



# SMS AT RUN and TCP AT RUN

## Application Note

80000NT10043a Rev.2 – 2013-04-16



## APPLICABILITY TABLE

	SW Versions
<b>GC Family ( Compact )</b>	
GC864-QUAD	
GC864-QUAD V2	
GC864-DUAL V2	
<b>GE/GL Family ( Embedded )</b>	
GE864-QUAD	
GE864-QUAD V2	
GE864-QUAD Automotive V2	<b>10.00.xx7</b>
GE864-QUAD ATEX	
GE864-DUAL V2	
GE864-GPS	
GE865-QUAD	
GL865-DUAL	
GL865-QUAD	
GL868-DUAL	
GE910-QUAD	<b>13.00.xx3</b>
GL865-DUAL V3	<b>16.00.xx2</b>
GL868-DUAL V3	
<b>GT Family ( Terminal )</b>	
GT863-PY	
GT864-QUAD	<b>10.00.xx7</b>
GT864-PY	
<b>HE910 Family</b>	
HE910 <sup>1</sup>	
HE910-GA	
HE910-D	
HE910-EUR / HE910-EUD	
HE910-EUG / HE910-NAG	
HE910-NAR / HE910-NAD	<b>upcoming 12.00.xx4</b>

**Note:** the present document covers the SW versions shown in the Applicability Table and may mention features which are not present or behave differently in previous SW versions.

<sup>1</sup> HE910 is the “type name” of the products marketed as HE910-G & HE910-DG.



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# 1. Introduction

## 1.1. Scope

The present document provides the reader with information concerning the use of the SMS AT Run, TCP AT Run and Event Monitor Services. Several local-remote modules configurations are illustrated and some examples are described. The document objective is to help the reader to select the suitable local and remote station configuration, how to carry out the hardware interface between the remote module and the generic user equipment and how to develop a simple software application using the AT commands that manage the mentioned services.

## 1.2. Audience

This document is intended for who needs to remotely control or monitor some variables using suitable sensor connected to a remote Telit module.

## 1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit's Technical Support Center (TTSC) at:

[TS-EMEA@telit.com](mailto:TS-EMEA@telit.com)

[TS-NORTHAMERICA@telit.com](mailto:TS-NORTHAMERICA@telit.com)

[TS-LATINAMERICA@telit.com](mailto:TS-LATINAMERICA@telit.com)

[TS-APAC@telit.com](mailto:TS-APAC@telit.com)

Alternatively, use:

<http://www.telit.com/en/products/technical-support-center/contact.php>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<http://www.telit.com>

To register for product news and announcements or for product questions contact Telit's Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.



## 1.4. Related Documents

- [1] Running AT Commands Remotely Application Note
- [2] Event Monitor Application Note
- [3] Telit EVK2 User Guide
- [4] AT Commands Reference Guide

## 1.5. Document History

Revision	Date	Changes
0	2010-10-13	First issue
1	2012-10-02	Modified Applicability Table, Added chapter 2. Changed “EASY GPRS” into “EASY IP”
2	2013-04-16	Updated Applicability Table

## 1.6. Abbreviations and acronyms

BTS	Base Transceiver Station
DTE	Data Terminal Equipment
GGSN	Gateway GPRS Support Node
GPIO	General Purpose Input/Output
GPRS	General Packet Radio Services
I2CBUS	I-squared-C Bus
PAP	Password authentication protocol
PDP	Packet Data Protocol
PLMN	Public Land Mobile Network
RDTSB	Remote Digital Temperature Sensor Board
RRTC	Remote Room Temperature Control
SGSN	Serving GPRS Support Node



## 2. Note

To reach the target described in chapter 1.1, the “Application Note” refers to the families of Telit modules having the serial ports called ASC0/1 and requiring the sequences of AT commands as described in the lists reported in the following chapters. The objective is to give to the readers the detailed information to develop their own scripts, see Appendix.

For the GE910 module and HE910 family the availability of serial ports and their names (USIF0, USIF1, USB, SPI) are not the same of that used in the examples and figures showed on the following pages. Moreover, these modules require sequences of AT commands that are slightly different from that showed hereafter. In any case, the basic concepts reported on the document are still valid. Refer to the hardware documents and “AT Commands Reference Guide” to get targeted information.

## 3. AT Run and Event Monitor Services Introduction

The AT Run Services [1] allow the user to run AT Commands on a remote module by means of the support of a communication protocol used to connect the local module operated by the user and the remote module located on a remote site, fig. 1. Telit modules provide the following types of AT Run Services:

- SMS AT Run Service:
  - Simple SMS AT Run Service;
  - Digest SMS AT Run Service.

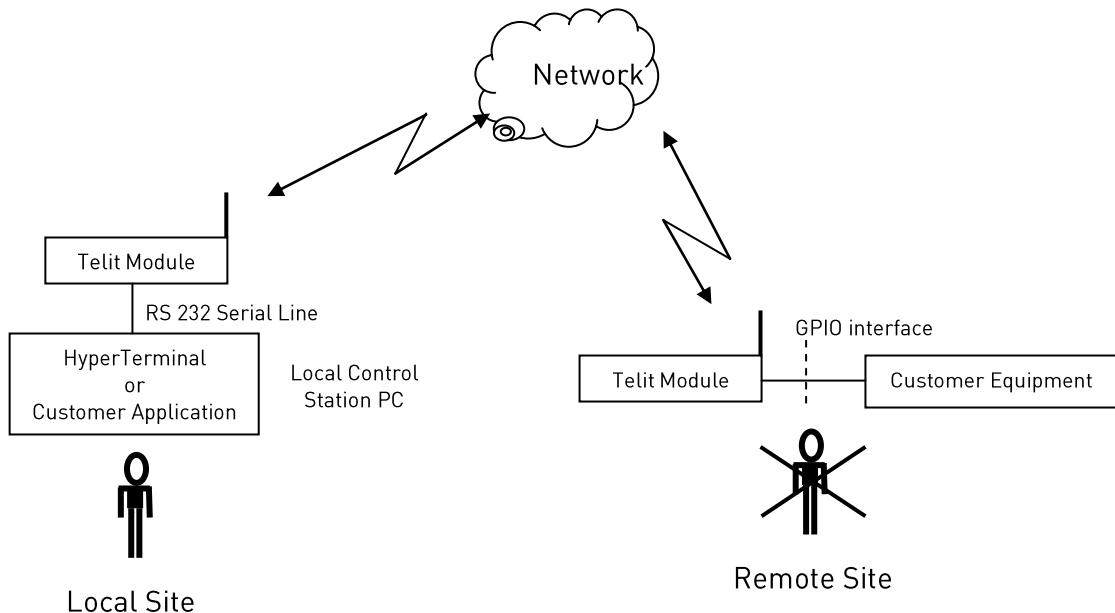
In general, SMS AT Run Service can be used in GSM mode or in GPRS<sup>2</sup> mode

- TCP AT Run Service
  - in Client mode;
  - in Server (Listen) mode.

---

<sup>2</sup> The Network Operator must support the SMS in GPRS mode.





**fig. 1: Basic Configuration**

The Event Monitor Service [2] provided by the Telit modules allows the user to associate an AT Command to a specified event monitored by the module itself. When the module recognizes the event occurring, it executes the associated AT Command. This service can be used jointly with the AT Run Services as will be shown on the following pages.



## 4. SMS AT Run Services

The SMS AT Run Service, running on remote module, is supported by the SMS protocol to receive the AT Commands from the local station and send back the results of the relative running.

The fig. 2 shows a remote station configuration without remote PC, the fig. 3 shows a remote station with remote PC running a customer application. Both remote station configurations run SMS AT Run Service and could be without operator.

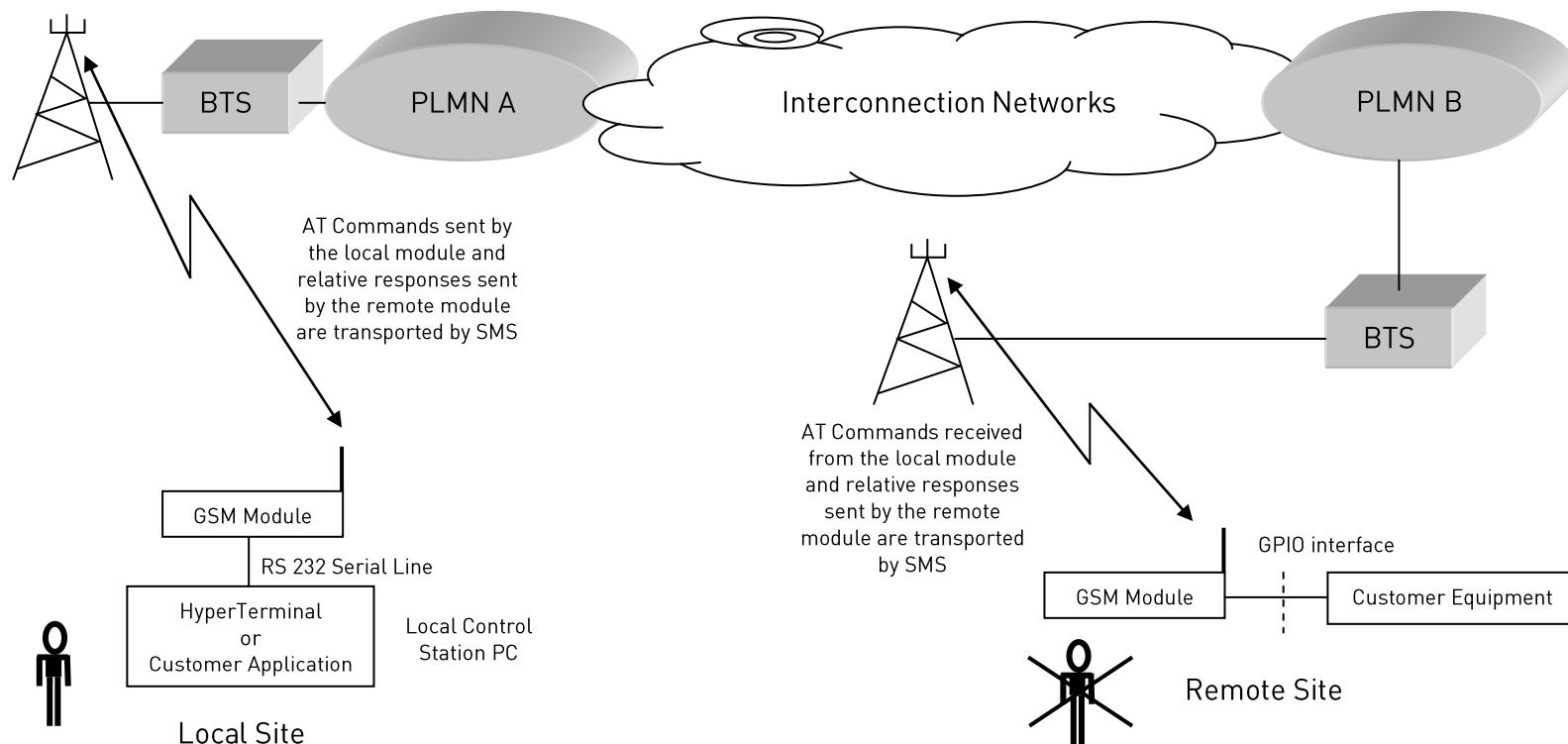
The hereafter described example shows how to run remotely an AT Command, let's suppose that the user needs to know the signal strength received by the remote module. On local station the AT Commands are entered by the user and the received responses are still manually read by the user using an HyperTerminal session.

Basic steps:

1. the user on the local control station writes and sends an SMS message holding the AT Command: AT#MONI;
2. the remote stand-alone module receives the SMS message, executes the AT Command transported by the SMS and sends to the local module, by means of an SMS message, the result of the just ran AT Command;
3. the local module receives the SMS holding the result and alerts the user that a new SMS has been received;
4. the user reads the received SMS holding the desired information.

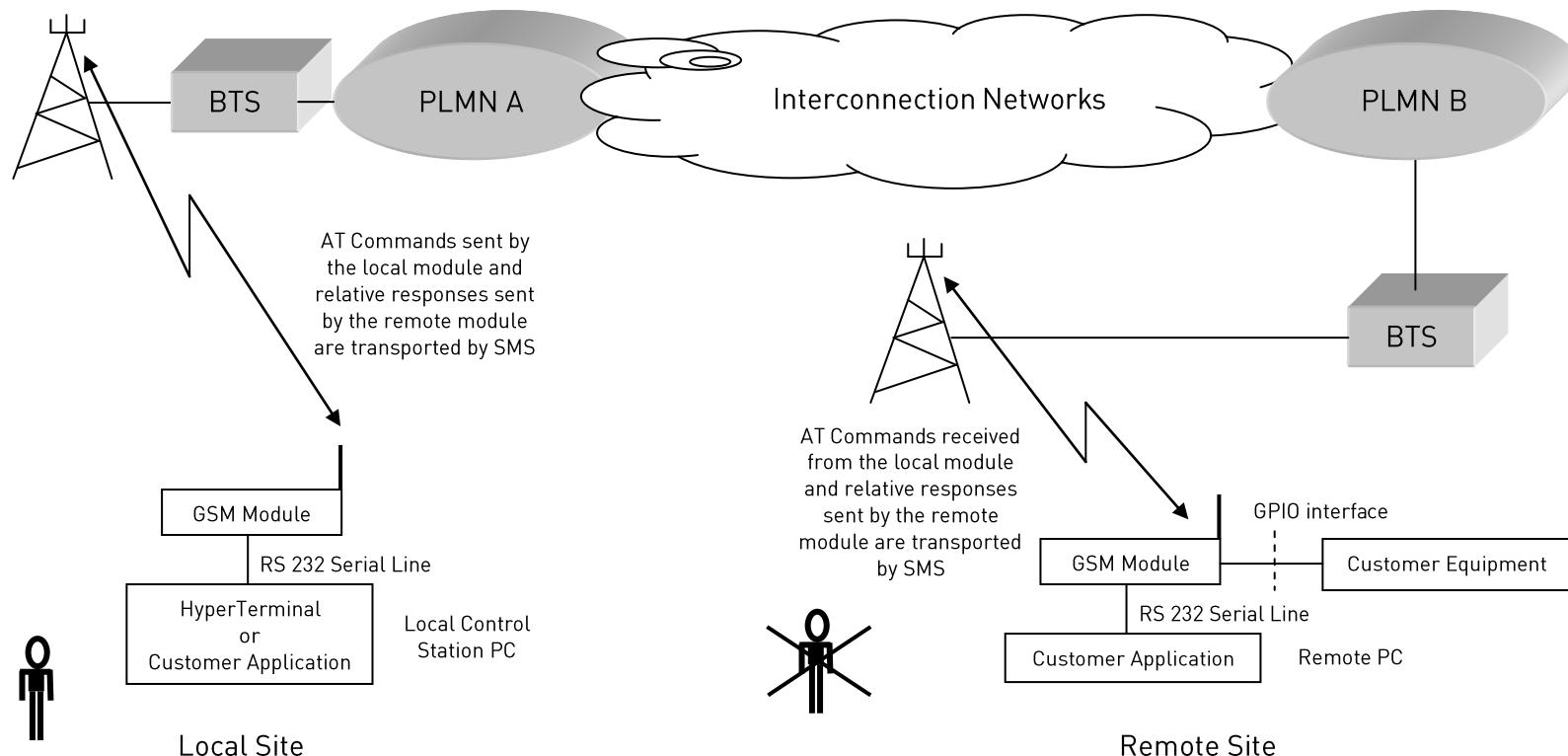
In applications where the customer equipment is not requiring specific control actions, the remote PC or the module Python facility could be substituted by the Event Monitor Service provided by the module. Consequently, the remote module will run at the same time: SMS AT Run and Event Monitor Services.





