Title:

SX-ULPAN-2402

Drawing Type :	Command Functional Specification
Drawing No.:	SC106470XE
Date :	2016/02/25

Rev.	Description	Date	Prepared	Checked	Approved
XX	First Version	Aug. 18, 15	Y.Aoyama	S.Tanaka	H.Miura
XA	Clerical error correction Added Description	Sep. 28, 15	Y.Aoyama	S.Tanaka	H.Miura
XB	UART Message Added Description Added the termination of command format Added about UART port initialization Added Flow control of ATB optional Added ATB2 command Fixed the initial value of Buffer size to 512	Oct. 22, 15	Y.Aoyama	S.Tanaka	H.Miura
XC	Added information to notes of ATPSUS command Changed explanation on ATWPHYMODE option Added 2.6 Delay between Commands Added 2.7 Status Transition Using Commands	Nov. 30, 15	Y.Aoyama	K.Yagi	H.Miura
XD	Added 2.2 Status Transition Image Added explanation on 2.5 ATBSIZE,ATTO Added information to notes of 2.5 ATNSOCK Added 4 Online Mode	Jan. 25, 16	Y.Aoyama	H.Miura	H.Miura
XE	Correct the escape command + interval to 1500 milliseconds Modified the properties of document	Feb. 25, 16	Y.Aoyama	K.Yagi	H.Miura

1. Overview

This document describes the detailed functions of SX-ULPAN-2402 (hereafter the wireless driver).

2. UART Command

2.1. Command Format

The command applies a system similar to the AT command developed by Hayes of United States but is not compatible to the common AT command used for a modem control.

The command format is as follows.

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AT(Command Name)=[Parameter](CRorLF)

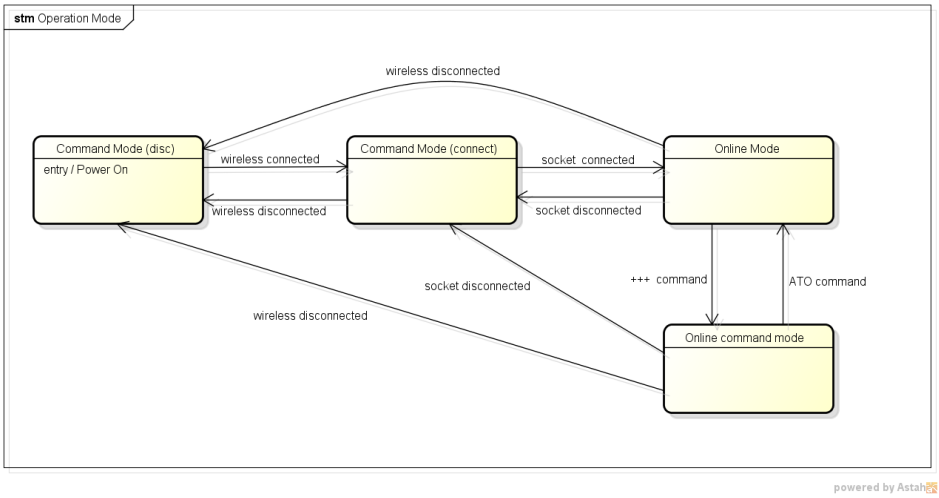
Even for status retrieval command not specifying a parameter, information before "=" is required as a command.

2.2. Operation Mode

UART Command models switches among 3 operating modes.

Operating mode	Details
Command mode	This is the mode that the command can be received. After the power on, the module is started in the command mode.
Online mode (Data mode)	This is the mode that the UART data is transmitted to / received from a wireless network as is.
Online command mode	This is the mode that the command can be received while connected wirelessly. If an escape command is input during the online mode, the mode will switch into the command mode.

XD Transition of status on each mode is shown in a below image.



