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Nubitek Email

First Steps

Quick Reference Guide

Nubitek Email v1.5

First steps. Quick Reference Guide.

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1. Introduction

This first steps guide will help you quickly start using the Nubitek Email library. You will be shown how to begin sending emails from your S7-200 in only a few minutes.

Intended audience
- S7-200 developers that want to begin using the Nubitek Email library to send emails.
- Automation clients who are not experts S7-200 development, yet want to see how simple it is to use the Nubitek Email library.

Structure of the document

Chapters 2 and 3 provide hardware requirements for the use of the library and explain how to connect the equipment.

Chapters 4 and 5 explain how to prepare the Step-7 MicroWIN software development environment for the use of the Nubitek Email library.

Chapter 6 explains step-by-step how to send an email from your S7-200 PLC using Nubitek Email.

Appendix 1 is the basic reference for the Nubitek Email library and offers a description of the library's functions.

Appendix 2 provides additional information concerning the key required for the use of the Nubitek Email library.

Notations used in this guide

This document uses differences in print to identify the type of text, as shown in the following table:

Print	Use and examples
Italics	Menu options Example: *File -> Add or remove library*
Bold	Important notifications for the reader. Example: **Attention**
`Monospaced`	File names and directory paths. Example: `nubitek_email_v1.5.mwl`
	Text referring to program code. Example: `VB2000 "david@gmail.com"`

2. Required Equipment

The following hardware is required to use the Nubitek Email library:

- A S7-200 CPU. (CPU 224, version xxx23, firmware 2.0 or higher)
- A TC65 GSM/GPRS modem, firmware 2.0, with antenna and power supply.
- A SIM card from any mobile telephone operator.
- A PC/PPI Multimaster cable (ref. Siemens 6ES7 901 3CB30 0XA0).
- A 9 pin, male-male Sub-D adapter.
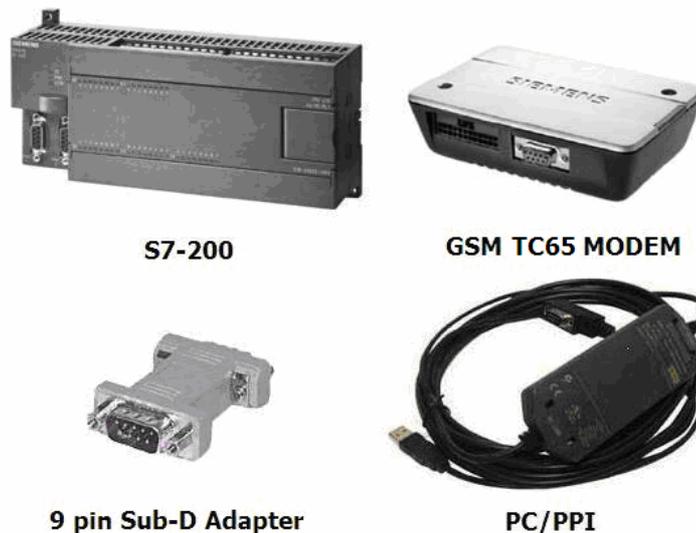
Image 2.1: Required hardware.

3. Connecting the Equipment

Follow the steps below to connect the equipment:

1. Insert the SIM card into the TC65 modem. The slot for the SIM card is labeled on the modem as SIM and has a small yellow button next to it. Open the SIM card tray by pressing on it with a sharp object.
2. Connect the 9-pin, male-male Sub-D adapter to the female serial port on the GSM modem.
3. Connect the antenna and the power supply to the modem (in the RJ11 jack).
4. Configure the PC/PPI cable: the PC/PPI cable microswitches should be set to support a transmission rate of 9600 baud, 10 bit format, PPI/Freeport mode and remote connection:

Microswitch	1	2	3	4	5	6	7	8
Position	0	1	0	0	0	1	1	0

5. Connect the serial end of the PC/PPI cable (female) to the modem using the 9 pin, male-male adapter. The PPI end (male) should be connected to Port 0 of the S7-200 PLC.
6. Turn on power to both devices. In some versions of TC65, you must press and hold the On/Off button for a second.

4. Installing the Nubitek Email Library

To use the Nubitek Email tool, you must first install the library in the STEP-7 MicroWIN programming environment.

