xE51/61 Test Stack Application Note

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CONTENTS

CHAPTER I. INTRODUCTION

I.1. Overview

Aim of this document is the handling description of the Test stack dedicated to the following modules from the xE51/61 family:

- ZE51-2.4/SMD-WA
- ZE51-2.4/SMD-IA
- ZE61-2.4/SMD-WA
- ZE61-2.4/SMD-IA

- XE51-2.4/SMD-WA
- XE51-2.4/SMD-IA
- XE61-2.4/SMD-WA
- XE61-2.4/SMD-IA

All given information shall be used as a guide and a starting point for properly developing of your product. Obviously this document cannot embrace all the hardware solutions and products that may be designed.

I.2. Reference documents

[1] SR Manager Tool User Guide	1vv0300899
[2] ZE51/61-2.4_RF_Module_User_Guide	1vv0300868
[3] XE51/61-2.4_RF_Module_User_Guide	1vv0300904

I.3. Document change log

Revision	Date	Changes
ISSUE # 0	07/05/10	First Release (ZE50/60)
ISSUE # 1	03/12/10	Updated with new products ZE51/61 and XE51/61

I.4. Glossary

ACP	Adjacent Channel Power
BER	Bit Error Rate
Bits/s	Bits per second (1000 bits/s = 1Kbps)
CER	Character Error Rate
dBm	Power level in decibel milliwatt (10 log (P/1mW))
EMC	Electro Magnetic Compatibility
EPROM	Electrical Programmable Read Only Memory
ETR	ETSI Technical Report
ETSI	European Telecommunication Standard Institute
FM	Frequency Modulation
FSK	Audio Frequency Shift Keying
GFSK	Gaussian Frequency Shift Keying
GMSK	Gaussian Minimum Shift Keying
IF	Intermediary Frequency
ISM	Industrial, Scientific and Medical
kbps	kilobits/s
LBT	Listen Before Talk
LNA	Low Noise Amplifier
MHz	Mega Hertz (1 MHz = 1000 kHz)
PLL	Phase Lock Loop
PROM	Programmable Read Only Memory
NRZ	Non return to Zero
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances
RSSI	Receive Strength Signal Indicator
Rx	Reception
SRD	Short Range Device
Tx	Transmission
SMD	Surface Mounted Device
VCO	Voltage Controlled Oscillator
VCTCXO	Voltage Controlled and Temperature Compensated Crystal Oscillator

I.5. Generality

The Test stack allows a quick testing of xE51/61 family RF performance.

- The xE51/61 family module can be easily configured with a Terminal (like HyperTerminal) to perform RF measurements: sensitivity, RSSI, output power and other RF parameters.
- All I/O from the xE51/61 family module are available on pin connectors on the Demo mother board, allowing easy interconnection to other devices.

I.6. Equipment

Before getting started make sure you have the necessary equipment from the demo case:

- 2 x Demo mother boards,
- 2 x xE51/61 family modules mounted on their DIP support,
- 2 x Serial cables (Sub-D 9, L=1,80 m),
- 2 x Power supply blocks (12V, 500 mA),
- 2 x Primary batteries (+9V) [1],
- 2 x Antennas (only for xE51/61 family WA)

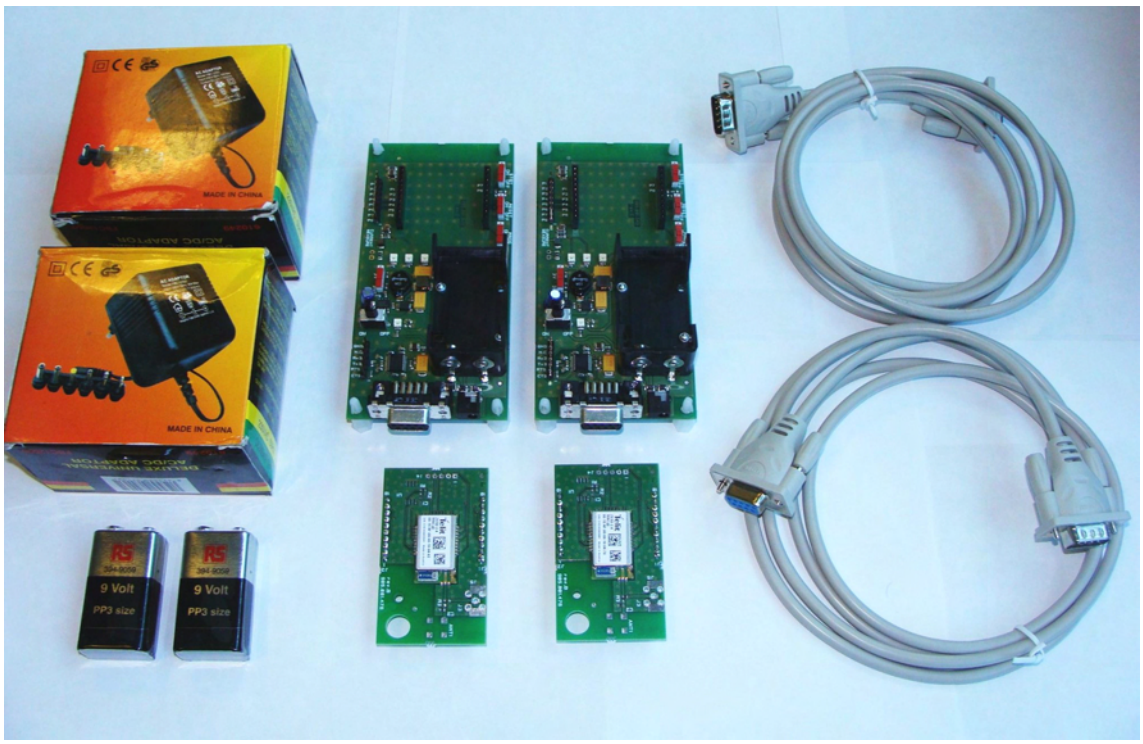


Figure 1 : xE51/61 family Equipment from Democase (IA version)

[1] Not available with xE61 family democase

CHAPTER II. DESCRIPTION

II.1. Demo mother board

The demo mother board is the main board with user interfaces:

- UART
- LEDs
- Serial Flash
- Switches

The demo mother board is the platform for the xE51/61 family module in DIP Version and can be connected to the PC via standard RS232 port.