2.3. Command List

Command	Description
ATW=	Gets WLAN status
ATB=	Enter the baud rate
ATB2=	Set UART clock scale /step
ATWREV=	Returns WLAN firmware version
ATWS=	Start WLAN Scan
ATWPM=	Set IEEE Power Save
ATPSUS=	Start power suspend and configure wakeup options
ATWDG=	Start watchdog timer
ATWA=	Associate with SSID, no security, open mode
ATWAWPS=	Associate using WPS
ATWAWPA=	Associate using WPA
ATWD=	Dissociate from connected AP
ATWREG=	Set/Get Regdomain Code
ATWANTDIV=	Set Diversity Antenna
ATWSC=	Control firmware scan behavior
ATWPHYMODE=	Set WLAN PHY mode
ATWRSSI=	Get RSSI
ATNPING=	Ping to specified host
ATNSET=	Set/Get Network Parameters
ATNDHCP=	Run DHCP client
ATNSOCK=	Open Socket
ATNCLOSE=	Close Socket
ATNCTCP=	Attempt TCP client connection to destination
ATNCUDP=	Attempt UDP client connection to destination
ATNSTCP=	Attempt TCP server connection
ATNSUDP=	Attempt UDP server connection
ATO=	Enter transparent mode
ATBSIZE=	Set the buffer size
ATTO=	Set the timeout
ATZ=	System reset
ATHELP=	Show the Help
+++	Escape

2.4. How to see the table

(1)	Config (2) Reference (3)
Description	(4)
Command	(5)
Command example	(6)
Command parameter	(7)
Output	(8)
Output (example)	(9)
Default	(10)
Notes	(11)

(1) Overview of the command

(2) Show if the command is for configuration.

(3) Show if the command is for reference.

(4) Contents of the command

(5) Command itself

(6) Input sample for each command

(7) Details on each command parameter

(8) Shows the message to reply for the command input.

(9) Shows the sample of message to reply for the command input.

(10) Default value of each command

(11) Notes on each command

2.5. Command Specification

Gets WLAN status		**Config**	-
		REF	✔
Description	The list of Wireless status information is displayed.		
Command	ATW=		
Command example	ATW=		
Command parameter	None		
Output	ssid	Current ESSID	
	Phy mode	Current communication mode setting (11a/11b/11g/mixed)	
	Power mode	Current power save mode Power Save: power save mode Max Perf: Normal mode	
	Mac Addr	MAC address	
	mode	Current operation mode station	
	passphrase	Password	
	channel	Channel connected	
	Link State	Link State	
	Disc Reason	Reason of disconnected	
	RSSI	Reception radio wave intensity (0-95 dB)	
	AP BSSID	MAC address of AP	
Output example	shell > ATW= ssid = ssid-test Phy mode = mixed Power mode = Max Perf Mac Addr = 00:80:92:01:23:45 mode = station channel = 11 Link State = Connected RSSI = 40 dB AP BSSID = 00:80:92:12:34:56		
Default	None		
Notes	None		

XA

Enter the baud rate		**Config**	✔
		REF	✔
Description	Configure a UART port		
Command	ATB=<baud rate>,<data bits>,<parity bit>,<stop bits>[,<flow>]		
Command example	ATB=115200,8,n,1		
Command parameter	baud rate	Baud rate (9600 | 19200 | 38400 | 57600 | 115200 | 230400 | 460800)	
	data bits	Only 8 bit data transmission is possible	
	parity bit	(n | o | e) n:no o:odd e:even parity	
	stop bits	Only one stop bit is supported	
	flow	Flow control (optional) (n | h) n:none h:hardware	
Output	Baud rate	Current Baud rate	
	Data bits	Set value	
	Stop bit	Set value	

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	Flow control	Set value (optional)
	result	OK or ERROR
Output example	shell > ATB= Baud rate is 115200 shell > ATB=115200,8,n,1 Data bits = 8 Stop bit = 1 OK	
Default	115200,8,n,1,n	
Notes	After wake up of suspend, UART port will return to the initial setting (115200 baud).	

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Set value (bps)	Effective value (bps)
9600	9542
19200	19157
38400	38314
57600	57471
115200	113640
230400	225230
460800	451670

XB

Set UART clock scale /step		**Config** ✔ **REF** ✔
Description	Configure a UART port with scale & step	
Command	ATB2=<Scale>,<Step>	
Command example	ATB2=34,8192	
Command parameter	Scale	UART clock scale (1-255)
	Step	UART clock step (4096, 8192)
Output	Scale	Current UART clock scale
	Step	Current UART clock step
	result	Baud rate or ERROR
Output example	shell > ATB2= Scale is 35 Step is 8192 shell > ATB2=34,8192 Baud rate = 116071	
Default	Scale is 35 Step is 8192	
Notes	After wake up of suspend, UART port will return to the initial setting.	

