

GT-540-OEM1

Intelligent GPRS Data Server

User Manual v1.1



High Quality, Industrial Data Acquisition, and Control Products

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1. Introduction

GT-540-OEM1 is an intelligent GPRS Device Terminal Unit based on GPRS connection providing data transparent tunnel. By applying GT-540-OEM1, it is convenient to allow your devices to connect to Internet easily. It is not need to build expensive fixed line network, saving cost substantially.

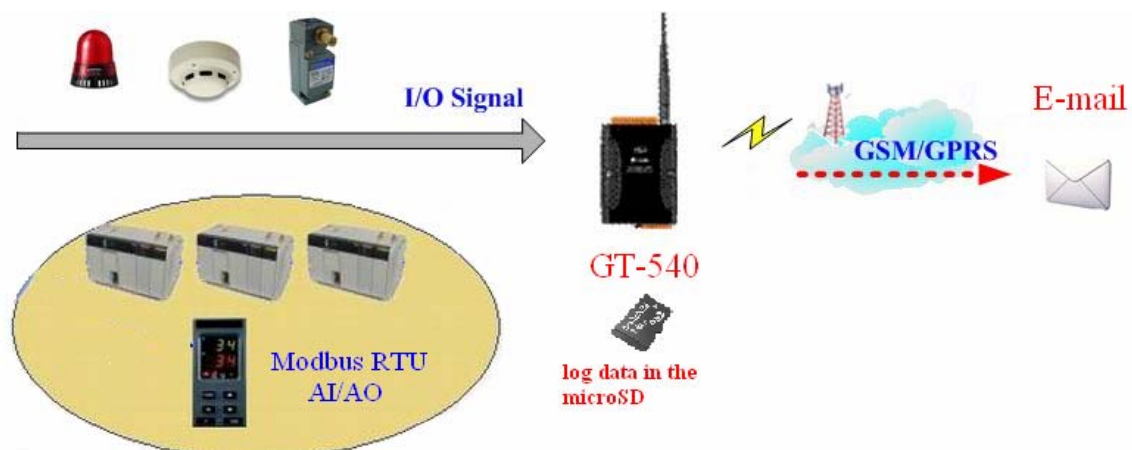
1.1 Features

- Quad-band 850/900/1800/1900 MHz
- Support E-Mail Transmission Via GPRS
- Support Reconnect Function
- Support Save Electronic Function
- Support Graphic Utility
- Support DC +10 V_{DC} ~ +30 V_{DC} Power Input
- Built-in Watch-dog Function
- Industrial Design with Surge Protection
- Support microSD Storage Card
- Support automatic I/O signal data logging

1.2 Applications

- IO Signal Date Log
- Modbus Device

Application: Data log and E-mail communication



2. Hardware

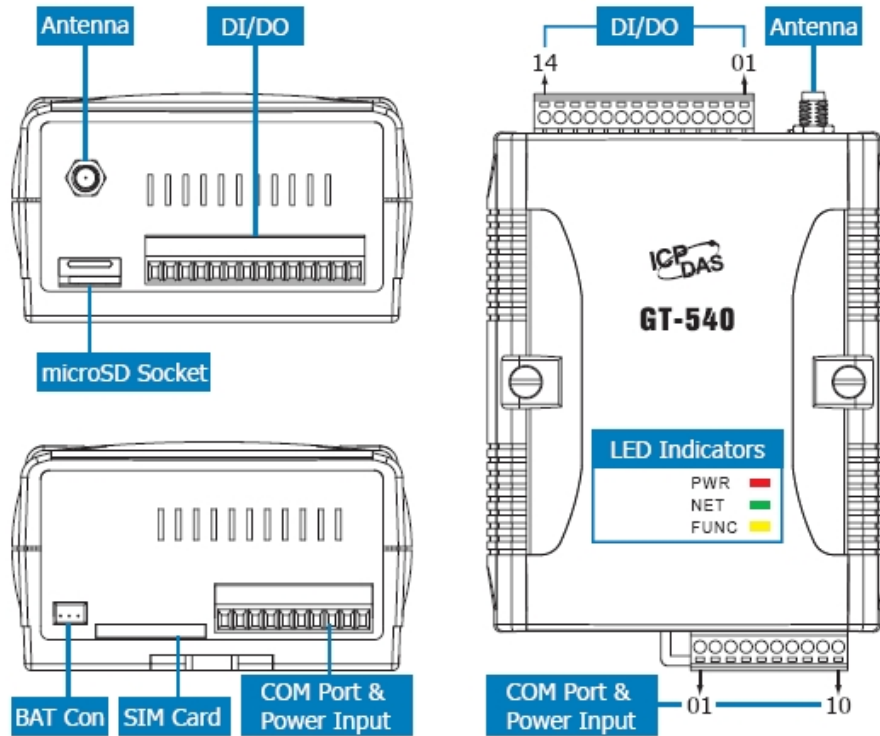
2.1 Specifications

System	
CPU	32 bit Arm7 CPU, 72 MHz
SRAM	32 KB
Flash Memory	512 KB
RTC	Gives time(sec, min, hour) & date, leap year compensation from 1980 to 2079
WDT(watchdog)	Yes
Serial ports	
COM2	RS-232 : TxD,RxD,GND for configuration
COM3	RS-485 : Transparency for communication with ICP DAS Modbus RTU devices
DIO	
Input	6 Channel On Voltage: +3.5~24VDC Off Voltage: +1V Max.
Output	D/O :2 Channel (isolation) Load Voltage: +24V Max. Load Current: 100 mA Max.
GPRS/GSM Module	
GPRS/GSM	GPRS/GSM Tri-Band 900/1800/1900 MHz GPRS multi-slot : class 10/8 GPRS mobile station : class B GPRS class 10 : Max download speed 85.6 kbps CSD max speed 14.4 kbps Compliant to GSM phase 2/2+ -Class 4(2W @ 900 MHz) -Class 1(1W @ 1800/1900 MHz) Coding schemes : CS 1, CS 2,CS 3,CS 4
Power	
Protection	Reverse polarity protection
Frame Ground Protection	ESD, Surge, EFT, Hi-Pot

Required Supply Voltage	+10 V _{DC} ~ +30 V _{DC}
Mechanical	
Casing	Plastic
Flammability	UL 94V-0 materials
Dimensions (W x H x D)	91 mm x 132 mm x 52 mm
Installation	DIN-Rail
Environment	
Operating Temperature	-25 °C ~ +55 °C
Storage Temperature	-40 °C ~ +80 °C
Humidity	5 ~ 95% RH, non-condensing

2.2 Appearance and pin assignments

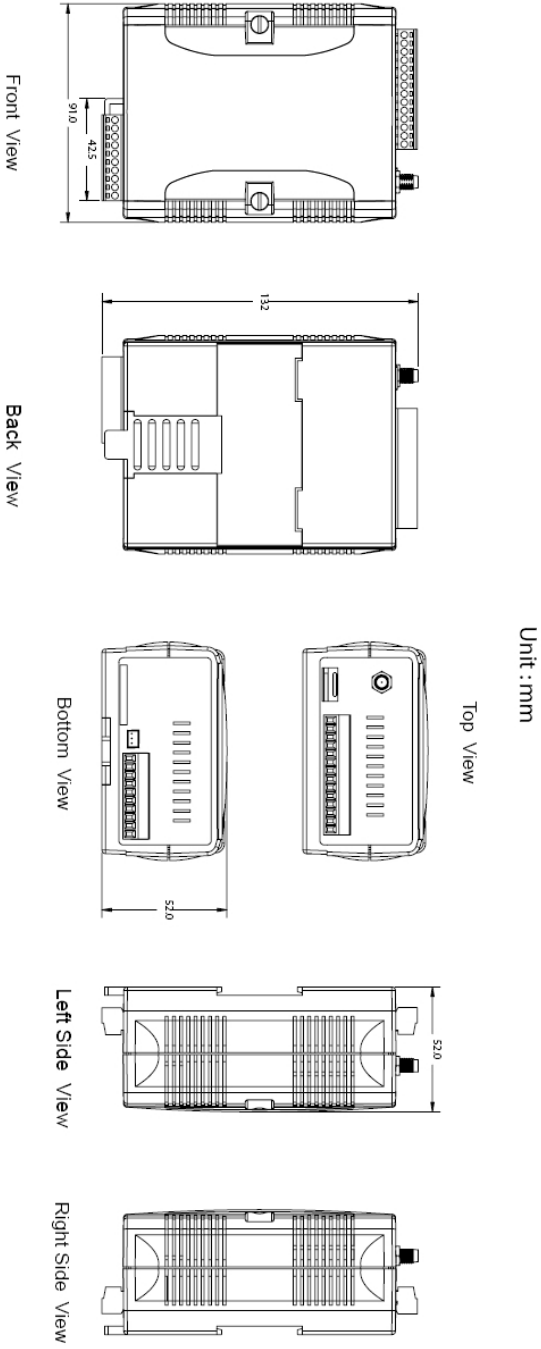
Pin assignments :



DI/DO		
Terminal No.		Pin Assignment
DI	01	DI0
	02	DI1
	03	DI2
	04	DI3
	05	DI4
	06	DI5
DI COM	07	DI COM
DO PWR	08	DO PWR
DO	09	DO0
	10	DO1
DO GND	11	DO GND
-	12	-
Ain+	13	Ain+
Ain-	14	Ain-

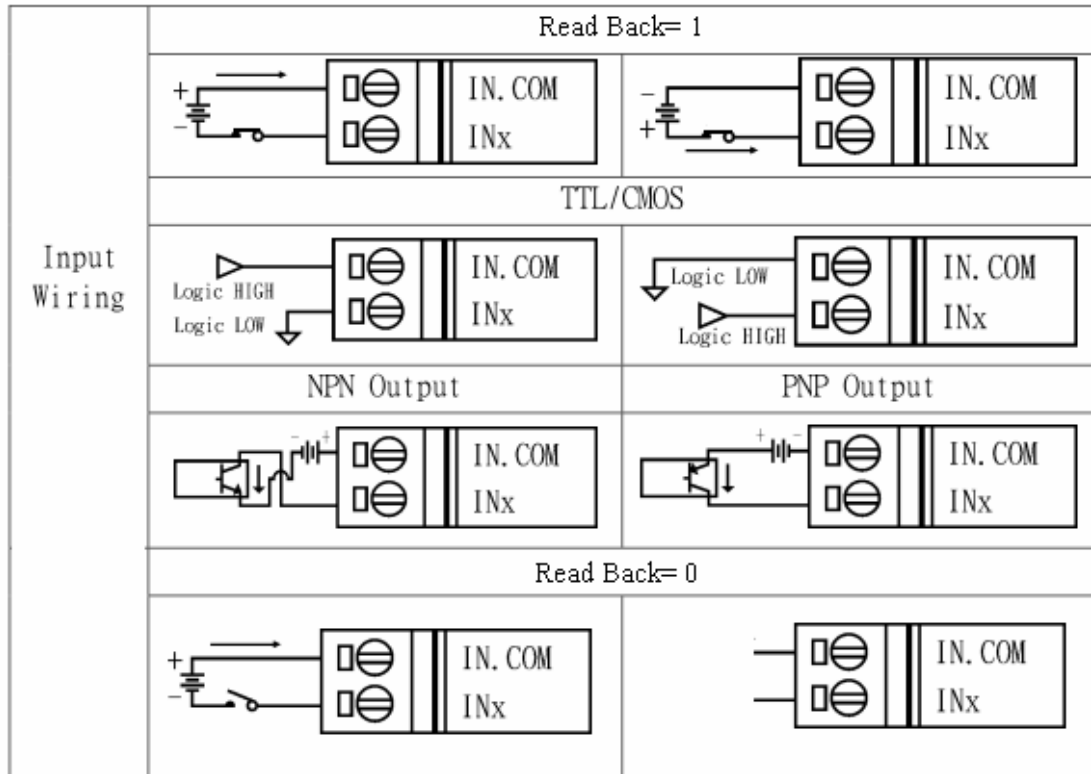
COM Port & Power Input		
Terminal No.		Pin Assignment
Ground for COM	01	GND
COM2 RS-232	02	RxD2
	03	TxD2
COM3 RS-485	04	D+
	05	D-
Reset	06	RST+
	07	RST-
Power Input: +10 ~ 30V _{DC}	08	DC.+VS
	09	DC.GND
Frame Ground	10	F.G