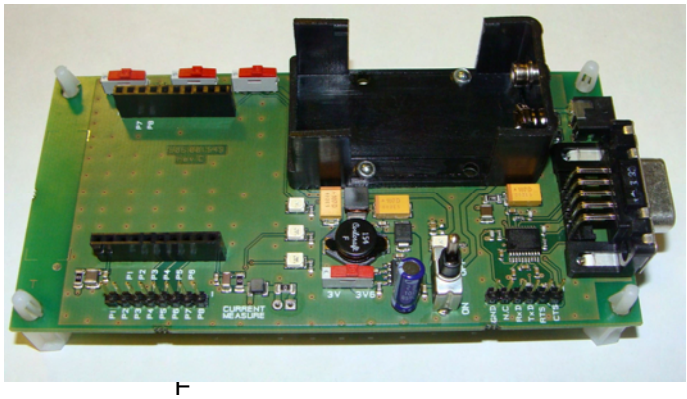


Figure 3 : Demo mother board

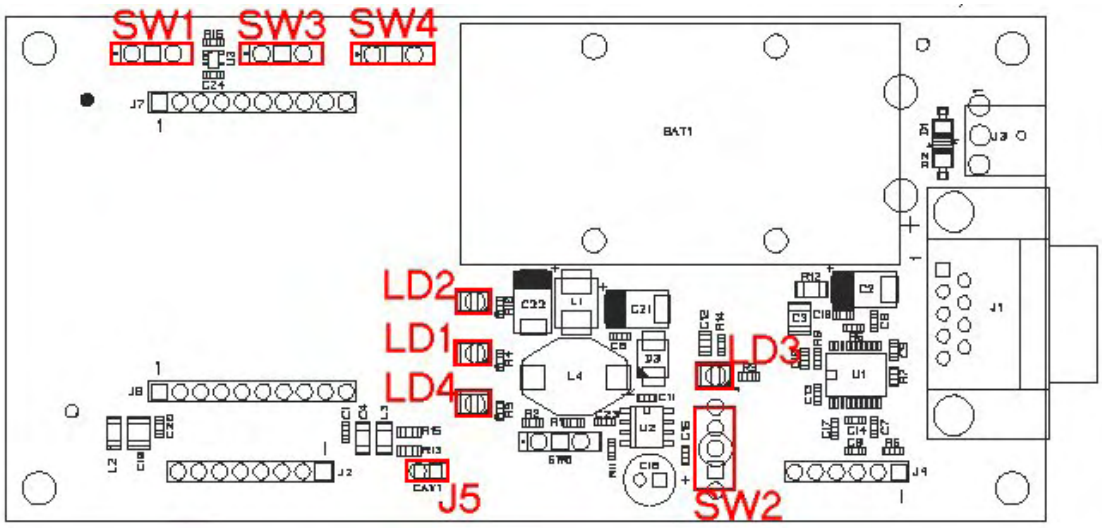


Figure 4 : Switches, connectors and LEDs placement on the Demo mother board

Feature	Designation
Stand-by switch	SW1
Reset switch	SW3
ON/OFF witch	SW2
Programming switch	SW4
Red LED	LD1
Green LED	LD2
Red LED	LD3
Yellow LED	LD4

II.2. xE51/61 Family Module in DIP Version

This is the xE51/61 family modules mounted on a DIP support. The DIP support can be plugged into the demo mother board directly.

Figure 5 : xE51/61-2.4/DIP-IA (With Integrated Antenna)

Figure 6 : xE51/61-2.4/DIP-WA (Without Integrated Antenna)