Set value (bps)	Scale	Step	Effective value (bps)
7935	255	4096	7949
2031251	1	8192	2040800

Formula to calculate Baud rate from Scale and Step:

Baud = (((65000000 * Step * 2) / (2<<16)) / (Scale+1) + 1) / 2

Formula to calculate Scale from Baud rate:

Scale = ((65000000 * Step * 2) / (2<<16)) / ((2 * Baud) - 1) - 1

* Calculate taking Step as 8192. If Scale becomes 256 or higher, divide Scale and Step by 2 until Scale becomes 255 or lower.

Returns WLAN firmware version			**Config**	**-**
			REF	✔
Description	Display a driver version information.			
Command	ATWREV=			
Command example	ATWREV=			
Command parameter	None			
Output	Firmware version	Target Firmware version		
Output example	shell > ATWREV= Firmware version : 17.2.7 Target version : 3.3.4.103 (Jun 29 2015 01:02:33)			
Default	None			
Notes	None			

Start WLAN Scan			**Config**	**-**
			REF	✔
Description	Execute scanning.			
Command	ATWS=			
Command example	ATWS=			
Command parameter	None			
Output	Scan result count	Number of scan results		
	ssid	SSID		
	bssid	BSSID		
	channel	channel		
	indicator	Reception radio wave intensity (0-95 dB)		
	security	Security method		
Output example	shell > ATWS= Scan result count: 1: ssi = ssid-01 bssid = 0:80:92:00:01:02 channel = 1 indicator = 25 security = RSN/WPA2= {PSK } {AES }			
Default	None			
Notes	None			

Set IEEE Power Save			Config	✔
			REF	✔
Description	Configure the power save mode.			
Command	ATWPM=<mode>			
Command example	ATWPM=			
Command parameter	mode	1:IEEE Power Save, 0:Max Perf		
Output	result	OK or ERROR		
	Power mode	REC_POWER : IEEE Power Save MAX_PERF_POWER : Max Perf		
Output example	shell > ATWPM=1 OK shell > ATWPM= Power mode = REC_POWER			
Default	mode=0 (Max Perf)			
Notes	None			

XA

Start power suspend and configure wakeup options			Config	✔
			REF	-
Description	Execute suspend.			
Command	ATPSUS=<sleep time in ms>,<WAKEUP mode>			
Command example	ATPSUS=1000,0			
Command parameter	sleep time in ms	wakeup when the timer expired 0:disable		
	WAKEUP mode	wakeup when edge detection of WAKEUP pin. 0:disable, 1:high, 2:low (Edge trigger)		
Output	result	OK or ERROR		
Output example	shell > ATPSUS=1000,0 OK			
Default	disable			
Notes	After wake up, outputs a "AT CMD: <ENTER>". After wake up, UART port will return to the initial setting (115200 baud). Be sure to specify 1(high) or 2(low) for WAKEUP mode. For the hardware reset using CHIP_PWD_L PIN(ULAPN #7), WAKEUP PIN(ULPAN #29) once needs to be set to Low-High after the reset is finished.			

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Start watchdog timer			Config	✔
			REF	-
Description	Configure a watchdog timer			
Command	ATWDG=<enable>			
Command example	ATWDG=1			
Command parameter	enable	0:disable 1:enable		
Output	Watchdog	enable | disable		
Output example	shell > ATWDG=1 Watchdog enable (10sec)			
Default	Enable			
Notes	Wireless driver will be reset when falling into an unresponsive state for 10 seconds.			