2.3 Dimensions

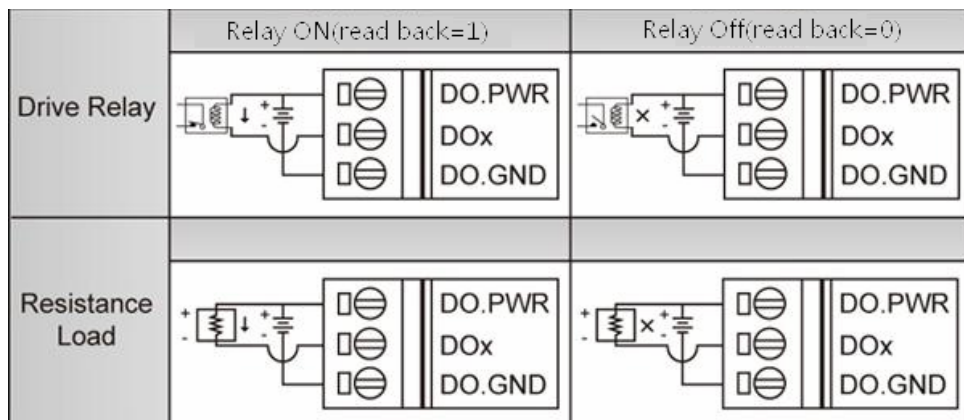


2.4 DI/DO Wire Connection

(1) DI Wire Connection



(2) DO Wire Connection



2.5 LED indicators

There are three LED indicators to help users to judge the various conditions of GT-540-OEM1. The description is as follows :

- A. EXT(Red) : External Power LED to indicate whether the external power is input or not. The description is as follows:

The external power is active	The external power is not active
on	off

- B. STA(Orange) : System LED is to indicate if the GT-540-OEM1 is normal or fail.

Normal	Device Fail	PIN code is wrong
Blanking (1 sec)	Always on or off	Blinking per 50 ms

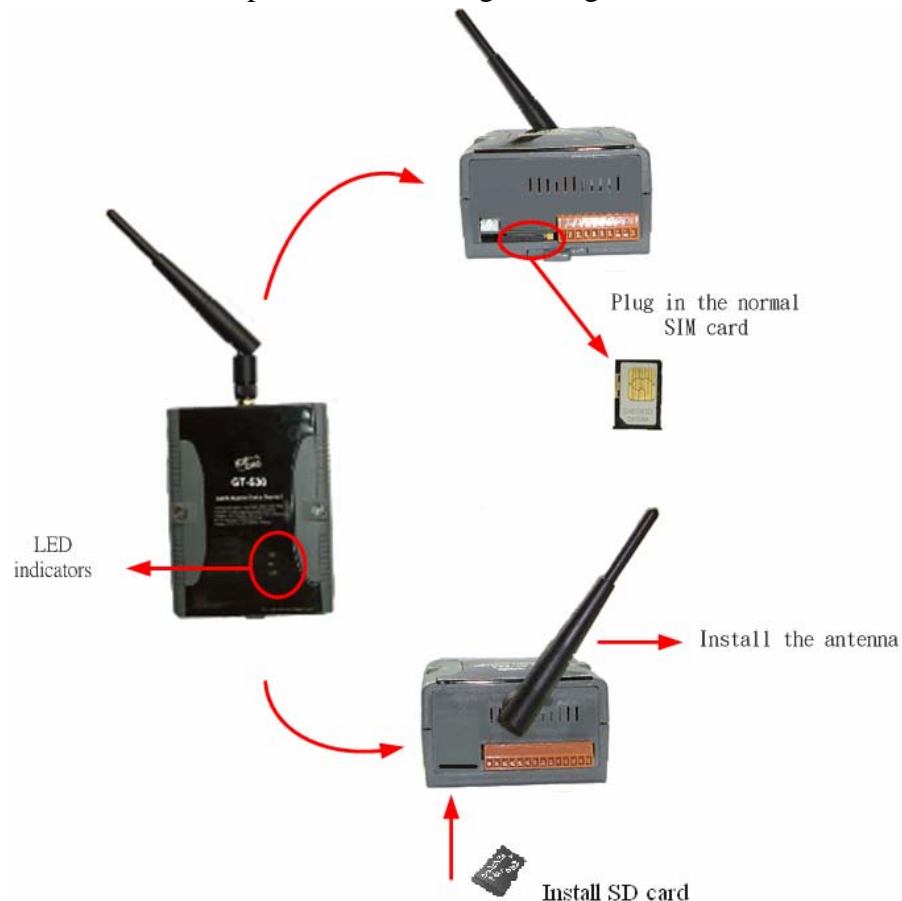
- C. GSM (Green) : The modem LED can indicate the status of GSM module.

Modem normal	Modem fail
Blanking (3 sec)	Off or Blanking (not 3 sec)

2.6 Installing GT-540-OEM1

If users want to start GT-540-OEM1 normally, it needs to follow these steps to install the GT-540-OEM1 below:

- A. Install the antenna
- B. Plug in the normal SIM card (Before apply the SIM card, confirm it is OK by mobile phone.)
- C. Pin08 and Pin09 connect to the DC.+VS and DC.GND of the power supply.
- D. Follow the section 2.4 to wire the I/O connection.
- E. It is needed to wait for 30 ~ 50 seconds to search the GSM base and register to the ISP. After finishing the process, GT-540-OEM1 would be in normal operation mode and the STA LED would blank per 3 sec. The start time of GT-540-OEM1 depends on the strength of signal.



2.7 How to reset GT-540-OEM1

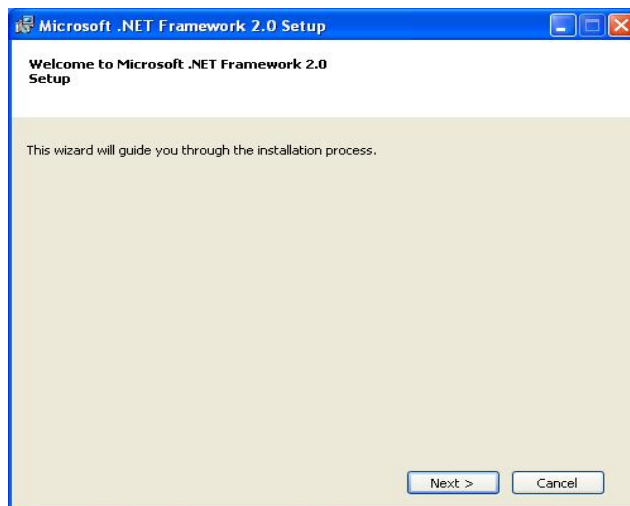
- (1) Turn off the external power and confirm the EXT LED is off.
- (2) Turn on the power.

3. Installing GT-540-OEM1 Utility

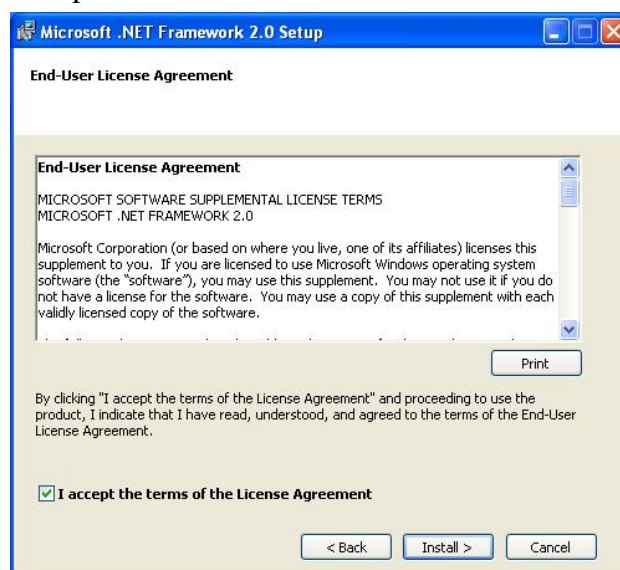
It needs the runtime environment with .NET Framework 2.0 or above to execute the GT-540-OEM1 Utility in the PC. If there has .NET Framework 2.0 or above in the PC, the section 3.1 can be omitted.

3.1 Installing .NET Compact Framework

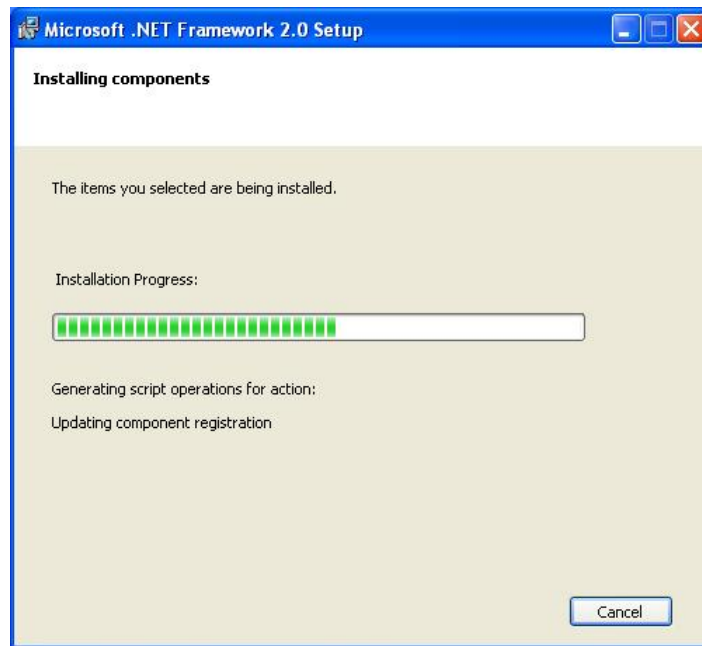
- A. Download .NET Compact Framework 2.0 at the following URL:
<http://m2m.icpdas.com/download.html>
- B. Execute setup file “dotnetfx20.exe”
- C. The install figure is as follows:
 - (1) Press “Next” to the next step.



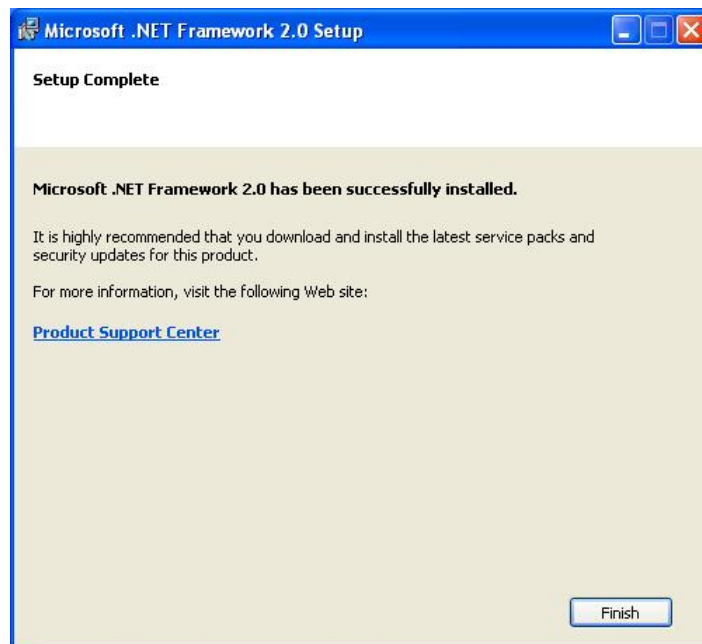
- (2) Select the “I accept the terms of the License Agreement” and “Install ” to the next step.