**fig. 2: Remote Station without PC**





**fig. 3: Remote Station with PC**



## 5. TCP AT Run Service

The TCP AT Run Service, running on remote module, is supported by the TCP protocol to receive the AT Commands sent by the local station, refer to fig. 4, fig. 5, fig. 6. The remote module executes the received AT Commands and sends back to the local station the results. In the following example it is assumed that the user needs to know the signal strength received by the remote module, and the TCP connection procedure is successfully completed:

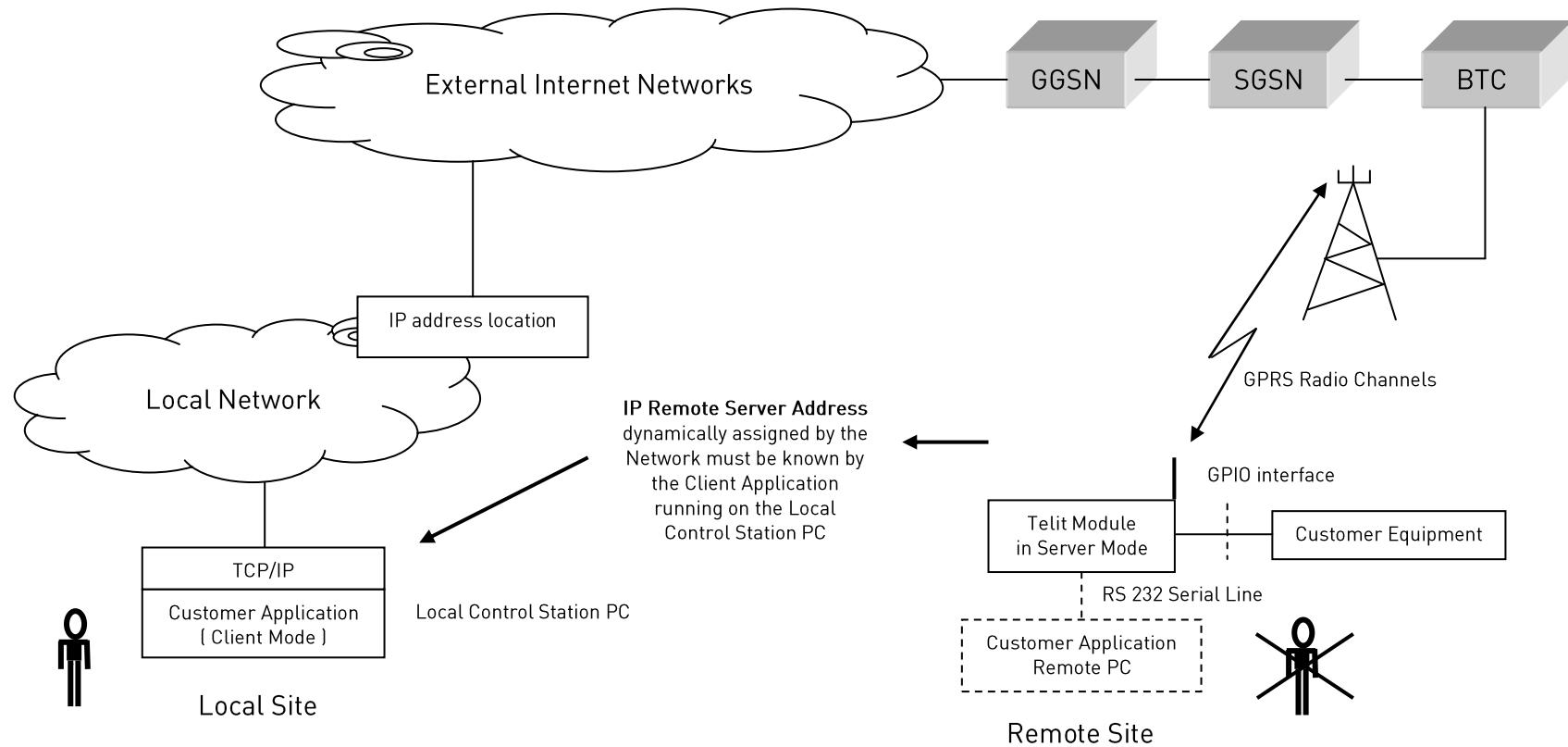
1. the user on local control station enters the AT Command: AT#MONI<CR>;
2. the remote stand-alone module receives the AT Command, executes it and sends to the local control station the Command result holding the required signal strength.

The above described activity can be accomplished using several hardware/software configurations, in accordance with the user requirements. Follow a short description of the showed configurations.

The fig. 4 and fig. 5 show two configurations in which the local control station doesn't use a module. The control station PC runs the TCP/IP protocol stack and it is connected to the local network or uses an Internet Service Provider.

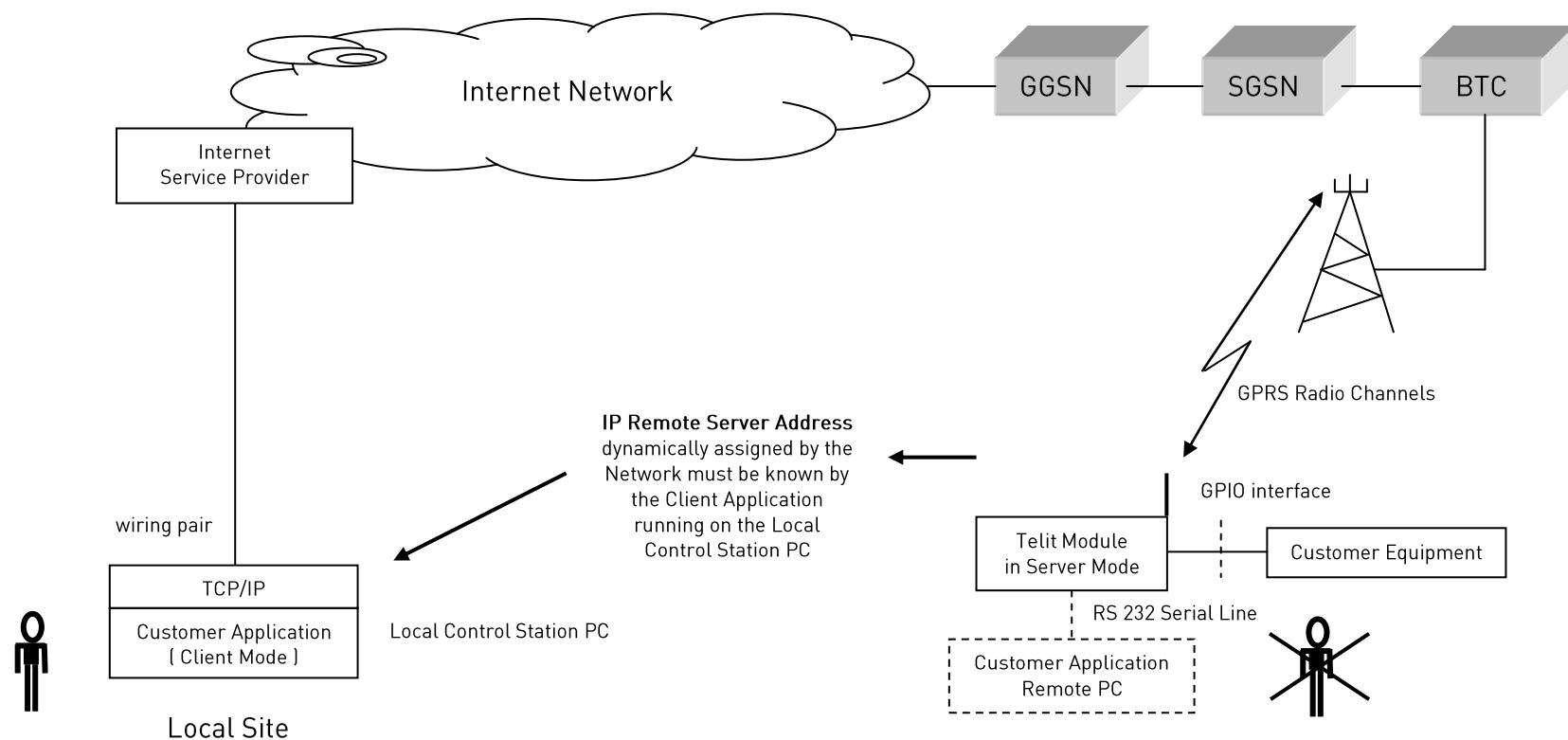
The fig. 6 shows a configuration in which the local control station uses a module. In this solution, the TCP/IP protocol stack runs on module (EASY IP). The control station PC is connected to the module through a serial line. In addition, in applications where the customer equipment is not requiring specific control actions, the remote PC could be substituted by the Event Monitor Service provided by the module itself. Consequently, the remote module will run at the same time: TCP AT Run and Event Monitor Services.





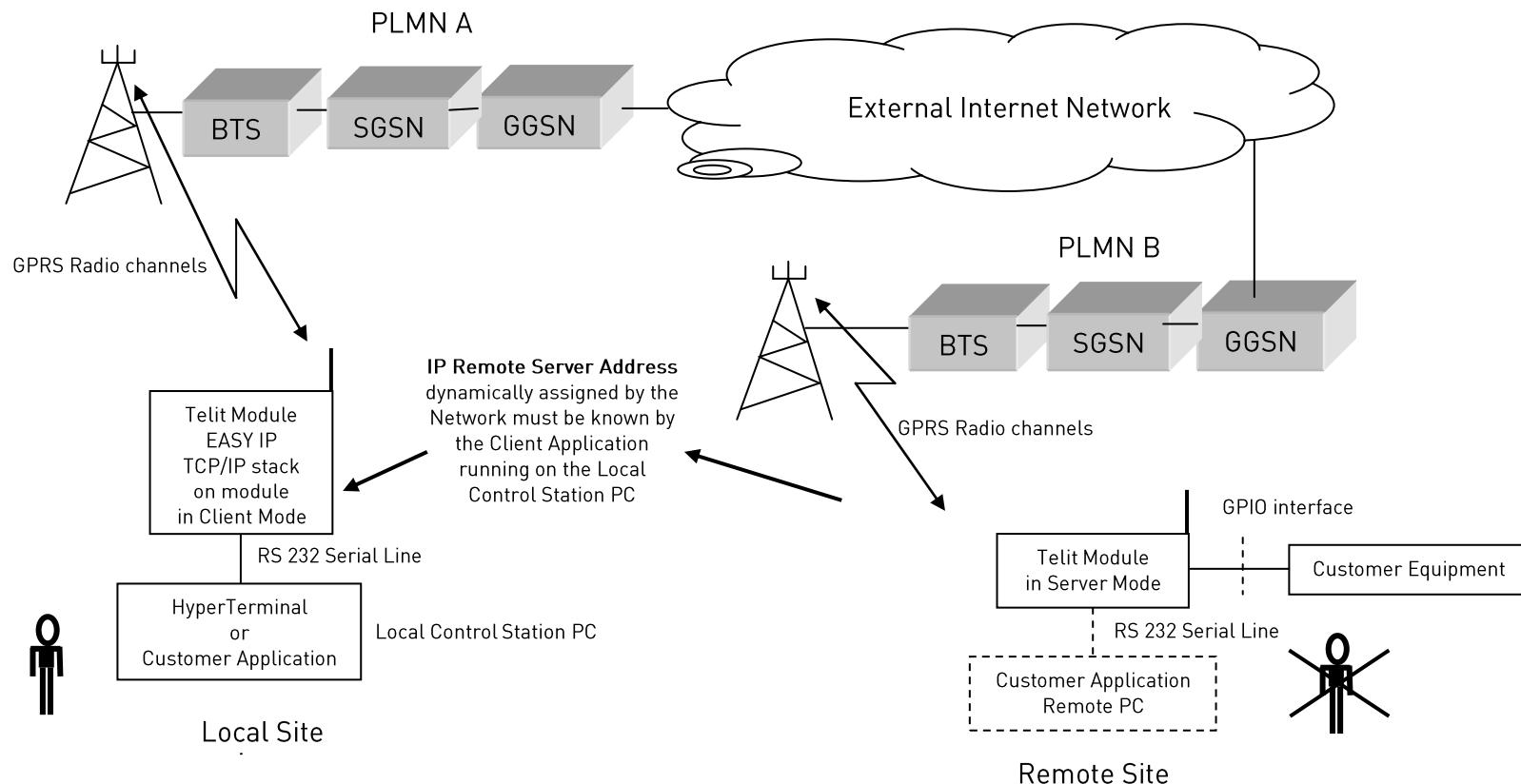
**fig. 4: Local Control Station connected to Local Network**





**fig. 5: Local Control Station using ISP**





**fig. 6: Local Control Station with module**



## 6. Event Monitor Service

The Event Monitor Service [2] provided by the Telit modules allows the user to associate an AT Command to a specified event monitored by the module itself. To perform the monitoring events actions no program or script must be developed by the user. When the module recognizes the event occurring, it executes the associated AT Command.

## 7. Remote Room Temperature Control Application

Aim of this chapter is to introduce a simple AT Run Services application example. Let's suppose that someone needs to control the temperature of a room located in a remote site. To accomplish the remote room temperature control the following items must be got ready:

### Local Site:

- the local module is installed on an EVK board [3] to simplify the interface between the module and the DTE;
- the DTE runs one or more HyperTerminal sessions to enter manually the AT Commands and in the meanwhile monitor the room temperature behavior.

### Remote Site:

- the remote room temperature control is based on a Digital Temperature Sensor which can be configured writing its registers by means of the I2CBUS. The temperature is read from the temperature register. The RDTSB board using a solid state relay turns on/off the heater in accordance with the Digital Temperature Sensor set up;
- the remote module is installed on an EVK board [3] to simplify the interface between the module and the RDTSB board. In addition, this configuration permits to use a unique AC/DC Power Supply for remote module and RDTSB board;
- the length of the wiring between the Telit module and the RDTSB board must be compliant with the electrical requirements of the I2CBUS<sup>3</sup> and GPIO;

---

<sup>3</sup> standard mode: 100 Kbps or fast mode: 400 Kbps, depends on module type.



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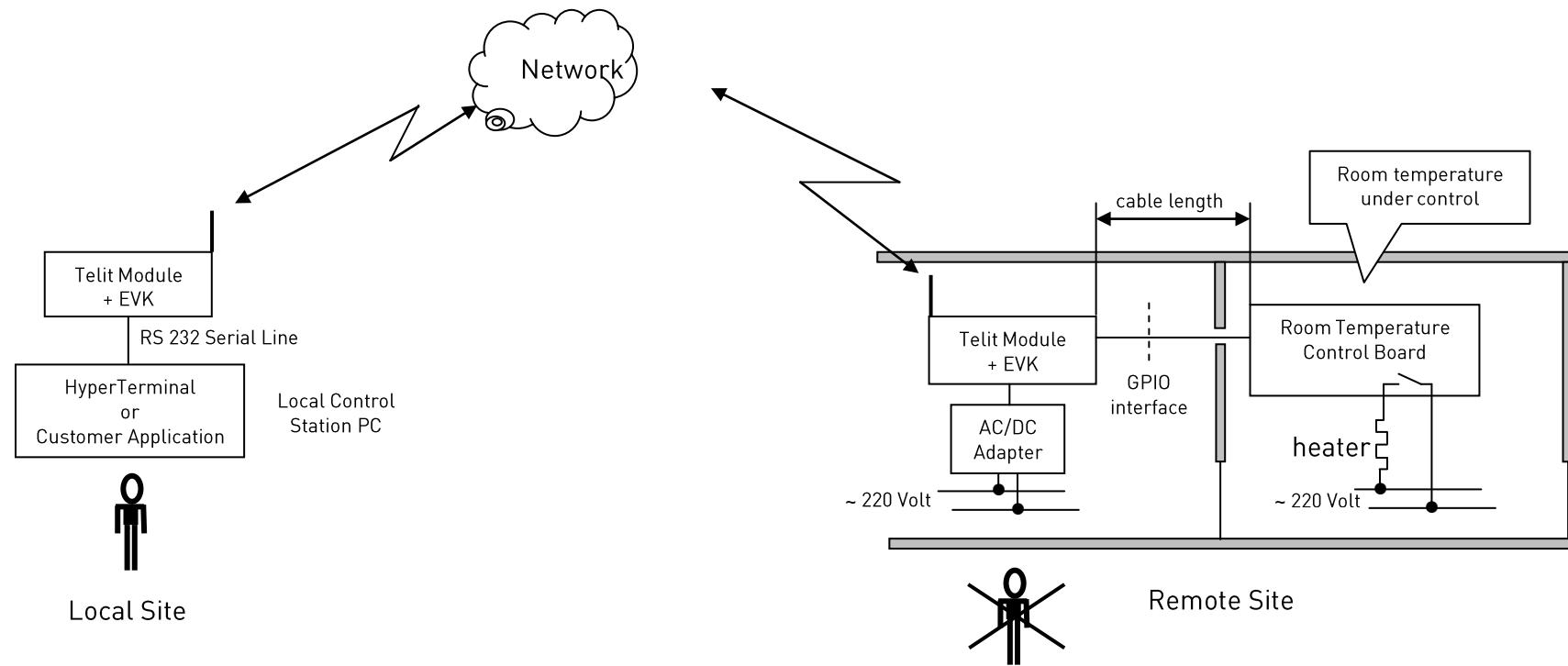
- the DTE runs a HyperTerminal session to enter manually the AT Commands to configure the remote module.