Associate with SSID, no security, open mode			Config	✔
			REF	-
Description	Configure character strings as ESSID. And connect to AP.			
Command	ATWA=<ssid>			
Command example	ATWA=ssid-test			
Command parameter	ssid	ESSID to be set. Character strings (1-64 characters)		
Output	None			
Output example	shell > ATWA=ssid-test Connected			
Default	None			
Notes	None			

Associate using WPS			Config	✔
			REF	-
Description	Execute WPS.			
Command	ATWAWPS=<0/1>,<PUSH/PIN>,[PIN Code]			
Command example	ATWAWPS=1,PUSH			
Command parameter	connect flag	0: Not connecting after WPS success. 1: Connect after WPS success.		
	mode	pin: PIN mode push: Push Button mode		
	PIN Code	PIN code (Omissible for Push Button)		
Output	WPS result	WPS ok. WPS error: <error str>		
Output example	shell > ATWPS=1,PUSH WPS ok. shell > ATWPS=1,PUSH WPS error: Walktimer Timeout			
Default	None			
Notes	None			

Associate using WPA			Config	✔
			REF	-
Description	Configure WPA/WPA2 authentication and password, connect to AP.			
Command	ATWAWPA=<ssid>,<wpa ver>,<ucipher>,<mcipher>,<passphrase>			
Command example	ATWAWPA=ssid-01, 2,CCMP,CCMP,0123456789			
Command parameter	ssid	ESSID (1-64 characters)		
	wpa ver	WPA version 1: WPA 2: WPA2		
	ucipher	Unicast encryption method (TKIP or CCMP)		
	mcipher	Multicast encryption method (TKIP or CCMP)		
	passphrase	passwords ASCII: 8-63 characters HEX: 64 characters		
Output	result	OK or ERROR		
	4 way handshake	success failure		
Output example	shell > ATWAWPA=ssid-01, 2,CCMP,CCMP,0123456789 OK 4 way handshake success Connected			
Default	None			
Notes	ucipher and mcipher should be the same.			

Dissociate from connected AP			Config	✔
			REF	-
Description	Disconnect the wireless connection			
Command	ATWD=			
Command example	ATWD=			
Command parameter	None			
Output	None			
Output example	shell > ATWD= Disconnected			
Default	None			
Notes	None			

Set/Get Regdomain Code			Config	✔
			REF	✔
Description	Configure the region code.			
Command	ATWREG=<regcode>			
Command example	ATWREG=0x80000348			
Command parameter	regcode	Regdomain Code US : 0x80000348 JP : 0x80000188		
Output	regcode	Regdomain Code		
Output example	shell > ATWREG=80000348 set regcode=0x80000348 (US) shell > ATWREG= 80000348 (US)			
Default	0x4000006a (WWR)			
Notes	When SX-ULPAN-2402(US) is used, the country code cannot be changed. Operation is not guaranteed if the unregulated code is specified.			

Set Diversity Antenna			Config	✔
			REF	✔
Description	Enable/Disable the diversity antenna function as well as configure each parameter.			
Command	ATWANTDIV=<idleTime>,<RSSIThresh>,<Enable>,<Threshold Rate>			
Command example	ATWANTDIV=10000,10,1,48			
Command parameter	idleTime	Check interval to switch the antenna by communication rate. (0- 2147483647 millisecond)		
	RSSIThresh	This is the RSSI threshold value for interrupt. Used as difference from the present RSSI. (0-127 dB) The interrupt occurs when the changes exceeding RSSIThresh is made to the beacon frame of the connected AP since the RSSI is registered. If the change is for upper limit, RSSIThresh will be used for the next upper limit as well as lower limit values. If the change is for lower limit, RSSIThresh will be used for the next upper limit value, while a half value of RSSIThresh will be set for lower limit value. <When RSSI exceeds the upper limit value> Upper limit value = RSSI + RSSIThresh Lower limit value = RSSI - RSSIThresh <When RSSI exceeds the lower limit value> Upper limit value = RSSI + RSSIThresh Lower limit value = RSSI – (RSSIThresh / 2)		
	Enable	Enable/Disable the Diversity Antenna 0:Disable (fixed to Ant1) 1:Enable 2:Disable (fixed to Ant2)		

	Threshold Rate	This is the threshold value of communication rate for the received data frames to switch the antenna. The antenna will switch when the communication rate for the data frame most recently received is lower than Threshold Rate during the antenna switch check. If there are no data frames, it will be treated as the communication rate is lower than Threshold Rate. (0-32767)
Output	result	OK or ERROR
	diversity	enable / disable
	current	1: Ant1 2:Ant2
Output example	shell > ATWANTDIV=10000,10,1,48 OK shell > ATWANTDIV= diversity : disable current : 1	
Default	10000,10,0,48	
Notes	None	