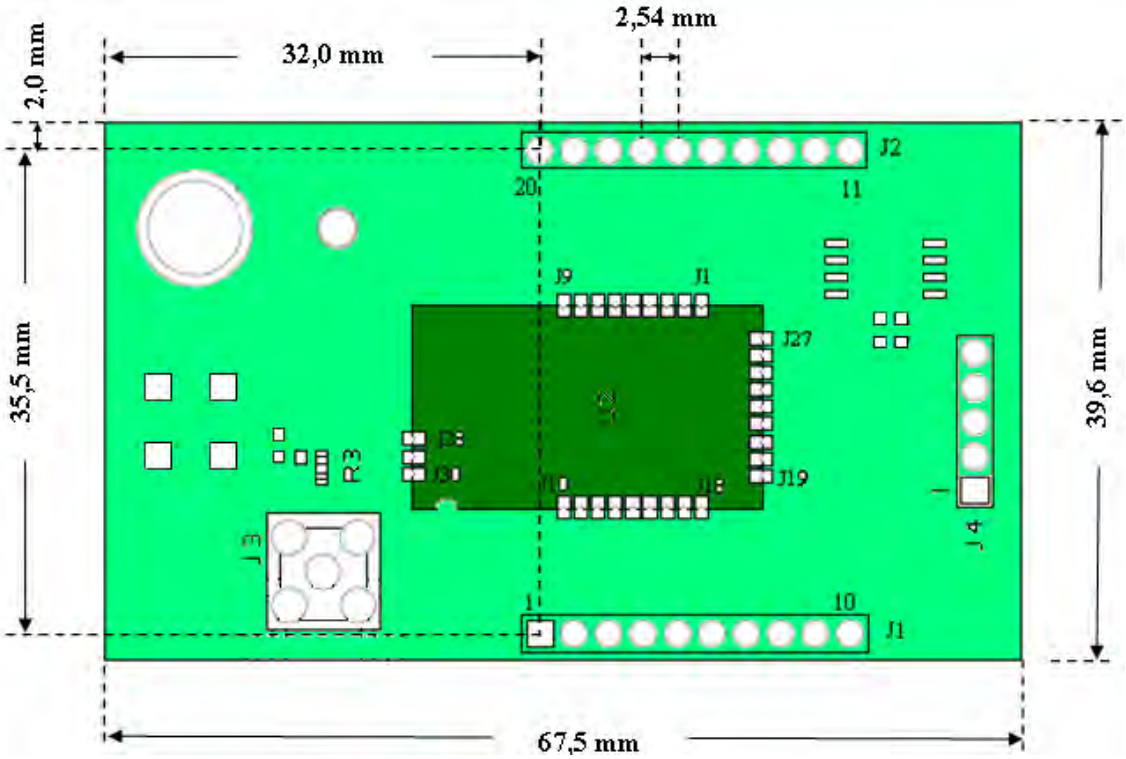


Figure 7 : Mechanical dimensions of the DIP Support

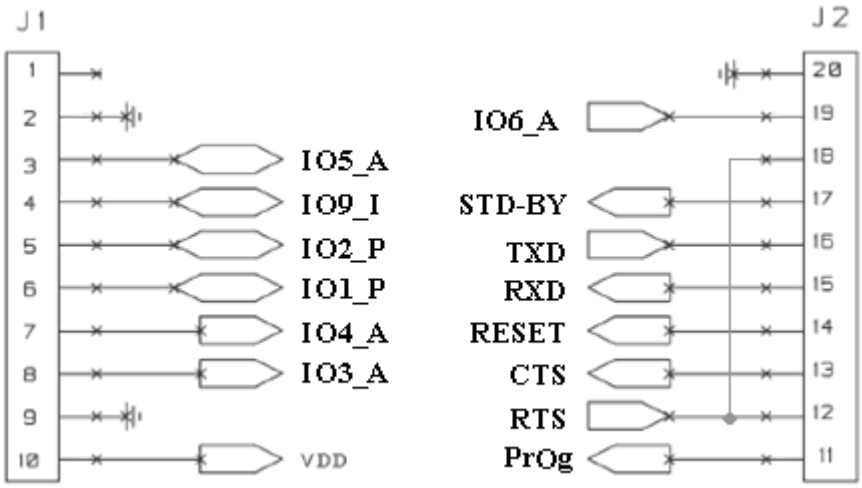


Figure 8 : Pin-out of the DIP Support

11.3. Demoboard

A demoboard is formed by a xE51/61 family Module in DIP Version mounted on a demo mother board.

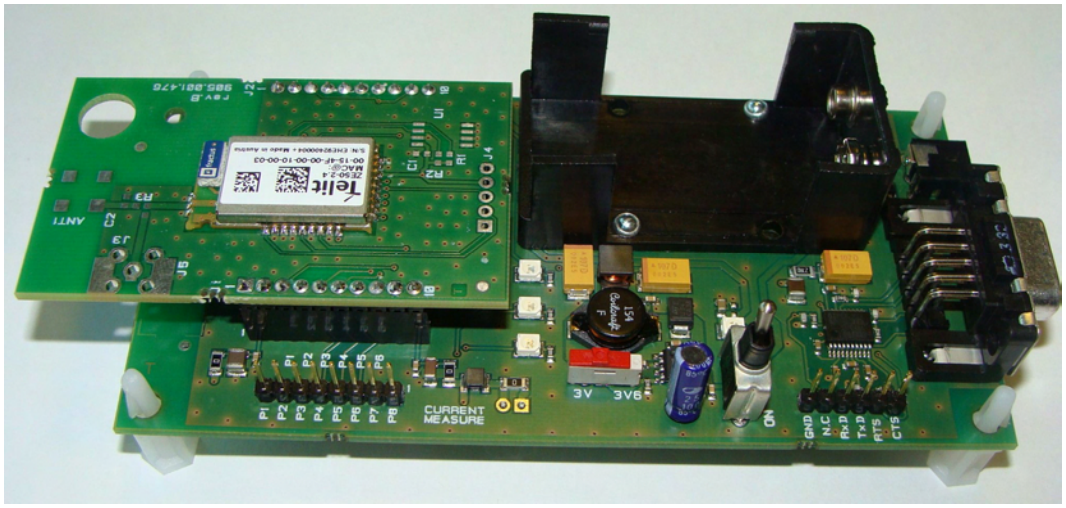


Figure 9 : xE51/61-2.4/DIP-IA (upper) fitted on demo mother board (lower)

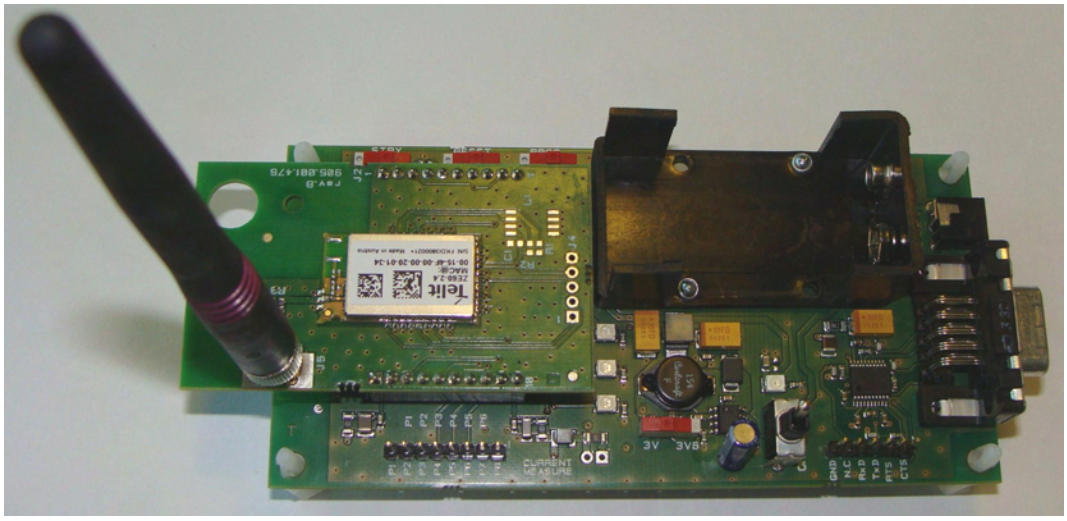


Figure 10 : xE51/61-2.4/DIP-WA (upper) fitted on demo mother board (lower)