Remote room temperature control is accomplished by the Digital Temperature Sensor used as a thermostat in accordance with the programmed high and low temperature limits. On the Local Control Station are available the following functions accomplished by means of the AT Commands executed by the remote module running the selected AT Run Service:

- Digital Temperature Sensor set up (I2C BUS);
- Start conversion and Power Down Mode set up (GPIO in output direction);
- Heating State monitoring (GPIO in input direction).

The fig. 7 shows a configuration where on remote side is not used a DTE and no operator is supervising the equipments: the figure depicts an operative configuration.





**fig. 7: Remote Room Temperature Control architecture**



Appendix 8 describes in detail the software and hardware items of the Remote Room Temperature Control application. Before going through the mentioned Appendix it is strongly recommended to examine carefully the following subparagraphs.

To get more information about the AT Commands used hereafter refer to [4].

## 7.1. SMS AT Run Service

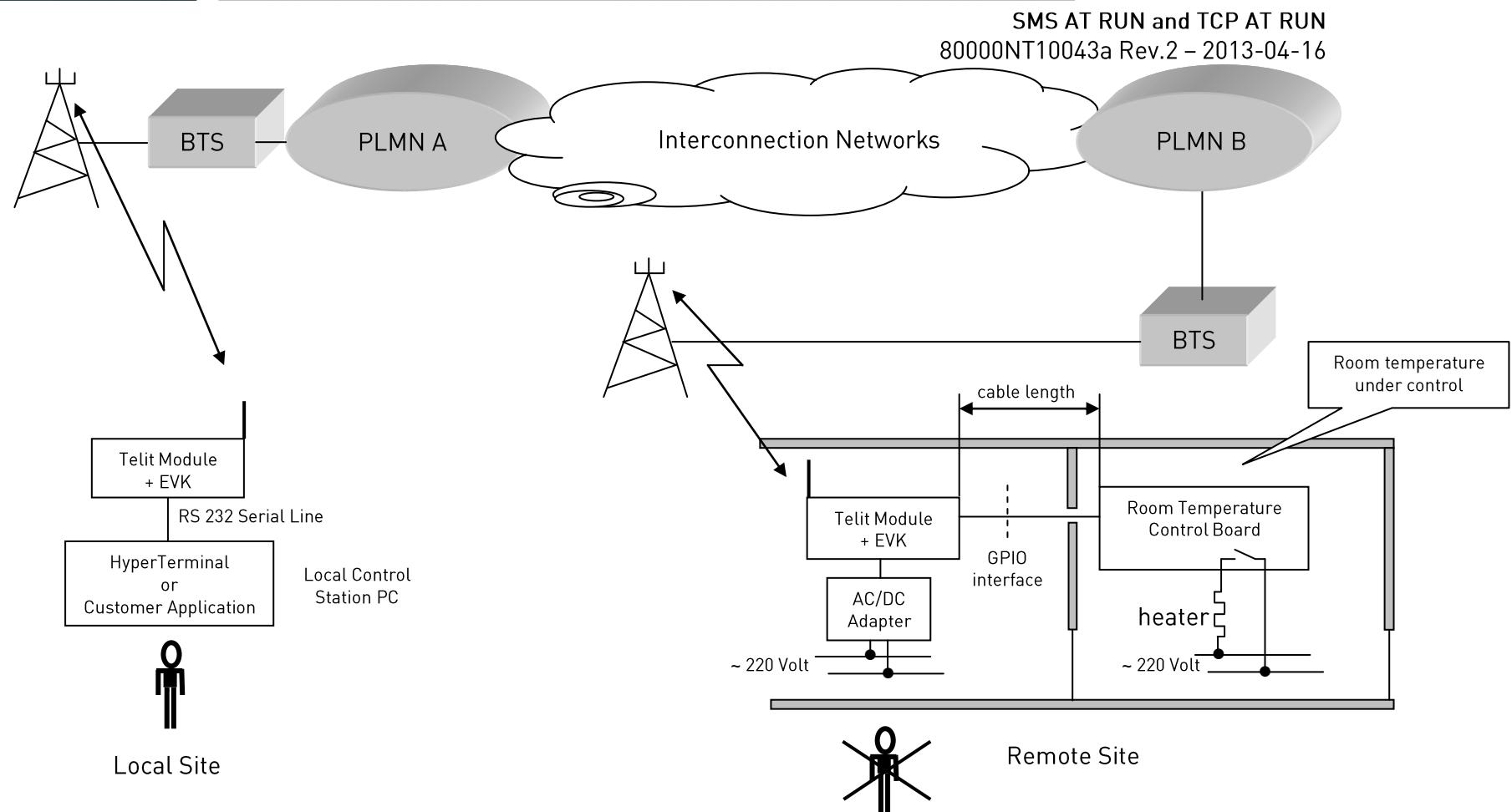
This chapter focuses the attention on the RDTSB board control carried out by means of the SMS AT Run Service running on the remote module and based on the GSM radio channels<sup>4</sup>, see fig. 8.

Despite the configuration showed by the fig. 8, in the following example it is assumed that the two modules are located close to each other on the same site (LAB) and the user can easily enter the AT Commands on both modules. Anyway, one module will be called “remote” and the second one will be called “local”. This approach permits to clearly show the procedure that must be followed to accomplish the remote room temperature control.

---

<sup>4</sup> As alternative: GPRS radio channels.





**fig. 8: RDTSB board & SMS AT Run Service**



### Preliminary DTE/REMOTE MODULE connection set up

Remote module runs the SMS AT Run Service to execute the AT Commands sent by the local module, see fig. 9. To set up the DTE/REMOTE MODULE connection follow these steps:

- connect COM1 to ASC0 using an RS 232 straight cable (pins are connected one on one);
- start an HyperTerminal session on DTE.

The HyperTerminal COM1 session will be used to configure the SMS AT Run Service and Digital Temperature Sensor installed on the RDTSB board.

### Preliminary REMOTE MODULE set up

```
AT#SELINT=2<CR>
OK
AT#SMSMODE=1<CR>
OK
AT#REGMODE=1<CR>
OK
AT+CMEE=2<CR>
OK
```

### Services vs. Instances

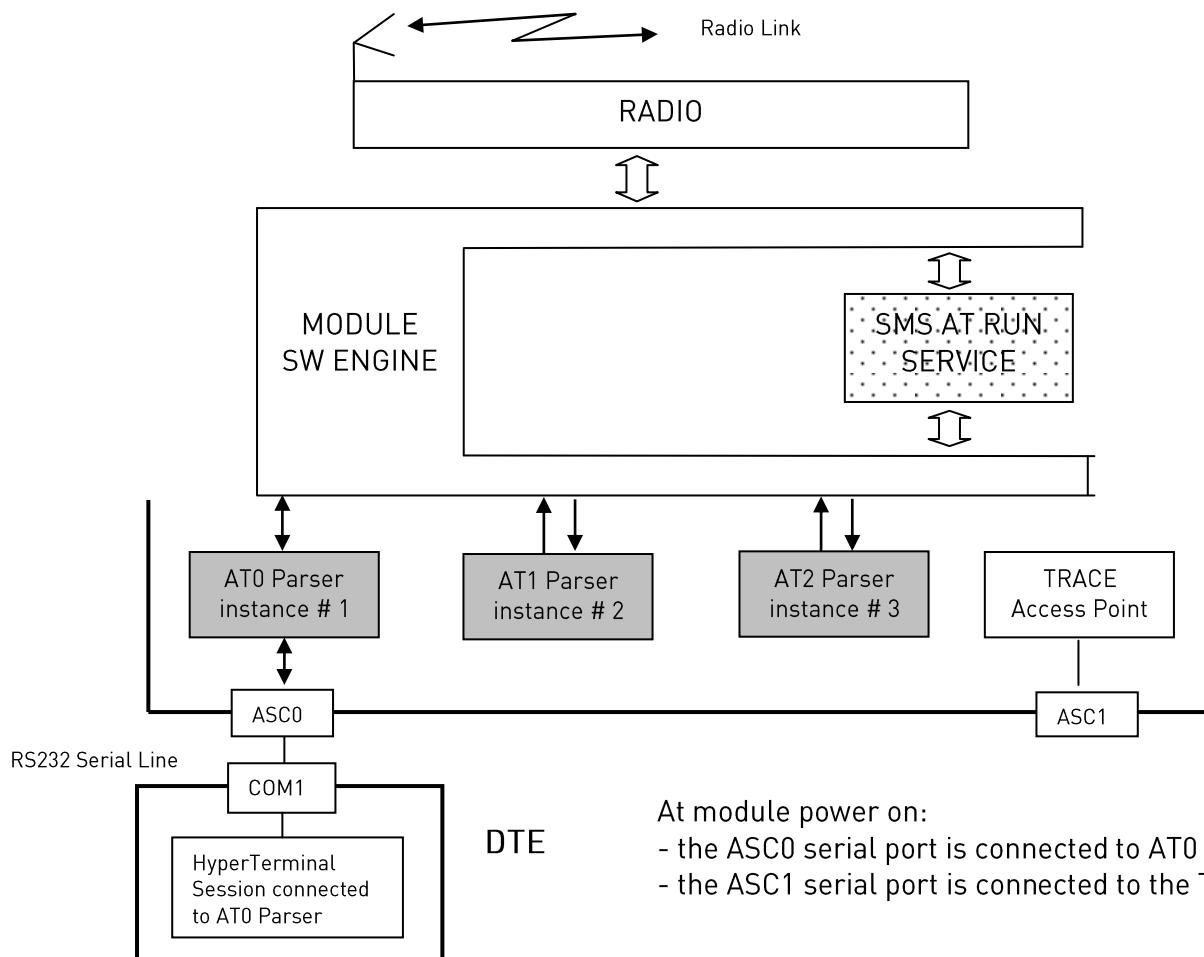
Before going on the remote module set up it is advisable to recall the concept of the instances and their relationships with the Services. With the term “instance” is intended an AT Commands Parser: Telit module provides three independent AT Commands Parsers as showed on fig. 9. Tab. 1 shows all the possible connection (⊕) between instances and services.

In this example, the remote module runs SMS AT Run Service. On Tab. 1 the default connection between the service and instance number is showed by the shadowed area.

Services	Instances available for Services		
	#1	#2	#3
SMS AT Run	/	⊕	⊕
TCP AT Run	/	⊕	⊕
Event Monitor	/	⊕	⊕

**Tab. 1: Default instance for SMS AT Run Service**





**fig. 9: Remote Module running SMS AT Run Service**

Make sure that all Services are disabled

```
AT#SMSATRUN=0<CR>
OK
AT#TCPATRUNL=0<CR>
OK
AT#TCPATRUND=0<CR>
OK
AT#ENAEVMONI=0<CR>
OK
```



### Set up the Digital Sensor Temperature



**Warning:** the AT#I2CWR Command, due its structure, is not supported by the SMS AT Run service, consequently Digital Temperature Sensor registers must be set up using the DTE connected to the remote module. It is worth remind that AT#I2CWR Command is supported by the TCP AT Run Service as will be described on the next chapters.

AT#I2CWR=11,12,50,02,02<CR>  
>1700CtrlZ  
OK

set up low temperature limit (Thyst)  
0x1700 = 23°C

AT#I2CWR=11,12,50,03,02<CR>  
>1B00CtrlZ  
OK

set up high temperature limit (Toti)  
0x1B00 = 27°C

### Set up the SMS AT Run Service on remote module

AT+CMGF=1<CR>  
OK

SMS in text mode.

AT#SMSATRUNCFG=3,1,5  
is  
OK

set up SMS AT Run Service, instance # 3

assigned to the service, fig. 9.

AT#SMSATWL=0,1,0,"+39\*"  
OK

add an element to the WhiteList.

AT#SMSATRUN=1  
OK

enable SMS AT Run Service.

Yet, the remote module when receives an SMS message holding an AT Command, executes the received AT Command and the relative result is sent back to the local module using the transport protocol provided by the SMS message Service.

### Preliminary DTE/LOCAL MODULE connection set up

Local module doesn't run AT Run or Event Monitor Services, see fig. 10. To set up the DTE/LOCAL MODULE connection follow these steps:

- connect COM1 to ASC0 using an RS 232 straight cable (pins are connected one on one);



- start an HyperTerminal session on DTE.

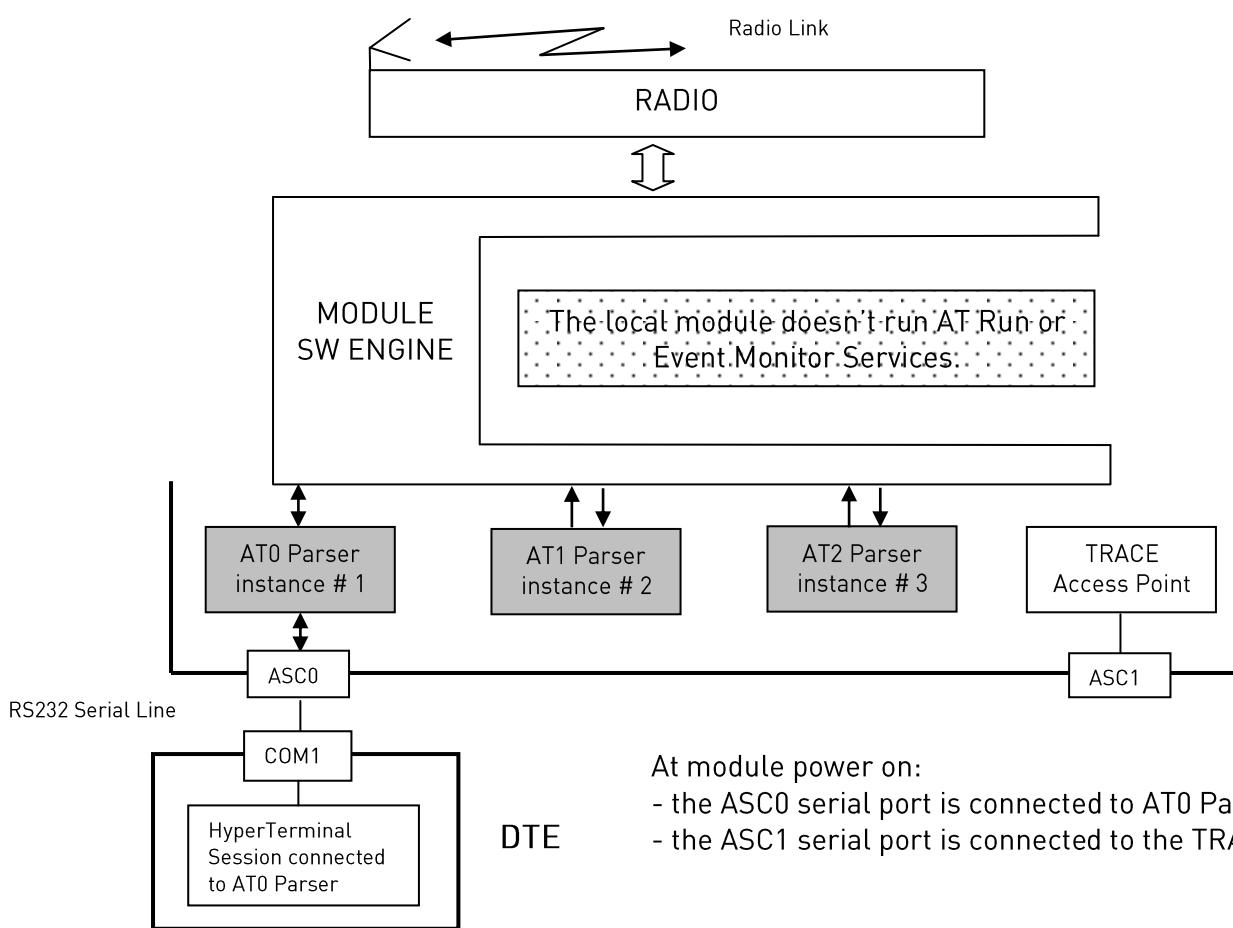
The HyperTerminal COM1 session will be used to read the registers of the Digital Temperature Sensor installed on the RDTSB board or read/write the remote GPIOs.