- Download the Nubitek Email library from the Nubitek website (www.nubitek.com) downloads page.
- Open STEP7-MicroWIN (STEP7 MicroWIN v4.0 SP2 or higher is required)
- From the menu bar, click on *File -> Add or remove library...*
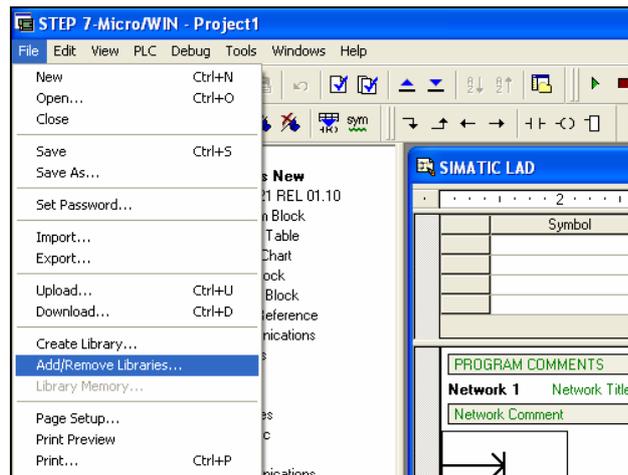
Image 4.1: Add library

- Click on *Add*, enter the directory where you downloaded Nubitek Email and select the `.mwl` file of the library. Once the library has been added, click on *Accept*.
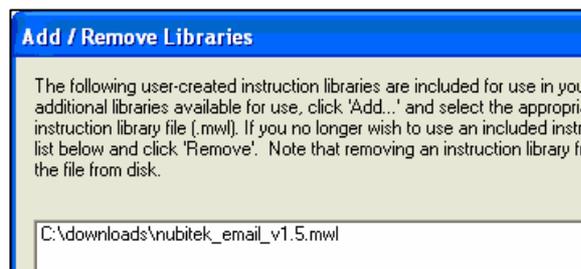
Image 4.3: Add library

- At this point the Nubitek Email library should already be installed. You can verify that the library has been properly installed by accessing the *Libraries* icon in the operation tree: the library folder and the 3 library functions should appear.
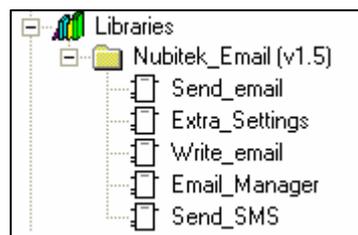
Image 4.3: Add library

5. Assigning Memory for the Library

Once you begin to use the library functions in your project, and always before you upload or compile it, you should assign a memory range for the library: its internal management requires 1001 bytes of V memory, whose location can be defined by the user.

- Click on *File->Library memory*:
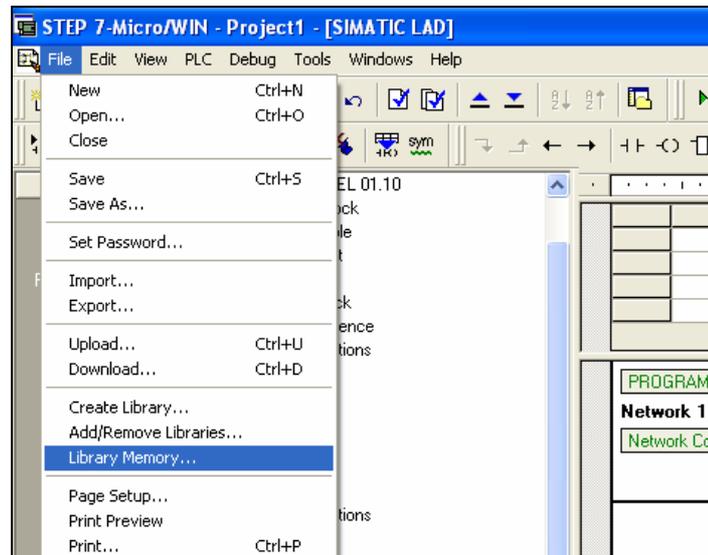
Image 5.1: Library memory