CHAPTER III. INSTALLATION

III.1. Startup procedure

Respect the following order during the start-up procedure :

1. Set properly all switch in the desired position. Check that stand-by, reset and programming switches are turned OFF.

Feature	Designation	
Stand-by switch	SW1	
Reset switch	SW3	
Programming switch	SW4	

2. Plug the xE51/61-2.4/DIP support into J7 and J8.

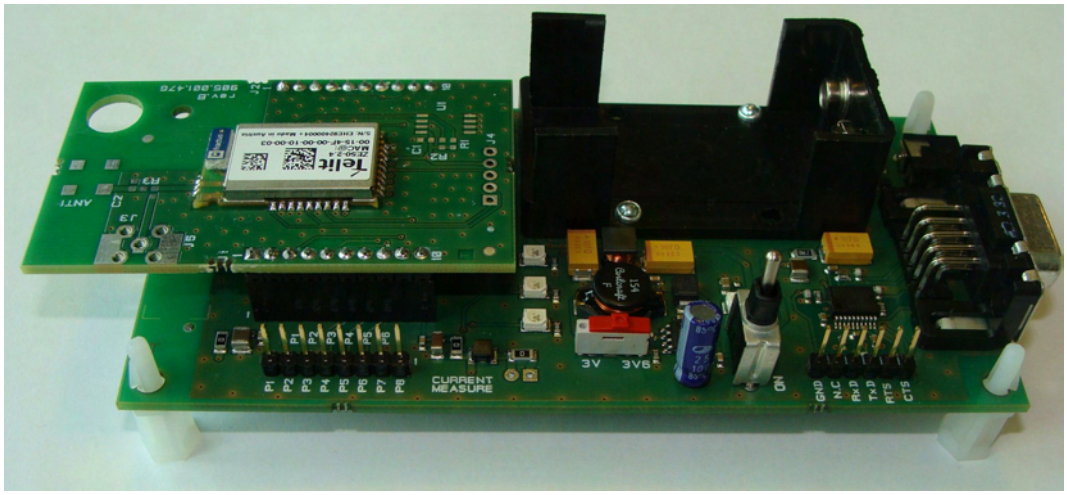


Figure 11 : xE51/61-2.4/DIP mounted on demo mother board

CAUTION
BE CAREFUL TO CORRECTLY PLUG THE RF MODULE ON ITS SUPPORT

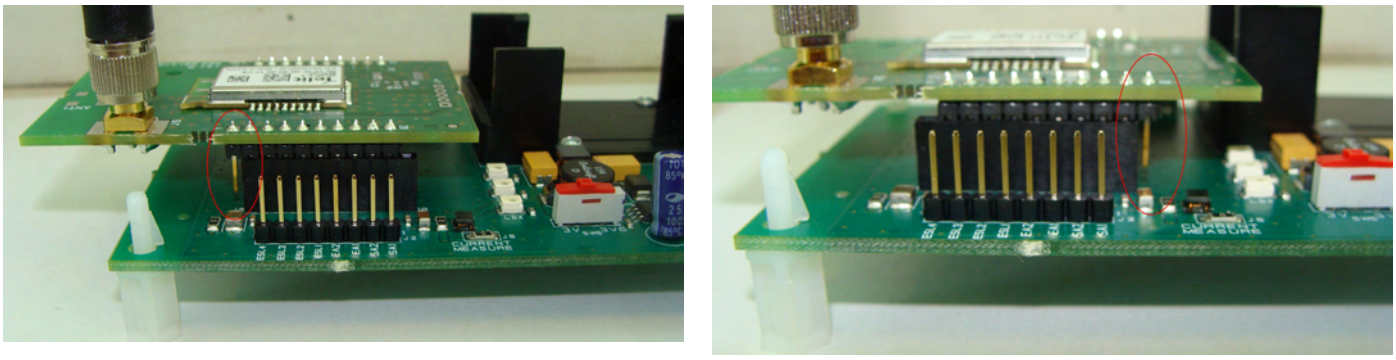
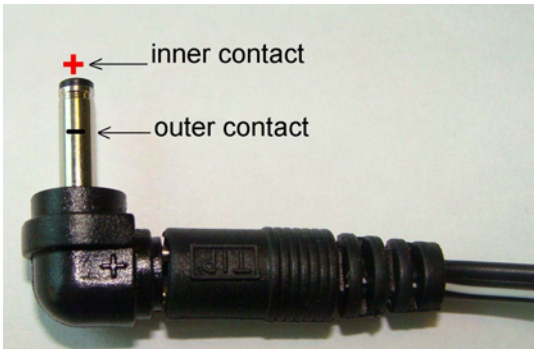


Figure 12 : Examples of xE51/61-2.4/DIP not correctly plug

3. Connect the antenna to RF connector (For WA version),
4. Connect the serial cable between your PC and RS-232 connector,
5. Plug the external power supply into J3 socket or/and plug the 9 Volt primary battery in BAT1 receptacle,



- Polarity: The positive setting inside the DC Output Plug (Negative polarity outside of plug)
- Select the proper adaptor plug (3.5x1.35mm)

