Title:

SX-ULPAN-2404 Silex AT Commands

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XX	First version (based on SXAT 1.5.0)	Sep. 30, 16	Y.Sasaki Y.Yamada	T.Kuwana	H.Miura
XA	Updated “3-13 ATPSUSW”	May. 17, 17	T.Kuwana	Y.Yamada	H.Miura
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1 Introduction

silex AT command is a modem-like UART control command set for SX-ULPAN-2404 WiFi module. This document describes the specification of silex AT command.

2 General description

2-1 System requirement

silex AT command works just like modem. It is intended to connect to a *host system* with UART and works as serial-to-WiFi media converter.
The default configuration of UART0 (debug UART) is 115200bps, 8bit, no parity, 1 stop bit, no flow control. UART parameters can be changed by ***ATB*** command.

2-2 AT command basics

silex AT command is based on legacy serial modem command syntax, known as *Hayes AT command*, which consists of *command*, *response* and *result code*. Every command, response and result code is an ASCII text string terminated by a carriage return (CR) and a line feed (LF).

Command is what the host system (maybe a user) sends to the module. All AT commands begin with a keyword "AT" and are terminated by a carriage return, except ***A/*** sequence. Although commands are case-insensitive, the case of T must be the same as A. Thus, "ATW" "atw" “ATw" "atW" are all valid commands, but "aTW" or "Atw" is not recognized as a command.
Command may take parameters. Some commands (like ATE) take a parameter directly after the command, such as "ATE1". Some commands (like ATS) take parameters with a keyword "=", such as "ATS12=100". In the latter case, a current value can be queried using a keyword "?", such as "ATS12?".

Response is a series of strings terminated by CR+LF. The format of response varies between commands. Simple commands (such as ATE) usually do not generate a response.

Result code indicates the results of the command, shown in Table 2-1. Result code can be configured as text format (default) or numeric format using ***ATV*** command. You can also configure not to show result codes using ***ATQ*** command. Note that the numeric format takes the form of a number followed by a CR but no LF.

XC

Table 2-1 List of result codes

Text format	Numeric format	Description
OK	0	Command was successful.
CONNECT	1	Data link (TCP or UDP socket) is connected, and the system has entered to transparent mode.
RING	2	This result code is not used.
NO CARRIER	3	Data link is disconnected, and the system has entered to command mode.
ERROR [<info>]	4	Generic error. Hints for developers could be given by [<info>]. Please do not interpret the [<info>] portion by a program on host system.
NO DIALTONE	6	Data or WiFi link is not established yet.
BUSY	7	Data or WiFi link is already established.
NO ANSWER	8	Data link could not be established.

The module has *command mode* and *transparent mode*. Command mode is the power-on default, which the host system can send AT command. When a data link is established, the module will enter to transparent mode, which is all incoming UART data is sent to the network (WiFi) and all received data from network is sent on UART.
You can interrupt transparent mode to command mode by sending "escape sequence", which is three (3) consecutive *escape code* (default "+") sandwiched between pauses (*Escape Guard Time*, default 1sec). You can re-enter to transparent mode by ***ATO*** command. If connection is broken or aborted, the module automatically exits from transparent mode, showing a "NO CARRIER" error message.

In command mode, the module echoes back incoming UART data by default. You can disable this behavior by ***ATE*** command.

A series of commands can be followed after a single "AT", such as "ATE1V1Q0S12?". This is compatible with legacy Hayes AT command but is not commonly used and somewhat tricky, because the end of a command is not well-defined when the command takes variable parameters.
When multiple commands are specified in a single line, each command is processed one by

one, and responses and result codes are sent to UART subsequently. When a command returns error (other than OK) result, command processing is terminated there.

3 Command set

3-1 A/

Repeat a previous command. This command does not require a carriage return at the end of line.

3-2 ATEn

Configure command mode echoback. Parameter n can be 0 (no echo) or 1 (echo, default).

Possible Result code:

OK (0) : Successful.

ERROR (4):Error, n is out of range.