- (3) The installation process would be going

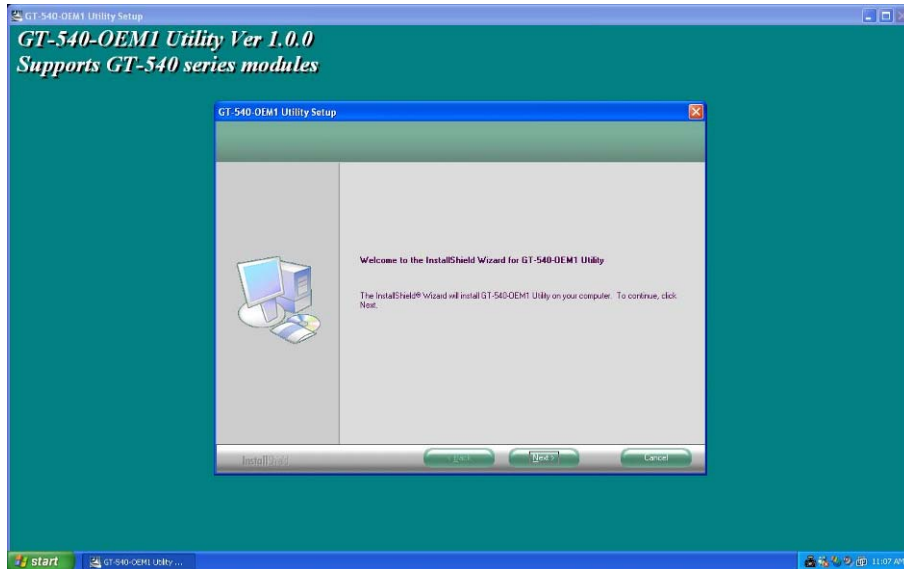


- (4) After finishing the installation, press "Finish" to exit the program.

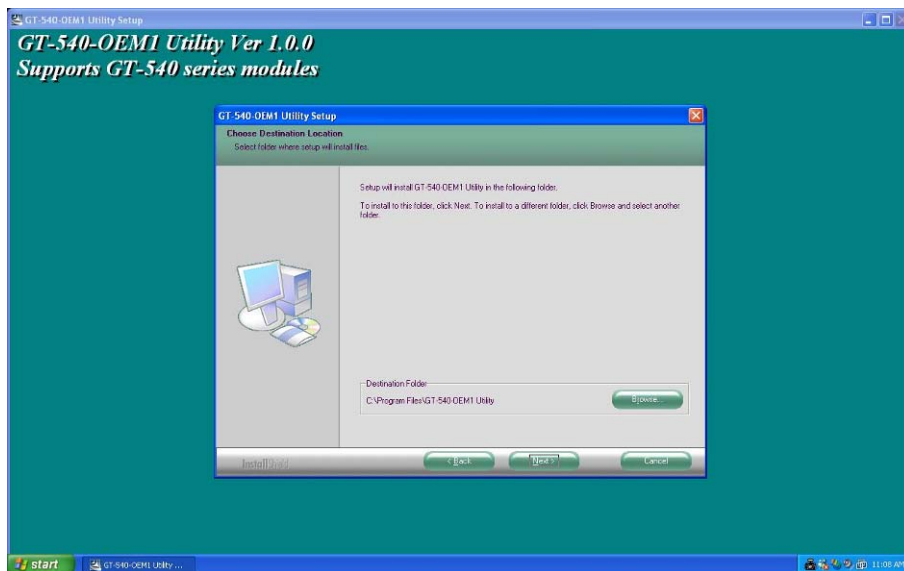


3.2 Installing GT-540-OEM1 Utility

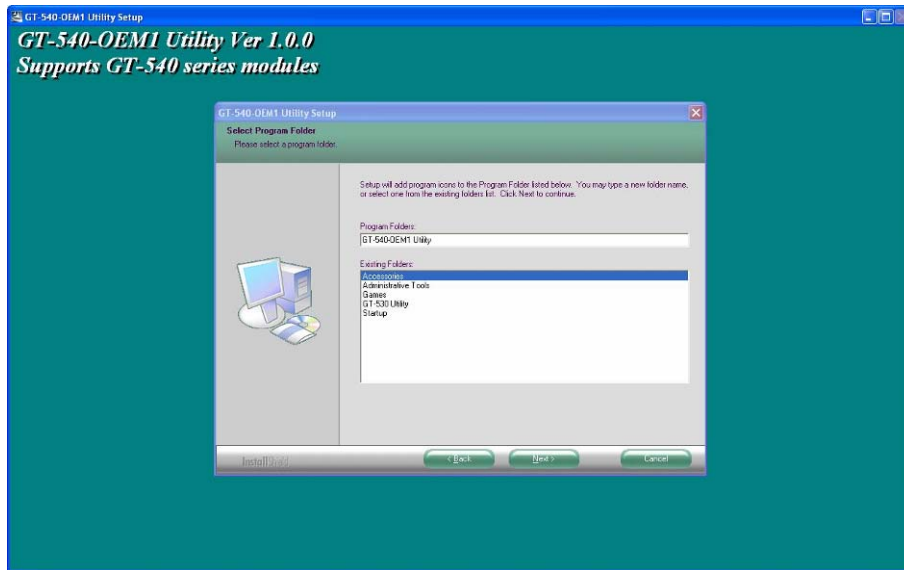
- A. Execute “Install_GT540_OEM1_Utility.exe”
- B. The installation figure is as follows:
 - (1) Press “Next” to start the installation procedure.



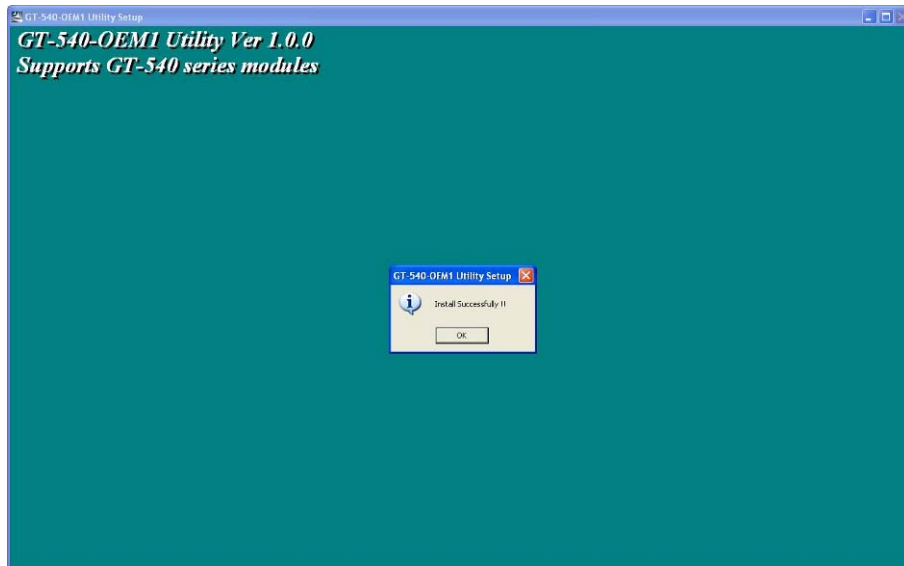
- (2) Select the installation path. The default path is ”C:\Program Files\GT-540-OEM1 Utility”. Press “Next” to the next step.



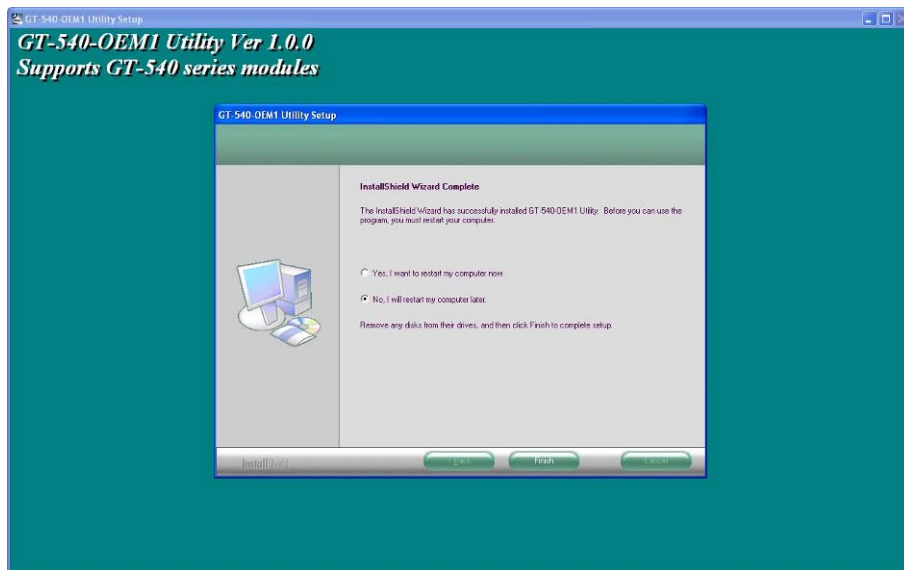
- (3) Input the name shown in “All Programs”. Press “Next” to the next step.



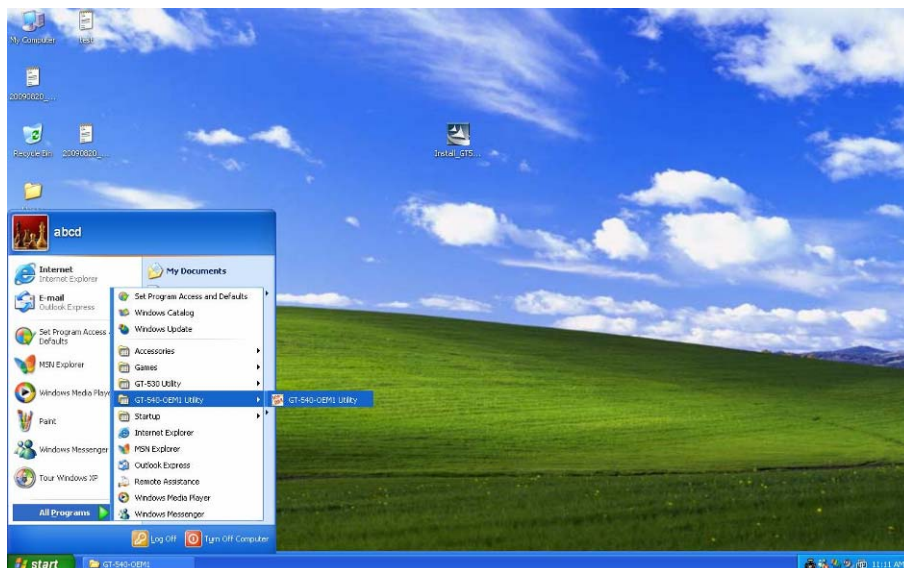
- (4) After finishing the installation procedure, press “OK” to the next step.



- (5) Press "Finish" to finish the installation procedure.



- (6) Launch GT-540-OEM1 Utility from the start menu "Start→All Programs→GT-540-OEM1 Utility→GT-540-OEM1 Utility".



