

SMS Power Controller



User Documentation

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(Firmware 5.2)

www.haute-solutions.com

SMS Power Controller Introduction:

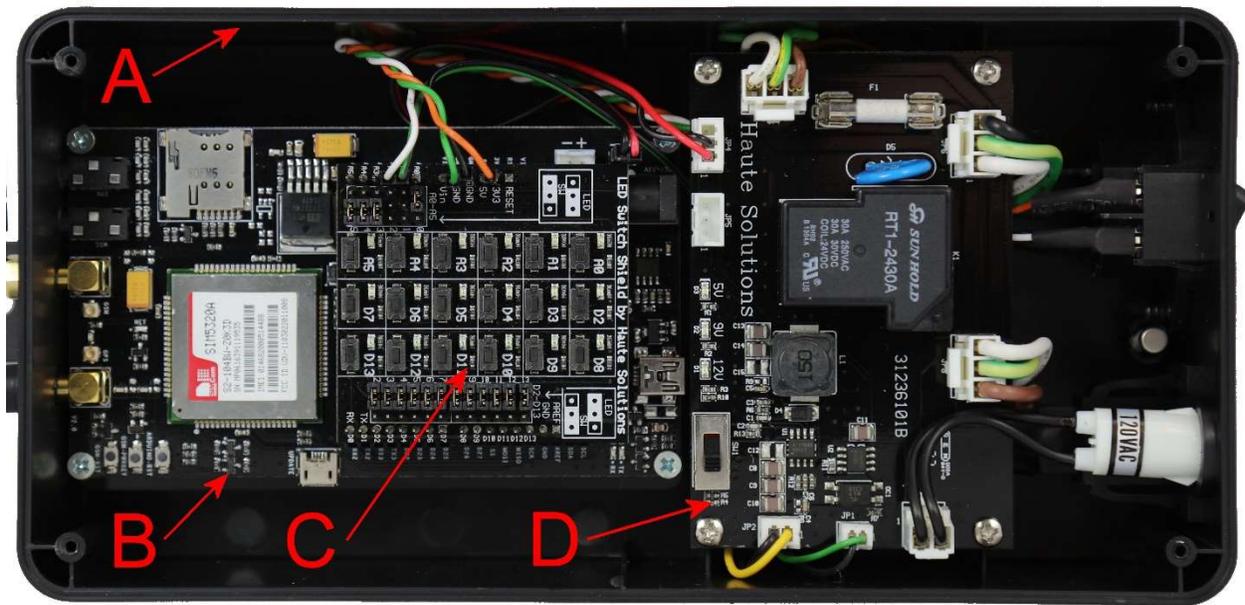
The SMS Power Controller can be used to remotely control, or schedule, power to a connected 120V appliance or circuit from virtually anywhere in the world!

- 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 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)
- Built-in 120V / 20A outlet and relay
- Table-top or wall-mount use
- Simple, easy to use, security prevents unauthorized access or control
- Up to 10 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).