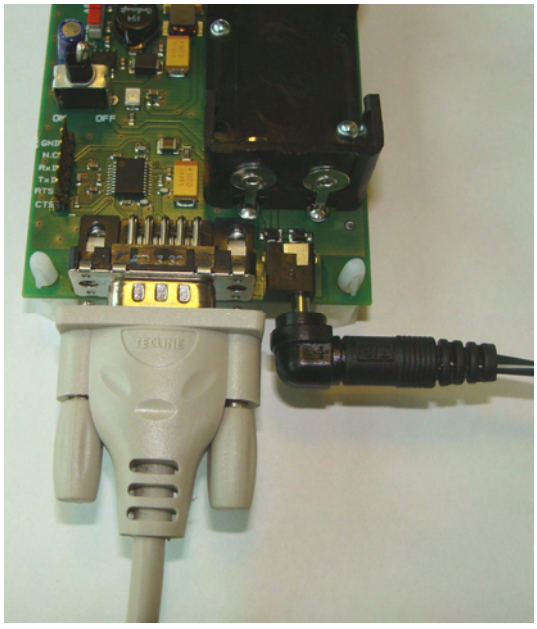


Figure 13 : External Power Supply Plug

CAUTION
- Two kinds of power supply are available on the Demoboard: through the +12V block or through a +9V battery. When it is connected, the power supply has priority on the battery. The battery takes over when the power supply is disconnected

- Be careful to check the power connection polarity, even if supply line is protected by a diode against "polarity reversing".

6. Select the appropriate Power Supply Voltage between 3 Volts and 3.6 Volts (SW5),

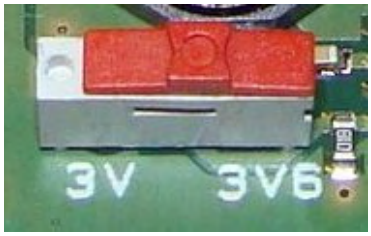


Figure 14 : Voltage Selection Switch

CAUTION
ALWAYS SWITCH OFF THE DEMOBOARD BEFORE SWITCHING 3V/3.6V VOLTAGE

7. Switch the Demoboard ON (SW2) :

   - Check that the red LED (LD3) lights ON when supplying the Demoboard (Power supply status)
   - The red LED (LD1) and yellow LED (LD4) blinked during a short lapse of time (xE51/61 family module is programmed and ready to communicate)

Feature	Designation	
ON/OFF switch	SW2	
Red LED	LD3	
Red LED	LD1	
Yellow LED	LD4	

III.2. Demo mother board Connectors pinout (J2 and J4)

The connectors allow access to I/O signals and to connect prototyping boards.

Pin	Signal Name	
1	P8	RTS
2	P7	IO6_A
3	P6	IO3_A
4	P5	IO4_A
5	P4	IO1_P
6	P3	IO2_P
7	P2	IO6_A
8	P1	IO5_A

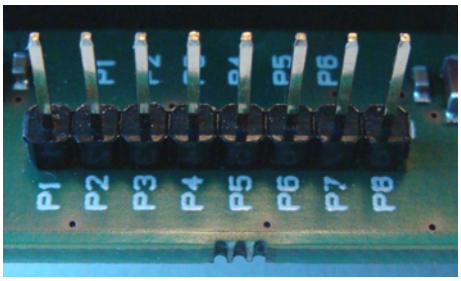


Figure 15 : J2 connector pinout

Pin	Signal Name
1	CTS
2	RTS
3	TxD
4	RxD
5	NC
6	GND

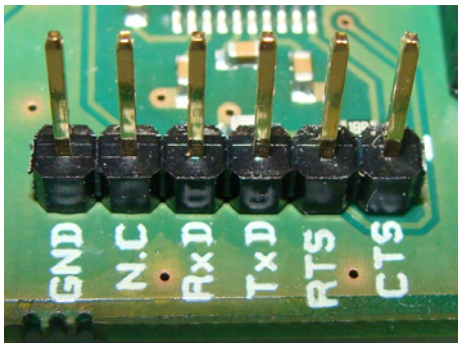


Figure 16 : J4 connector pinout

III.3. Connectors pinout correspondence

Pin-Out correspondence between Demo mother board, xE51/61-2.4/DIP,and xE51/61-2.4/SMD module.

Demo mother board	*xE51/61-2.4/DIP Pin-out*	*xE51/61-2.4/SMD Pin-out*	*Comments*
	J1 (Pin 1) : Not connected		
	J1 (Pin 2) : GND	GND GND	
J2 (Pin 8) : P1	J1 (Pin 3) : P1	Pin J5 : IO5_A	
J2 (Pin 7) : P2	J1 (Pin 4) : P2	Pin J9 : Reserved	
J2 (Pin 6) : P3 / Led LD1	J1 (Pin 5) : P3	Pin J2 : IO2_P	
J2 (Pin 5) : P4 / Led LD4	J1 (Pin 6) : P4	Pin J1 : IO1_P	
J2 (Pin 4) : P5	J1 (Pin 7) : P5	Pin J4 : IO4_A	
J2 (Pin 3) : P6	J1 (Pin 8) : P6	Pin J3 : IO3_A	
	J1 (Pin 9) : GND	GND GND	
	J1 (Pin 10) : VDD	Pin J25 : VDD	
Switch 4 / Led LD2	J2 (Pin 11) : PROG	Pin J16 : PROG	
J4 (Pin 2) : RTS	J2 (Pin 12) : RTS	Pin J22 : RTS	
J4 (Pin 1) : CTS	J2 (Pin 13) : CTS	Pin J24 : CTS	
Switch 3	J2 (Pin 14) : Reset	Pin J23 : Reset	
J4 (Pin 4) : RxD	J2 (Pin 15) : RxD	Pin J21 : RxD	
J4 (Pin 3) : TxD	J2 (Pin 16) : TxD	Pin J19 : TxD	
Switch 1	J2 (Pin 17) : STAND_BY	Pin J18 : STAND_BY	
J2 (Pin 1) : P8	J2 (Pin 18) : P8	Pin J22 : RTS	
J2 (Pin 2) : P7	J2 (Pin 19) : P7	Pin J6 : IO6_A	
	J2 (Pin 20) : GND	GND GND	
	J4 Connector for debugging and programmation		
	J4 (Pin 1) : Debug D	Pin J14 : Debug D	
	J4 (Pin 2) : Debug C	Pin J10 : Debug C	
	J4 (Pin 3) : Reset	Pin J23 : Reset	
	J4 (Pin 4) : VDD	Pin J25 : VDD	
	J4 (Pin 5) : GND	GND GND	
	Eeprom connections		
	SCL pin (Eeprom U1)	Pin J7 : IO7_A	Eeprom U1,R1 and R2 are not mounted on xE51/61-2.4 DIP
	SDA pin (Eeprom U1)	Pin J8 : Reserved	
	RF connection		
	J3 or J5 : SMA connector for RF Input/Output	Pin J29: Ext_Antenna	A 2.45 Ghz Half-Wave antenna is recommended
	ANT1 and C2: Not mounted on xE51/61-2.4/DIP		