- In the window that opens, select the Nubitek_Email tab (if you do not have any other libraries installed this will be the only tab available).
- Click on the *Suggest address* button and MicroWIN will indicate a free memory range.
- If for any reason you prefer a different range, all you need to do is click *Suggest address* again or manually write the desired start address. **Important:** user variables should not be included in the memory range used by the library.
- Click on *Accept.*
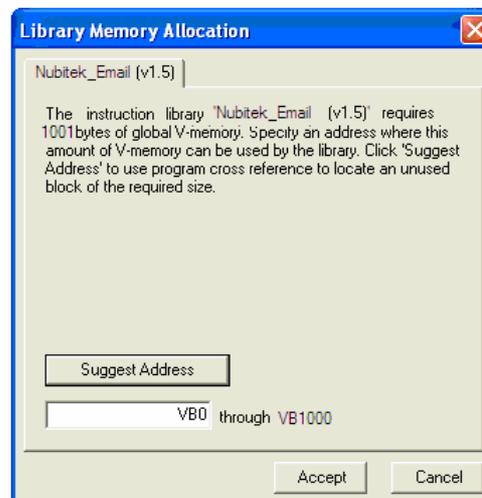
Image 5.2: Assign memory for the library

6. Sending an Email

The example below shows a very quick and direct way to send an email. The following steps should be performed:

1. Prepare and connect the equipment according to the indications in Chapters 2 and 3 of this guide. Make sure that you have the Nubitek_Email library installed, as indicated in Chapter 4.

2. In the Program Block, call the `Email_Manager` function: it is found in the *libraries* folder at the bottom of the MicroWIN navigation tree. Use `SM0.0` enabling contact to have it executed all of the program cycles. Insert the following parameters:

   ▪ `PIN`: the PIN for the SIM card, in double quotation marks. For example, "2244".
    ▪ `apn:` access point address for the GPRS network. For example: if you are using a Vodafone España SIM card, enter "airtelnet.es".
    ▪ `user:` username for the GPRS connection. For example: if you are using a Vodafone España SIM card, enter "vodafone".
    ▪ `passwd:` password for the GPRS connection. For example: If you are using a Vodafone España SIM card, enter "vodafone".

    Important: the GPRS communication parameters (`apn, user` y `passwd`) are unique to each mobile telephony operator. They can be found easily by consulting its technical support service.

    ▪ `Nubitek_Key`: without quotation marks write 0, for it is the key for test mode. If you already have a Nubitek key for your modem you may also use it now. For more information concerning the Nubitek key, see Appendix 2 of this guide.
    ▪ `Ready`: write `Q0.0`. This way you will know when system initialization is complete and are able to begin sending emails.
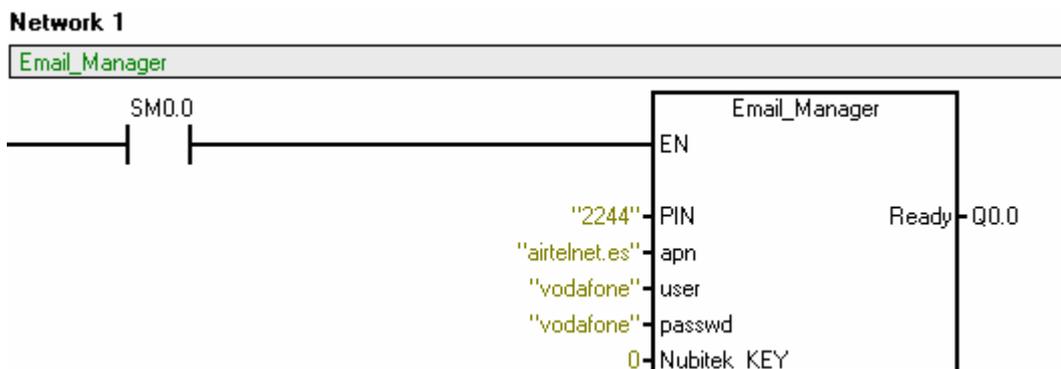

Image 6.1: Email_Manager function call

3. Assign memory to the library as pointed out in Chapter 5. For this example, you can use the default range, from `VB0` to `VB1000`.

Up until this point, you have defined a base configuration: the general control is ready to manage the sending emails. All applications require that you perform the previous 3 steps.

4. Define the text of the email as a text string in the Data Block (warning: the STRING format uses double quotation marks). For example:
- `VB3000    "Remote station operating within parameters"`

In order to make it easier to understand the program, it is recommended that you assign symbolic names to the text phrases. For example, if `VB3000` → `Station_OK` the Data Block would appear as:
- `Station_OK    "Remote station operating within parameters"`

No individual text string to be sent in the email may exceed 254 characters. However, it is possible to insert as many different sequential text strings as permitted by the amount of V memory, using the `Write_email` function. The maximum length of an email to be sent is 1500 characters.