### Preliminary LOCAL MODULE set up

```
AT#SELINT=2<CR>
OK
AT#SMSMODE=1<CR>
OK
AT#REGMODE=1<CR>
OK
AT+CMEE=2<CR>
OK
```

local module is not using the Services.

```
AT#SMSATRUN=0<CR>
OK
AT#TCPATRUNL=0<CR>
OK
AT#TCPATRUND=0<CR>
OK
AT#ENAEVMONI=0<CR>
OK
```



**fig. 10: Local Module doesn't run AT Run and Event Monitor Services**



Hereafter is reported an example showing how the user, by means of the LOCAL MODULE, can get information from the REMOTE MODULE:

AT+CMGF=1<CR>  
OK

SMS in text mode

AT+CNMI=2,1,0,0,0  
OK

set up New Message Indication on DTE.

//-----  
AT+CMGS="+393290569XYZ"<CR>  
>AT#MONI CtrlZ  
+CMGS: 243  
OK

get the remote module signal strength.

The local module operator waits for the response from the remote module.

+CMTI: "SM",1  
AT+CMGR=1<CR>  
+CMGR: "REC UNREAD" .....  
#MONI: I TIM BSIC:21 RxQual:0 LAC:D5BD Id:5265 ARFCN:9 PWR:-89dbm TA: 1  
OK  
OK

unsolicited code indicates that an SMS is received.  
display the remote module signal strength.

//-----  
AT+CMGS="+393290569XYZ"<CR>  
>AT#GPIO=9,2,0 CtrlZ  
+CMGS: 244  
OK

set up the remote GPIO9 in input mode.

The local module operator waits for the response from the remote module.

+CMTI: "SM",2  
AT+CMGR=2<CR>  
+CMGR: "REC UNREAD" .....  
#GPIO: 0,1  
OK  
OK

display the remote GPIO9 state.

//-----  
AT+CMGS="+393290569XYZ"<CR>  
>AT#I2CRD=11,12,50,00,02CtrlZ

get the remote room temperature value.



+CMGS: 245  
OK

The local module operator waits for the response from the remote module.

+CMTI: "SM",3

unsolicited code indicates that an SMS is received.

AT+CMGR=3<CR>  
+CMGR: "REC UNREAD" .....  
#I2CR: 17C0  
OK  
OK

display the remote room temperature value.

//-----

AT+CMGS="+393290569XYZ"<CR>  
>AT#I2CRD=11,12,50,01,01CtrlZ  
+CMGS: 246  
OK

get Config Register content

The local module operator waits for the response from the remote module.

+CMTI: "SM",4

unsolicited code indicates that an SMS is received

AT+CMGR=4<CR>

display Config Register value.

+CMGR: "REC UNREAD", .....  
#I2CR: 00  
OK  
OK

//-----  
AT+CMGS="+393290569XYZ"<CR>  
>AT#I2CRD=11,12,50,02,02CtrlZ  
+CMGS: 247  
OK

get low temperature limit (Thyst).

The local module operator waits for the response from the remote module.

+CMTI: "SM",5

unsolicited code indicates that an SMS is received.

AT+CMGR=5<CR>

display low temperature limit (Thyst).

+CMGR: "REC UNREAD", .....  
#I2CR: 1700  
OK  
OK



```
//-----
AT+CMGS="+393290569XYZ"<CR>          get high temperature limit (Toti).
>AT#I2CRD=11,12,50,03,02CtrlZ
+CMGS: 248
OK
```

The local module operator waits for the response from the remote module.  
+CMTI: "SM",6 unsolicited code indicates that an SMS is received.

```
AT+CMGR=6<CR>          display high temperature limit (Toti).
+CMGR: "REC UNREAD", .....
#I2CR: 1B00
OK
OK
```

```
//-----
AT+CMGS="+393290569XYZ"<CR>          get heating state (input GPIO9).
>AT#GPIO=9,02CtrlZ
+CMGS: 249
OK
```

The local module operator waits for the response from the remote module.  
+CMTI: "SM",7 unsolicited code indicates that an SMS is received.

```
AT+CMGR=7<CR>          display heating state (input GPIO).
+CMGR: "REC UNREAD", .....
#GPIO: 0,1
OK
OK
//-----
```

This introductory example gives the basic information to:

- develop a suitable software application running on the Local Control Station PC to automatically control the remote room temperature and store its behavior;
- set up the remote module to obtain a stand-alone remote station without DTE and install it in the remote site;
- select the suitable AT Run Service in accordance with the application requirements and AT Run Service capability.




---

**Note:** in this configuration all the actions are initiated by the local module, the remote module doesn't take own initiative.

---



## 7.2. Event Monitor Service

The example described on the chapter 7.1 shows that all the actions are initiated by the local module. The remote module executes the AT Command received from the local module and sends back the SMS holding the relative result. Using the Event Monitor feature the remote module can send on its initiative the heater state to the local module every time the state goes high (refer to the example on chapter 7.1, GPIO9). In this case the local module doesn't need to send an AT Command to the remote module to read the GPIO associated to the remote heater activity.

This chapter illustrates the set up of the remote module running only the Event Monitor Service, the local module is set up as described on chapter 7.1.

### Preliminary DTE/REMOTE MODULE connection set up

Remote module runs the Event Monitor Service, see fig. 11. To set up the DTE/REMOTE MODULE connection follow these steps:

- connect COM1 to ASC0 using an RS 232 straight cable (pins are connected one on one);
- start an HyperTerminal session on DTE.

The HyperTerminal COM1 session will be used to configure the Event Monitor Service and the Digital Temperature Sensor installed on the RDTSB board.

### Preliminary REMOTE MODULE set up

```
AT#SELINT=2<CR>
OK
AT#SMSMODE=1<CR>
OK
AT#REGMODE=1<CR>
OK
AT+CMEE=2<CR>
OK
```

### Make sure that all Services are disabled

```
AT#SMSATRUN=0<CR>
OK
AT#TCPATRUNL=0<CR>
OK
AT#TCPATRUND=0<CR>
OK
AT#ENAEVMONI=0<CR>
OK
```

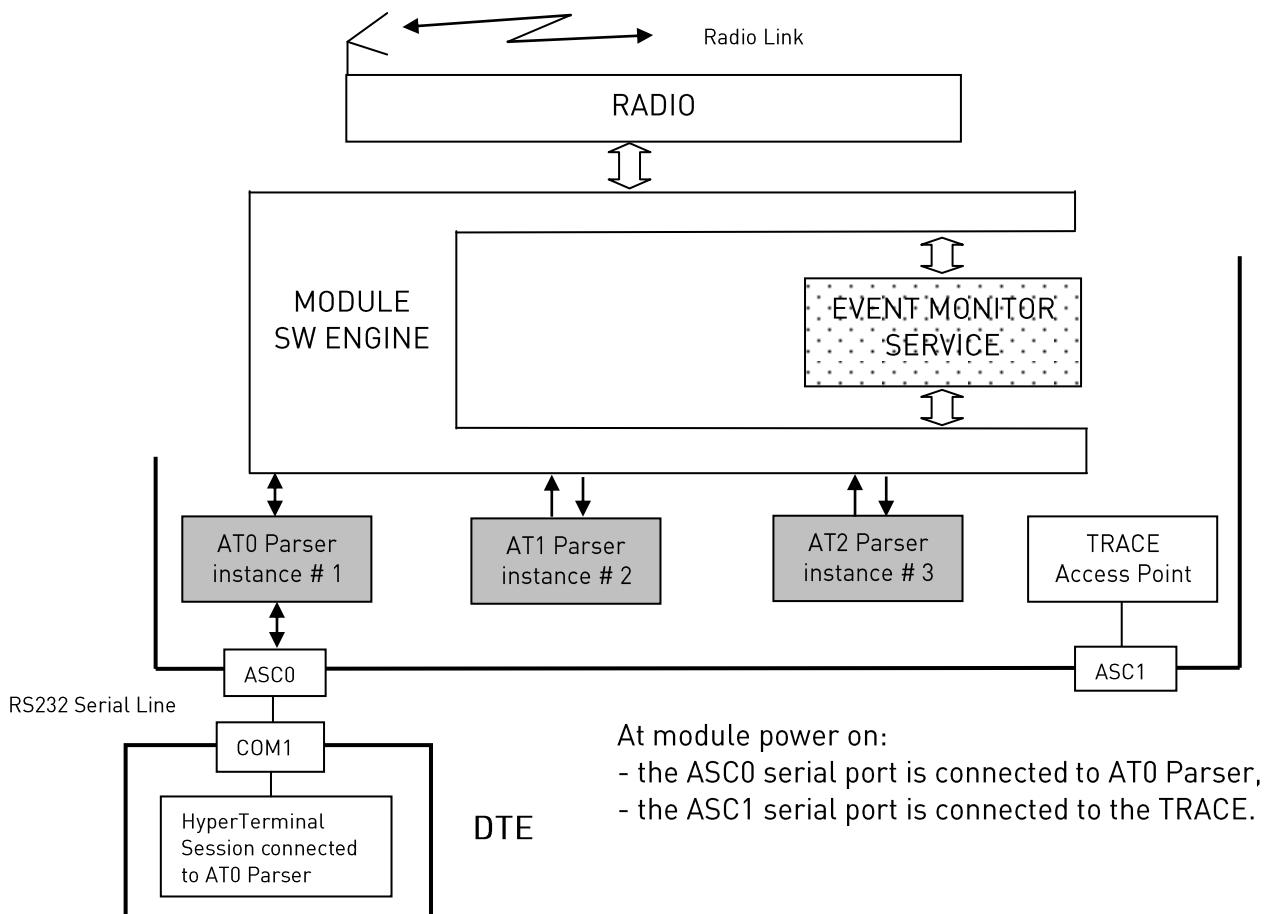


### Services vs. Instances

In this configuration, the remote module only runs the Event Monitor Service. On Tab. 2 the default relationship between the service and the instance is showed by the shadowed area.

Services	Instances available for Services		
	#1	#2	#3
SMS AT Run	/	☺	☺
TCP AT Run	/	☺	☺
Event Monitor	/	☺	☺

**Tab. 2: Instances vs. Event Monitor Service**



**fig. 11: Remote Module running Event Monitor Service**



### Event Monitor Service configuration

AT#ENAEVMONICFG=3,1,5<CR>  
OK

set up Event Monitor Service, instance # 3 is assigned to Event Monitor Service, fig. 11.

AT#EVMONI="GPIO1",0,1,9<CR>  
OK

GPIO9 is connected to GPIO1 label.

AT#EVMONI="GPIO1",0,2,1<CR>  
OK

GPIO9 = HIGH starts the action.

AT#EVMONI="GPIO1",0,3,5<CR>  
OK

time interval (sec) after GPIO9 is gone HIGH the AT Command is sent.

Connect "GPIO1" label with the dispatch of an SMS message and force in SMS text mode the instance #3, fig. 11. The AT Commands managed by the Event Monitor Service are analyzed by the AT2 Parser (instance # 3), in accordance with the analyses results the AT Commands are executed by the remote module:

AT#EVMONI="GPIO1",0,0,"AT+CMGF=1;#CMGS=+393468686XYZ,\22HEATER ON\22"  
OK

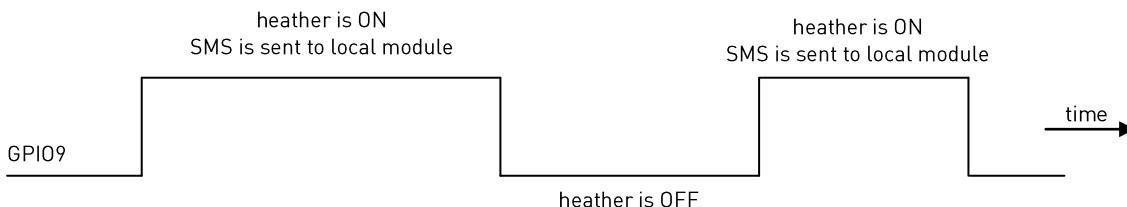
AT#EVMONI="GPIO1",1  
OK

enable the single "GPIO1" Event.

AT#ENAEVMONI=1  
OK

enable the Event Monitor Service.

Yet, if the GPIO9 is high or when it goes high, the remote module sends to the local module the configured SMS message.



**fig. 12: Heater State (GPIO9)**



## 7.3. TCP AT Run Service

This paragraph focuses the attention on the RDTSB board control performed by means of the TCP AT Run Service running on remote module. The fig. 13 shows the configuration target that must be reached to accomplish a remote control. This introductory example assumes that the local module and the remote module are located on the same site (LAB) and the AT Commands are entered by the user through two DTE equipments.

It is assumed that the user enters the AT Commands and waits for the responses from the remote module. This approach permits to clearly show the procedure used to accomplish the remote temperature control.

### Preliminary DTE/REMOTE MODULE connection set up

The remote module runs the TCP AT Run Service to execute the AT Commands sent by the local module, see fig. 14. To set up the DTE/REMOTE MODULE connection follow these steps:

- connect COM1 to ASC0 using an RS 232 straight cable (pins are connected one on one);
- start an HyperTerminal session on DTE.

The HyperTerminal COM1 session will be used to configure the TCP AT Run.

### Preliminary REMOTE MODULE set up

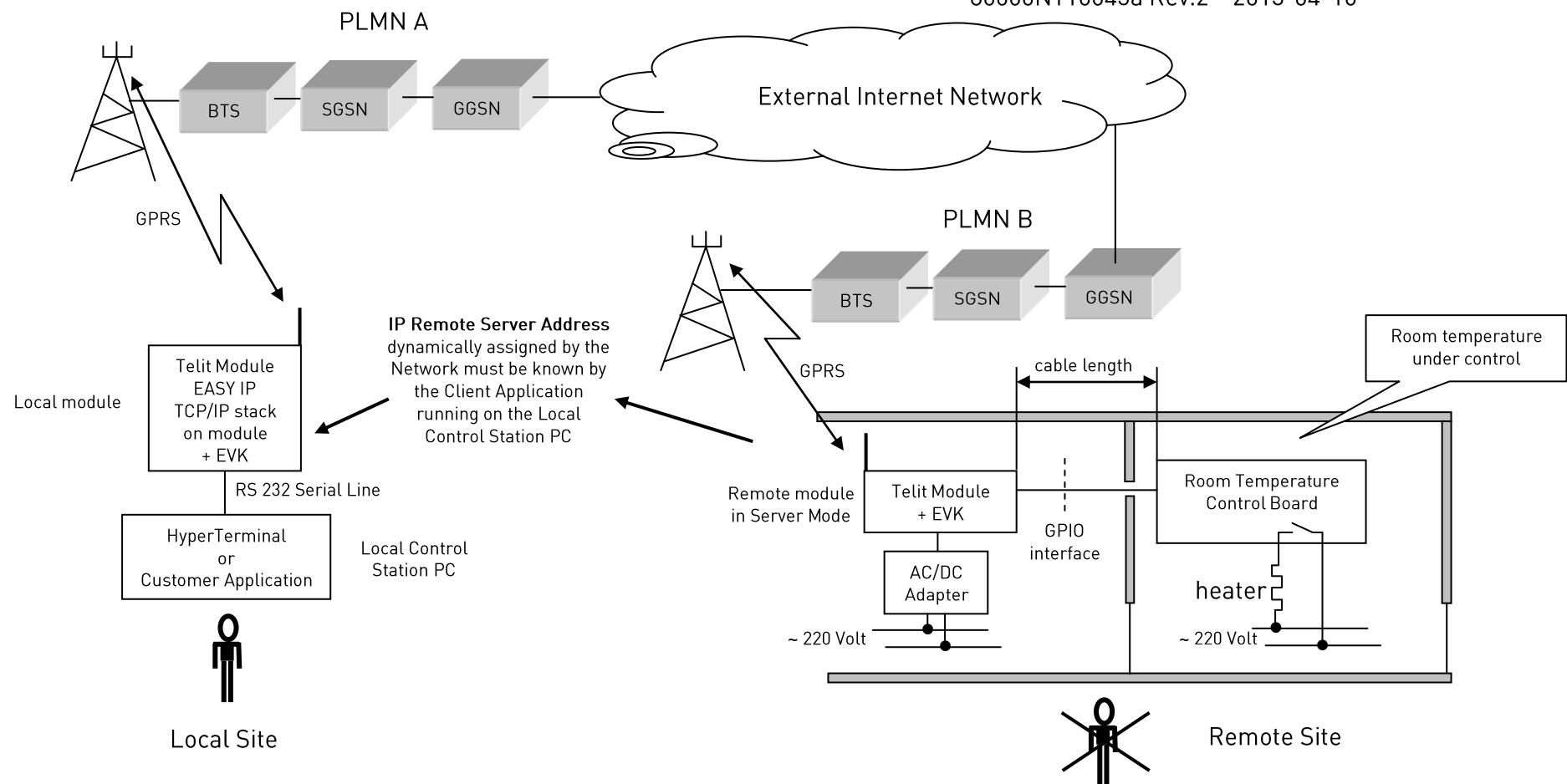
```
AT#SELINT=2<CR>
OK
AT#SMSMODE=1<CR>
OK
AT#REGMODE=1<CR>
OK
AT+CMEE=2<CR>
OK
```