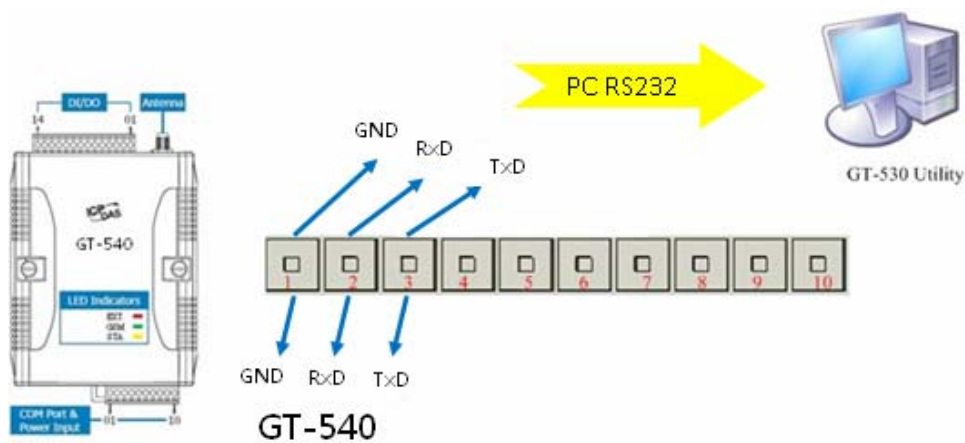
4. GT-540-OEM1 Utility operation

Before GT-540-OEM1 utility is connected to the PC correctly, please confirm these following steps:

1. The STA LED is blanking. There are 2 kinds of blanking in GT-540-OEM1.

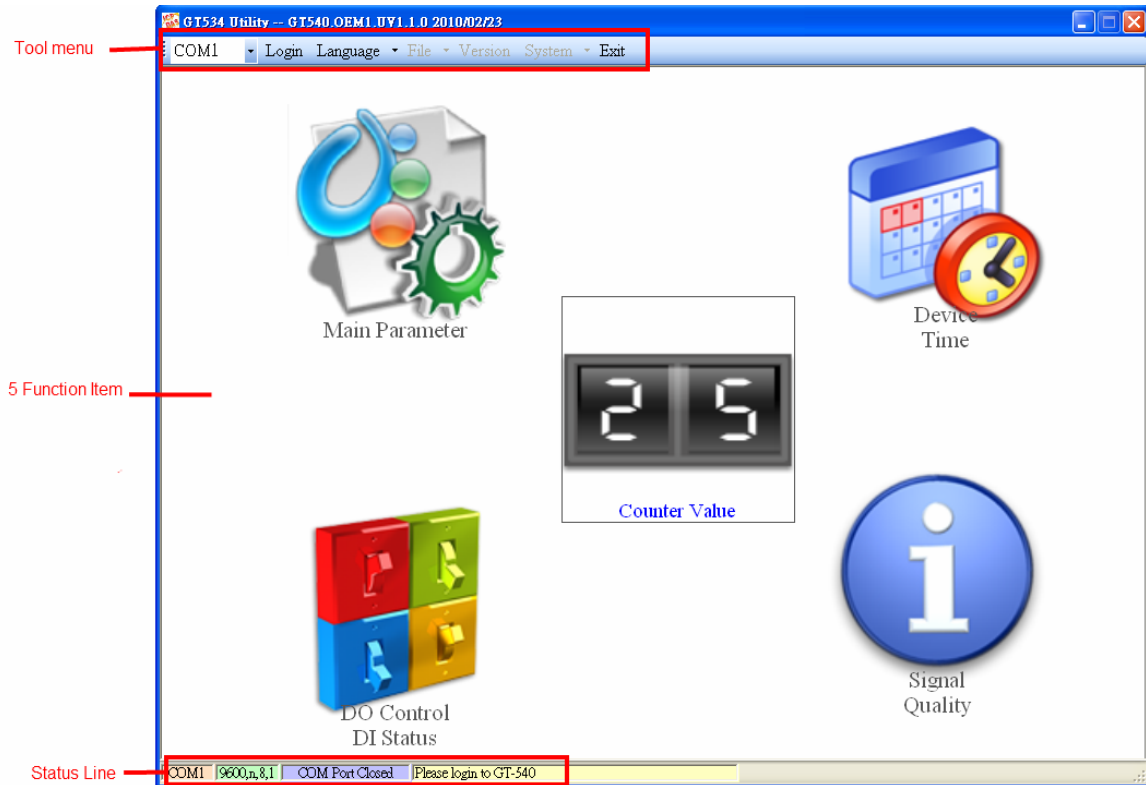
STA LED	Description
Blanking per 1 sec	Normal mode
Blanking per 50 ms	The pin code is wrong. The login windows would show the field to input pin or PUK code

2. Confirm the RS232 connection between GT-540-OEM1 and PC is correct. Users can refer to the following figure.
3. During the setting procedure, the external power must be turn on.



4.1 Main menu

The main menu of GT-540-OEM1 Utility includes the following sections:



A. Tool menu

- (1) “COM”: Set the COM port number in PC connecting to GT-540-OEM1.
- (2) Login/Logout: Before operating GT-540-OEM1, users need to login to GT-540-OEM1 Utility. After login the system successfully, the menu item “login” would become “logout” and the GT-540-OEM1 Utility would be operated normally. Once the power is reset, the login procedure needs to do again.
- (3) “Language”
GT-540-OEM1 Utility just supports English now, but it will support multi-language in the future.
- (4) File
There are import and export functions in “File” item. The functions would be enabled when “Main parameters” window is open.
Export: The function can export the parameters as .par file from the “Main parameters” windows.
Import: The parameters would be shown in “Main parameters” window from the specific .par file.
- (5) Version: Including the firmware and Utility version information.

- (6) System: Provide users for recovering GT-540-OEM1 to factory ,resetting GT-540-OEM1 and debug mode.
- (7) Exit: To exit GT-540-OEM1 utility

B. 5 function item :

- (1) “Main parameter”: The main parameter setting of GT-540-OEM1 includes E-mail address, mail server, Modbus device, data log, scan time and comport setting.
- (2) “Device time”: Display and set the RTC time of GT-540-OEM1. It is also can get the information of the last and next time of the return report.
- (3) “DO Control/DI statuses”: Display the status of I/O and control the DO output.
- (4) “Signal Quality”: Show GSM signal strength in GT-540-OEM1
- (5) Counter Value: Enable or disable counter function and show or set counter value.

C. Status Line

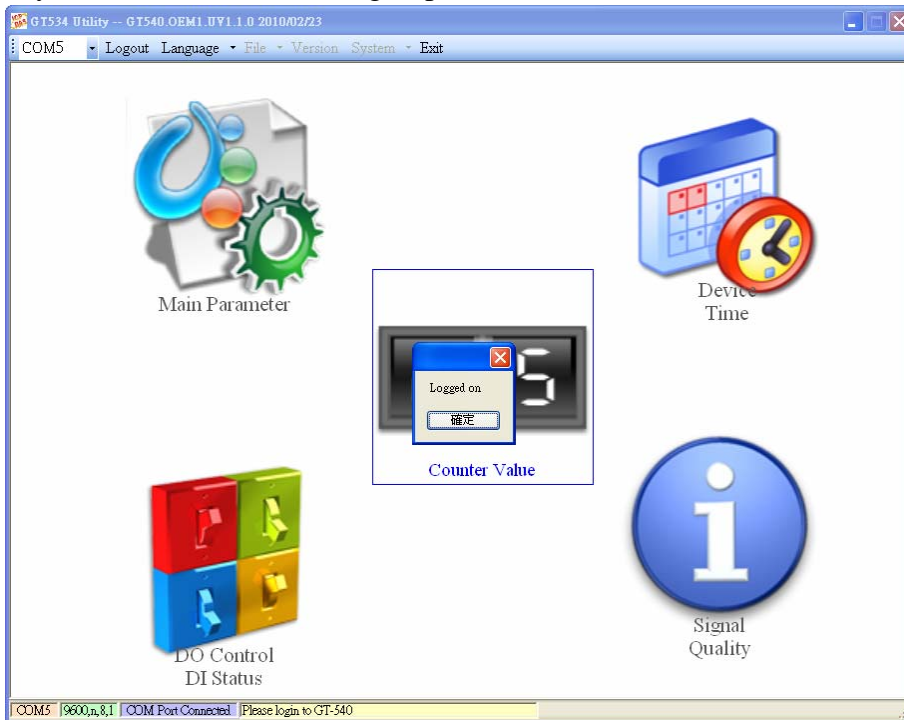
Show the related information during the operation procedure including:

- (1) The com port number of PC
- (2) The communication setting of COM Port
- (3) The status of COM Port
- (4) The result of Utility operation

4.2 Login

It needs to login into GT-540-OEM1 to set its parameters. The description is below:

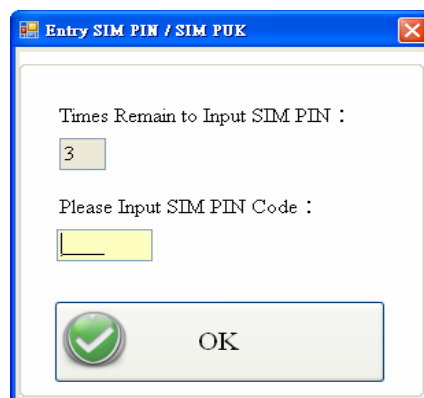
- (1) Select the COM port number of PC.
- (2) Press the “login” button
- (3) If you are the first time to login, please set the time of GT-540-OEM1.



If the pin code in GT-540-OEM1 is not correct, the STA led would be blanking per 50 ms and GT-540-OEM1 utility would ask for users to input Pin or PUK code.

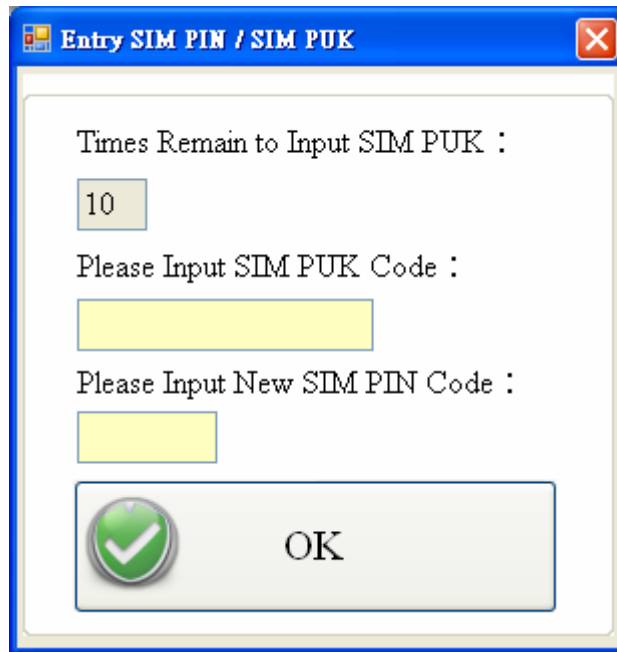
- (1) Asking for inputting PIN code:

If the PIN code is effective, the “Enter SIM PIN/SIM PUK” window would pop-up as follows. If the number of times for inputting the wrong PIN code is more than the allowed number, the PIN code would be ineffective. And the “PUK code” window would pop up.



(2) Asking for inputting PUK code

If the PIN code is ineffective, the “PUK code” window would pop-up as follows. As the number of times for inputting the wrong PUK code is more than allowed number, the SIM card would be ineffective forever. Therefore, it is important to input the correct PUK code.



If the PIN or PUK code is correct, the STA led would blank per second. Users can operate other function of GT-540-OEM1 in this utility.