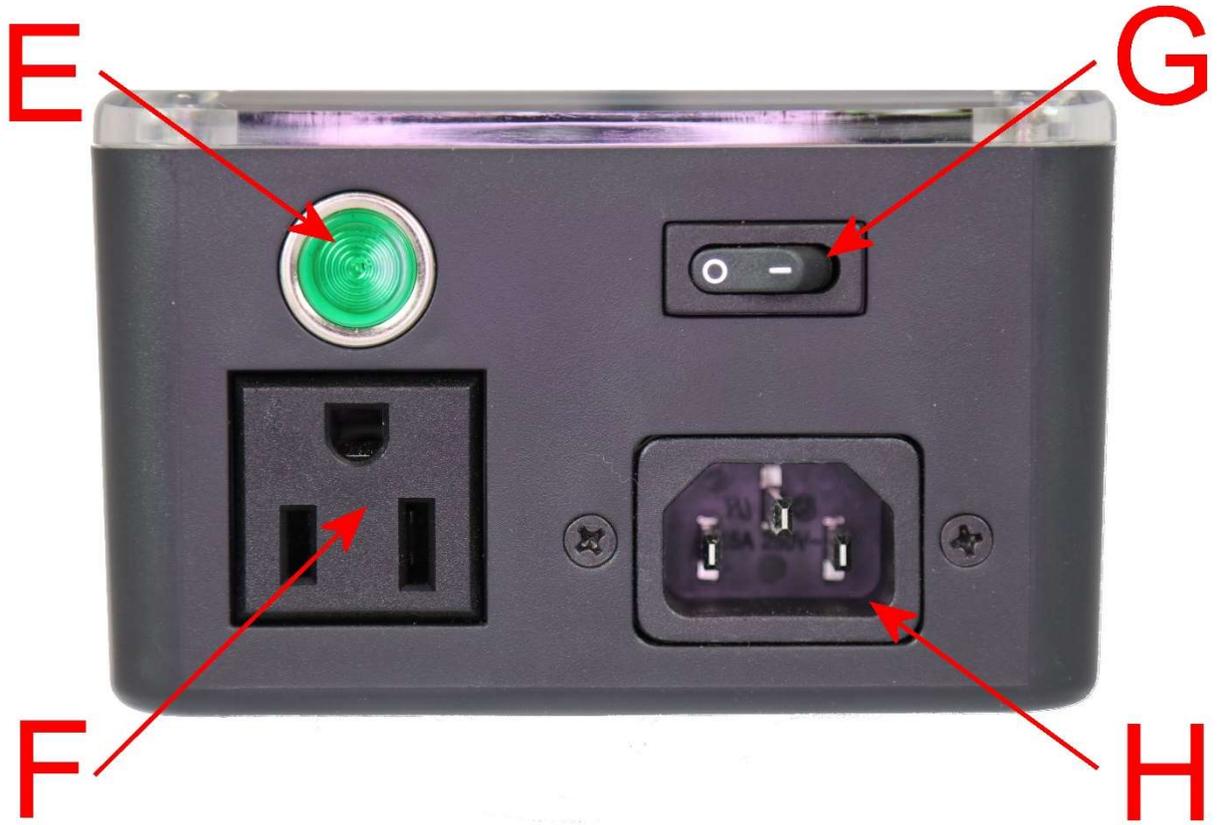
The Haute Solutions MeGGaBoard 3G in the SMS Relay uses a Simcom SIM5320A chipset to exchange SMS messages for control and reporting. The SIM5320A is a Quad-Band chipset designed for use in North American markets. It has the following communications capabilities:

- Supported Frequencies: 850/900/1800/1900
- Supported Protocols: EGSM/DCSI/PCSI/WDCMA/HSPDA

Hardware:



- A. Enclosure
- B. Haute Solutions MeGGaBoard 3G (Arduino Mega2560 Compatible) Microcontroller Board
- C. Haute Solutions LED Switch Shield
- D. Power/Relay Circuit Board