Standard AT command: Yes

3-3 ATQn

Configure result code. Parameter n can be 0 (show result code, default) or 1 (not to show result code).

Possible Result code:

OK (0) : Successful.

ERROR (4):Error, n is out of range.

Standard AT command: Yes

3-4 ATVn

Configure result code format. Parameter n can be 0 (numeric) or 1 (text, default).

Possible Result code:

OK (0) : Successful.

ERROR (4):Error, n is out of range.

Standard AT command: Yes

3-5 ATSn<=value or ?>

Configure or query S register. Parameter n specifies register number between 0 and 255. Table 3-1 shows the list of S registers and corresponding functions. Note that non-existing S registers are handled as dummy, always 0 on read.

When "=value" is followed, specified register is set. value must be a decimal number 0 to 255. When "?" is followed, current register value is shown as a response as 3-digit non zero-suppressed decimal number.

Table 3-1 S registers

Number	Description	Default
2	Escape code	43("+")
3	CR code	13
4	LF code	10
5	Backspace code	8
12	Escape guard time (x 20msec)	50
100	(Reserved)	0
101	(Reserved)	1
102	Abort enable. When set to 0, UART input does not abort WiFi/TCP connect commands. (ATWAWPS, ATWA, ATWAWPA, ATWAPWPS, ATNDHCPC, ATNSTCP)	1
103	Connect timeout for ATNCTCP. 1-255 seconds, 0 is infinity. * For this product, timeout occurs no later than 145 seconds even if a greater value or 0 is set.	10
104	Accept timeout for ATNSTCP. 1-255 second, 0 is infinity.	0
105	Auto transparent mode. When set to 0, the module do not enter transparent mode at successful network connection. In this case result code "OK" is returned instead of "CONNECT". You can still enter to transparent mode by ATO. (ATNCTCP, ATNSTCP, ATNCUDP, ATNSUDP)	1
106	WiFi-TCP disconnection timeout, 1-255 seconds. This is timeout between WiFi disconnect detection and TCP connection close. When set to 0, WiFi disconnect does not cause TCP close.	60
107	TCP transmission window-full retry interval time, 0-255 seconds. Reducing this value may improve throughput when TCP reception is slow.	10

Number	Description	Default
108	UART transmission flow control busy retry timeout, 0-255, x10 msecs. Increasing this value may improve throughput when UART reception is slow. Specifying 0 means wait for UART infinity.	10
109	(Reserved)	0
110	Auto close mode. When set to 0, the module does not close a socket automatically and stays in transparent mode after a network connection is recognized as broken. In this case, running an escape sequence and ATNCLOSE explicitly is required to close the broken socket.	1

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error, n or value is out of range.

Standard AT command: Yes

3-6 ATO

Return to transparent mode, if data connection is established. The response is “Enter transparent mode”.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error, connection is not established.

Standard AT command: Yes

3-7 ATZ

Reboot the system.

Possible Result code:

OK (0) : Successful.

Standard AT command: Yes

3-8 ATTO<=value or ?>

Configure or query *buffer timeout* which is how long the system waits to send UART-received data to network. Parameter value is timeout in msec, between 1 and 60000. The default value is 200.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error, value is out of range.

Standard AT command: No

3-9 ATBSIZE<=value or ?>

Configure or query *buffer threshold*, which is to specify threshold to send UART-received data to network when length of data stored in the buffer reaches or exceeds the specified number of bytes. Parameter value can be between 1 and 1420. The default value is 1200.

For this product, the maximum value is limited by transport protocols:

TCP/IPv4 1420

TCP/IPv6 1196

UDP/IPv4 1416

UDP/IPv6 1416

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error, value is out of range.