4.3 Device Parameters

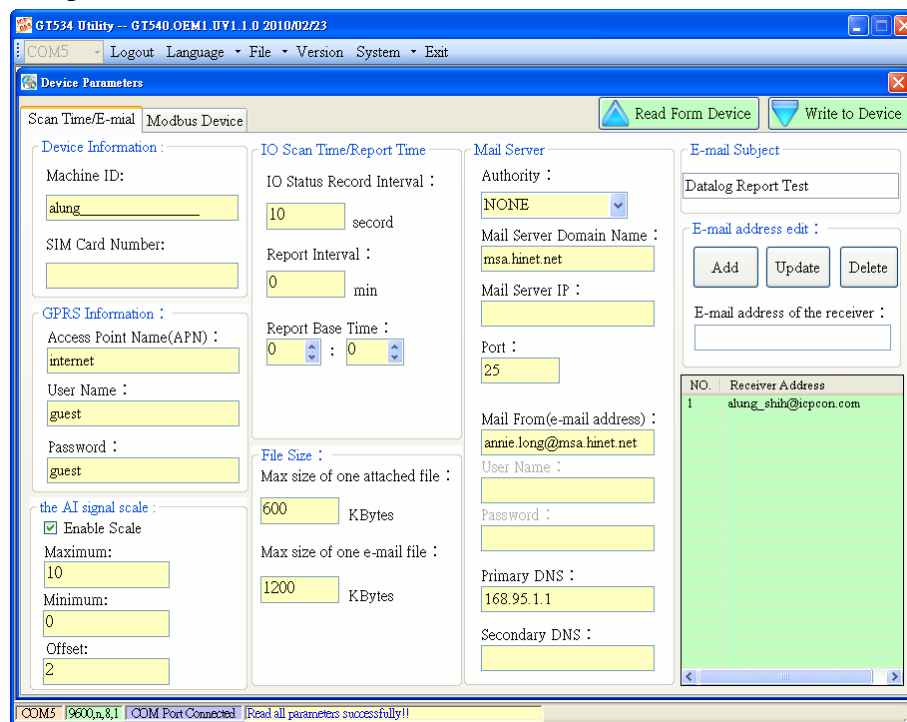
There are 2 pages in “Device parameter” window. They are “Scan Time/E-mail” and “Modbus Device” pages.

After configuring the 2 pages, press “Write to Device” button to save these settings to GT-540-OEM1. Then, reset GT-540-OEM1 to enable these settings.

The “Read Form Device” button can help users to read back these settings from GT-540-OEM1. In addition, these setting would be read from GT-540-OEM1 when the “Main Parameter” window pops up from the main menu.

4.3.1 Scan Time/E-mail

The following page is “Scan Time/E-mail”. Users can refer the explanation below :



1. Device Information

Textbox name	describe
Machine ID	The device ID would be shown in the report. It can be used for recognizing the GT-540-OEM1. The length of characters is 20 without supporting Unicode and “;” characteristic.
SIM Card Number	This text field can show or input the phone number of the plug-in SIM card. Take Taiwan for example: 0928xxxxxx.

2. GPRS Information

Textbox name	describe
--------------	----------

Access Point Name	Access point name (APN) is the name used to identify a general packet radio service (GPRS) bearer service in the GSM mobile network. The APN defines the type of service that is provided in the packet data connection. You can get this APN by ISP.
User name	After the ISP registration, ISP will give you user name, and you can use GPRS by the user name.
Password	After the ISP registration, ISP will give you password, and you can use GPRS by the password.

3. The AI signal scale:

Textbox name	Describe
Maximum	If “Enable Scale” is checked ,the AI signal using three new fields that will be introduced by the user .These values must be used in the following formula: $\frac{\text{max}-\text{min}}{16}*(\text{AI}-4) + \text{min} + \text{offset}$ and the result must be added in the attached file used in the e-mail.
Minimum	
Offset	

4. IO Scan Time/Report Time

Textbox name	describe
IO Status Record Interval	The GT-540-OEM1 can log IO status including Modbus RTU I/O in the micro SD. The value can set record time interval(unit: sec)
Report Interval	Set report time interval. The GT-540-OEM1 calculate time interval according to report base time.(unit: min)
Report Base Time	The GT-540-OEM1 calculate time interval according to report base time. (Unit: min), for example, if report base time set 8:30and report interval set 60 min, it will report data log at 9:30 from e-mail.

5. File Size

Textbox name	describe
Max size of one attached file	Max size of each attached file for e-mail and data log. If data is more than max size of one attached file, it will create new file to record data.
Max size of one E-mail file	Max size of one E-mail file, this value must more than max size of one attached file, Some mail server

	limit one of the e-mail size.
--	-------------------------------

6. Mail Server

Textbox name	Describe
Authority	NONE or AUTHORITY
Mail Server Domain name	Send mail server Domain name, if Domain and IP is setting, IP setting is primary.
Mail Server IP	IP of mail server
Port	TCP port of mail server for send e-mail
Mail From(E-mail address)	If the e-mail can't send to user, it will return error message and e-mail to this e-
User name	User can register user name from mail server
Password	User can get password to match username from mail server
Primary DNS	The Domain Name System (DNS) is a hierarchical naming system for computers, services, or any resource connected to the Internet or a private network. You must give this value which is DNS server IP if you want to connect mail server by domain name.
Secondary DNS	Backup DNS server

7. E-mail subject

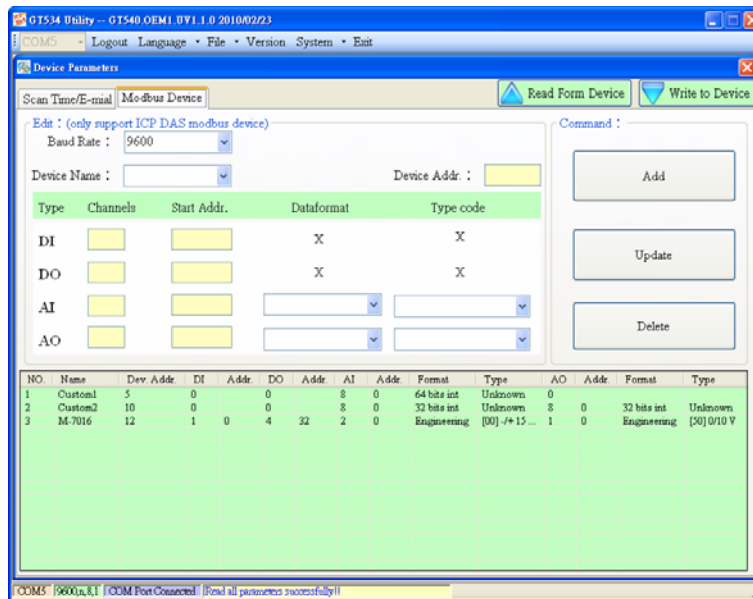
Textbox name	Describe
E-mail Subject	The User can change the e-mail subject from the field.

8. E-mail Address edit

Name	describe
Add	User can add e-mail address of the receiver by this bottom. The maximum of the E-mail address is 10.
Update	User can renew e-mail address of the receiver by this bottom <ol style="list-style-type: none"> 1. Select the receiver in the table 2. Renew E-mail on “E-mail address of the receiver” textbox 3. Chick update bottom.
Delete	User can delete e-mail address of the receiver by this bottom <ol style="list-style-type: none"> 1. Select the receiver in the table. 2. Chick delete bottom.
E-mail address of the receiver	You can add, delete or update form this textbox.
table	Receiver list.

4.3.2 Modbus Device

Another page in “Device parameter” is about Modbus device setting. The explanation is below:



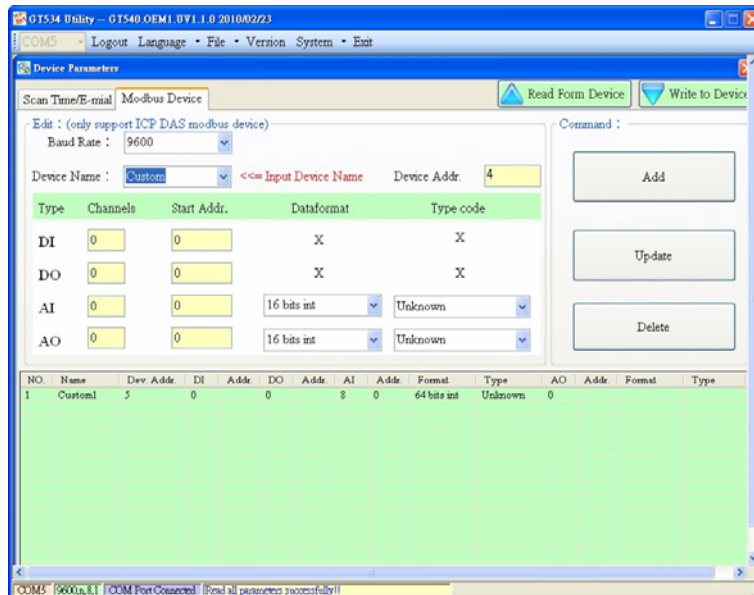
The GT-540-OEM1 supports Modbus RTU. If users add, update, or delete device by utility.

Function	Describe
Baud rate	Baud rate of device, The GT-540-OEM1 supports baud rate detection: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200.
Device name	You can select Modbus RTU device (Only ICP DAS products). The maximum of the Modbus devices is 3.
Device addr	1-247, Modbus address according to Modbus device
Channels	Channel number
Start address	Start address of IO in the Modbus device. The details please refer Modbus device manual
Data format	2's comp HEX/Engineering unit
Type code	Please refer Modbus device configuration
Add	User can add Modbus device by this bottom. The maximum of the Modbus devices is 3.
Update	User can renew configuration of the Modbus device by this bottom 1. Select the Modbus device in the table 2. Renew configuration 3. Click update bottom.
Delete	User can delete configuration of the Modbus device by this bottom 1. Select the receiver in the table. 2. Click delete bottom.

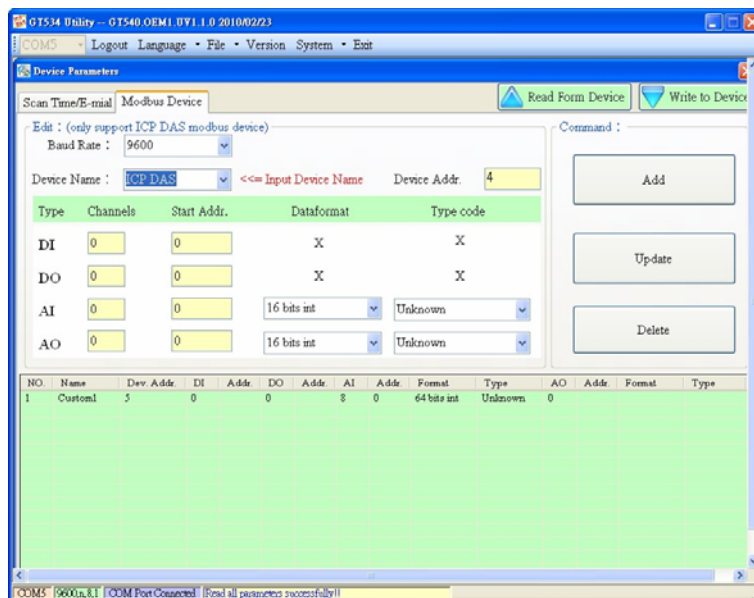
4.3.3 Add new Modbus Device

If device name doesn't exist in the Device Name list, Users can add new device on the following step and figures.