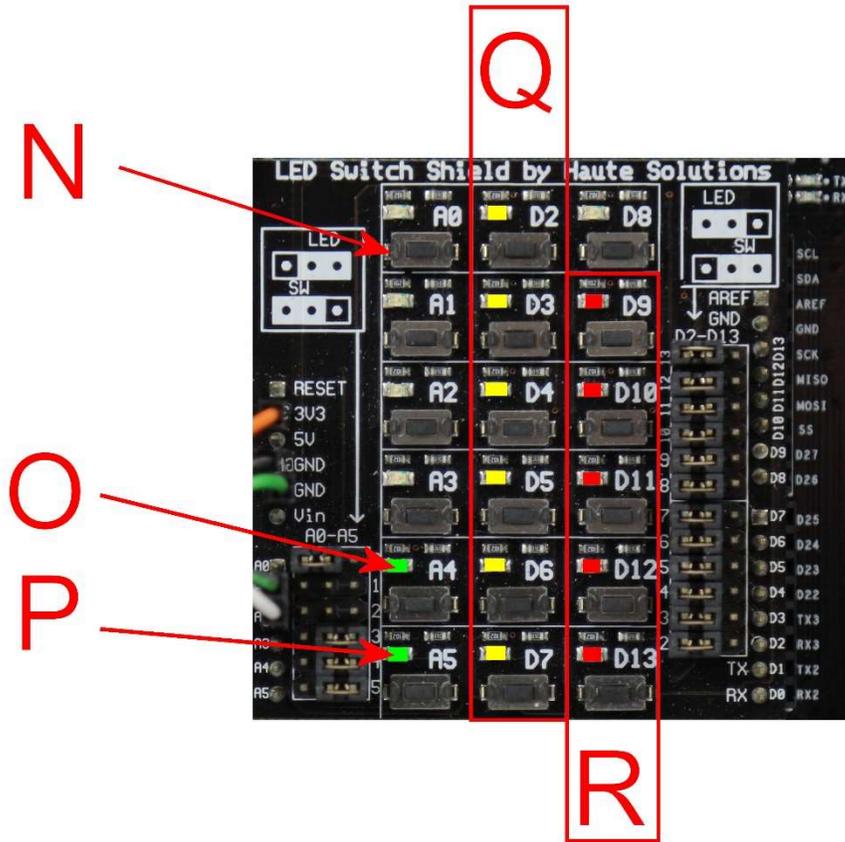


- E. Power Indicator Light
- F. 120V Socket (For Device)
- G. Manual On/Off Toggle Switch
- H. Power Supply Socket (For Power Cable)



- I. Speaker Connector (Not Used)
- J. Microphone Connector (Not Used)
- K. GSM/Cellular Antenna
- L. Pull out tab for optional wall mounting
- M. GPS Antenna Connector (Not Used)

NOTE: The Haute Solutions MeGGaBoard 3G 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!)



- N. Factory Reset Button (A0)
- O. READY LED (A4) (ON = Device is READY, OFF = Not Ready, FLASH = Waiting for Initial Setup)
- P. GSM Status LED (A5) (ON = Connected to Network, OFF = Not Connected, FLASH = No SIM)
- Q. SMS Inbound (D7-> D2) / Outbound (D2 -> D7) Indication Sequential LED's
- R. Signal Strength (0-5) LED's (D13 -> D9))

Note: Functionality of these LED's and switch is described in more detail later in this documentation

INBOUND MESSAGE:

**LEDs Sequence
FROM
Antenna**



(Antenna This Side)