Standard AT command: No

3-10 ATB=<baud>,[bits],[parity],[stop],[flow]

Configure UART parameters for current port. Parameter after baud can be optional. When a parameter is omitted, current value is used. For example, "ATB=9600" just changes baud rate only. "ATB=115200,,,,h" configures 115200bps and hardware flow control, leaving bits, parity, stop as current value.

baud: decimal number specifies baud rate.
bits: optional, decimal number specifies data bits, must be 8.
parity: optional, single letter or decimal number specifies parity.
n(0): none
o(1): odd parity
e(2): even parity
stop: optional, decimal number specifies stop bit, must be 1.
flow: optional, single letter or decimal number specifies flow control.
n(0): none
h(1): hardware, RTS/CTS.

You can query current UART settings by "ATB?" or "ATB=?".

Possible Result code:
OK (0) : Successful.
ERROR (4) : Error, value is out of range.
Standard AT command: No

3-11 ATWREV

Show firmware revision. The response format is as shown below.

SX-ULPAN-2404
Firmware version : 1.0.0
Target version : 3.3.4.103 (Sep 2 2015 11:30:37)

Possible Result code:
OK (0) : Successful.
Standard AT command: No

3-12 ATWDG=<enable>,<timeout>

Configure watchdog function. Parameter enable is 0 (disable, default) or 1(enable). Parameter timeout is watchdog timeout in seconds, 1 to 600, however longer than 5 seconds is recommended to prevent accidental watchdog reboot. "ATWDG?" or "ATWDG=?" can query current watchdog configuration. The response format is a single line like "1,10", the first number is enable flag and the second number is timeout in seconds.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

XA

3-13 ATPSUSW=<sleep time>,<wake mode>

Initiate Suspend mode for specified <sleep time> milliseconds. Timer based wakeup is disabled if 0 is given as <sleep time>. Parameter <wake mode> indicates WAKEUP pin's edge trigger mode, 1 (High) or 2 (Low).

The suspend mode is only available while the module is running WiFi station mode.

After using this command, hardware reset by CHIP_PWD_L PIN (ULPAN # 7) must not be used.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-14 ATWAWPS=<flag>,PUSH

Initiate WPS (WiFi Protect Setup) trying to connect to an AP. Parameter flag must be 1. The second parameter specifies WPS mode as a string. "PUSH" (PBC) is only supported.

This command times out after 2 minutes from WPS start. While waiting for WPS, any input from UART will abort the attempt.

Possible Result code:

OK (0) : Successful.
ERROR (4) : Error.
BUSY (7) : AP uplink is already established.

Standard AT command: No

3-15 ATWAWPA=<ssid>,<ver>,<ucipher>,<mcipher>,<passphrase>

Connect to WPA-configured Access Point. Parameter ssid specifies a SSID. The maximum length of a SSID is 32 characters. Parameter ver specifies WPA version (1=WPA, 2=WPA2/RNS). Parameter ucipher and mcipher specifies encryption algorithm for Unicast and Multicast, either numeric (0=TKIP, 1=CCMP) or text ("TKIP" or "CCMP") format. Parameter passphrase specifies a passphrase which is either an ASCII string of 8 - 63 characters or a 64-digit hexadecimal number.
For this product, the parameter mcipher is ignored. mcipher must be the same value as ucipher.

While waiting for connection, any input from UART will abort the attempt.

XD This product has the following restrictions which come from the product specification:

The authentication method must be WPA2 (ver = 2).
The encryption algorithm must be AES (ucipher = CCMP, mcipher = CCMP).

Possible Result code:

OK (0) : Successful.
ERROR (4) : Error.
BUSY (7) : AP uplink is already established.

Standard AT command: No

3-16 ATWA=<ssid>

Connect to an open Access Point. Parameter ssid specifies a SSID. The maximum length of a SSID is 32 characters.

While waiting for connection, any input from UART will abort the attempt.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

BUSY (7) : AP uplink is already established.

Standard AT command: No

3-17 ATWAPCH=<channel or ?>

Configure or query channel number used for Access Point mode. The default value is 6. The module supports the following channels:

1 - 13

W52(36, 40, 44, 48)

W58(149, 153, 157, 161, 165)

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-18 ATWAPWPS=<flag>,PUSH

Initiate WPS (WiFi Protect Setup) trying to connect to a station. Parameter flag must be 1. The second parameter specifies WPS mode as a string. "PUSH" (PBC) is only supported.