5. Define the destination email addresses in the Data Block in the same way as the email texts. Indicate the email address to which you want the email to be sent, for example:
- `VB2000    "david@gmail.com"`

Assign symbolic names to the addressees, for example, if `VB2000` → `MAIL_David`:
- `MAIL_David    "david@gmail.com"`

You can enter as many different email addresses as permitted by the amount of V memory available.

6. Define the text that you want to appear as the subject of the email when it is received. Assign a symbolic name if you so wish.
- `VB2100 "Works reporting"`

7. The system is ready to send an email. The process consists of two steps. First is to define the sending order and enter subject and addressees. Then you enter the text of the email.

8. Call the `Send_email` function using `SM0.0` enabling contact.
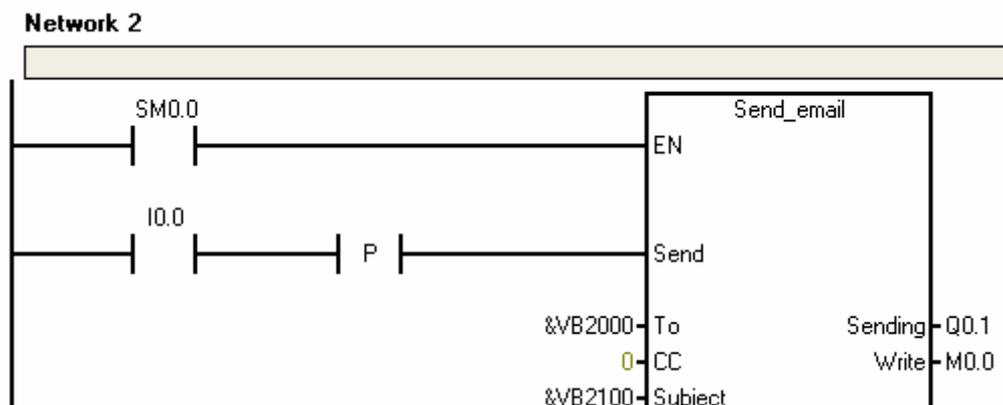

Image 6.2: A call to the Send_email function

Enter the following parameters:
- `T0:` `&VB2000`. This is the email address defined in step 5.
- `CC:` This is not used in this example, enter 0.
- `Subject:` `&VB2100`. This is the subject of the email as defined in step 6.

- Sending: write Q0.1. This output will be active while the email is proccessed and sent. It will reset when the sending has finished successfully.
- Write: use a free memory bit, for example, M0.0. It will be used in the next step to make the Write_email function call.

9. Use the Write_email function to sequentially generate the text of the email. Each time the function is called it links a new text string to the body of the email.
Important: the function must be called using the output bit Write assigned in Send_email function, in this case, M0.0.
For this example, call the function 2 times, as shown in image 6.3, and enter the following parameters:
- Text: the text can be entered directly (i.e. "Station MALAGA-8") or enter a memory position (i.e. VB3000, the text defined in step 4)
- Value: this is not used in this example, enter 0.
- Return: enter 1 to add a line break at the end of the sentence.
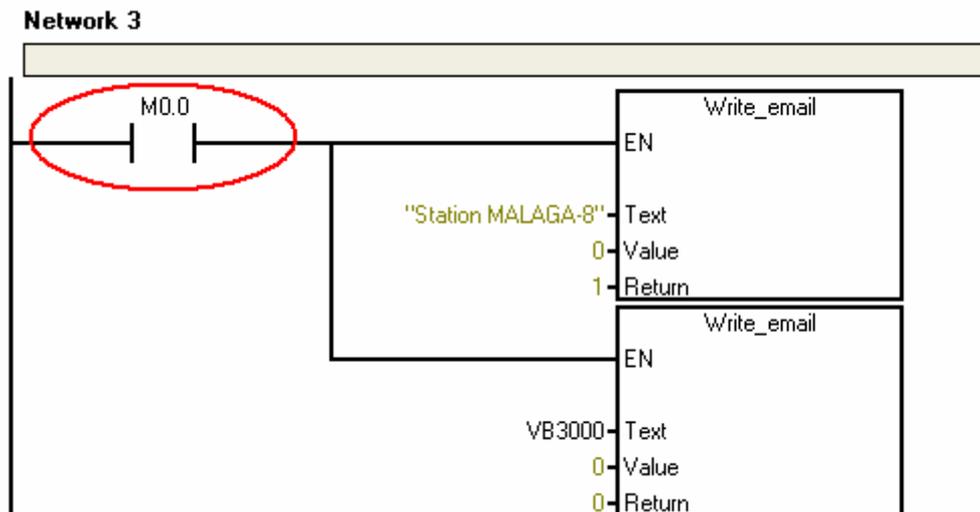
Image 6.3: A call to the Write_email function