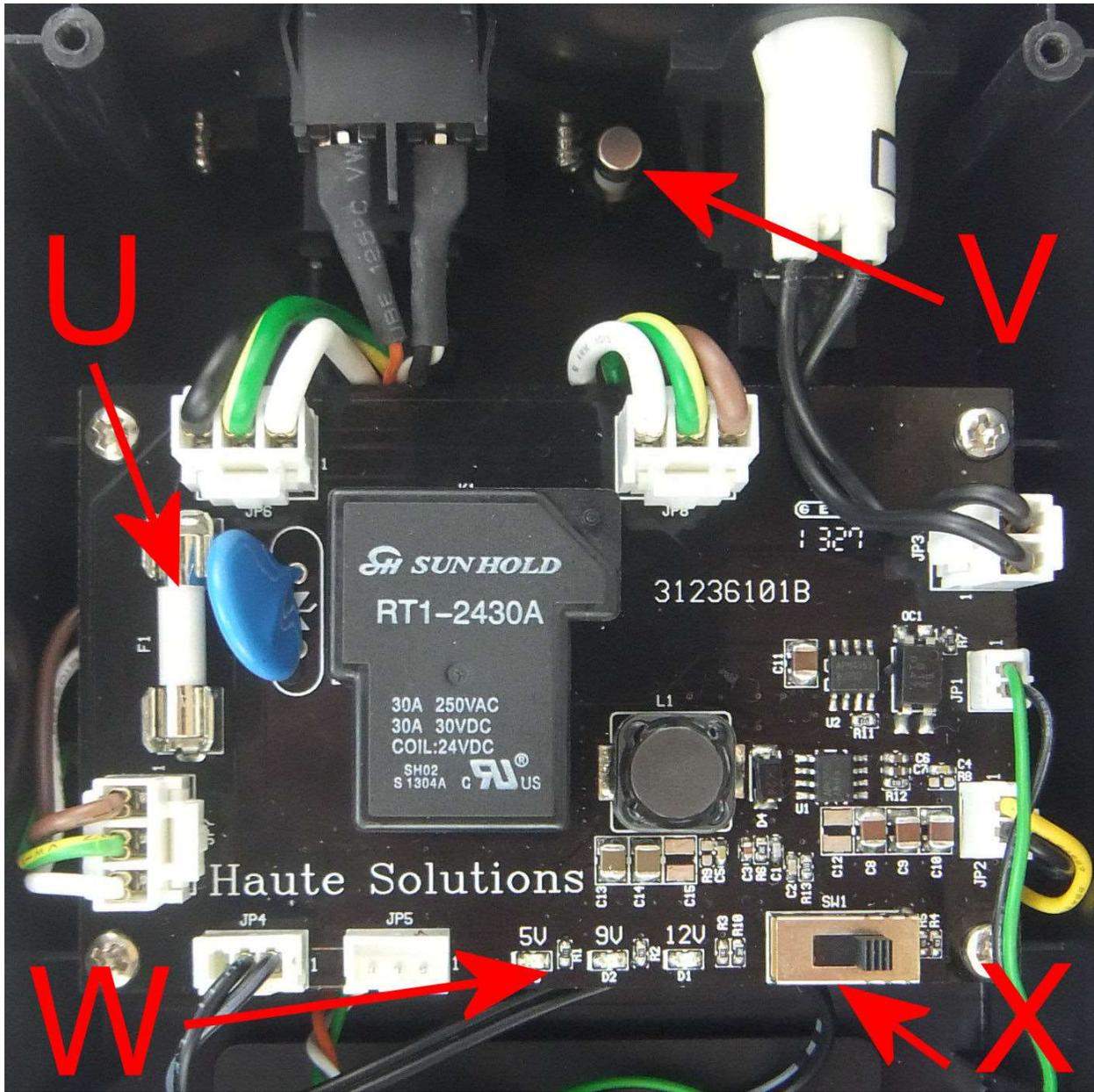
OUTBOUND MESSAGE:

**LEDs Sequence
TOWARDS
Antenna**



(Antenna This Side)

Note that Inbound/Outbound SMS Message Indication is relative to the location of the Antenna on the enclosure. INBOUND Messages sequence the LEDs away from the antenna. OUTBOUND Messages sequence the LED's towards the antenna.



- S. Fuse
- T. Fuse (Spare)
- U. 5V-9V-12V power indication LED (12V LED should be illuminated)
- V. 5V-9V-12V microcontroller power selector switch (Should be set to 12V)

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 SIM5320A based MeGGaBoard 3G is a Quad Band 3G GSM/WCDMA/HSPA device optimized for use in North America. It has the following communications capabilities:

- Supported Frequencies: 850/900/1800/1900
- Supported Protocols: EGSM/DCSI/PCSI/WDCMA/HSPDA

You can obtain a SIM card from any 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).