1. Select Custom in the Device Name list box

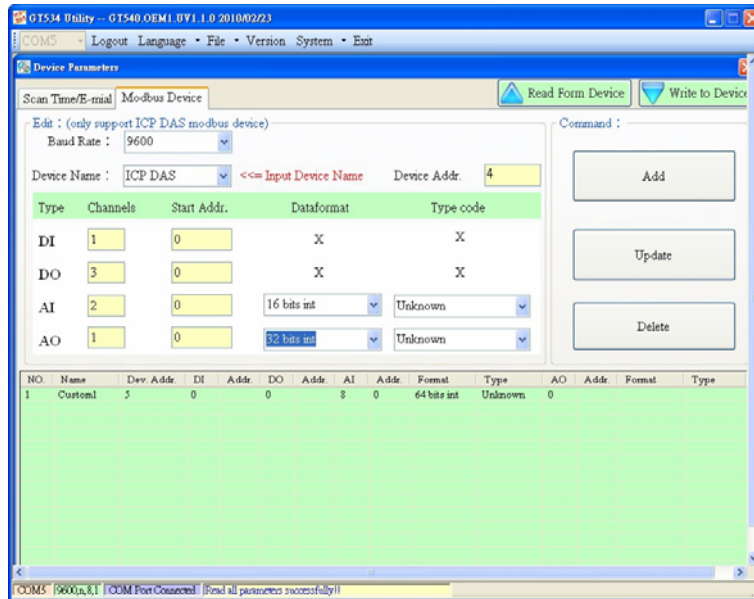


2. Rename "Custom"

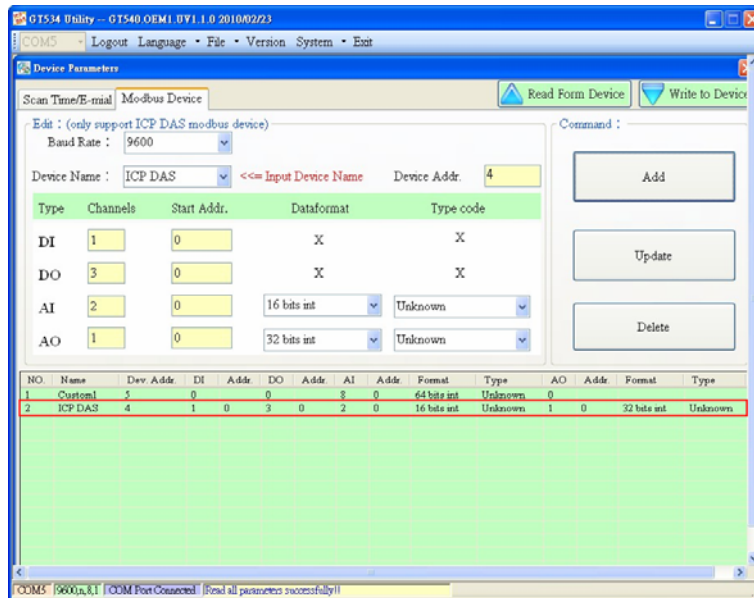


3. Set Device Address, DI/DO/AI/AO channels, start address, and date format.

The GT-540 just supports HEX value for AI/AO. The 16-bit data format can support to the maximum number of channel is 32. The 32-bit data format can support to the maximum number of channel is 16. The 64-bit data format can support to the maximum number of channel is 8.

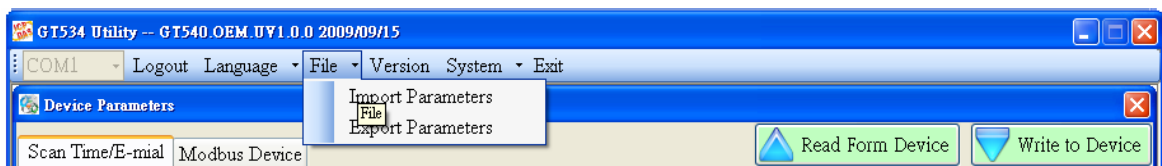


4. Click “Add” button



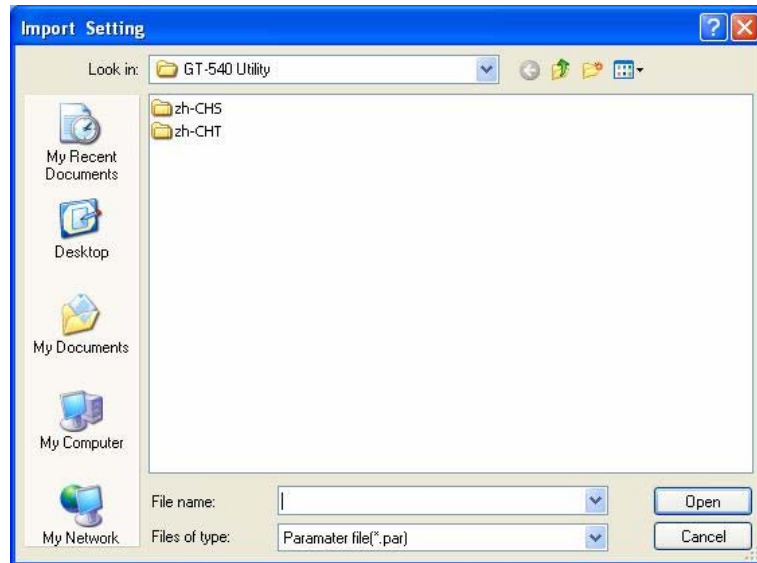
4.3.4 Import/Export Parameters

Users can use the import and export functions from the menu bar. This function would be enabled when the “Device Parameter” window is open. The explanation is below:

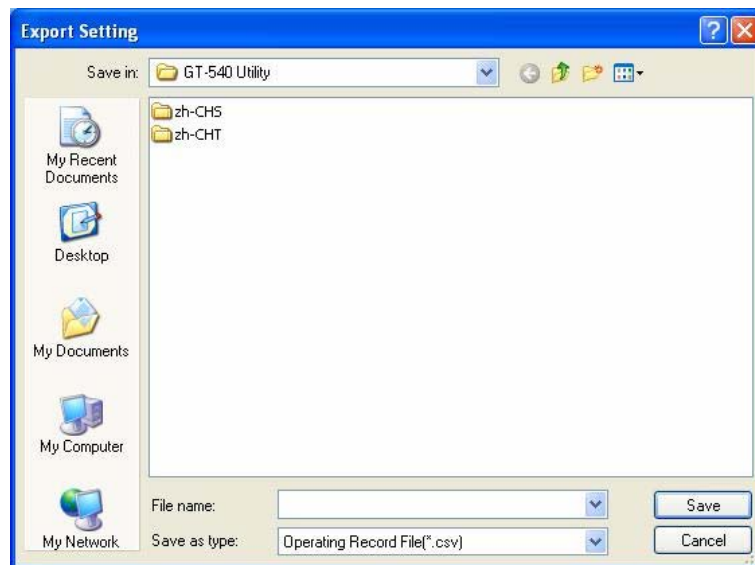


- A. Import Parameters : This function is used for reading back the setting of device parameters from .par file and displaying in “Device parameter” window. When press “import” button, a file selection window would pop up for users to choice

the .par file.

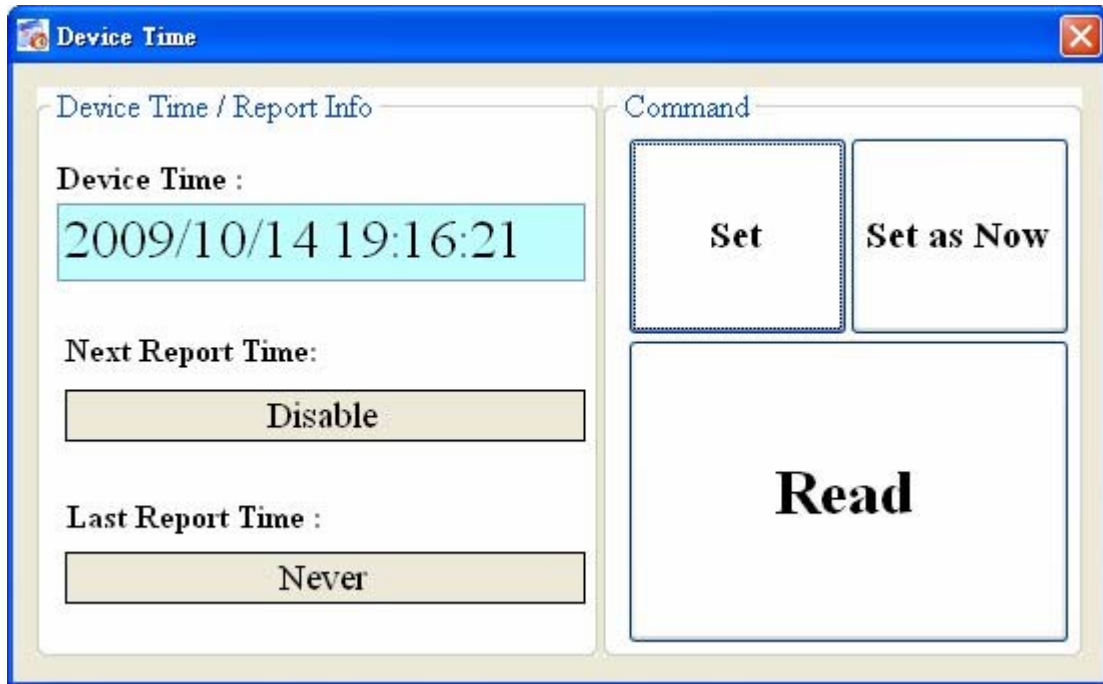


- B. Export Parameters: The function is used for saving the setting of “Device parameter” window as .par file. When press “Export” button, a file selection window would pop-up for users to save the setting as .par file in specific path.



4.4 Device Time

This window provides the function to inquire and modify the time of GT-540-OEM1. Besides, the next and last report times are also shown. The text field operation is below.



Text field :

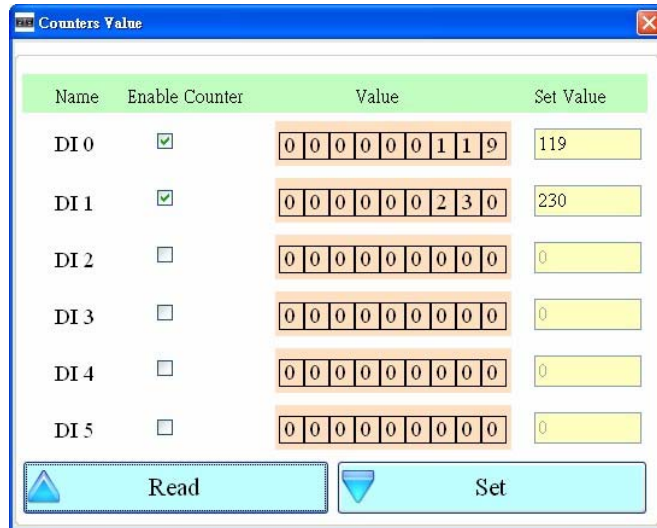
- (1) Device time: show the time of GT-540-OEM1. Users also can change the time in this field to key in the specific time.
- (2) Next Report Time : show the next report time
- (3) Last report time : show the last report time

Operation:

- (1) “Set as Now”: Set the PC time to GT-540-OEM1. After setting the time successfully, the information of GT-540-OEM1 time and report time would be updated.
- (2) Set: Set the GT-540-OEM1 time according the “Device Time” field. After setting the time successfully, the information of GT-540-OEM1 time and report time would be updated.
- (3) Read: Read back the time of GT-540-OEM1, the next report time and the last report time.

4.5 Counter Value

The window provides the function to enable or disable function and inquire or modify the counter values of DI0 ~ DI5. The explanation of operation and text field is below:



Text field :

1. Name: The DI name of DI0 ~ DI5 °
2. Enable Counter: DI Counter enables or disable.
3. Value : The current counter value (maximum: 999999999)
4. Set Value: Input the defined counter value. The maximum is 999999999. This field is enabled when DI is set as counter mode.

