SAPIP-GSM Quick Start Guide

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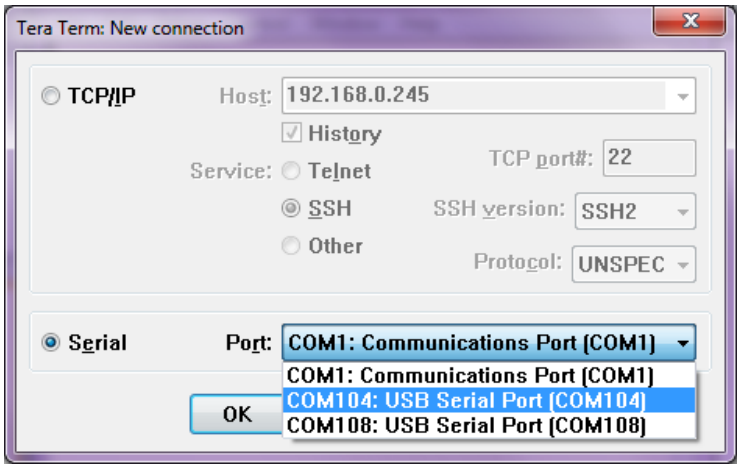
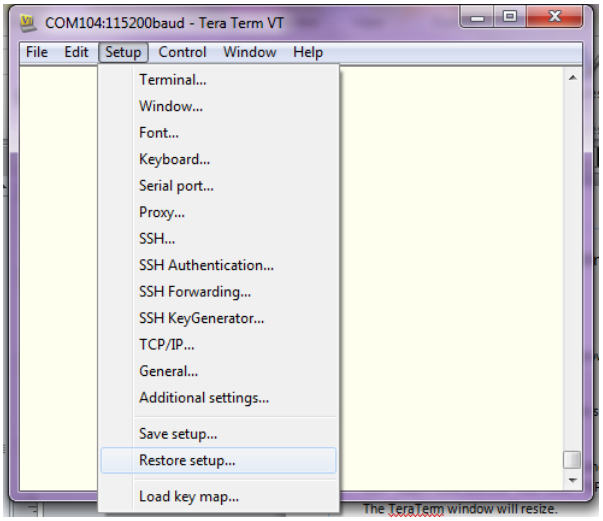
Section 1 — Connect to SapIP-GSM through TeraTerm

- Connect antenna to SapIP and lay antenna vertically next to a window.
- Power on SapIP-GSM then connect it to PC using provided black USB cable.
- When looking down from top of the enclosure, left window will show a yellow LED blinking. The sequence is short-short-long-long-short-short, then repeat one more time. The blinking sequence happens every 30 seconds under normal operation.
- Right window will show a dim red LED blinking. This is SapIP processor LED which blinks once a second.
- GSM green LED is difficult to notice under bright sunlight. If you cover it with your hands, through the enclosure, you may be able to catch that fast green LED which blinks twice a second.
- Run TeraTerm program from PC then select associated COM port, click “OK”.
- Go to “Setup—Restore Setup” and navigate to “C:\Program Files (x86)\teraterm” folder and select “SapIP-TeraTerm.ini” file, click “OPEN”. The TeraTerm window will resize.
- If you don’t have the file available, download it here.





Section 2 — Verify SapIP Status

- Type *** to enter USB command mode.
- There is a list of USB commands available and can be downloaded from here.
- Type “STAT” to check battery status, date/time, battery level, and logging status.
- Type “MVER” to verify GSM version number, the latest version is 544 (domestic) and 545 (China).
- Type “SERNO” to verify GSM address, this is a 8-digit number that has to match with SapIP address on agrisensors.net.
- Type “AVRS” to verify heater voltage. Refer to downloaded document to change heater setting.
- Type “INTER” to verify logging interval. Default interval is 15 (15 minutes). Refer to downloaded document to change logging interval.
- Type “ADC” to verify channel setting and labels. Refer to downloaded document to change channel configuration. This has to be done via TeraTerm.

```
***OK
$stat
BATT OK      - 03896, 06/28/2019, 09:25:00, F, F, Battery = 12.0 V, ----------K
$avrs
ON       - 5000 mV - 5083 mV - 0004 mA
$inter
15
$mver
Ver544.012
$serno
00890006
$
```

```
$adc
0 0 6 Ch1_V
1 0 6 Ch2_V
2 0 6 Ch3_V
3 0 6 Ch4_V
4 0 6 Ch5_V
5 0 6 Ch6_V
6 0 6 Ch7_V
7 0 6 Ch8_V
8 _Pcnt
9 ACFre
```