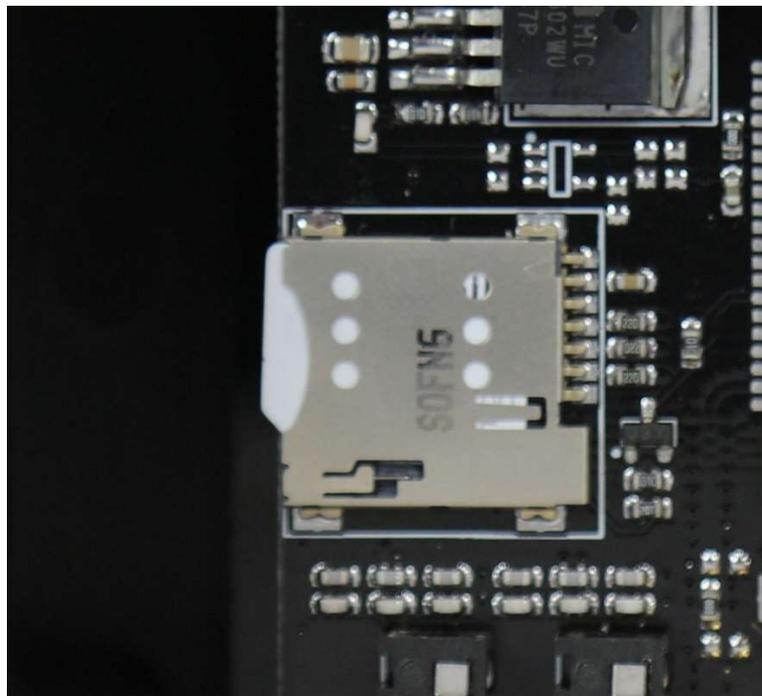
The registration process for each GSM carrier will be slightly different. However, you must register with your provider in order to obtain a SIM card and have a unique phone number associated with your SMS Relay.

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 clear cover and carefully insert the SIM card in the proper orientation until it fully “clicks” into the slot. 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. Remove the clear cover from the enclosure
2. Insert your SIM card as shown above if not already done so.
3. Reinstall the clear cover onto the enclosure.
4. Plug in the Enclosure. (Ensure that the 12V power LED is illuminated on the power supply circuit board). Be very careful as 120V power is now operating inside the enclosure.
5. Once the enclosure is plugged in, the initial power up sequence will begin.
6. Once the device has connected to the GSM network, the Green GSM Status LED will illuminate. (Identified as "Q" in our LED Switch Shield photo and "A5" on the board itself). It may take several minutes to register on the network if this is the first time you have used your new SIM card. Otherwise it should connect to the cellular network in 30-60 seconds (just like your cell phone). If the GSM Status LED is flashing then the SIM card is not fully inserted or inserted incorrectly!
7. Once your device connects to the cellular network, you should see the associated signal strength (1-5) on the Signal Strength LED's. (Identified as "S" in our LED Switch Shield photo and "D13 – D9" on the board itself). 3 LED's illuminated is even a very strong signal!
8. The very first time you start up your SMS Relay (or after a Factory Reset) it will NOT have any registered callers in the authorized users list. The READY LED should be flashing to indicate that no callers are registered. (Identified as "O" in our LED Switch Shield photo and "A4" on the board itself). 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!
9. Although **any** SMS message will work to establish the Master Cell Phone number, we might as well go ahead and set a Master Password as our first message. The Master Password will be important so other 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).
10. Send a single SMS message to the device 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).
11. Wait for an SMS reply to be sent back from the SMS Power Relay to your cell phone. You should see two messages "Authenticated!" and "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 responses to come back.