This command requires that the module is running access point mode with WPA2/AES security configuration.

This command times out after 2 minutes from WPS start. WPS errors are not reported until timeout expires. While waiting for WPS, any input from UART will abort the attempt.

Note that a result code and actual connection status might be different depending on a target WiFi station behavior.

Possible Result code:

OK (0) : Successful.
ERROR (4) : Error.
NO DIALTONE (6) : AP is not running.

Standard AT command: No

3-19 ATWAPWPA=<ssid>,<ver>,<ucipher>,<mcipher>,<passphrase>

Initiate an access point with WPA security. The parameter specification is the same as ATWAWPA. See 3-15 for the details.

However, this product has the following restrictions:

A SSID is a string of 1 - 31 characters.
Parameter ver must be 2.
Both parameter ucipher and mcipher must be CCMP.
A passphrase is an ASCII string of 8 - 63 characters.

Possible Result code:

OK (0) : Successful.
ERROR (4) : Error.
BUSY (7) : AP uplink is already established.

Standard AT command: No

3-20 ATWAP=<ssid>

Initiate an open Access Point. Parameter ssid specifies a SSID.

For this product, an access point's SSID is a string of 1 - 31 characters.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

BUSY (7) : AP uplink is already established.

Standard AT command: No

3-21 ATWD

Disconnect from currently connected Access Point, if any. If AP mode is initiated, shut down the AP.

Possible Result code:

OK (0) : Successful.

Standard AT command: No

XE

3-22 ATWREG=<regcode or ?>

Configure or query a region code. One of the following hexadecimal numbers should be given as regcode:

- 4000006a (WWR, default)
- 80000188 (JP)
- 80000348 (US)
- 80000114 (EU(DE))

For the US model, region configuration is fixed to US so cannot be changed.
Other codes not listed above are not supported.

To restore the configuration to WWR, perform software reset by ATZ.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-23 ATWANT=<?>

Query the current antenna number.
The response is either 1 (ANT1, internal) or 2 (ANT2, external).

Possible Result code:

OK (0) : Successful.

Standard AT command: No

3-24 ATWANTDIV=<idle time>,<rssi threshold>,<enable>,<rate threshold>

Configure antenna diversity.

idle time: Interval time[msec] to check data rate.

rssi threshold: RSSI threshold.

Initial threshold is set to:

Upper threshold = Current RSSI + <rssi threshold>

Lower threshold = Current RSSI - <rssi threshold>

When RSSI exceeds upper threshold:

Upper threshold = Current RSSI + <rssi threshold>

Lower threshold = Current RSSI - <rssi threshold>

When RSSI exceeds lower threshold:

Upper threshold = Current RSSI + <rssi threshold>

Lower threshold = Current RSSI - <rssi threshold> / 2

enable: Enable/Disable antenna diversity (antenna configuration).

0: Disable (select ANT1), default

1: Enable

2: Disable (select ANT2)

rate threshold: Data rate threshold.

The module switches an active antenna when data rate gets lower than <rate threshold>. Note that receiving no data frames also triggers the switching.

To enable antenna diversity, run a command like:

ATWANTDIV=10000,10,1,48

To select ANT2 (the external antenna):

ATWANTDIV=10000,10,2,48

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-25 ATWS

Show AP scan result. The response format is as shown below. Each AP entry is represented by 4 (open) or 5 (secure) lines. Note that you cannot distinguish WEP APs from OPEN APs. Note that BSSID is zero-suppressed hexadecimal string.

```
ssid = OPEN_AP
bssid = 12:34:56:78:9a:bc
channel = 6
indicator = 22
security = NONE!

ssid = WPA_PSK_AP
bssid = 1:2:3:4:5:6
channel = 6
indicator = 32
security =
WPA= {PSK }{TKIP }

ssid = WPA2_PSK_AP
bssid = 0:80:92:3:14:15
channel = 1
indicator = 28
security =
RSN/WPA2= {PSK }{AES }

ssid = WPA2_ENTERPRISE_AP
bssid = 38:32:79:50:28:84
channel = 6
indicator = 21
security =
RSN/WPA2= {802.1X }{TKIP }
```

Possible Result code:

OK (0) : Successful.