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Control firmware scan behavior		**Config** ✔ **REF** -
Description	Configure scan control.	
Command	ATWSC=<foreground>,<background>	
Command example	ATWSC=1,1	
Command parameter	foreground	foreground scan 1 : enable 0 : disable
	background	background scan 1 : enable 0 : disable
Output	foreground	1 : enable 0 : disable
	background	1 : enable 0 : disable
Output example	shell > ATWSC=1,1 set foreground=1 set background=1	
Default	foreground=1 background=1	
Notes	None	

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Set WLAN PHY mode		**Config** ✔ **REF** -
Description	Configure communication mode of wireless LAN I/F.	
Command	ATWPHYMODE=<a/b/g/n>	
Command example	ATWPHYMODE=n	
Command parameter	PHY mode	a: 11n/a mode b: 11b mode g: 11b/g mode n: 11n/b/g mode
Output	result	OK or ERROR
Output example	shell > ATWPHYMODE=n OK	
Default	None	
Notes	None	

Get RSSI		Config	-
		REF	✔
Description	Display radio wave intensity of connected AP.		
Command	ATWRSSI=		
Command example	ATWRSSI=		
Command parameter	None		
Output	RSSI	Reception radio wave intensity (0-95 dB)	
Output example	shell > ATWRSSI= RSSI = 32 dB		
Default	None		
Notes	None		

Ping to specified host		Config	-
		REF	✔
Description	Send ICMP ECHO REQUEST.		
Command	ATNPING=<IP addr>,<ping_size(optional)>		
Command example	ATNPING=192.168.0.1		
Command parameter	IP addr	host ip address	
	ping_size	size of ping packet (32 – 1200 byte) default:64	
Output	result	Ping reply from <IP addr>: bytes=<size> time=*ms Request timed out ERROR:	
Output example	shell > ATNPING=192.168.0.1 Ping reply from 192.168.0.1: bytes=64 time=5ms		
Default	None		
Notes	None		

Set/Get Network Parameters		Config	✔
		REF	✔
Description	Display/Configure IP address.		
Command	ATNSET=<IP>,<Mask>,<GW>		
Command example	ATNSET=192.168.0.100,255.255.255.0,0.0.0.0		
Command parameter	IP	IP Address	
	Mask	Subnet Mask	
	GW	Default Gateway	
Output	result	OK or ERROR	
	IP	IP Address	
	Mask	Subnet Mask	
	GW	Default Gateway	
Output example	shell > ATNSET=192.168.0.100,255.255.255.0,0.0.0.0 OK shell > ATNSET= IP:192.168.0.100, Mask:255.255.255.0, Gateway:0.0.0.0		
Default	IP:192.168.1.10 Mask:255.255.255.0 GW:192.168.1.1		
Notes	None		

Run DHCP client			Config	✔
			REF	-
Description	Startup DHCP client and acquire an IP address.			
Command	ATNDHCP=<enable>			
Command example	ATNDHCP=1			
Command parameter	enable	1:enbale		
Output	result	OK or ERROR		
Output example	shell > ATNDHCP=1 OK			
Default	disable			
Notes	None			

Open Socket			Config	✔
			REF	-
Description	Open a socket.			
Command	ATNSOCK=<protocol>			
Command example	ATNSOCK=TCP			
Command parameter	protocol	TCP UDP		
Output	handle	socket handle		
	result	OK or ERROR		
Output example	shell > ATNSOCK=TCP TCP handle:0x45a4c8 OK			
Default	None			
Notes	Only one socket of TCP/UDP can be opened.			

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Close Socket			Config	✔
			REF	-
Description	Close a socket			
Command	ATNCLOSE=			
Command example	ATNCLOSE=			
Command parameter	None			
Output	Socket handle	Socket handle		
	result	OK or ERROR		
Output example	shell > ATNCLOSE= Close TCP Socket handle = 0x4420f0 OK			
Default	None			
Notes	None			

Attempt TCP client connection to destination			Config	✔
			REF	-
Description	Connect to TCP server.			
Command	ATNCTCP=<IP>,<PORT>			
Command example	ATNCTCP=192.168.0.1,80			
Command parameter	IP	host ip address		
	PORT	host port		
Output	result	OK or ERROR		
Output example	shell > ATNCTCP=192.168.0.1,80 OK Entering data mode			
Default	None			
Notes	After connected, the mode will automatically switch into the online mode (data mode).			