Section 3 — Verify GSM Status

- Reboot SapIP by typing in “rboot”.
- During the reboot, pay close attention to the following messages:
  - ◊ Version
  - ◊ Signal strength — CSQ
  - ◊ APN
  - ◊ Date/time
- Signal strength interpretation below.
- There is a list of GSM commands available and can be downloaded from here.
- To verify signal strength without rebooting SapIP, use can do the following:
  - ◊ Type *** to enter USB mode
  - ◊ Type +++ and hit “ENTER” to access GSM mode
  - ◊ Type “AT+CSQ” and wait for response. User may have to type in this command 2 -3 times before a response can happen
  - ◊ When done, wait until GSM mode timed out and “$” sign re-appears
  - ◊ Type “EXIT” to disconnect from SapIP

```
rboot
OK
00:00:00 CPU RESET, V544 (CNHOST GSM)
```

```
AT+CSQ

+CSQ: 9,0

OK
00:00:18 SIGNAL : 9
```

```
OK
AT+SAPBR=3,1,"APN","telargo.t-mobile.com"
```

```
OK
AT+COPS=0

*PSUTTZ: 2019,6,28,14,29,10,"-20",1

DST: 1

OK
AT+CCLK?

+CCLK: "19/06/28,09:29:12-20"
```

Signal	dBm
0	-115 or less
1	-111
2-30	-110 ~ -54 Good Readings?
31	-52 or greater, Excellent result
99	not known or not detectable

Section 4 — Verify Log and GSM Communication

- Refer to USB Command List downloaded earlier.
- Change logging interval to Test Normal (Type “INTER TN”).
- Change heater voltage to minimum required voltage for the sensor used. For example, if dynagage, set heater to 3.5V (Type “AVRS 3500”).
- Connect sensor to SapIP then reboot SapIP. Wait for the reboot process to complete (about 60-90 seconds).
- Enter USB command mode then start logging (Type “START”).
- Monitor transmission on TeraTerm while verifying data on agrisensors.net (Test Normal logging interval produces a new data every 100 seconds, it takes about 15 minutes for new data to be uploaded to agrisensors.net website).
- While waiting for the new data, verify remote commands through **agrisensors.net SapIP control panel**. Monitor SapIP response through TeraTerm.
    - ◊ Status
    - ◊ Repeat Last Reading (0th reading will not show.)
    - ◊ Show Device Config
    - ◊ Stop Logger
    - ◊ Start Logger—Verify data is good.
    - ◊ Update Date/Time
    - ◊ Send SMS to Device (or send a single letter from cellphone to the listed SapIP number)
- All above commands except SMS would wake up SapIP and execute the command, then go back to sleep. SMS will only wake up SapIP for a few seconds to check if there is any pending commands waiting then go back to sleep.
- When new data is ready and uploaded to website, verify it on agrisensors.net under “Sensor Report”.
- Stop logging by issuing remote “STOP LOGGER” command or typing “STOP” in TeraTerm.
- SapIP-GSM is now ready to be deployed to the field.

Appendix: SAPIP-Cell-GSM Message Explanations

CPU RESET, V532 (CNHOST GSM)

CPU (central processor unit) Power-on message with the firmware version number (532) and options (LTE NOSLEEP). Possible options are

GSM - 3G network

CMNET - China Mobile network (GSM only)

CNHOST - using Web Host in China (agrisensors.cn)

Wait for power up...

The CPU is waiting for the LTE module to acknowledge that it has powered up. A response is sent only if the module was previously powered down or reset.

Scanning flash…

DEF ATSM=0

DEF ATOS=50

ATOW=4000

Flash memory setup

DTR lo

The CPU has de-activated the DTR line to hard-reset the GSM module

DTR hi

The CPU has activated the DTR line to enable communications to the GSM module

AT

This is the wake-up command to the GSM module and sets the baud rate. Lines beginning with AT are commands sent from the CPU to the GSM module (the modem). The debug port shows the commands sent and the replies (if any).