CHAPTER IV.
TEST STACK FIRMWARE : DESCRIPTION OF THE FUNCTIONALITY

Telit modems and boards are provided with an embedded software which allows to choose between different communication protocols and to play on numerous parameters.

On the xE51/61-2.4 modules can be uploaded the following firmwares :

- ***Test Stack :*** The Test Stack integrates the transparent mode of the S-ONE. Allows only to send short frames. (100bytes)

- ***Z-ONE protocol stack***: available only for ZE51/61 modules

This Chapter is dedicated to the Test Stack.

There are 2 different modes available for Test protocol stack that are described in following paragraphs :

- The ***configuration mode*** which allows to parameter the module. It is set through the use of Hayes commands (AT commands) sent on the serial link.

- The ***operating mode*** which is the functional use for data transmission. The module transmits the data transparently, without encapsulation or addressing. It acts as a half duplex wired serial link (type RS485).

IV.1. Configuration mode

Telit modems and boards parameters are set through the use of Hayes type commands sent on the serial link.

Hayes or 'AT' commands complies with Hayes protocol used in PSTN modem standards. This ‘AT’ protocol or Hayes mode is used to configure the modem parameters, based on the following principles:

- ⇨ A data frame always begins with the two ASCII ’AT’ characters, standing for ‘ATtention’.
- ⇨ Commands are coded over one or several characters and may include additional data.
- ⇨ A given command always ends up with a <CR> Carriage Return

A	*T*	*Command*	*Additional data*	*<CR>*

Note**:** The delay between 2 characters of the same command must be less than 10 seconds

The only exception to this data-framing rule is the switching command from the operating/communication mode to ‘AT Mode’. In this case only, the escape code (‘+++’) must be started and followed by a silent time at least equal to the serial time out. In this case only <AT> and <CR> shall not be used.

These three + characters must be sent as one frame. The use of the keyboard to type them will not work. If you use a terminal, you will have to copy/paste them.

Despite its similarity to standard telecommunication modem, Telit RF modems and boards remain radio link modems and are consequently fitted with some particular and specific ‘AT’ commands proper to radio transmission (I.e. communication channel, radio rate, ...).

Note 1 : After an AT command (ended by <CR>), the serial link gives back result code, which is "OK", or "ERROR xx", with xx error code.

Note 2 : "+++" command gives back OK.

These commands are effective after a maximum delay of 10 mS, the back code OK indicates the good execution of the command, and another command can be sent right after the back code OK.

Command	Description
Operating mode	
+++	***Hayes Mode Activation*** '+++' command gives an instant access to the modem's parameters configuration mode (Hayes or AT mode), whatever the current operating mode in process might be. '+++' command should be entered as one string, i.e. it should not be preceded by 'AT' and followed by <CR> but two silent times which duration is configurable via S214 register (Serial time-out). The time between two'+' must not exceed the time-out value. Hayes mode inactivates radio functions.
ATO	***Communication mode activation*** 'ATO' command gives an instant access to the modem's operating mode, configured in S220 register. 'ATO' command is used to get out of Hayes mode. Answer : OK or ERROR if the configuration in not complete.
Register Handling	
AT/V	***Modem's firmware and bootloader version*** 'AT/V' command displays the modem's firmware + bootloader version number as follow: *pp.TP0.*MM.mm-Bbbb *pp*.BP0.MM.mm-Bbbb With: pp is the hardware platform **Module** / **ZE/XE51-2.4** (IA, WA) / **ZE/XE61-2.4** (IA, WA) **pp**: FR, FS, FY, FX TP0: T means Test firmware, P=0 for OEM boards, P=1 for USB dongle MM: Major version mm: minor version Bbbb: Build number Example: FS.T01.01.02-B008 is a Test firmware V1.02 (Build 008) for ZE51-2.4/SMD-WA module. FS.B00.01.01 is a Boot firmware V1.01 for ZE51-2.4/SMD-WA
AT/B	'AT/B' command displays the modem's bootloader version number.
AT/F	'AT/B' command displays the modem's firmware version number.
AT/S	***Modem's registers status*** 'AT/S' command displays a dynamic and clear status of all relevant registers of the modem with the following categories: • Radio • Serial link • Operation

ATSn?	***Register interrogation*** 'ATSn?' command displays the content of Hayes register number n (Refer to the register description table). Some registers are standard for every Telit RF modems while others are specific to some products. Answer : Sn=x<CR>
ATSn=m	***Register modification*** 'ATSn=m' command configures Hayes register number n with the value m, e.g. ATS200=4<CR> enters the value '4' in the register S200. The value is automatically stored in the EEPROM memory. Answer : OK or ERRORxx (Refer to the Error codes table)
ATR	***Parameters reset*** 'ATR' command resets all modem's parameters to their default values. Answer : OK
ATP	***Parameters standby*** 'ATP' command put the modem in soft standby
ATBL	***Parameters programming*** 'ATBL' command puts the modem in programming mode.