Attempt UDP client connection to destination			Config	✔
			REF	-
Description	Connect to UDP server.			
Command	ATNCUDP=<IP>,<PORT>			
Command example	ATNCUDP=192.168.0.1,9100			
Command parameter	IP	host ip address		
	PORT	host port		
Output	result	OK or ERROR		
Output example	shell > ATNCUDP=192.168.0.1,9100 OK Entering data mode			
Default	None			
Notes	After connected, the mode will automatically switch into the online mode (data mode).			

Attempt TCP server connection			Config	✔
			REF	-
Description	Execute TCP server.			
Command	ATNSTCP=<PORT>			
Command example	ATNSTCP=9100			
Command parameter	PORT	Listen port (1024 – 65534)		
Output	result	OK or ERROR		
Output example	shell > ATNSTCP=9100 OK Receiving from 0xc0a80101 Remote port:49925 Entering data mode			
Default	None			
Notes	None			

Attempt UDP server connection			Config	✔
			REF	-
Description	Execute UDP server.			
Command	ATNSUDP=<PORT>			
Command example	ATNSUDP=9100			
Command parameter	PORT	Listen port (1024 – 65534)		
Output	result	OK or ERROR		
Output example	shell > ATNSUDP=9100 OK Receiving from 0xc0a80101 Remote port:49925 Entering data mode			
Default	None			
Notes	After the data is received from the UDP client, the mode will switch into the data mode. UDP server sends the data to the address previously received the data from.			

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Enter transparent mode		Config	✔
		REF	-
Description	Switch to the online mode		
Command	ATO=		
Command example	ATO=		
Command parameter	None		
Output	Entering data mode		
Output example	shell > ATO= Entering data mode		
Default	None		
Notes	None		

Set the buffer size			Config	✔
			REF	✔
Description	Configure the buffer size of the online mode (MTU). When the received data on UART exceeds the specified buffer size, and send to the network the data.			
Command	ATBSIZE=<size>			
Command example	ATBSIZE=512			
Command parameter	size	size (1-1200 bytes)		
Output	result	OK or ERROR		
Output example	shell > ATBSIZE=512 OK shell > ATBSIZE= Buffer size is 512			
Default	512			
Notes	None			

XD

XB

Set the timeout		Config	✔
		REF	✔
Description	Configure the timeout for waiting to receive data of the online mode. When elapsed the specified time from the last data received by the UART, send to the network the data accumulated in the buffer until that time.		
Command	ATTO=<timeout>		
Command example	ATTO=		
Command parameter	timeout	timeout in millseconds not less than 200	
Output	result	OK or ERROR	
Output example	shell > ATTO=200 OK shell > ATTO= Transmit Time Out is 200		
Default	300		
Notes	None		

System reset		Config	✔
		REF	-
Description	Execute system reset.		
Command	ATZ=		
Command example	ATZ=		
Command parameter	None		
Output	None		
Output example	shell > ATZ= AT CMD:<ENTER>		
Default	None		
Notes	After reset, outputs a "AT CMD: <ENTER>". After reset, UART port will return to the initial setting (115200 baud).		

Show the Help		Config	-
		REF	✔
Description	Display the command help.		
Command	ATHELP=		
Command example	ATHELP=		
Command parameter	None		
Output	command help		
Output example	shell > ATHELP= ATW= Gets WLAN status ATB= Enter the baud rate ATB=<baud rate>,<data bits>,<parity bit>,<stop bits> data bits = 8 Parity is n - no parity, e - even parity and o - odd parity 1 stop bit Ex: ATB=9600,8,n,1 ATWREV= Returns WLAN firmware version ATWS= Start WLAN Scan ATWPM= Set power mode =<mode> mode- 1:IEEE Power Save, 0:Max Perf ATPSUS= Start power suspend and configure wakeup options =<sleep time in ms>,<WAKEUP mode> sleep time-0:disable, >0:wakeup when the timer expired WAKEUP mode-0:disable, 1:high, 2:low ATWDG= Set Watchdog=<enable> enable- 1:enable, 0:disable ATWA= Associate with SSID, no security, open mode =<ssid> ATWAWPS= Associate using WPS =<1>,<PUSH/PIN> ATWAWPA= Associate using WPA =<ssid>,<wpa ver>,<ucipher>,<mcipher>,<passphrase>		