12. 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.
13. Sometimes the cell phone network may send one or more “welcome” SMS messages when your SIM card connects to the network for the very first time. If this happens before you have a chance to register your cell phone, you would see the READY LED stop flashing and turn on solid. (The READY LED is identified as “O” in our LED Switch Shield photo and “A4” on the board itself). When this LED turns on steady, it indicates that at least one caller has been authenticated. If this wasn’t you, then you may have received a “welcome message” from your cellular provider. Simply Factory RESET the device to start over and de-authorize your carrier. (Factory Reset method described below)
14. When the device is connected to the GSM Network, with at least one cell phone authenticated, and operating properly, normal operating status should be reflected by the onboard LED’s as follows:
 - GSM Status LED (A5) (On)
 - Signal Strength (1-5) LED’s (D13 -> D9)
 - READY LED (A4) (ON)
15. 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 10 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 user can Factory Reset the device at any time to clear the list of authorized callers (inc the Master Caller) and start over.
16. Plug in the electrical device to be controlled.
17. 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.

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.

- **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 may remove the cover and hold down the "Factory Reset" button on the LED Switch Shield for one second. (The Factory Reset button is identified as "N" in our LED Switch Shield photo and "A0" on the board itself. Resetting the device clears all security information and prepares it for first time use.

General Operation:

SMS Commands:

The device has several simple commands to control operation. As implemented, most commands will send back an SMS status message to help confirm that the command was received and properly implemented. (It is possible to turn off this reply in the firmware to save text messaging costs, but it is highly recommended as a valuable confirmation). 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 2013 at 2:35 PM would be sent as: "ON @ 13/05/20,14:35". 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 2013 at 8:30 AM would be sent as: "OFF @ 13/05/21,08:30". A STATUS reply will be returned.

AUTHLIST

Request a listing of all Authorized Callers registered on the device. Only the Master Cell Phone (first caller) can request a list of Authorized Callers.

PWD: {password}

Set the device password so addition cell phones (users) can operate the device. Up to 10 cell phones can be authorized (including the Master Cell Phone). Only the Master Cell Phone (first caller) can set the password. 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!"

{password}

Once a password has been set on the device (by the Master Cell Phone), other cell phones can be added to the authorized users list by simply sending the password as a

single work SMS message. Up to 10 cell phones can be authorized. In order to authorize a new cell phone, with the password set as “secret”, simply send the SMS message “secret”. You will get back a reply which states “Authorized!”

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. Only the Master Cell Phone (first caller) can issue the RESET command.

In the event that an SMS command is sent to the device which is not understood, a reply of “What?” will be returned.

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 the scheduled event actually occurs.

Unauthorized Caller Notification: If an unauthorized caller sends a text message to your device, it will automatically be forwarded to all users in the authorized list. 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. 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 cleared instead.

Diagnostic LEDs:

The LED's on the LED Switch Shield can be used to determine the state of the device.

A0 = Reset Switch: This is the FACTORY RESET switch which you can use to reset all the factory settings and clear your SMS notification/authorization list

A4 = READY LED (ON = READY, OFF = Not Ready Yet, FLASH = Waiting for initial configuration/first caller): This LED will flash until you register your primary cell phone with the device. Once you have at least one phone registered/authorized, it will stay continuously lit.

A5 = GSM Status LED (ON = Connected, OFF = Not Connected, FLASH = No SIM Detected): This LED will illuminate when your device is registered on the cellular network. If it's not lit, then there is no cellular connectivity. If its flashing, then a SIM is not inserted or inserted incorrectly.

D2-D7 = SMS Indication: Indicates when an SMS message comes in or goes out:

- D7-D2 Sequence (lights move Away from Antenna) = Inbound SMS
- D2-D7 Sequence (lights move Towards Antenna) = Outbound SMS

D9-D13 = GSM Signal Strength (More LED's lit = better signal): These five LEDs are used to indicate the current cellular signal strength.

Once you have called in the first time to set your master cell number, you would want to see the following LED activity.

- A5 (GSM LED) should be constantly lit indicating cellular connection
- A4 (READY LED) should be constantly lit to indicate you have at least one cell phone authorized/registered for command/control
- D9-D13 should be lit to indicate current signal strength. One is OK, but more is better. Three is actually pretty good!
- LEDs will sequence D7->D2 (away from antenna) when an SMS message is received
- LEDs will sequence D2->D7 (towards antenna) when an SMS message is being sent

Manual Control:

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 toggle 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. Press the switch for about 1 second 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).

