENING THE COVER OF THE ENCLOSURE!** Note that there are two USB connectors on the ESP324G. The micro USB connector on the side is used to upgrade the firmware on the GSM chip. The micro USB connector on the back of the board (opposite the antenna connectors) will be used to program the SMS Relay Firmware onto the ESP324G.
2. Ensure that the enclosure is unplugged before removing the ESP324G.
3. Unplug any device plugged into the SMS Relay.
4. Unscrew the antenna from the enclosure.
5. Remove the cover from the enclosure. (Be careful not to displace any of the wires).
6. You DO NOT need to detach the Wiring Shield from the ESP324G.
7. Remove the four screws at the corners of the ESP324G.
8. You can tip the back end of the ESP324G up and out of the enclosure without removing any of the power/control wires if you are careful. You can set the ESP324G lengthwise across the top edge of the enclosure for support without disconnecting any wires.
9. Although NOT recommended, if you choose to detach the wires, carefully note the location of where each wire is attached to the boards. A photo might be helpful if you need to document the connections of the wires. Note that there are multiple green wires and black wires. Don't get them mixed up!
10. DO NOT attach the USB programming cable to the ESP324G yet...
11. Open up the Arduino Development Environment if not already open. Go to the TOOLS menu and open the PORT option. Note the COM ports currently visible to your system (if any).

12. Now attach a “micro” USB cable between your PC and the ESP324G.
13. If your computer asks for a USB driver, you should point it to the "C:\Program Files (x86)\Arduino\drivers" folder. Ensure the driver search is set to include sub-folders as well...
14. Go back to the Arduino Development Environment, open the TOOLS menu, and select the PORT option. You should now see a **new/additional** COM port listed. This should be the COM your ESP324G is using. Select the new COM port.
15. Load the OLEDRelay.INO project into the Arduino IDE (if not already done so).
16. Under TOOLS menu, set the BOARD type to "ESP32 Dev Module" (if not already done so).
17. Click on the UPLOAD toolbar icon (right arrow button) in the Arduino IDE and confirm that the program compiles and uploads properly.
18. If the UPLOAD function does NOT work properly, check the following items:
 - Is the USB Driver installed properly? (Any USB devices NOT being loaded properly in your hardware manager?)
 - Does the COM Port selected in the IDE properly correspond to the USB port being used by the ESP324G?
 - Is the board properly selected in the IDE ("ESP32 Dev Module")
 - Are all the libraries properly installed
19. If the UPLOAD function works properly, then all the software was properly installed, all the HARDWARE was properly attached, and all the configuration settings were successful! You can now modify the source code and program the device as you wish!
20. Reinstall the ESP324G into the enclosure, replace the cover, and re-attach the antenna.