	wpa version-1:wpa, 2:wpa2 cipher-TKIP/CCMP ATWD= Dissociate from connected AP = ATWREG= Set/Get Regdomain Code=? or <regcode> ATWANTDIV= Set Diversity Antenna=<time>,<rssi>,<ant>,<rate> time- Diversity Idle Time rssi- Antenna RSSI Thresh ant- Diversity Enable <0:Ant1, 1:DiversityEnable, 2:Ant2> rate- Threshold Rate ATWSC= Control firmware scan behavior =<foreground>,<background> foreground-1:enable, 0:disable background-1:enable, 0:disable ATWPHYMODE= Set WLAN PHY mode to =<a/b/g/n> ATWRSSI= Get RSSI ATNPING= Ping to specified host=<IP addr>,<ping_size(optional)> IP addr- a.b.c.d ATNSET= Set/Get Network Parameters=? or <IP>,<Mask>,<GW> ATNDHCP= Run DHCP client =<1> ATNSOCK= Open Socket =<TCP/UDP> ATNCLOSE= Close Socket ATNCTCP= Attempt TCP client connection to destination=<IP>,<PORT> ATNCUDP= Attempt UDP client connection to destination=<IP>,<PORT> ATNSUDP= Attempt UDP server connection =<PORT> ATNSTCP= Attempt TCP server connection =<PORT> ATO= Enter transparent mode ATBSIZE= Enter the buffer size <1-1200> ATTO= Enter the timeout (200 to 20000 millseconds) ATZ= System reset ATHELP= Display the this help
Default	None
Notes	None

Escape	**Config**	✔
	REF	-
Description	Switch to online command mode.	
Command	+++	
Command example	+++	
Command parameter	None	
Output	switch to cmd mode. Entering cmd mode	
Output example	switch to cmd mode. Entering cmd mode	
Default	None	
Notes	If “+” is output 3 times at 1500 msec or more interval during the online mode, the mode will switch into the online command mode.	

XE

XC

2.6. Delay between Commands

For following commands, an interval must be left before the next command is sent after the command reply is received.

Command/Operation	Received message	Delay (msec)
Start	AT CMD:<ENTER>	5
ATZ=	AT CMD:<ENTER>	5
ATWPHYMODE=	OK	5
ATWAWPS=	WPS ok	1200
ATWRSSI=	RSSI=	1
ATNSOCK=	OK	5
ATNCUDP=	OK	3
ATNCTCP=	OK	3
ATNSUDP=	OK	6
ATNSTCP=	OK	6
ATNCLOSE=	OK	2