### Make sure that all Services are disabled

```
AT#SMSATRUN=0<CR>
OK
AT#TCPATRUNL=0<CR>
OK
AT#TCPATRUND=0<CR>
OK
AT#ENAEVMONI=0<CR>
OK
```



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**fig. 13: RDTSB board & TCP AT Run Service**

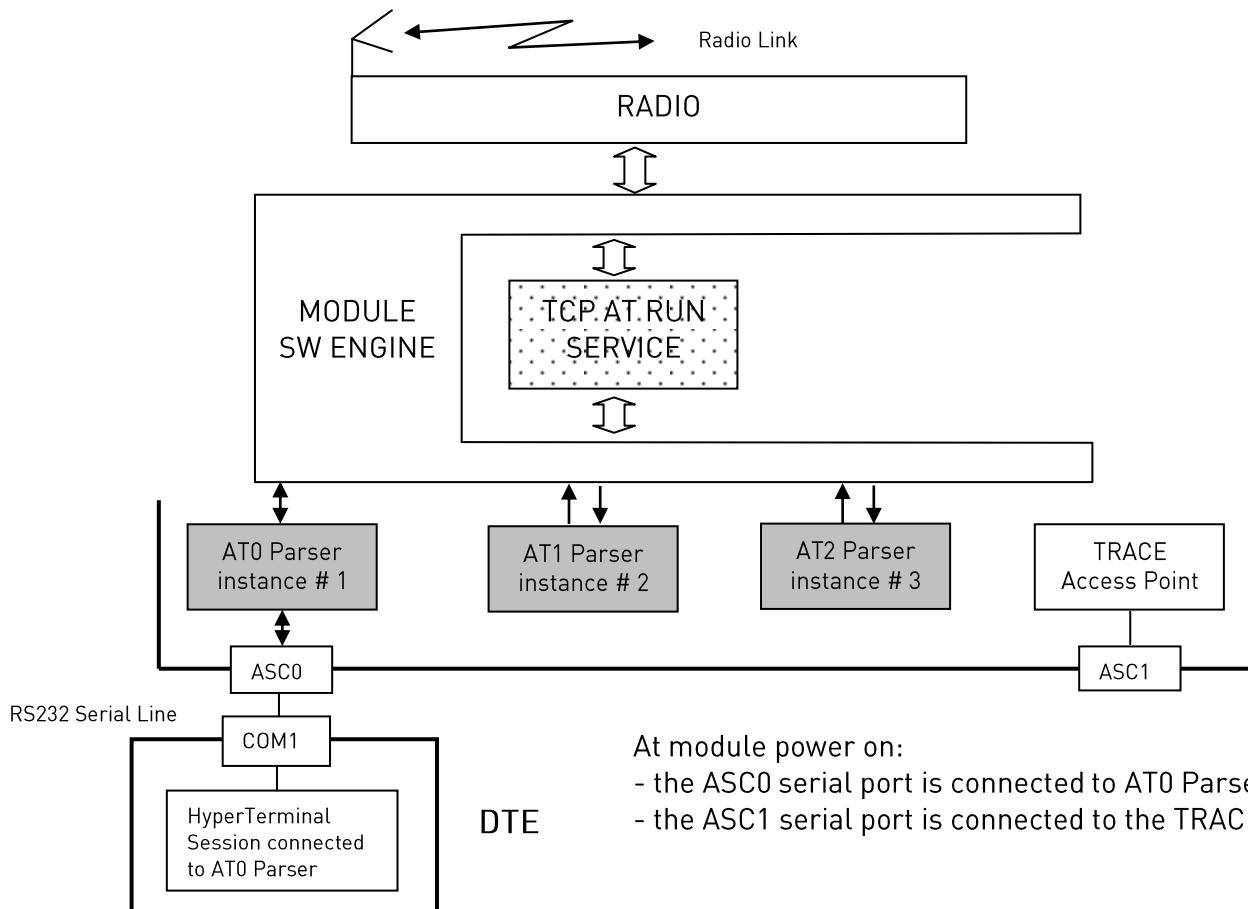


### Services vs. Instances

In this configuration the remote module only runs TCP AT Run Service. On Tab. 3 the default relationship between service and instance is showed by the shadowed area.

Services	Instances available for Services		
	#1	#2	#3
SMS AT Run	/	☺	☺
TCP AT Run	/	☺	☺
Event Monitor	/	☺	☺

**Tab. 3: Instances vs. TCP AT Run Service**



**fig. 14: Remote Module running TCP AT Run Service**



### TCP AT Run Service in Server Mode configuration

AT+CGATT?<CR>  
+CGATT:1  
OK

check if the remote module is GPRS attached,  
it is attached.

AT+CGDCONT=1,"IP","IBOX.TIM.IT"<CR>  
OK

set up PDP Context definition.



**Warning:** the IP Remote Server Address is dynamically assigned by the Network Operator and it must be known by the local module.

AT#SGACT=1,1<CR>  
#SGACT: 217.203.146.115  
OK

PDP activation,  
IP address assigned by the Network.

AT#SCFG=1,1,300,0,600,1<CR>  
OK

socket configuration



**Warning:** the remote TCP port must be known by the local module.

The AT Command sent by the local module is received by the remote module, fig. 14. The AT1 Parser (instance # 2) analyzes it and in accordance with the analyses result the AT Command is executed by the remote module, the result is sent back to the local module.

AT#TCPATRUNCFG=1,2,1024,12345,"",1,5,1,5,2<CR>  
OK

TCP AT Run Service configuration,  
instance # 2 is assigned to TCP AT Run Service.

AT#TCPATRUNFRWL=2<CR>  
OK

drop the old firewall configuration.

AT#TCPATRUNFRWL=1,"000.000.000.000","000.000.000.000"<CR>  
OK

set up new firewall configuration.

AT#TCPATRUNAUTH=2<CR>  
OK

drop old authentication parameters.

AT#TCPATRUNAUTH=1, "TESTUSER", "TESTPASSW"<CR>  
OK

set up new authentication parameters.

AT#TCPATRUNL=1<CR>  
OK

enable TCP AT Run service in Server mode.



```
AT#SS<CR>
#SS: 1,4, 217.203.146.115,1024
#SS: 2,0
#SS: 3,0
#SS: 4,0
#SS: 5,0
#SS: 6,0
OK
```

check the Socket Status

Yet, the remote module is running the TCP AT Run Service in Server (Listen) mode, it is waiting for AT Commands from the local module in order to execute them and send back the relative results.

#### Preliminary DTE/LOCAL MODULE connection set up

Refer to fig. 10: the local module doesn't run AT Run or Event Monitor Services. To set up the DTE/LOCAL MODULE connection follow these steps:

- connect COM1 to ASC0 using an RS 232 straight cable (pins are connected one on one);
- start an HyperTerminal session on DTE.

The HyperTerminal COM1 session will be used to read/write the registers of the Digital Temperature Sensor installed on the RDTSB board or read/write the remote GPIOs.

#### Preliminary local module set up

```
AT#SELINT=2<CR>
OK
AT#SMSMODE=1<CR>
OK
AT#REGMODE=1<CR>
OK
AT+CMEE=2<CR>
OK
```

local module is not using the Services.

```
AT#SMSATRUN=0<CR>
OK
AT#TCPATRUNL=0<CR>
OK
AT#TCPATRUND=0<CR>
OK
AT#ENAEVMONI=0<CR>
OK
```

#### Open a TCP connection

```
AT+CGATT?<CR>
+CGATT:1
```

check if the Remote module is attached,  
it is attached.



OK

AT+CGDCONT=1,"IP","WEB.OMNITEL.IT"<CR>  
OK

AT#SGACTAUTH?<CR>  
#SGACTAUTH: 1  
OK

check authentication,  
PAP authentication (factory default)

AT#SCFG=1,1,300,0,600,1<CR>  
OK

socket configuration.

AT#SCFGEXT=1,2,0,0,0,0<CR>  
OK

extended socket configuration.

AT#SGACT=1,1<CR>  
#SGACT: 109.113.46.58  
OK

PDP activation,  
IP address assigned by the Network.

Yet, the local module is able to open the connection by means of the configured socket:



**Warning:** the IP Remote Server Address and remote TCP port must be known.

AT#SD=1,0,1024,217.203.146.115,255,1,0<CR>

open the connection

yet, on the DTE is displayed:

CONNECT	unsolicited message
Username:	message from remote module
TESTUSER<CR>	entered by the user, characters are not echoed
Password:	message from remote module
TESTPASSW<CR>	entered by the user, characters are not echoed
Login successful.	message from remote module

Yet, the local module is in ON Line Mode, it is connected to the remote module running the TCP AT Run Service in Server (Listen) mode, fig. 14. The AT Commands characters entered by the user are echoed on the local DTE by the remote module (instance # 2). The AT Commands are executed by the remote module and their results are sent back to the local module.



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ATE1<CR>  
OK

enable echo on the instance # 2 of the remote module,  
fig. 14.

### Remote Digital Temperature Sensor configuration

AT#I2CWR=11,12,50,02,02<CR>  
>1700CtrlZ  
OK

set up low temperature limit (Thyst)  
0x1700 = 23°C

AT#I2CWR=11,12,50,03,02<CR>  
>1B00CtrlZ  
OK

set up high temperature limit (Toti)  
0x1B00 = 27°C

AT#GPIO=9,2,0<CR>  
#GPIO: 0,1  
OK

set up the remote GPIO 9 in input mode  
and display heating state.

get the remote temperature and display it.  
AT#I2CRD=11,12,50,00,02<CR>  
#I2CR: 1700  
OK

get heating state (input GPIO9) and display it.  
AT#GPIO=9,02<CR>  
#GPIO: 0,1  
OK

### Exit ON Line Mode

When the user needs to send AT Commands to the local module, the module must exit ON Line Mode and enter Command Mode. To accomplish this action the user must enter the following escape sequence:

+++<sup>5</sup>  
OK

escape sequence without <CR>

Yet, the local module is in Command Mode, the TCP connection with the remote module is still active, but the DTE is not more connected to the used TCP/IP socket. DTE can be used to enter AT Commands addressed to the local module.

---

<sup>5</sup> The remote connection must be open with the AT#SD Command using the <closureType> = 255, [4]



### Exit Command Mode

If the user needs to modify the configuration of the remote RDTSB board or read the remote temperature room, the ON Line Mode must be entered again.

```
AT#SO=1<CR>
CONNECT
```

Yet, the operator can read/write registers of the remote RDTSB board.

### Disconnect

Let's suppose that the module is in Command Mode, to disconnect the connection with the remote module the user must enter the following Command:

```
AT#SH=1
OK
```

disconnect the connection with the remote module.



---

**Note:** in this example all the actions are initiated by the user from the local site, the remote module sends the result to the local module only after a previous "query". No actions are autonomously initiated by the remote module.

---



## 7.4. TCP AT Run & Event Monitor Services

In the last paragraph an introductory example illustrating the use of the TCP AT Run Service was considered. In this paragraph the description is extended to the jointed use of two services on the remote module: TCP AT Run (in Server<sup>6</sup> mode) and Event Monitor Services.

The combined use of the two services on the remote module, allows the user to read/write the Digital Temperature Sensor registers installed on the RDTSB board and in addition, when the user doesn't need to read the remote room temperature value, the local module can be forced to exit the ON Line Mode, enter the Command Mode and check if some SMS messages are arrived from the remote module to detect if some configured events are happened. In fact, the remote module can send an SMS message in order to communicate that an event is occurred, e.g.: the heater is on.

With the support of the Telit Serial Port MUX application installed on the DTE<sup>7</sup> connected to the local module it is possible to dedicate an HyperTerminal session to the ON Line Mode, a second HyperTerminal session to the Command Mode and a third HyperTerminal session to the reception of the SMS messages sent by the remote module.

Hereafter is following the set up procedure of the REMOTE and LOCAL MODULES.

### Preliminary DTE/REMOTE MODULE connection set up

Remote module must run, at the same time, two services: the TCP AT Run Service to execute the AT Commands sent by the local module and the Event Monitor Service to send an SMS message when a configured event is occurred, see fig. 15. To set up the DTE/REMOTE MODULE connection follow these steps:

- connect COM1 to ASC0 using an RS 232 straight cable (pins are connected one on one);
- start an HyperTerminal session on DTE.

The HyperTerminal COM1 session will be used to configure the TCP AT Run and Event Monitor services.

---

<sup>6</sup> Server mode or Listen mode.

<sup>7</sup> PC running Windows.



### Preliminary remote module set up

```
AT#SELINT=2<CR>
OK
AT#SMSMODE=1<CR>
OK
AT#REGMODE=1<CR>
OK
AT+CMEE=2<CR>
OK
```

### Make sure that all Services are disabled

```
AT#SMSATRUN=0<CR>
OK
AT#TCPATRUNL=0<CR>
OK
AT#TCPATRUND=0<CR>
OK
AT#ENAEVMONI=0<CR>
OK
```

### Services vs. Instances

In this configuration the remote module runs two services at the same time: TCP AT Run and Event Monitor, see fig. 15. On Tab. 4 the relationships between services and instances are showed by the shadowed areas.