IV.2. Specific test command

Specific 'AT' commands have been integrated in order to make measurements in continuous mode.

Command	Description
Test functions	
ATT0	***Pure carrier transmission*** for testing purposes
ATT1	***Modulated carrier transmission*** for testing purposes
ATTOUT	***Exit the carrier mode transmission***

The yellow LED (LD4) lights ON during transmission.

IV.3. Registers Detailed Use

The parameters to be configured via Hayes mode are stored in the modem's permanent memory, called S registers.
Those registers are always listed as follows:
- S20x registers correspond to the radio parameters
- S21x registers correspond to the serial parameters
- S22x registers correspond to the general operation parameters

Numbers in **bold** indicate the default value

Access	Register	Name	Description
Module identification			
R	S190	IEEE address	IEEE Address of the module on 8 bytes. xx-xx-xx-xx-xx-xx-xx-xx
R	S192	Serial Number	Serial Number of the module on 11 bytes.
Radio			
R/W	S200	Channel	Number of the radio channel in use. From 11 to 26 Fn=2405+(n-11)*5 Mhz **Default: 11 (1st Channel).**
R/W	S202	Output Power	Adjustable radio output power in dBm. **Default: 0.**
W	S208	Temporary channel	Number of the radio channel in use, but not stored in EEPROM : if the modem is switched on – off, the channel will come back to the S200 value. Used to change channel often without burning the internal EEPROM

<table>
<tr><th>Access</th><th>Register</th><th>Name</th><th>Description</th></tr>
<tr><td colspan="4">Serial Link</td></tr>
<tr><td>R/W</td><td>S210</td><td>Serial Speed.</td><td>Indicates the speed on the Serial Connection
'1': 1200 Bits/s '5': 19200 Bits/s (default)
'2': 2400 Bits/s '6' : 38400 Bits/s
'3': 4800 Bits/s ‘7’ : 57600 Bits/s
'4': 9600 Bits/s ‘8’ : 115200 Bits/s

The time out value must be compatible with the serial speed:
<table>
<tr><th>Min. time-out (S214)</th><th>Serial Speed (S210)</th></tr>
<tr><td>17 ms</td><td>1200 bits/s</td></tr>
<tr><td>9 ms</td><td>2400 bits/s</td></tr>
<tr><td>5 ms</td><td>4800 bits/s</td></tr>
<tr><td>3 ms</td><td>9600 bits/s</td></tr>
<tr><td>2 ms</td><td>⩾19200 bits/s</td></tr>
</table></td></tr>
<tr><td>R/W</td><td>S211</td><td>Data Bits</td><td>Serial Link Data Bits :
• 8 bits (default).</td></tr>
<tr><td>R/W</td><td>S212</td><td>Parity</td><td>Serial Link Parity Type:
• '1': None (default)
• '2': Even,
• '3': Odd.</td></tr>
<tr><td>R/W</td><td>S213</td><td>Number of Stop bits</td><td>Serial Link Stop Bits :
• 1 bit (default)</td></tr>
<tr><td>R/W</td><td>S214</td><td>Serial Link Time Out</td><td>Indicates the value of the time-out on the serial link. The time out value must be compatible with the serial speed: (see S210 register description).
Between 1 and 100 milliseconds
Default : 5.</td></tr>
<tr><td>R/W</td><td>S216</td><td>Flow Control</td><td>Indicates flow control type:
• '0': Hardware: CTS/RTS
• '1': Software: Xon/Xoff
• '2': None (default)</td></tr>
<tr><td>R/W</td><td>S218</td><td>Buffer Size</td><td>Indicates the maximum frames size that will be given to the Modem. When this size is reached, the modem resets the RTS signal. Between 30 and 115
Default : 115.</td></tr>
</table>

<table>
<tr><th>Access</th><th>Register</th><th>Name</th><th>Description</th></tr>
<tr><td colspan="4">Operation</td></tr>
<tr><td>R/W</td><td>S220</td><td>Function Mode</td><td>Operation mode of the Modem.
'1' : Transparent</td></tr>
<tr><td>R/W</td><td>S221</td><td>Auto-Repeat Mode</td><td>Indicates auto repeat status :
‘0’: Auto-Repetition Off (Default)
‘1’ : Auto-Repetition On.</td></tr>
<tr><td colspan="4">Low Power</td></tr>
<tr><td>R</td><td>S240</td><td>Type of Low-power</td><td>Indicates whether the low power control pin is used or not
‘0’: No Low Power (default),
‘1’: Stand-By activated by Hardware pin,
‘2’: Stand-By activated by Serial,</td></tr>
<tr><td colspan="4">RSSI</td></tr>
<tr><td>R/W</td><td>S255</td><td>RSSI</td><td>
<table>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
<tr><td>Write RSSI</td><td>Reserved</td><td>Reserved</td><td>Return Off</td><td>Reserved</td><td>Header Num</td><td>Reserved</td><td>Header On</td></tr>
</table>
Header On: activate the header on the serial link
Header Num: activate the hexadecimal header
Return Off: deactivate the return on the serial link (“OK”, “ERROR”)
Write RSSI: activate the RSSI writing on the serial link.