OK

Normal response to the CPU after it sends a command to the modem

ATE0

Turn off the echo

AT+CSCLK=0

Set the clock mode to zero (normal clock, no sleep)

AT+CNMI=0

Pause responses to incoming SMS

AT+CSDT=0

Switch off SIM card detector messages

AT+CGREG=0

Network registration off

AT+CIURC=0

Turn off URC (Unsolicitated Response Control)

AT+CSQ

Get signal strength

+CSQ: 0,0

Modem responds with signal strength zero (no signal)

SIGNAL : 0

No signal (usually means the antenna is disconnected)

Wait 5 sec

The CPU is going to wait 5 seconds before checking the signal strength again

SIGNAL : 9

The signal strength is 9 (not a great signal). The signal strengths are:

0-5 poor (equivalent to one bar)

6-9 marginal (two bars)

10-22 good signal (three to four bars)

RST lo

The CPU is attempting to reset the modem (network component only)

RST hi

The CPU has released the modem reset

+CPIN: READY

The network functions are ready

SMS Ready

The SMS functions are ready

Reset no help

The CPU could not restore the network by resetting the modem

4 min delay

The CPU will wait 4 minutes before attempting to contact the network

CheckforCommands…

The CPU will check the network for pending commands from the web server

AT+CTZR=1

Requesting local time zone when the network connects

AT+COPS=2

Disconnect the network to force date and time update

AT+COPS=0

Reconnect the network to get date and time

***PSUTTZ: 2019,6,13,22,53,38,"-20",1**

Modem reports date and timezone (see +CCLK below)

AT+CCLK?

Get the date and time

+CCLK: "19/06/13,17:53:40-20"

Date and time response meaning 2019-Jun-13, 5:53 pm, timezone 20 hours behind GMT.

AT+CGACT?

Network context activate check

+CGACT: 1,0

+CGACT: 2,0

+CGACT: 3,0

Response to context activate check with three possible contexts (networks)

AT+CGACT=1,1

Context activate (context id = 1)

GSM not OK

Could not connect to data network

AT+CGATT?

Check network attached

+CGATT: 1

Confirm network attached

AT+SAPBR=2,1

Disconnect from APN (Access Point Name)

+SAPBR: 1,3,"0.0.0.0"

Confirm disconnect from APN

AT+SAPBR=3,1,"APN","telargo.t-mobile.com"

Select t-mobile as the APN

AT+SAPBR=1,1

Connect to APN

Connected!

CPU confirms connected to cellular data network

updated Date Time

Date and time were updated from the cell network

4 min delay

The next call to CheckForCommands to poll the web server will happen in 4 minutes

Got: {"Commands":[]}

Sample empty command string (no commands in the buffer)

SENDING STATUS

The CPU is sending a status message to the web server

Completed

The HTTP request is done (no error)

Meas Start

The CPU has started a measurement cycle

Last Meas

After this upcoming measurement cycle, the averages will be taken and the data will be recorded to FLASH memory and sent to the webserver

Skipping CFC

Due to an upcoming measurement cycle (in <90 seconds), the CPU is skipping the call to CheckForCommands

CheckforCommands...

The CPU is about to check the web server for new commands

00567,04/15/2019,15:30,12.2,+0.2206,+0.2222,+0.2225,+0.0083,+0.2229,+0.2228,+0.2229,+0.0087,00.0470,00000,+30.3,5.07,0000,0000.0,T,F,KKKKKKKKKUK

Sample data record (number 567) to be sent for this unit with date, time, analog and digital readings

SENDING DATA

The CPU has initiated the SendData function

AT+HTTPINIT

Init the HTTP connection to the server

AT+HTTPPARA="CID",1

Select context identifier 1

AT+HTTPPARA="REDIR",1

Enable HTTP redirect

AT+HTTPPARA="URL","http://54.223.247.231:80/ServiceInterface.asmx/GetCommands?ID=ZZ00890004"

Specify URL (Universal Resource Link or web address) to server

AT+HTTPACTION=0

Send the request in an HTTP “GET”

+HTTPACTION: 0,601,0

The response code (here it is 601) to the request and the number of bytes in the response

601 = no connection

200 = OK (no error)

404 = Not Found

etc…

AT+HTTPTERM

Terminate the HTTP session

Sleep

The GSM modem is going to be put to sleep

AT+CMGF=1

Set SMS message mode to text

AT+CMGDA="DEL ALL"

Delete all pending SMS messages

AT+CNMI=3,1,0,0

Wake up the modem from sleep if we get an SMS and send the message to the CPU

AT+CSCLK=2

Set clock mode to 2 (slow clock) which is the normal sleep mode

AT+HTTPDATA=349,10000

HTTP “PUT” request of 349 chars for the SAPIP data and wait 10 sec (10000 msec) for the reply

DOWNLOAD

HTTP data being sent to server

<idigi_data><sample>...</sample></idigi_data>

HTML string for the SAPIP data

AT+HTTPACTION=1

“PUT” request

+HTTPACTION: 1,200,26

“PUT” request acknowledged with code 200 (success) and 26 character reply

601 = no connection

200 = OK (no error)

404 = Not