Services	Instances available for Services		
	#1	#2	#3
SMS AT Run	/	☺	☺
TCP AT Run	/	☺	☺
Event Monitor	/	☺	☺

**Tab. 4: Combined Services & Instances**

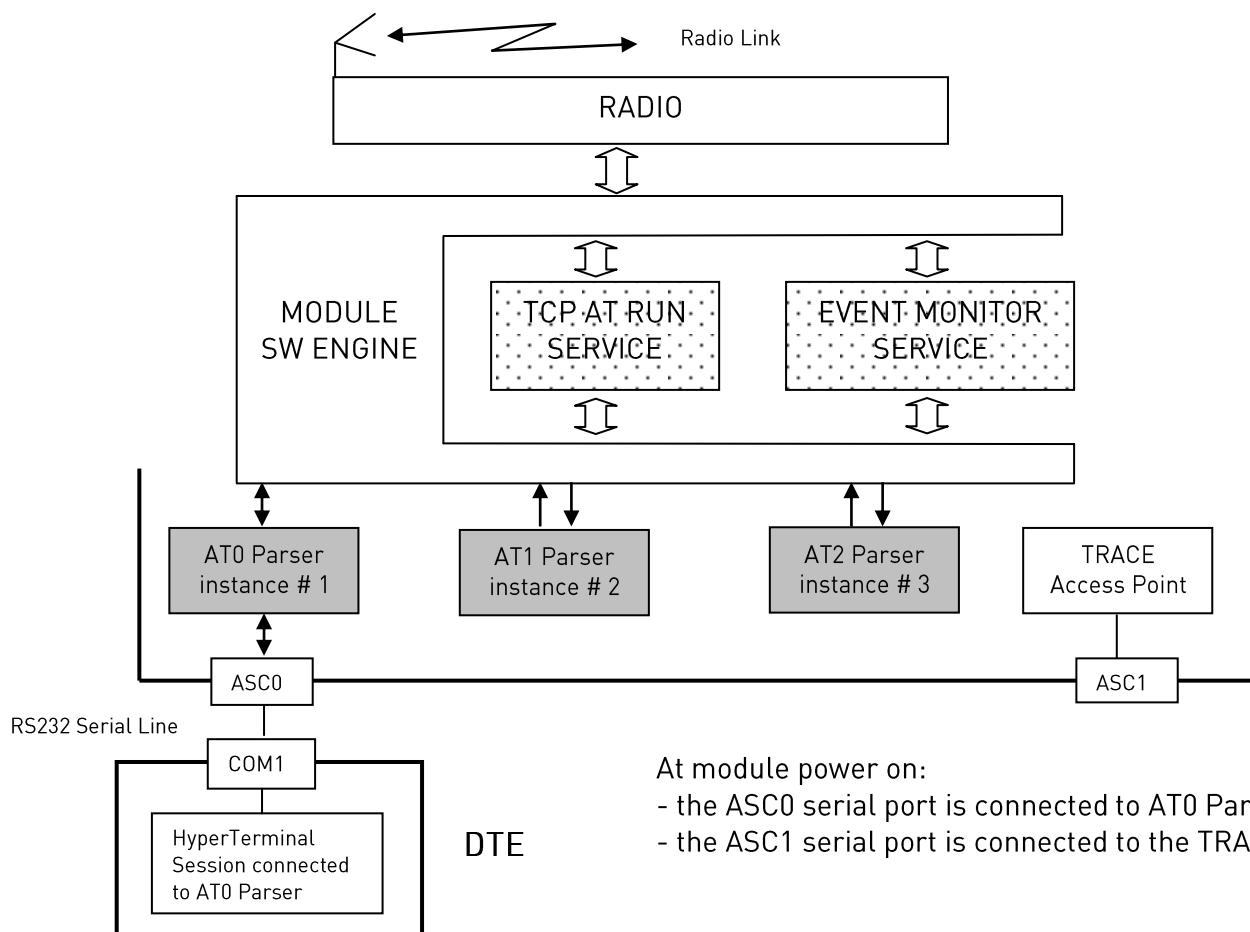
### Event Monitor Service configuration

Refer to chapter 7.2.

### TCP AT Run Service in Server Mode configuration

Refer to chapter 7.3.





**fig. 15: Combined Services on Remote Module**

#### Preliminary DTE/LOCAL MODULE connection set up

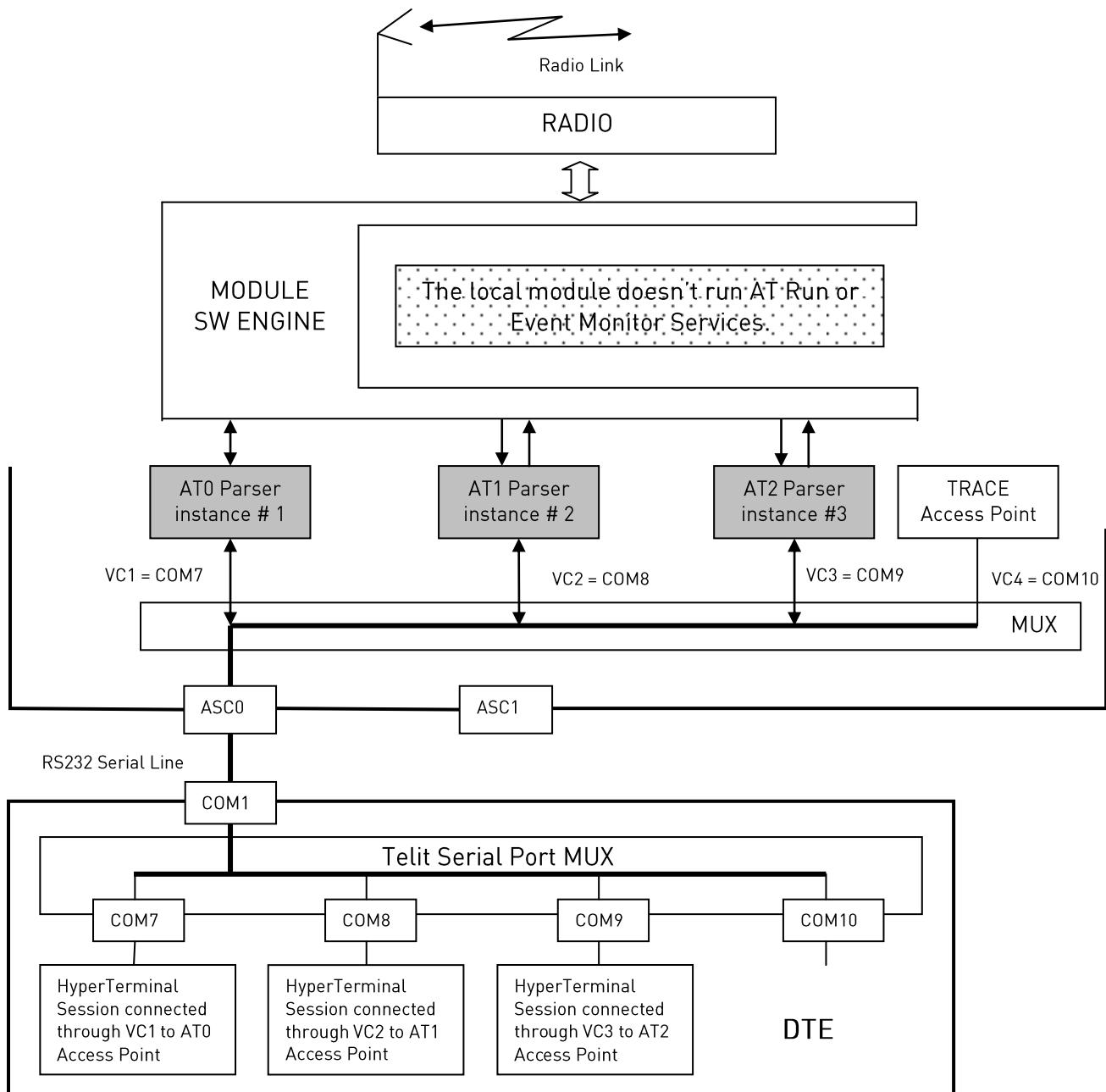
At the same time, the local module must manage: the TCP connection to the remote module in order to write/read the remote Digital Temperature Sensor registers and display on DTE the received SMS messages indicating the remote heater status. The SMSs are sent by the remote module using the Event Monitor Service. Follow these steps, see fig. 16:

- load and run on DTE<sup>8</sup> the Telit Serial Port MUX application;
- connect COM1 to ASC0 using an RS 232 straight cable (pins are connected one on one);
- ran three HyperTerminal sessions: the first one connected to COM7<sup>9</sup>, the second one connected to COM8, the last one connected to COM9.

<sup>8</sup> PC running Windows.

<sup>9</sup> COM number is function of the DTE configuration.





At module power on, when the Telit Serial Port MUX application is running on the connected DTE, the internal module control establish the following connection:

VC1/COM7/AT0 (instance#1); VC2/COM8/AT1 (instance#2); VC3/COM9/AT2 (instance#3); VC4/COM10/TRACE.

**fig. 16: Telit Serial Port MUX on Local Module.**



The HyperTerminal COM7 (hereafter called HTC7) will be used to manage the TCP remote connection.

The HyperTerminal COM8 (HTC8) will be used to enter AT Commands to the local module.

The HyperTerminal COM9 (HTC9) will be used to display the SMSs sent by the remote module.

#### Preliminary LOCAL MODULE set up, use HTC7 session

```
AT#SELINT=2<CR>
OK
AT#SMSMODE=1<CR>
OK
AT#REGMODE=1<CR>
OK
active only on instance #1/HTC7 session.
AT+CMEE=2<CR>
OK
```

```
local module is not using the Services.
AT#SMSATRUN=0<CR>
OK
AT#TCPATRUNL=0<CR>
OK
AT#TCPATRUND=0<CR>
OK
AT#ENAEVMONI=0<CR>
OK
```

#### Open a TCP connection, use HTC7 session

Refer to chapter 7.3.

Yet, the local module is in ON Line Mode, it is connected to the remote module. The AT Commands characters entered by the user are echoed on the local HTC7 session by the remote module (instance # 2) then, the AT Commands are executed by the remote module and their results are sent back to the local module on HTC7 session.

```
ATE1<CR>
OK
```

enable echo on the instance # 2 of the remote module.

#### Remote Digital Temperature Sensor configuration, use HTC7 session

Refer to chapter 7.3.

#### Remote room temperature monitoring, use HTC7 session

Refer to chapter 7.3.



Enter AT Commands addressed to local module (Command Mode), use HTC8 session

AT+CNMI=0,0,0,0,0  
OK

disable New Message Indications on HTC8 session.

When the remote module sends an SMS, its unsolicited code will not be displayed on HTC8 session, it will be displayed on HTC9. In the meanwhile the user, by means of the HTC7 session (in ON Line Mode), can use the TCP AT Run Service features running on the remote module.

AT#MONI<CR>  
#MONI: vodafone IT BSIC:60 RxQual:0 LAC:4E54 Id:6A1A ARFCN:90 PWR:-80dbm TA:1  
OK

Enable the notification of the unsolicited code , use HTC9 session

AT+CMGF=1<CR>  
OK

SMS in text mode.

AT+CNMI=2,1,0,0,0  
OK

set up New Message Indications on HTC9 session.

When the remote module sends an SMS, its unsolicited code will be displayed on HTC9 session.

+CMTI: "SM",21  
unsolicited CODE on HTC9 session.

AT+CMGR=21<CR>  
+CMGR: "REC UNREAD", .....

read SMS number 21

HEATER ON  
OK

Hereafter are listed some AT Commands that should be useful when only one HyperTerminal session (e.g.: HTC7) is available on DTE.

Exit ON Line Mode, use HTC7 session

When the user needs to send AT Commands to the local module, the module must exit ON Line Mode and enter Command Mode. To accomplish this action the user must enter the following escape sequence:



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+++<sup>10</sup>  
OK

escape sequence without <CR>

Yet, the local module is in Command Mode, the TCP connection with the remote module is still active, but the HTC7 session is not more connected to the used socket, it can be used to enter AT Commands for the local module.

#### Exit Command Mode, use HTC7 session

If the user needs to modify the configuration of the remote RDTSB board or read the remote temperature room, the ON Line Mode must be entered again.

AT#SO=1<CR>  
CONNECT

Yet, the operator can read/write registers of the remote RDTSB board.

#### Disconnect, use HTC7 session

Let's suppose that the module is in Command Mode, to disconnect the connection with the remote module the user must enter the following command:

AT#SH=1  
OK

disconnect the connection with the remote module.

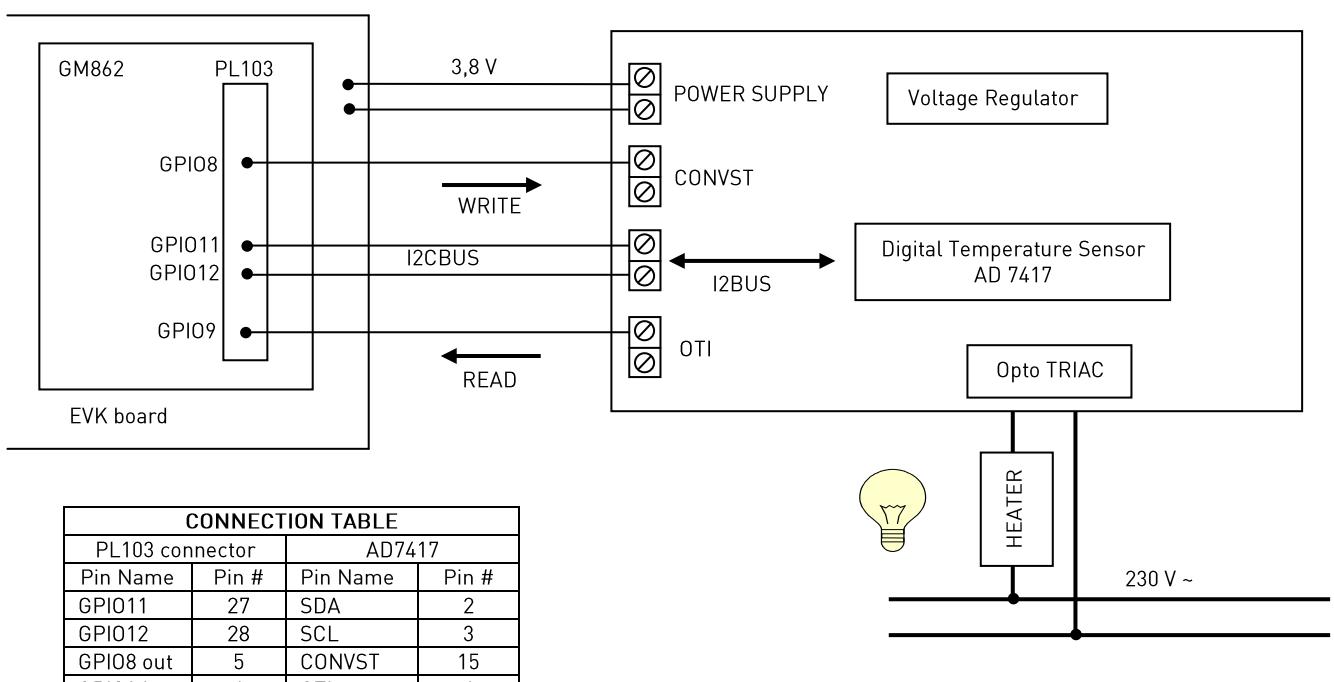
---

<sup>10</sup> The remote connection must be open with the AT#SD Command using the <closureType> = 255, [4]



## 8. Appendix: RRTC Application

The objective of this chapter is to provide the reader with the description of a simple demo application of the TCP AT Run and Event Monitor services. The simple application is the Remote Room Temperature Control introduced by chapter 7. To accomplish it a Remote Digital Temperature Sensor Board is needed. Refer to Telit Download Zone to download the DEMO software package and the schematic of the RDTSB board.



**fig. 17: Remote Digital Temperature Sensor Board**

For demo purposes the heater is substituted by a light bulb just to create some thing like to the room temperature changes. When the light bulb is on the temperature value goes high, the digital temperature sensor - when the high temperature limit is reached - turns the light bulb off. When the temperature reaches the low limit value, the digital temperature sensor turn the light bulb on ... and so on. The temperature behavior and the light bulb state are monitored and stored by the local module. Refer to paragraph 8.3 to glance at some RDTSB board photos.



## 8.1. First Demo Hardware Configuration

The “First Demo Hardware Configuration” is showed in detail on fig. 18, it can be used to carry out the architecture showed on fig. 13. For practical arrangement in the LAB, only one PC is used to manage both local and remote Telit modules.

On the LAB PC run the following applications, refer to fig. 18:

TelitSerialPortMUX: creates four virtual ports (e.g. : COM7 ÷ COM10), consequently four application can use at the same time the physical port COM1.

TelitActiveObj: the generic VBScript can access by means of the TelitActiveObj the virtual or physical serial ports and also the TCP/IP stack.