Standard AT command: No

XC

3-26 ATW

Show current WiFi status. The response format is as shown below. Note that there is no explicit indication uplink status; Unlink status is implicitly shown as ssid=null and channel=0. Each byte of Mac Addr is displayed as a zero-suppressed hexadecimal value.

```
ssid        =
Phy Mode    =   mixed
Power Mode  =   Power Save
Mac Addr    =   0:80:92:12:34:56
Mode        =   Station
Channel     =   0
```

Possible Result code:

OK (0) : Successful.

Standard AT command: No

3-27 ATWRSSI

Query current RSSI. The response format is as shown below.

```
indicator = xxx
```

RSSI values are valid only when the module has a wireless link to an access point.

Possible Result code:

OK (0) : Successful.

NO DIALTONE (6) : AP uplink is not established.

Standard AT command: No

3-28 ATWPM=<wpm or ?>

Configure or query WiFi power mode. Parameter wpm is 0 (Max Performance) or 1 (Power Save, default). When ? is specified, current power mode is queried. The response format as shown below.

```
Power Mode  =   Max Perf

or

Power Mode  =   Power Save
```

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error, wpm is out of range.

Standard AT command: No

3-29 ATNSET=<ip address>,[subnet mask],[default gateway]

Configure or query current IPv4 settings. When "?" is specified as a parameter, the response is IP address configuration as shown below:

```
IP:0.0.0.0, Mask:255.0.0.0, Gateway:0.0.0.0
```

The module cannot accept 0.0.0.0 for its IP address. The default configuration is as follows:

```
IP:192.168.1.10, Mask:255.255.255.0, Gateway:0.0.0.0
```

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-30 ATNSET6=<?>

Query current IPv6 settings. Current version does not support IPv6 manual address configuration, only accepts query parameter (?). The IPv6 address configuration response is as shown below.

```
Link-Local IPv6 Address ..... : fe80::3252:cbff:fefa:dfc7/64
Global IPv6 Address ......... : ::
Default Gateway  ............ : ::
Global IPv6 Address 2 ....... : ::
```

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-31 ATNDHCPC

Configure IP by DHCP. This command times out after one minute from DHCP start. Any input from UART aborts command process. Note that static IP configuration is applied to the module if an error occurred.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-32 ATNDHCPSADDR=<startip,endip> or <?>

Configure or query the range of IP addresses leased by DHCP server. Parameter startip and endip specify the range.

The response format is <startip>,<endip> when "?" is specified as a parameter.

The default configuration is as follows:

startip: 192.168.1.100, endip: 192.168.1.199

DHCP server is enabled in access point mode. The server must be configured before access point startup. Once the module has started an access point, you must perform software reset by ATZ to reconfigure DHCP server.

The module does not acquire an IP address from its own server by DHCP. Thus, a static IP address must be specified by ATNSET. The class of IP addresses must match between module's static IP address and lease addresses.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-33 ATNPING=<address>,[size],[loop_ mode_wait]

Send ping to a specified IP address. Parameter address can be an IPv4 or IPv6 address. Optional parameter size specifies the size of ICMP ECHO data, default is 64.
When the third parameter loop_ mode_wait is specified, the unit will keep sending ping until aborted by any input from UART. loop_mode_wait specifies the interval in msec.

Possible Result code:

OK (0) : Ping was successful.

ERROR (4) : Error, invalid address or size.

NO ANSWER (8) : No ping reply received.

Standard AT command: No

3-34 ATNSOCK=<type>, [family]

Create a network socket. Parameter type specifies the socket type, either numeric (0:TCP, 1:UDP) or text format. Optional parameter family specifies the IP version, 4 or 6.

Possible Result code:

OK (0) : Successful.
ERROR (4) : Error, invalid type or family.
BUSY (7) : Socket is already established.