A compensation is done which depends of the module:

<table>
<tr><th>Module</th><th>ZE/XE51 IA</th><th>ZE/XE 51 WA</th><th>ZE/XE61 IA</th><th>ZE/XE61 WA</th></tr>
<tr><td>Part Number Header</td><td>FR</td><td>FS</td><td>FX</td><td>FY</td></tr>
<tr><td></td><td>0dB</td><td>0dB</td><td>0dB</td><td>0dB</td></tr>
</table>
Ex: to write RSSI on the serial link on reception of radio frame the register must be: S255=129

‘0’ : default
</td></tr>
<tr><td colspan="4">IO</td></tr>
<tr><td>R/W</td><td>S260</td><td>IO Direction</td><td>Configure Pin in Input or Output:

<table>
<tr><td>Bit 15</td><td>Bit 14</td><td>Bit 13</td><td>Bit 12</td><td>Bit 11</td><td>Bit 10</td><td>Bit 9</td><td>Bit 8</td><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
<tr><td>/</td><td>/</td><td>/</td><td>/</td><td>/</td><td>IO1_P</td><td>IO2_P</td><td>IO3_A</td><td>IO4_A</td><td>IO5_A</td><td>IO6_A</td><td>IO7_A</td><td>IO8_A</td><td>IO9_I</td><td>RTS</td><td>CTS</td></tr>
</table>
Ouput Pin: 0
Input Pin: 1</td></tr>
<tr><td>R/W</td><td>S262</td><td>IO Value</td><td>Value of each Pin:

<table>
<tr><td>Bit 15</td><td>Bit 14</td><td>Bit 13</td><td>Bit 12</td><td>Bit 11</td><td>Bit 10</td><td>Bit 9</td><td>Bit 8</td><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
<tr><td>/</td><td>/</td><td>/</td><td>/</td><td>/</td><td>IO1_P</td><td>IO2_P</td><td>IO3_A</td><td>IO4_A</td><td>IO5_A</td><td>IO6_A</td><td>IO7_A</td><td>IO8_A</td><td>IO9_I</td><td>RTS</td><td>CTS</td></tr>
</table>
</td></tr>
</table>

IV.4. Operating mode

- The yellow LED (LD4) lights ON for each transmission frame
- The red LED (LD1) lights ON for each reception frame

IV.5. Error codes

Code	*Error*
Hayes commands	
01	AT characters are missing in the command
02	Command unknown or unauthorized in the current configuration
03	Register unknown
04	Register content not correct. Refer to the registers description for various limitations
07	Serial speed modification impossible because of low time-out. Time-out should be modified before serial speed.
08	Time-out modification impossible because of high serial speed. Serial speed should be modified before time-out
09	The addressing is missing in the command (Client ID =)
10	Channels to be scanned not correct
11	Command not correct. The client must have a network ID different from 0
12	Command not correct. The server must have a network ID different from 0
13	Client activation impossible. The network ID must be different from 0
14	Server activation impossible. The network ID must be different from 0
15	Radio speed modification impossible because of high serial speed. Serial speed should be modified before radio speed
16	Serial speed modification impossible because of low radio speed. Radio speed should be modified before serial speed
17	Radio speed modification impossible because of high number of channels. Number of channels should be modified before radio speed
18	Repeater mode only. Radio speed modification impossible because channel N°2 is above the number of channel limits. Channel N°2 should be modified before radio speed
19	Repeater not allowed in network

CHAPTER V. ADVANCED OPERATIONS

The following paragraph described the main aspects of the standby mode, programming, range evaluation, etc.

V.1. Stand-by Mode

In order to make stand-by consumption measurement on the Demoboard (e.g. for integration application), the radio module can be put in stand-by mode.

To configure the stand-by mode, only one register needs to be modified, S240 :

- ⇨ If S240 is set to '1' (ATS240=1<CR>), the unit is ready to be in stand-by mode.
- ⇨ If S240 is set to '0' (ATS240=0<CR>), the unit can not be configured in stand-by mode.

To perform power consumption measurement :

1. Connect an ammeter in place of the R13 Resistor .

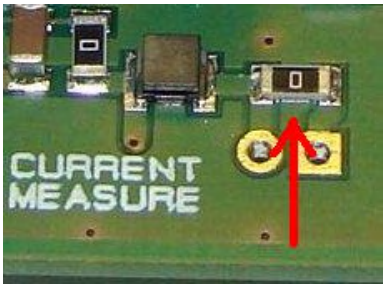


Figure 17 : Current measure

To perform the stand-by mode, the unit must be configured in stand-by mode by setting its register S240 to '1'. Then :

2. Switch the Demoboard ON.

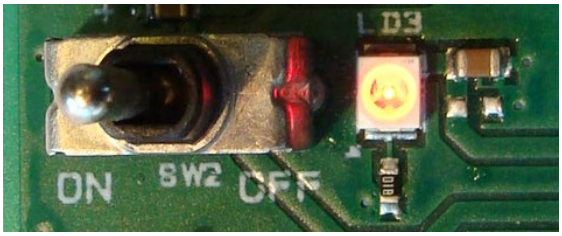


Figure 18 : Power switch

3. Turn the stand-by switch ON.

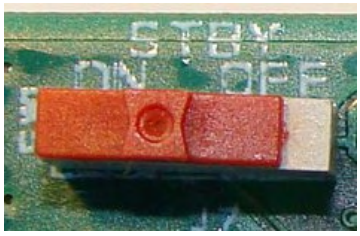


Figure 19 : Standby switch

4. To exit the stand-by mode. Turn back the stand-by switch OFF.

V.2. Programming Mode

All the detail regarding flashing of the xE51/61 Family modules can be found in the SR Manager Tool User Guide [1].

V.3. Auto-repeat mode :

This is a specific communication protocol in which the module sends back the frames it has received (radio or serial) without echoing. It allows the user to easily test the module remotely and to measure the communication range.

- ***Basic Illustration of Autorepeat mode***

	Demoboard N°1	*Demoboard N°2*
Configuration Mode	+++ ATO	+++ ATS221=1 ATO
Operating Mode	**<HELLO>** **<HELLO>**	**<HELLO>***

<in blue> : data sent
<in red> : data received

- ***Basic Illustration of Autorepeat mode with RSSI level***

	Demoboard N°1	*Demoboard N°2*
Configuration Mode	+++ ATS255=129 ATO	+++ ATS221=1 ATO
Operating Mode	**<HELLO>** **<rssi_level/HELLO>**	**<HELLO>***

<in blue> : data sent
<in red> : data received

*Received data do not appear on the serial link for demoboard in auto repeat mode