Operation:

1. Read: Read the current counter value from GT-540. If the “Enable Counter” is not checked, the counter value is 0.
2. Set: Change the counter value into GT-540 according to the "Set Value"

Datalog file format :

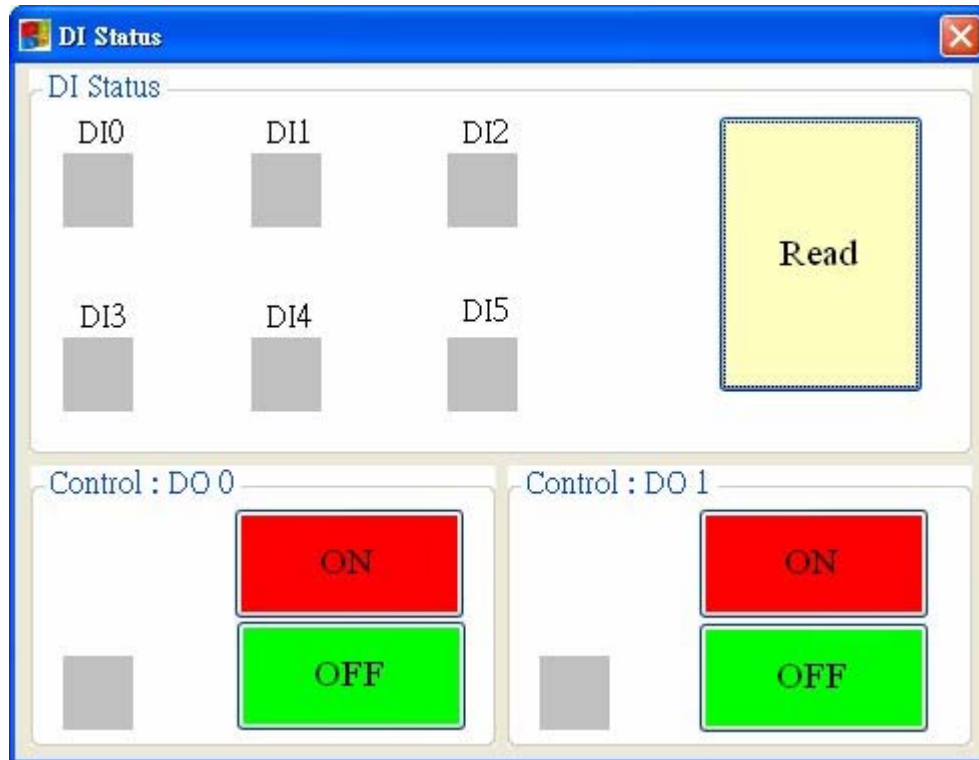
1. If the DI counter function is enabled, the title will show “CIx”(x: channel number) in .csv file, and the content is counter value.
2. If the DI counter function is disabled, the title will show “DIx”(x: channel number) in .csv file, and the content is signal value(0 or 1).

The sample:

A	B	C	D	E	F	G	H	I	J
Date	CI0	CI1	DI2	DI3	DI4	DI5	DO0	DO1	AI0
20100223 175626	11111	22222	0	0	0	0	0	0	-0.494
20100223 175636	11111	22222	0	0	0	0	0	0	-0.497
20100223 175704	11111	22222	0	0	0	0	0	0	-0.494
20100223 175714	11111	22222	0	0	0	0	0	0	-0.494

4.6 DO control/DI status

The function is used for controlling DO and reading the status of DIs:



Text field

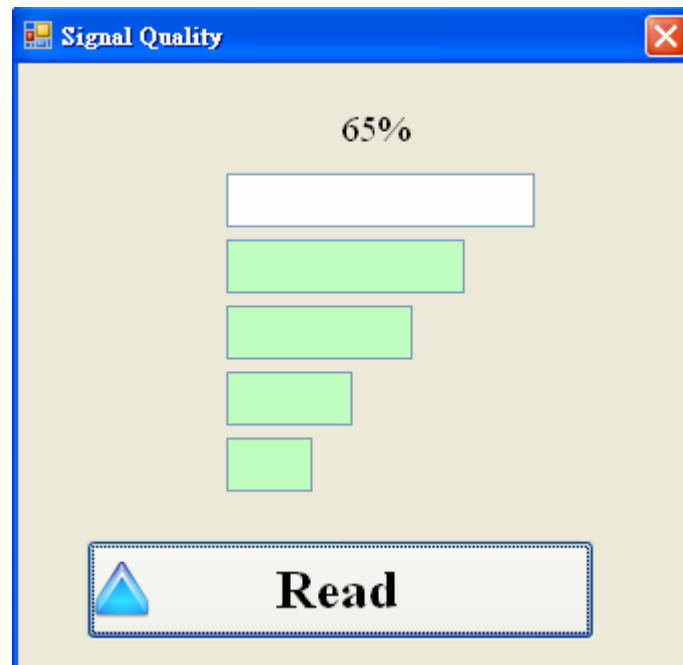
- (1) DI0 ~ DI6、DO0 ~ DO1 :
 - ✧ Grey : The voltage logic is high.
 - ✧ Red : the voltage logic is low

Operation

- (1) Read : Read back the status of DI0 ~ DI6 and DO0 ~ DO1 from GT-540-OEM1.
- (2) DO0 ~ DO1 ON : Set the DO output on
- (3) DO0 ~ DO1 OFF : Set the DO output off

4.7 Signal Quality

This window can show GSM signal strength.



Text field :

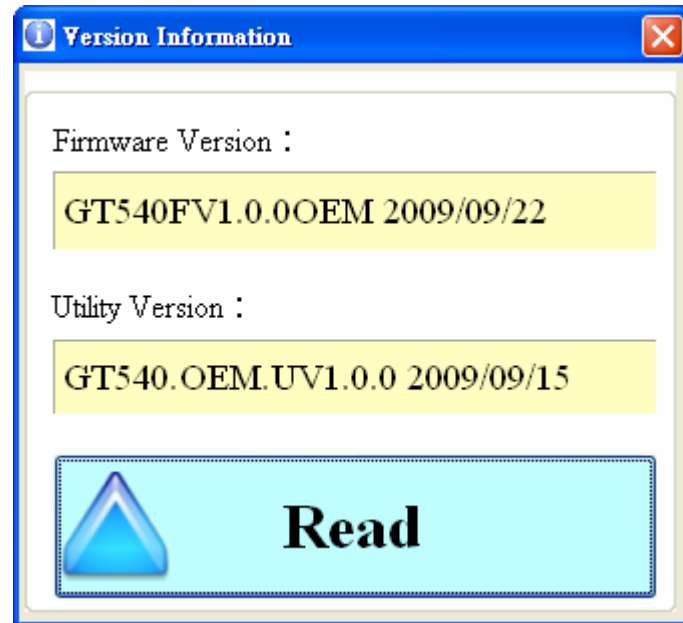
The strength is divided into 5 sections shown in percentage.

Operation :

- (1) Read : Read the GSM signal strength.

4.8 Version

Press "Version" in tool menu, and the window would show the version of Utility and firmware.



Text field:

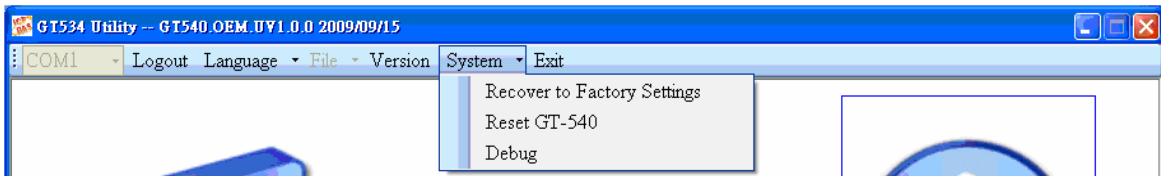
- (1) Firmware version: show the version information of GT-540-OEM1's firmware
- (2) Utility version: show the version information of GT-540-OEM1's utility

Operation:

Read: Read this information from GT-540-OEM1.

4.9 System

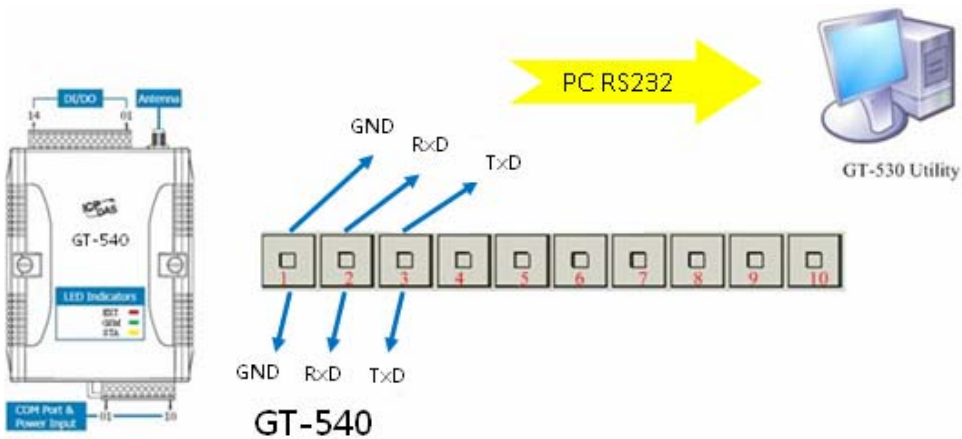
“System” menu item has 3 functions of recovering factory setting and resetting GT-540-OEM1



4.9.1 Recover to Factory Settings

The function is used to recover GT-540-OEM1 as factory settings including password. The steps are below:

- (1) Make sure the STA led is blanking per 1 sec.
- (2) Select the Recover to Factory Settings.

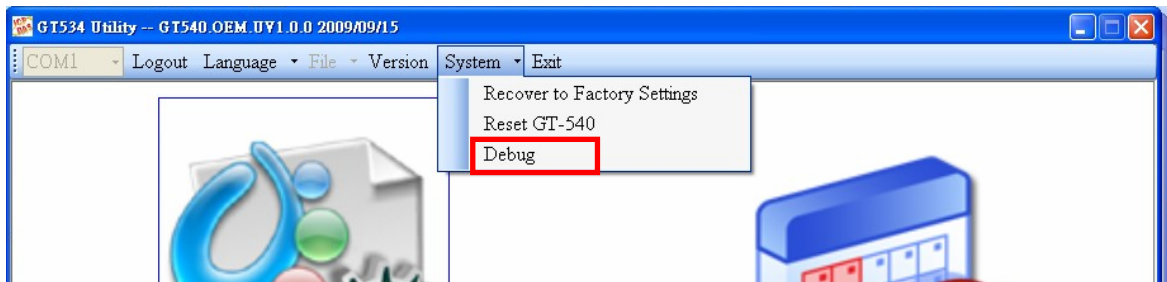


4.9.2 Reset GT-540-OEM1

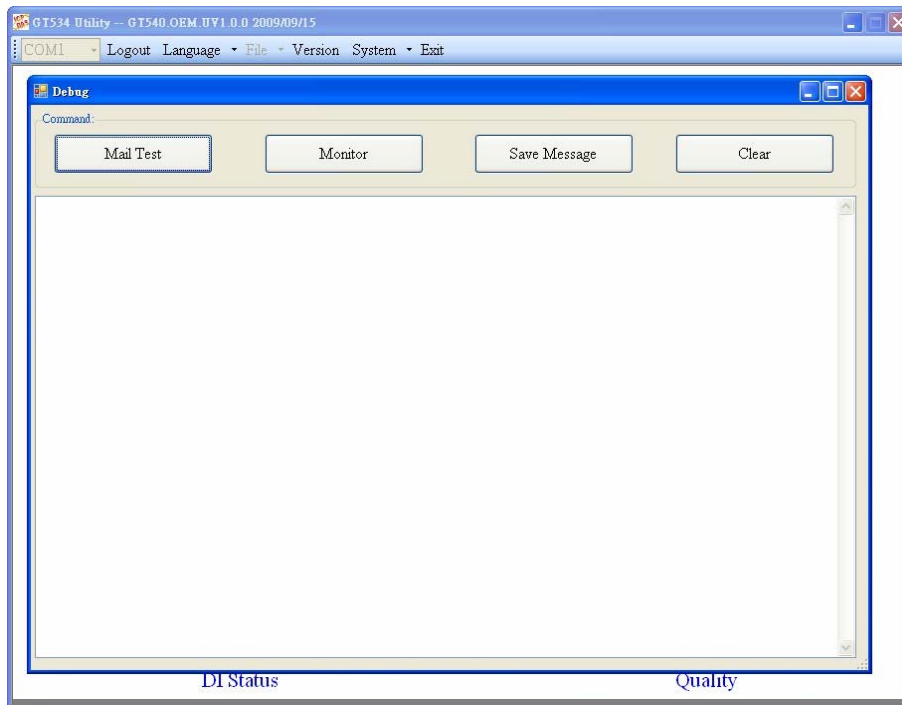
The function is used to reset GT-540-OEM1 by software.