Standard AT command: No

3-35 ATNCLOSE

Close a network socket, if any.

Possible Result code:

OK (0) : Successful.
ERROR (4) : Error.

Standard AT command: No

3-36 ATNCTCP=<address>,<port>

Open a client mode TCP socket, connected to specified address. The local TCP port number is dynamically assigned. When successfully connected, the module enters transparent mode right after "CONNECT" result code. Depending on the ATS105 setting, the result code can be “OK”. The command mode continues after the “OK” result code.

Note that unlike ATWA or ATNSTCP, this command cannot be aborted by UART input. Connection timeout can be configured by ***ATS103*** command, default is 10 seconds.

XC If a connection attempt failed on a TCP socket (NO CARRIER), the socket cannot be reused. Please close it using ATNCLOSE command.

Possible Result code:

OK (0) : Successful (staying in command mode).
CONNECT (1) : Successful (entering transparent mode).
NO CARRIER (3) : Connection failed.
ERROR (4) : Error.
BUSY (7) : Connection is already established.

Standard AT command: No

3-37 ATNSTCP=<port>

Open a server mode TCP socket, wait for an incoming connection at the specified TCP port. When successfully connected, the module enters transparent mode right after "CONNECT" result code. Depending on the ATS105 setting, the result code can be “OK”. The command mode continues after the “OK” result code. When result code is text mode, socket information is added after result code (such as "CONNECT 192.168.1.1,4097").

While waiting for connection, any input from UART will abort the attempt. After abortion, ATNSTCP= can be issued again to resume waiting for an incoming connection. Accept timeout can be configured by ***ATS104*** command, default is 0 (infinity).

Possible Result code:

OK (0) : Successful (staying in command mode).
CONNECT (1) : Successful (entering transparent mode).
NO CARRIER (3) : Aborted.
ERROR (4) : Error.
BUSY (7) : Connection is already established.

Standard AT command: No

3-38 ATNCUDP=<address>,<port>

Open a client mode UDP socket, connected to specified address. The local UDP port number is dynamically assigned. When successfully connected, the module enters transparent mode right after "CONNECT" result code. Depending on the ATS105 setting, the result code can be “OK”. The command mode continues after the “OK” result code.
Note: In this mode, the UDP socket only receives datagrams sent from address / port.

Possible Result code:

OK (0) : Successful (staying in command mode).
CONNECT (1) : Successful (entering transparent mode).
ERROR (4) : Error.
BUSY (7) : Connection is already established.

Standard AT command: No

3-39 ATNSUDP=<port>

Open a server mode UDP socket, at specified UDP port. When successfully connected, the module enters transparent mode right after "CONNECT" result code. Depending on the ATS105 setting, the result code can be “OK”. The command mode continues after the “OK” result code.

Note: In this mode, the UDP socket receives datagrams sent from any source, as far as destination port patches.

Possible Result code:

OK (0) : Successful (staying in command mode).

CONNECT (1) : Successful (entering transparent mode).

ERROR (4) : Error.

BUSY (7) : Connection is already established.

Standard AT command: No

3-40 ATNSENDTO=<address>,<port>

Configure destination address / port for UDP transmission. ATNSENDTO=? can query current configuration. This command does not take effect for a TCP socket.

Possible Result code:

CONNECT (1) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-41 ATNDNSSVR[n]=<address or ?>

Configure or query DNS server settings.
When the parameter is an IPv4 (4 decimal numbers separated by '.') or IPv6 (1 to 16 hexadecimal numbers separated by ':') address, it is added to DNS server entries.

[n] is ignored when you add a DNS server entry. The maximum number of DNS server entries is 3. When you try to add more than 3 DNS server entries, it is just ignored, does not return any errors.