10. Upload the program and set the CPU to RUN:
- It should take less than one minute and a half to activate the output Q0.0, which indicates that the system is ready to operate.
- Activate the input I0.0. In a few seconds, you will receive the next email:

Station MALAGA-8:
Remote station operating within parameters

Note: The sender will appear as emailsender@nubitek.com due to the fact that the Nubitek email server is being used, embedded in the code as a courtesy for tests and setting up purposes. For indefinite use, it is recommended to make use of the Extra_Settings function that will enable you to define your email server and the sender.

Appendix 1: Nubitek Email Program Functions

The Nubitek Email library is composed of 5 functions or subroutines: `Email_Manager`, `Send_email`, `Write_email`, `Send_SMS` and `Extra_Settings`.

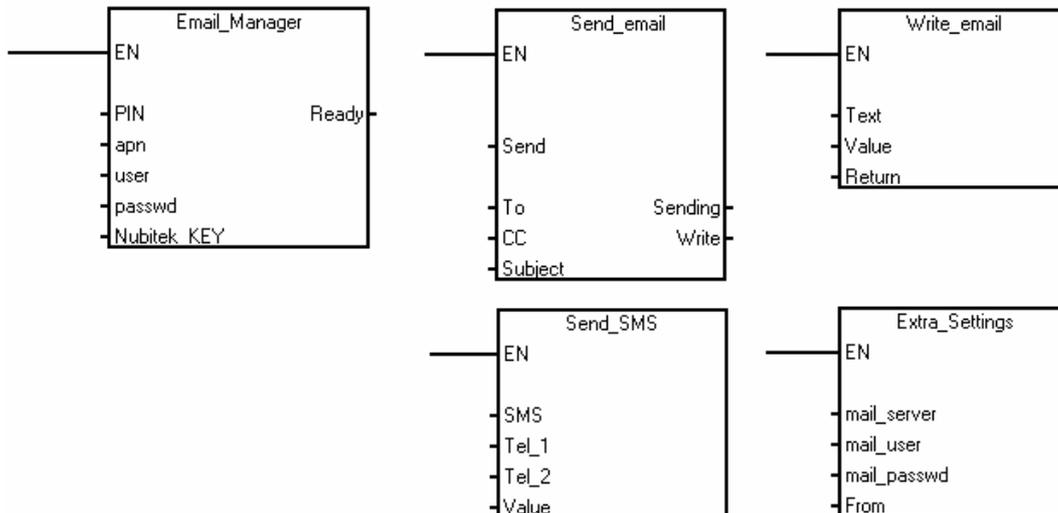Image A1.1: Email_Manager, Write_email, Send_email, Send_SMS and Extra_Settings.

1. Email_Manager.

This is the main management block of the library. It should be called one time in each program cycle, that is, using the `SM0.0` contact. It has 5 inputs and one output.

- **PIN:** STRING input. Text string with the PIN code of the SIM card inserted into the GSM modem. E.g.: "1234". If the SIM card does not have a PIN code, it should be indicated with the empty string "".

- **apn**: STRING input. Text string with the address of the access point to the GPRS network. For example, "airtelnet.es".

- **user**: STRING input. Text string with the username for the GPRS connection. For example: "vodafone".

- **passwd**: STRING input. Text string with the password for the GPRS connection. For example: "vodafone".

- **Nubitek_KEY:** INT input. Numeric key provided by Nubitek for the correct functioning of the library. To work in test mode the value 0 must be set. Appendix 2 provides additional details and explains how to acquire the key.

- **Ready:** BOOL output. It is activated when the library has finished the initialization process and is ready to send emails and SMS messages.

2. Extra_Settings.

This is an OPTIONAL function. Extra_Settings is used if you wish to send an email via a mail server (smtp server) other than that of Nubitek. We recommend you specify your own email server and not to use the Nubitek server, which is embedded in the code as a courtesy for tests and setting up purposes.

This function must be called once per program cycle, in other words, using the SM0.0. contact after the `Email_Manager` function. There are 4 input parameters:

- **`mail_server`:** STRING input. Text string with the address of the mail server you want to use.