- (1) Make sure STA led is blanking per 1 second
- (2) Select “Rest GT-540-OEM1” button to reset GT-540-OEM1.

4.9.3 Debug Window



The function is used to test E-mail and save setting log. The steps are below:





Debug mode has 4 Items of Mail test, Monitor, save message, and clear.

1. Mail test: Users can send e-mail form utility by the GT-540, and users can see the log of process.
2. Monitor: Users can see all command and response, and users can save the log of process.
3. Save message: save command and response log(*.txt)
4. Clear: clear message

5. Firmware Update

5.1 Hardware and software

5.1.1 Hardware

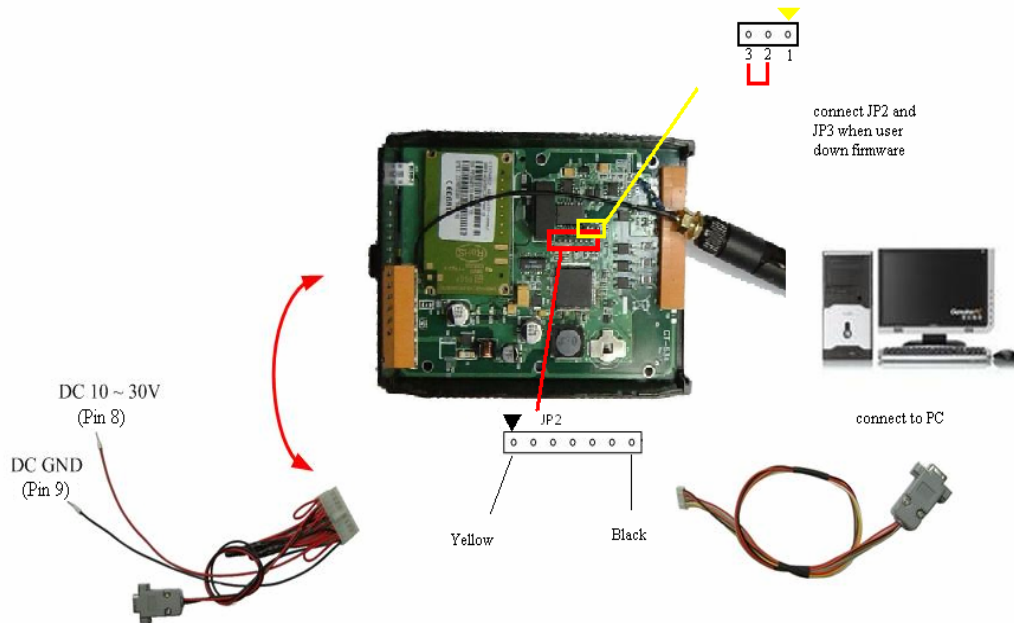
GT-540-OEM1 module	
Download Cable	
Power Cable	10V ~ 30V

5.1.2 Software

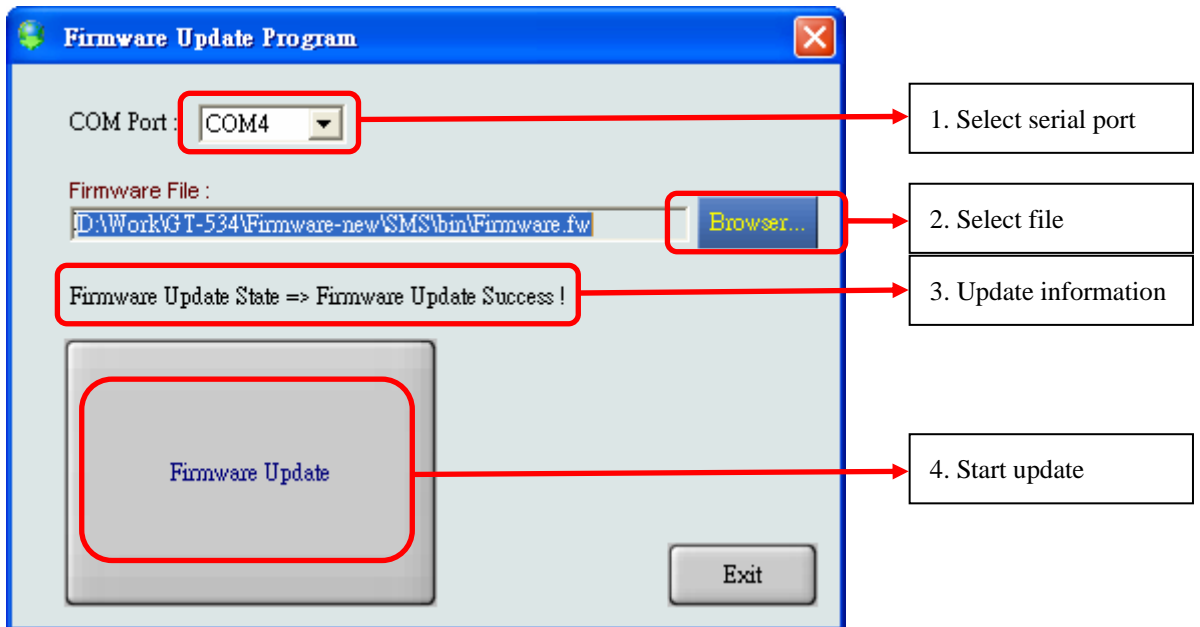
1. Download tool : ISP_Firmware_en.exe
2. Firmware file(*.fw)

5.2 Update Process

1. GT-540-OEM1 power input pin connect to DC power supply
2. Connect download cable with GT-540-OEM1 J2 and PC COM port



3. Turn on the DC power
4. Run ISP_Firmware_en.exe in PC
5. Select serial port
6. Click “Browser”, and select file to update (*.fw)
7. Click “Firmware Update” , and wait to update
8. after success ,click “Exit” to exit



6. Data log and upload

The GPRS maybe happen disconnect during transmission, and the GT-540-OEM1 support data log and data upload for complete data. This chapter will introduce process and format for data log.

P.S It doesn't support SSL/TLS encryption.

6.1 Data format

The file format is "*.csv" that divided each record with ",".In each file, the title is name of record, and according to the order are date, The GT-540-OEM1 IO data, and Modbus device data.

Example:

2009/09/24 17:55:18

Local DI0~DI1: Counter mode (title CI)

Local DI2~DI5: DI mode (title DI)

Modbus device M-7016

Address: 5

DI*1, DO*4, AI*2, AO*1

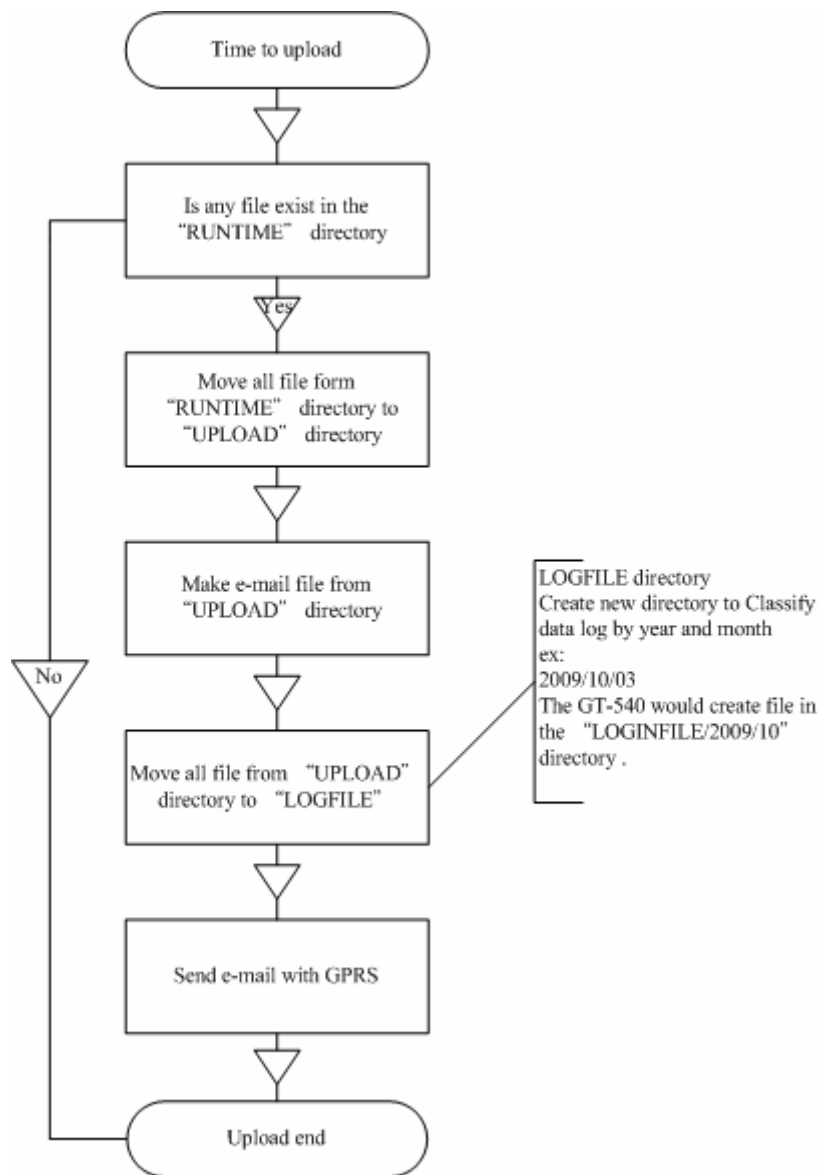
Record data:

Date	CI0	CI1	DI2	DI3	DI4	DI5	DO0	DO1	AI0	Module [M-7016]	Addr.	DI0	DO0	DO1	DO2
20090924 175518	119	230	0	0	0	0	0	0	-0.492		5	1	1	1	1
20090924 175519	119	230	0	0	0	0	0	0	-0.493		5	1	1	1	1

DO3	AI0	AI1	AO0
1	0.001	0.002	6.8
1	0.001	0.003	6.8

6.2 Process of Upload E-Mail

Please refer flow chart below.



The system would create record file by date of now and scan time that user can differentiate variety of data. The GT-540 records data continuously when it uploads data.

Example:

Date: 2009/09/28 06:30 PM , scan time : 1

The file name is "20090910_1830_1.csv".

The new file will be created when the event is on condition below.

1. Users add, update, delete Modbus device
2. The size of file is over the setting
3. Upload report time
4. Update scan time

7. Troubleshooting

Item	Trouble state	Solution
1	EXT LED is off	Please check the external power and wire connection.
2	STA is always on	Check SIM card Check Antenna Check the GSM signal strength
3	GT-540-OEM1 Utility can't connect to GT-540-OEM1	Check STA LED blinking every 1 sec Check com port connection and baud rate setting
4	STA led is blanking per 50 ms	The pin code is wrong. The login windows would show the field to input PIN or PUK code