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. Download the latest "GSMSMS" Library from the Haute Solutions web site (*.ZIP):
<http://www.haute-solutions.com/software.html>
4. Extract the contents of the GSMSMS library archive (GSMSMS.ZIP) to your "Documents\Arduino\Libraries" folder. You should have a folder named GSMSMS with at least two files in it (GSMSMS.CPP and GSMSMS.h). (Every Arduino library MUST be located in its own dedicated folder under "Documents\Arduino\Libraries").
5. Download the latest "LEDSwitchShield" Library from the Haute Solutions web site (*.ZIP):
<http://www.haute-solutions.com/software.html>
6. Extract the contents of the LEDSwitchShield library archive (LEDSwitchShield.ZIP) to your "Documents\Arduino\Libraries" folder. You should have a folder named LEDSwitchShield with at least two files in it (LEDSwitchShield.CPP and LEDSwitchShield.h). (Every Arduino library MUST be located in its own dedicated folder under "Documents\Arduino\Libraries").
7. Download the latest SMS Relay Software (SMSRELAY.ZIP) from the Haute Solutions Web Site
Download the latest "GSMSMS" Library from the Haute Solutions web site (*.ZIP):
<http://www.haute-solutions.com/software.html>
8. Create a folder named "SMSRelay" under "Documents\Arduino".
9. Extract the contents of the SMSRELAY.ZIP archive to the "Documents\Arduino\SMSRelay" 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).
10. Double click on the SMSRELAY.INO file which was just extracted and it should load automatically into the Arduino Development Environment

11. Open the Tools Menu in the Arduino Development Environment, select the “Board” option, and choose “Arduino/Genuine Mega or Mega 2560”.
12. Click on the VERIFY toolbar icon (check button) in the Arduino IDE and confirm that the program will compile properly
13. If the program does NOT Verify (compile) properly check to ensure the GSMSMS library is properly installed
14. If the program Verifies (compiles) without error, all software, libraries, and code should now be properly installed!

Programming the HARDWARE (MeGGaBoard 3G):

1. You must remove the MeGGaBoard 3G from the enclosure in order to access the mini USB connector for programming. Note that there are two USB connectors on the MeGGaBoard. The smaller (micro) connector is used to upgrade the firmware on the GSM chip. The larger (mini) USB connector will be used to program the SMS Relay Firmware onto the MeGGaBoard.
2. Ensure that the enclosure is unplugged before removing the MeGGaBoard.
3. Unplug any device plugged into the SMS Relay.
4. Unscrew the antenna from the enclosure.
5. Remove the cover from the enclosure.
6. You DO NOT need to detach the LED Switch Shield from the MeGGaBoard.
7. Remove the four screws at the corners of the MeGGaBoard.
8. You can tip the back end of the MeGGaBoard up and out of the enclosure without removing any of the power/control wires if you are careful. You can set the MeGGaBoard 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 cable to the MeGGaBoard 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 "mini" USB cable between your PC and the MeGGaBoard.
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 MeGGaBoard is using. Select the new COM port.
15. Load the SMSRELAY.INO project into the Arduino IDE (if not already done so).
16. Under TOOLS menu, set the BOARD type to "Arduino/Genuine Mega or Mega 2560" (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 MeGGaBoard?
 - Is the board properly selected in the IDE ("Arduino/Genuine Mega or Mega 2560")
 - Is the GSMSMS Library properly installed
19. If the UPLOAD function works properly, then all the software was properly installed, all the HARDWARE properly attached, and all the configuration settings successful! You can now modify the source code and program the device as you wish!
20. Reinstall the MeGGaBoard into the enclosure, replace the cover, and re-attach the antenna.