When [n] is not specified and "?" is specified as the parameter, the response is all DNS server entries. The first line represents number of entries, followed by DNS server addresses each per line, either IPv4 or IPv6 address format.

```
ATNDNSSVR=?
2
192.168.1.1
fe80::60b4:631:c2d6:1b7f
```

When [n] is within the range of existing DNS server entry index (1 to 3) and "?" is specified as the parameter, the response is a corresponding DNS server entry as a single line.

```
ATNDNSSVR1=?
192.168.1.1
```

When [n] is within the range (1 to 3) and "0" is specified as the parameter, the corresponding DNS server entry is deleted.

```
ATNDNSSVR1=0
```

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-42 ATNDNSQUERY[6]=<domain name>

Perform DNS query. The first line of response indicates results, 0 (error) or 1 (success). If query was successful, a single line of the corresponding address follows.

```
ATNDNSQUERY=www.sta.com
1
192.168.1.200
```

When [6] is specified, an IPv6 address (AAAA record) is queried instead of IPv4 A record.

```
ATNDNSQUERY6=www6.sta.com
1
fe80::214:d1ff:fe14:b981
```

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-43 ATNDNSA[n]=<hostname>,<address>

Register, delete or query DNS A records. Parameter hostname specifies a hostname and parameter address specifies an IPv4 address.

[n] is ignored for registration. The maximum number of records is 4, including AAAA records. Note that only a record can specify a hostname.

To query all A records, specify "?" as the parameter without [n]. The response includes all records. The first line indicates the number of records and records follow as shown below:

ATNDNSA=?
2
host1,192.168.1.100
host2,192.168.1.200

To query a specific record, specify "?" as the parameter with a valid index [n] (1 - 4). The corresponding record is returned as a response.

ATNDNSA1=?
host1,192.168.1.100

To delete a specific record, specify "0" as the parameter with a valid index [n] (1 - 4). The corresponding record is to be deleted.

ATNDNSA1=0

Possible Result code:
OK (0) : Successful.
ERROR (4) : Error.
Standard AT command: No

3-44 ATNDNSAAAA[n]=<hostname>,<address>

Register, delete or query DNS AAAA records. Parameter hostname specifies a hostname and parameter address specifies an IPv6 address.

[n] is ignored for registration. The maximum number of records is 4, including A records. Note that only a record can specify a hostname.

To query all AAAA records, specify "?" as the parameter without [n]. The response includes all records. The first line indicates the number of records and records follow as shown below:

ATNDNSAAAA=?
2
host1,fe80::1
host2,fe80::2

To query a specific record, specify "?" as the parameter with a valid index [n] (1 - 4). The corresponding record is returned as a response.

ATNDNSAAAA1=?
host1,fe80::1

To delete a specific record, specify "0" as the parameter with a valid index [n] (1 - 4). The corresponding record is to be deleted.

ATNDNSAAAA1=0

Possible Result code:
OK (0) : Successful.
ERROR (4) : Error.
Standard AT command: No

3-45 ATNDNSS<=enable or ?>

Configure or query DNS server status. Parameter enable is either 0(disable, default) or 1(enable). The current status is returned as a response when "?" is specified as the parameter.

Note that DNS server only works with access point mode.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-46 ATNDOMAIN=<domain name or ?>

Configure or query a domain name. Parameter domain name is a domain name string whose length is up to 32 characters. The default value is "localdomain". Current value is returned as a response when "?" is specified as the parameter.

The domain name set by this command is referred from DHCP and DNS server.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

3-47 ATOTAUPGRADE=<address>,[filename],[preserve]

Perform Over-The-Air (OTA) firmware upgrade. Parameter address is an IP address of the TFTP server, IPv4 only. Parameter filename is a file name to download, default is "ota.bin". Parameter preserve is partition preserve mode, 0 to allow overwriting exiting partition, 1 to preserve existing partition (default).
When result code OK (0) is returned, the response is shown as "<filename>,<code>,<size> is shown as below.

```
ota.bin,0,786408
```

<code> is an internal status code, always 0.
<size> is downloaded image size. It is 24byte smaller than original OTA image file (ota_image_xxxx.bin).

When result code ERROR (4) is returned, additional information will be added after "ERROR".

(ADDR) : IP address is not specified or invalid.
(FNAME) : Filename is not specified or invalid.
(<number>) : Internal error code.