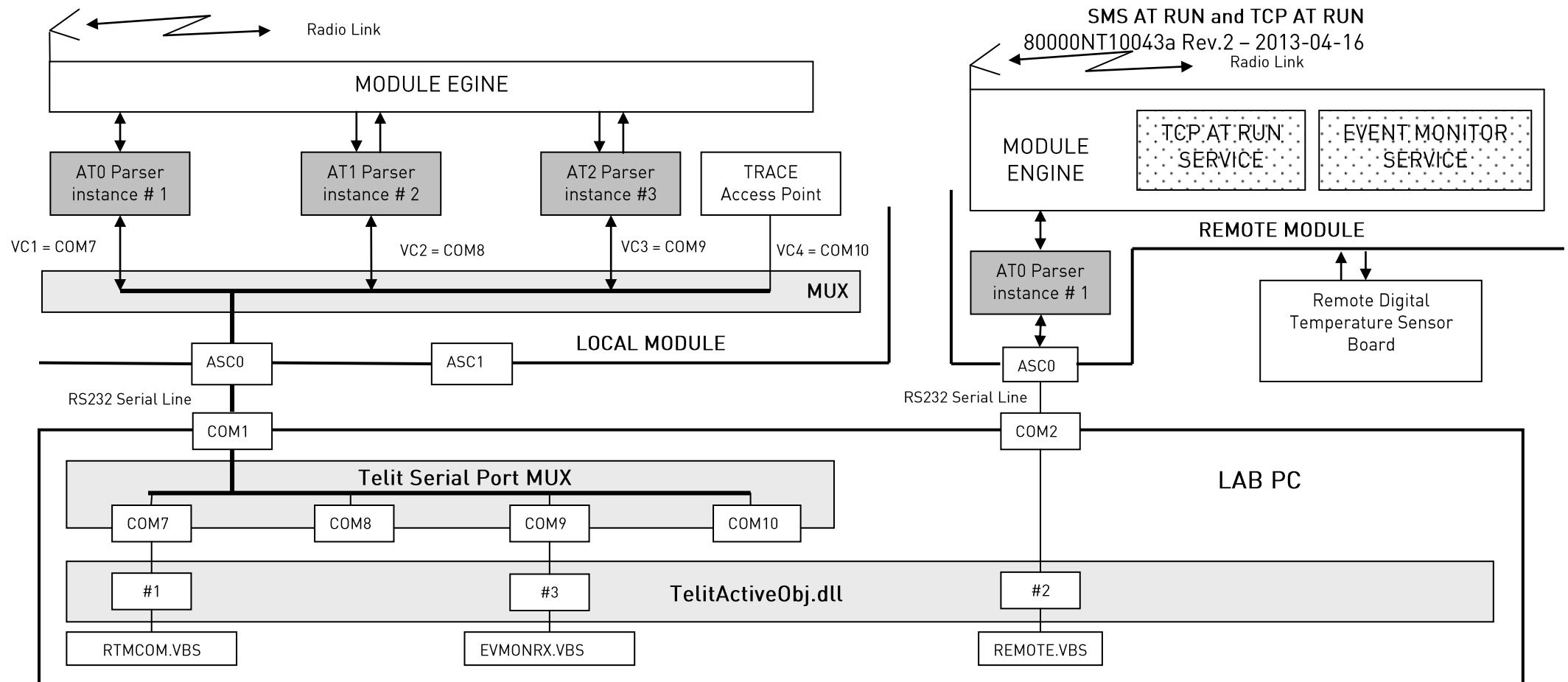
RTMCOM.VBS: opens the connection towards the remote module, sets up the Remote Digital Temperature Sensor Board and monitor the remote room temperature. It is connected to TelitActiveObj instance # 1, virtual port COM7, AT0 Parser instance # 1.

EVMONRX.VBS: receives the SMS messages sent by the Event Monitor Service running on the remote module. It is connected to TelitActiveObj instance # 3, virtual port COM9, AT2 Parser instance # 3.

REMOTE.VBS: enables on the remote module TCP AT Run and Event Monitor Services. It is connected to TelitActiveObj instance # 2, physical port COM2, AT0 Parser instance # 1.

The following pages show how the above mentioned applications announces themselves; the user, before starting the applications, can change the configuration parameters. In addition, are also showed the applications windows during the running.

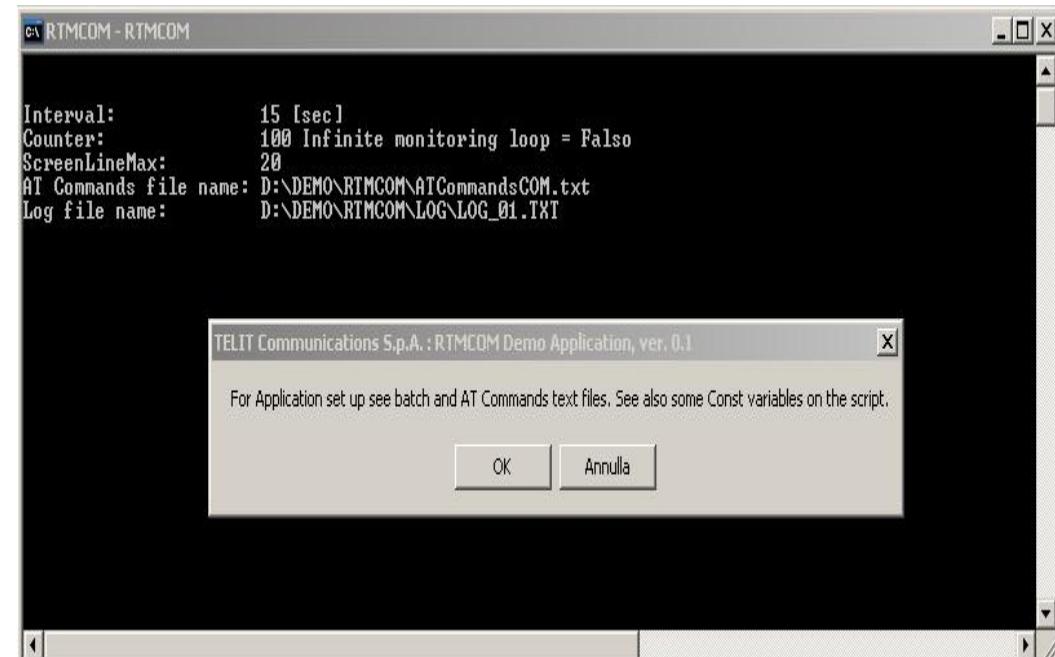
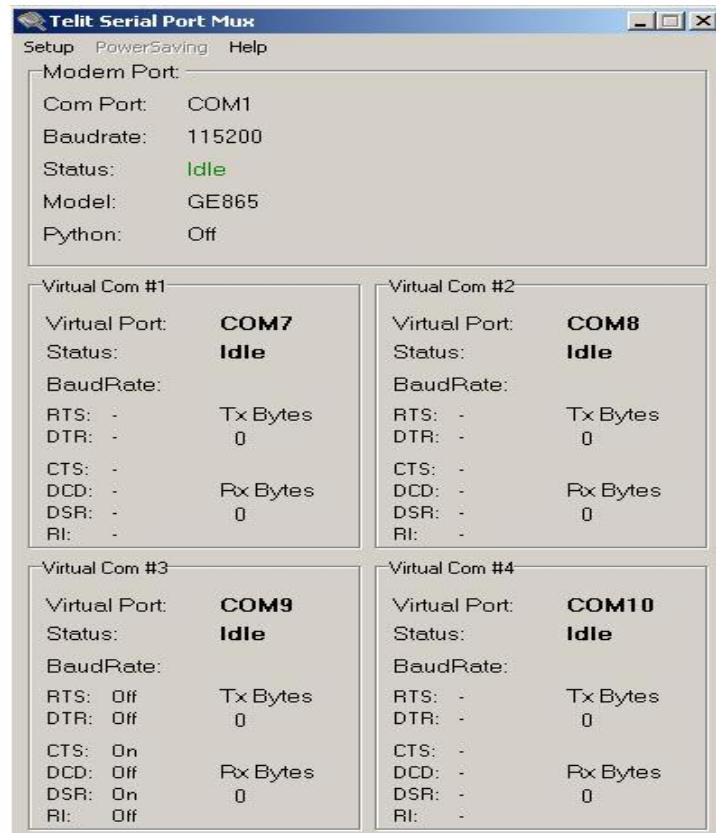




**fig. 18: First Configuration Details**



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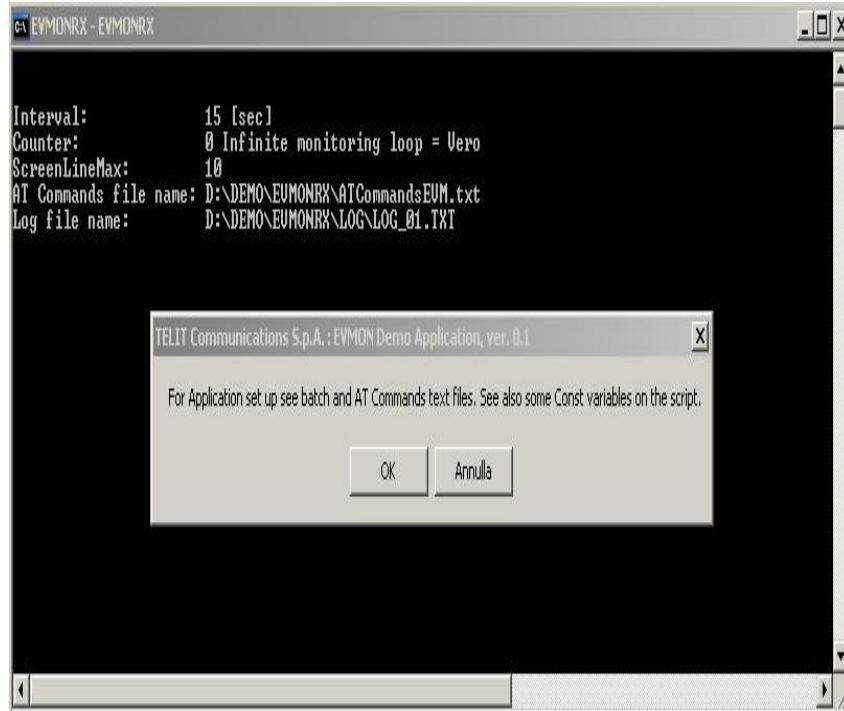


RTMCOM window. Push OK button if the configuration parameters are accepted. Otherwise change them following the indications.

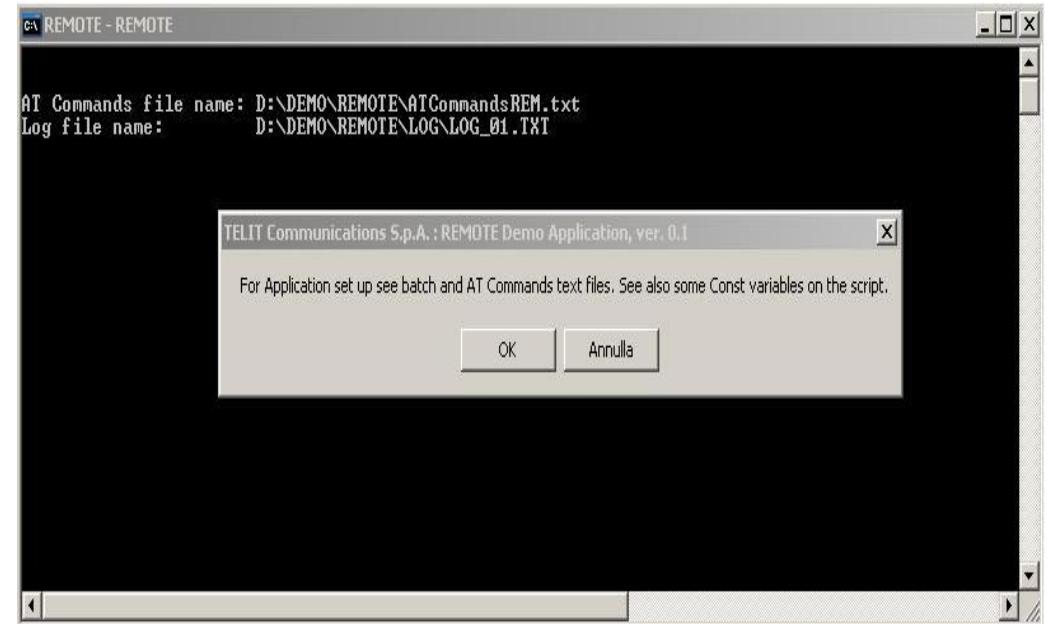
TelitSerialPortMux Window



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EVMONRX window. Push OK button if the configuration parameters are accepted. Otherwise change them following the indications.



REMOTE window. Push OK button if the configuration parameters are accepted. Otherwise change them following the indications.



```
c:\ RTMCOM - RTMCOM
Successfully executed !!!
=====
=====NO MORE SECTIONS TO READ=====
+++++ START REMOTE TEMPERATURE MONITORING ++++++
=====
DATE      TIME      TEMPERATURE [°C]  LOW LIMIT [°C]  HIGH LIMIT [°C]  HEATER STATE
17/03/2010 12.05.16  33,00          35,00          45,00          ON
17/03/2010 12.05.35  35,25          35,00          45,00          ON
17/03/2010 12.05.54  37,25          35,00          45,00          ON
17/03/2010 12.06.14  39,00          35,00          45,00          ON
17/03/2010 12.06.34  40,75          35,00          45,00          ON
17/03/2010 12.06.54  42,00          35,00          45,00          ON
17/03/2010 12.07.13  43,25          35,00          45,00          ON
17/03/2010 12.07.33  44,50          35,00          45,00          ON
17/03/2010 12.07.53  41,00          35,00          45,00          OFF
17/03/2010 12.08.14  37,75          35,00          45,00          OFF
17/03/2010 12.08.34  36,00          35,00          45,00          OFF
17/03/2010 12.09.08  39,75          35,00          45,00          ON
:

```

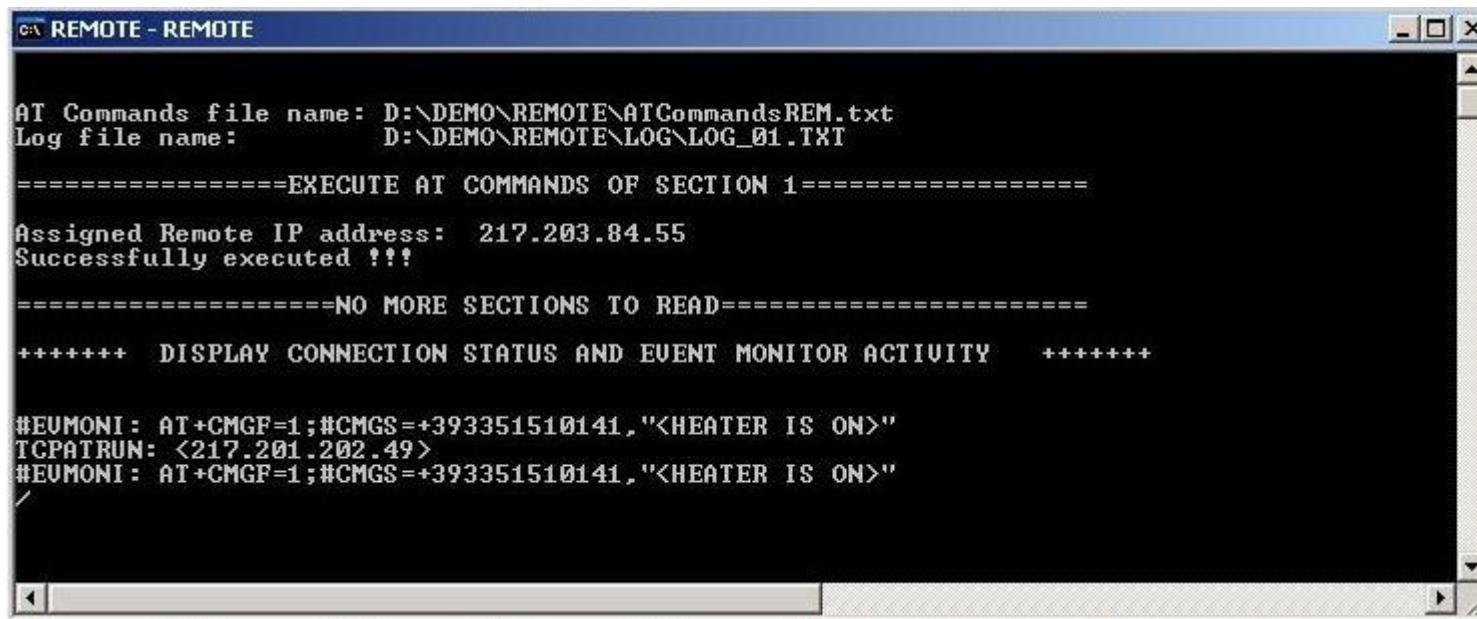
From the above window it is possible to evict that the RTMCOM application reads periodically the remote room temperature, when the light bulb is on the heater state is marked on. In addition, the collected remote information is stored on a log file.