- **`mail_user`:** STRING input. Text string with the username that must be used with the chosen mail server.

- **`mail_passwd`:** STRING input. Text string with the password that must be used with the chosen mail server.

- **`From`:** STRING input. Text string with the sender's email address you want to appear when the email is received.

3. Send_email.

The Send_email function is used once per different email that you want to send.

The function must be called every program cycle, that is, use a SM0.0 contact to call the function enable (EN).

There are 4 input and 2 output parameters. Those that are POINTER inputs require the use of the & prefix.

- **`Send`:** BOOL input. This is the trigger for asking to send the email. It should be used with a rising edge.

- **`To`:** DWORD input. Pointer to the text string that contains the email address to which you want to send the email. For example, &`VB2000`, or in symbolic format, &`MAIL_David`.

- **`cc`:** DWORD input. Pointer to the text string that contains another email address to which you want to send the email. This is OPTIONAL: if you do not want to send to another mail account, simply enter a value of 0 here.

- **`Subject`:** DWORD input. Pointer to the text string that contains the subject or title of the email. For example, &`VB2100`, or in symbolic format, &`Report`.

- **`Sending`:** BOOL output. It means that the email is in the sentbox. It's active from the time when the sending order is triggered until the task is successfully completed. Nubitek_Email can manage several orders simultaneously, so it's posible to find several `Sending` outputs active at the same time.

- **`Write`:** BOOL output. Bit for managing the email body writing proccess. It must be used calling to the `Write_email` function.

4. Write_email.

The `Write_email` function is used once per text string (each with a maximum of 254 characters) that you want to include in the email.

Important: The function must be called using the output bit `Write` from the associated Send_email function. The functin can be used as many times as necessary to generate the full text of the email, but all the calls must be done using the contact with the bit `Write`.

There are 3 input parameters:

- **Text:** STRING input. Text string that will be sent. The text can be entered directly, between doubles quotes, or enter a memory position where the text is (i.e. `VB3000`, or in symbolic format, `Header`.)

- **Value:** DWORD input. Pointer to the numeric variable to be inserted into the email text. This parameter is OPTIONAL: if you are not going to include an input value, `Value` should be 0. Consult the user manual for additional information concerning the inclusion of variables.

- **Return:** BYTE input. A value of '1' is used to end the text string defined in the `Text` input with a line break. The line break is not included if a value of '0' is used.

Important: the application assembles the text of the email starting at the last position of reserved memory (VB1000 in this example). Therefore, the control program must leave the space required for this action free (if in this example an email of 400 characters is to be sent, VB1000 to VB1400 approximately must be left free).

5. Send_SMS.

The `Send_SMS` function is used once per different SMS that you want to send. This function is the same as the function contained by the Nubitek SMS Manager library.

You should call the function only one program cycle when the condition to send an SMS is produced. Therefore it is advisable to attack the enable input (EN) with the trigger condition and a positive edge.

This function has 4 input parameters, all of which are POINTER parameters, meaning that the prefix & should be used.

- **SMS:** DWORD input. Pointer to the text string to be sent.

- **Tel_1:** DWORD input. Pointer to the text string containing the recipient telephone number.

- **Tel_2:** DWORD input. Pointer to the text string containing the second recipient telephone number. This parameter is OPTIONAL: if you do not wish to send the SMS to another telephone number you only need to enter 0 for this input.

- **Value:** DWORD input. Pointer to the numeric variable to be inserted into the SMS text. This parameter is OPTIONAL: if you are not going to include an input value, `Value` should be 0. Consult the user manual for additional information concerning the inclusion of variables.

Appendix 2: The Nubitek Key and the Test Mode

The Nubitek key is required to use the library. It must be inserted into the program as the incoming parameter `Nubitek_KEY` to the main function, Email_Manager. It may be easily acquired in the Nubitek web site www.nubitek.com.

This key allows the library to work for an unlimited period of time but exclusively with a specific modem. To acquire a key you must indicate the IMEI of your modem: it is the 15-digit identifier found on the sticker on the back of the modem.

Test mode: Nubitek allows the user to test Nubitek_Email and all of its features for **free:** just use the value 0 for the `Nubitek_KEY` parameter. Every 5 hours the application will be blocked and the modem will be siwtched off, but you may continue your testing by turning on the modem and restarting the CPU.