Possible Result code:

OK (0) : Successful.
ERROR (4) : Error.
NO DIALTONE (6) : AP uplink is not established.

Standard AT command: No

3-48 ATOTADONE=[flag]

Finish Over-The-Air (OTA) firmware upgrade after successful ATOTAUPGRADE. Without performing ATOTADONE, firmware upgrade does not take effect.
Optional parameter flag indicates if loaded firmware is good (1, default) or bad (0).
When result code ERROR (4) is returned, additional information will be added after "ERROR".

(<number>) : Internal error code.

Possible Result code:

OK (0) : Successful.

ERROR (4) : Error.

Standard AT command: No

4 Differences from SX-ULPAN-2402

4-1 Debug output

Debug output to UART has been disabled.

4-2 Asynchronous messages

Asynchronous messages for notification (wireless link / authentication status) have been removed. However, the result code “NO CARRIER” is still asynchronously notified on TCP disconnection. This behavior can be modified by ATS110.

4-3 Parameter syntax flexibility

All SX-ULPAN-2402 commands are terminated with "=", regardless if the command takes parameter or not, and not all parameters can be queried.
silex AT command does not require "=" (for example, both "ATWD" and "ATWD=" work in the same way) and all parameters can be queried, either in Hayes AT syntax (such as "ATNSET?") or SX-ULPAN-2402 syntax ("ATNSET=?").

XB

4-4 Result Code

The command always returns a result code. For details on result codes, please refer to the specification of each command or Table 2-1.

XB

4-5 Termination Code

The termination code of response lines is unified as shown below (it used to be different for each command).

Response		<CR><LF>
Result code	Text form	<CR><LF>
	Numerical value form	<CR>

<CR> is the termination code for all commands. For details on the command syntax, please also refer to 2.2.

XB

4-6 Echo Back

Every command input is echoed back by default. To disable this behavior, please execute ATE0 command.

XB

4-7 Removal of Prompt

The prompt “shell> ” is removed. Any command needs to be input after a result code for previous command.

XB **4-8 ATW Command**

There are not Link State, RSSI, AP BSSID on response of ATW command. ATWRSSI command can be used instead for Link State and RSSI.

BSSID of the connected AP cannot be retrieved by silex AT command.

SX-ULPAN-2402	silex AT
ssid = ssid-test Phy Mode = mixed Power Mode = Max Perf Mac Addr = 0:80:92:1:23:45 Mode = Station Channel = 11 **Link State = Connected** **RSSI = 40 dB** **AP BSSID = 0:80:92:12:34:56**	ssid = ssid-test Phy Mode = mixed Power Mode = Max Perf Mac Addr = 0:80:92:1:23:45 Mode = Station Channel = 11

4-9 Transparent mode behavior

SX-ULPAN-2402 transparent mode works in unusual way. Escape is three consecutive "+" but you have to keep guard time between escape codes (in other words, +(wait...)+(wait...)+). silex AT command escape works similar way as Hayes AT ((wait...)+++(wait...)).

4-10 IPv6 capability

silex AT command supports both IPv4 and IPv6 for:

- ATNPING
- ATNSOCK
- ATNCTCP
- ATNCUDP.

4-11 Access point mode

This product supports access point mode. Once a module is used as a WiFi station, it must be reset by ATZ to reconfigure as an access point, and vice versa.

4-12 DHCP server

This product supports DHCP server.

4-13 DNS

This product supports DNS client and server.

4-14 OTA update capability

silex AT command supports OTA update by ATOTAUPGRADE and ATOTADONE commands.

XB

4-15 Discontinued commands

The commands listed in the following table have been discontinued or replaced.

Commands	Alternative
ATB2	ATB (any baud rate can be set)
ATBMODE	(None) [This product behaves as ATBMODE=1 by default]
ATHELP	(None)
ATMSG	ATS110
ATNDHCP	ATNDHCPC
ATPSUS	ATPSUSW
ATWPHYMODE	(None)
ATWSC	(None)