The above window shows that the EVMONRX application receives the Event Monitor SMS's when the light bulb is turned on. In addition, the received SMS's are stored on a log file.





REMOTE - REMOTE

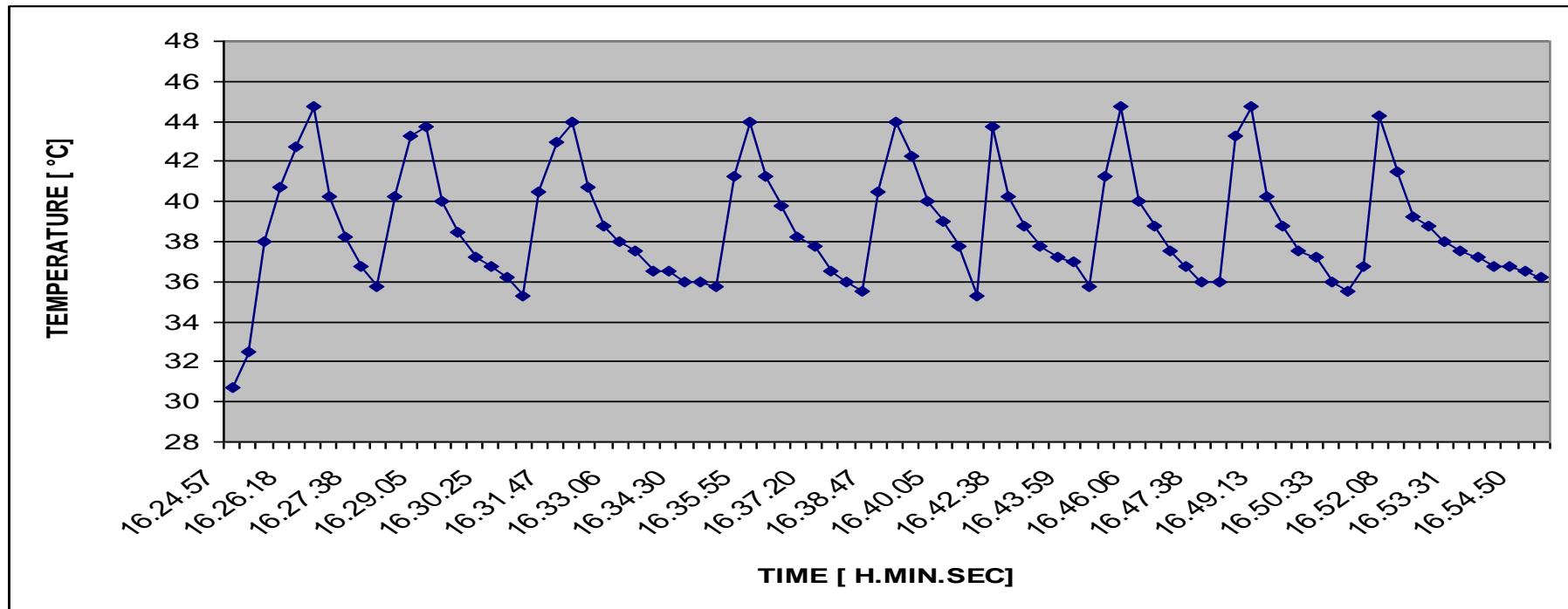
```
AT Commands file name: D:\DEMO\REMOTE\ATCommandsREM.txt
Log file name: D:\DEMO\REMOTE\LOG\LOG_01.TXT
=====EXECUTE AT COMMANDS OF SECTION 1=====
Assigned Remote IP address: 217.203.84.55
Successfully executed !!!!

=====NO MORE SECTIONS TO READ=====

++++++ DISPLAY CONNECTION STATUS AND EVENT MONITOR ACTIVITY ++++++
#EUMONI: AT+CMGF=1;#CMGS=+393351510141,"<HEATER IS ON>"
TCPATRUN: <217.201.202.49>
#EUMONI: AT+CMGF=1;#CMGS=+393351510141,"<HEATER IS ON>"
```

The above window shows that the REMOTE application displays on the screen the remote IP address assigned by the network. When the local module accomplishes successfully the connection, on the screen is displayed the local IP address. In addition, when a Event Monitor SMS is sent, its contents is showed on the screen.





Temperature values collected by the RTMCOM application and stored into a log file, it is possible arrange them into the above graph.



## 8.2. Second Demo Hardware Configuration

The "Second Demo Hardware Configuration" is showed in detail on fig. 19, it can be used to carry out the architecture showed on fig. 4. For practical arrangement in the LAB, only one PC is used to manage the TCP/IP connection to the Internet Network and the remote Telit module.

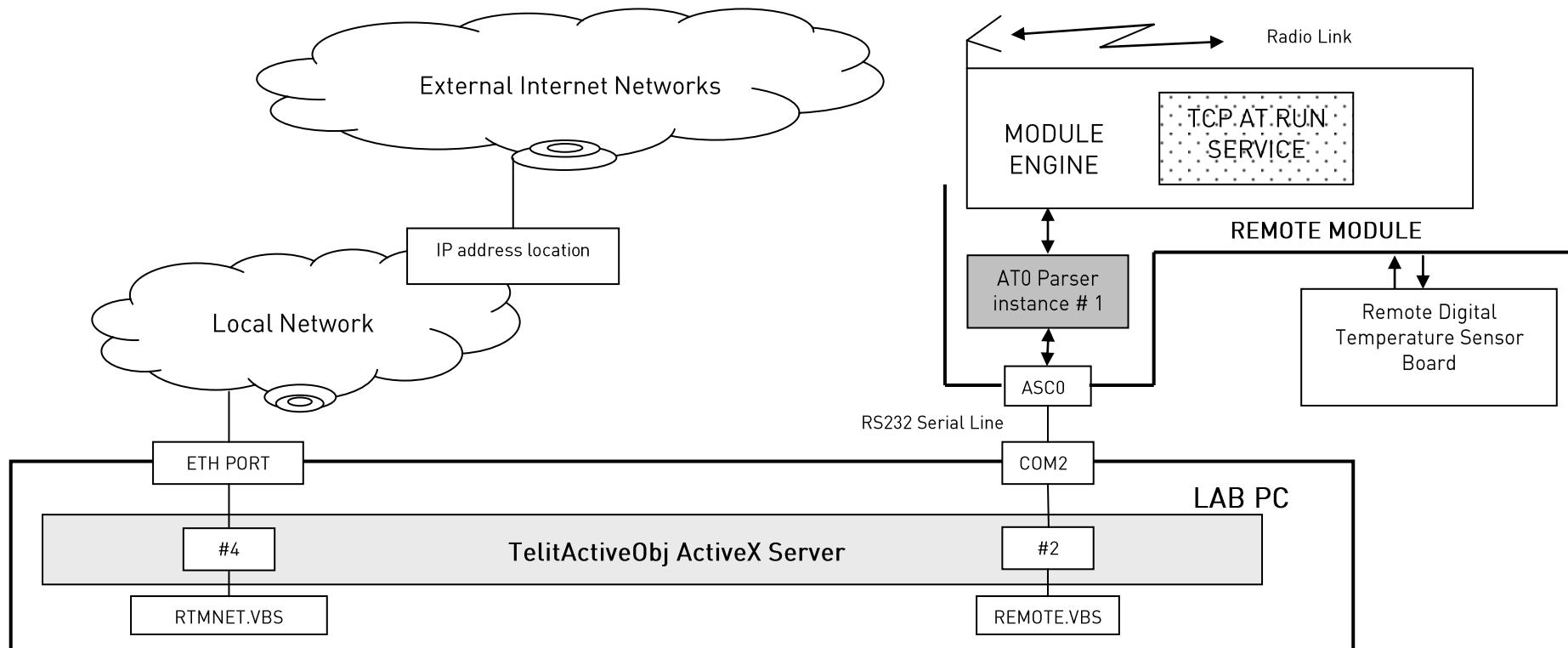
On the LAB PC run the following applications, refer to fig. 19:

TelitActiveObj: the generic VBScript can access by means of the TelitActiveObj the virtual or physical serial ports and also the TCP/IP stack.

RTMNET.VBS: opens the connection towards the remote module, sets up the Remote Digital Temperature Sensor Board and monitor the remote room temperature. It is connected to TelitActiveObj instance # 4, ETH port.

REMOTE.VBS: enables on the remote module TCP AT Run and Event Monitor Services. It is connected to TelitActiveObj instance # 2, physical port COM2, AT0 Parser instance # 1.

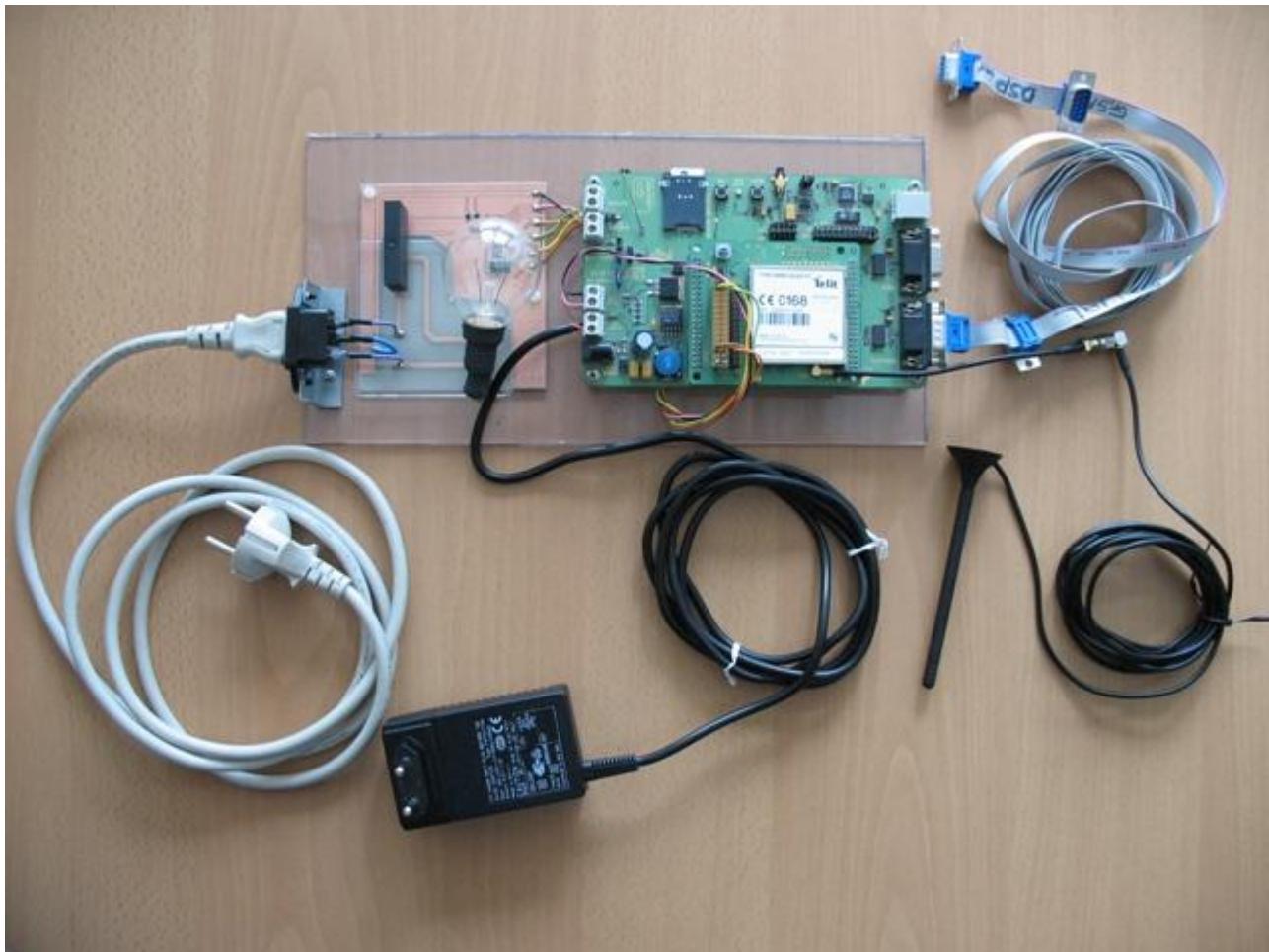




**fig. 19: Second Configuration Details**



### 8.3. RDTSB board Pictures



**photo 1: RDTSB board & Remote Module**



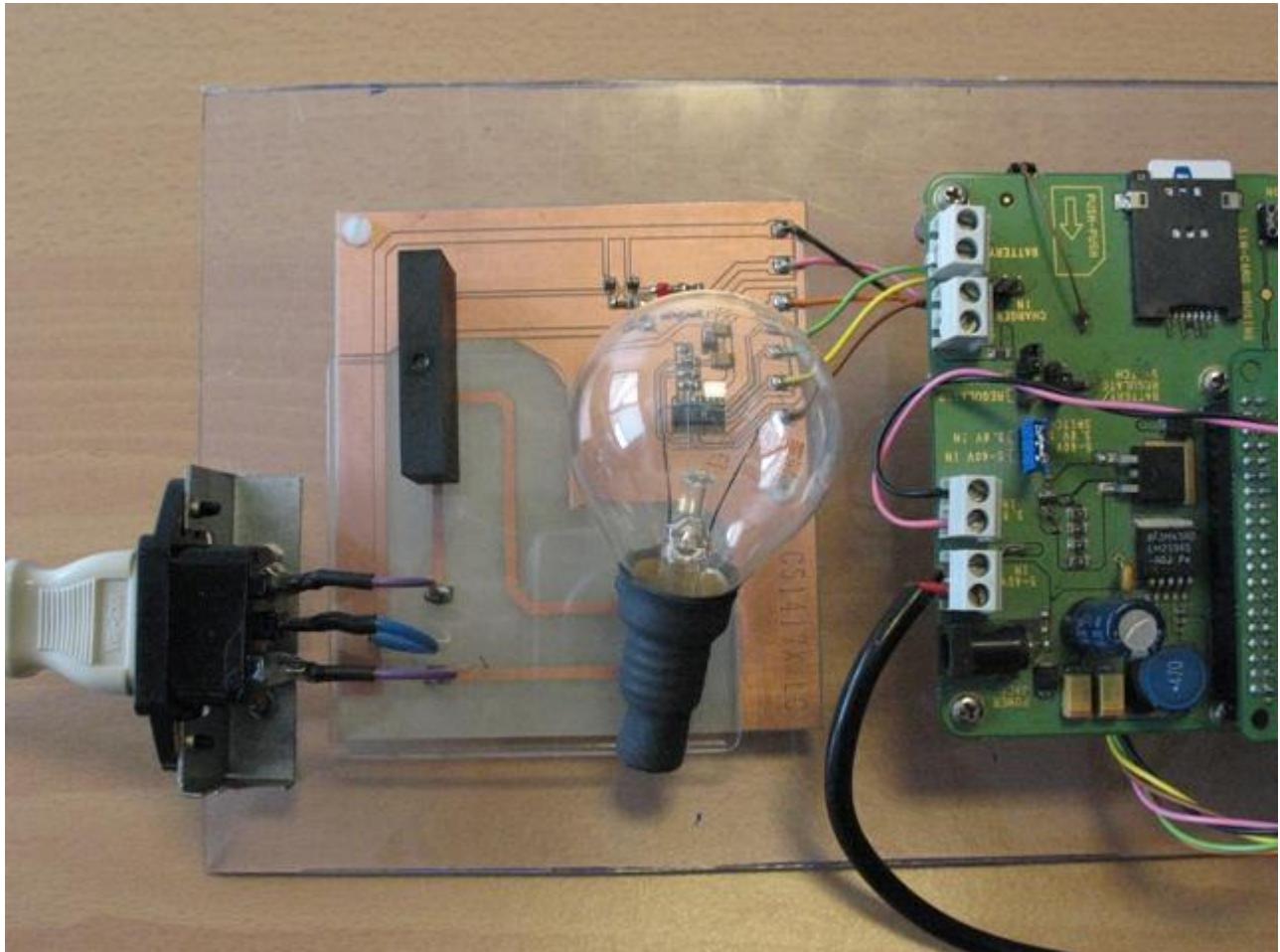


photo 2: RDTSB board details



SMS AT RUN and TCP AT RUN  
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**photo 3: RDTSB/Module Connection details**