XC

2.7. Status Transition Using Commands

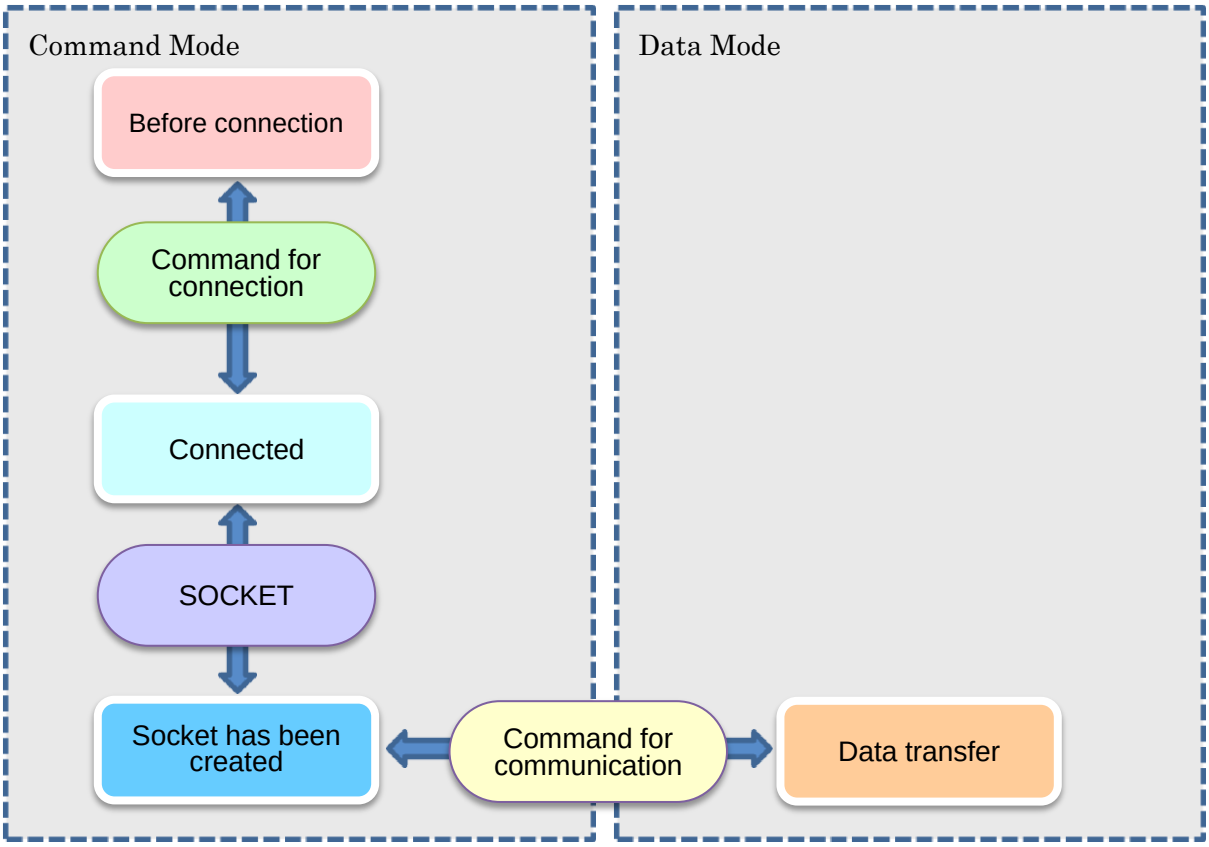
The following shows each status and the commands which are recommended to execute during that status.

Mode	Status	Command	Status transition command
Command Mode	Before connection	ATWREG=	
		ATWPHYMODE=	
		ATWS=	
		ATWA=	Command for connection
		ATWAWPA=	
		ATWAWPS=	
	Connected	ATWD=	
		ATWRSSI=	
		ATNDHCP=	
		ATNPING=	
		ATNSOCK=	Command for SOCKET
	Socket has been created	ATNCLOSE=	
		ATNCUDP=	Command for communication
		ATNSUDP=	
		ATNCTCP=	
		ATNSTCP=	
		ATO=	
Data Mode	Data transfer	+++	

(Example)
The ATWREG= command and ATWPHYMODE= command are recommended to use before the connection is made.
Using the connection command such as ATWA=, etc. will switch the status to the connected status if it is used during the before-connection status.
The ATWD= command is recommended to use during the connected status. Once it is used, the status will switch to the before-connection status.

* Commands other than above can be executed on any status conditions of Command Mode.

Status Transition Image



XB

3. UART Message

Messages that are output to the asynchronous.

Event	Message	Command
Start	AT CMD:<ENTER>	ATPSUS= ATZ=
Prompt	shell>	
Wireless connection	Connected	ATWA= ATWAWPA=
Wireless disconnection	Disconnected	ATWA= ATWAWPA= ATWD=
Authentication success	4 way handshake success	ATWAWPA=
Authentication failure	4 way handshake failure	ATWAWPA=
Client connect	Receiving from 0xXXXXXXXX Remote port:XXXXX Entering data mode	ATNSTCP= ATNSUDP=
TCP disconnection	ERROR: tcp client rx error! Close TCP Socket handle = 0xXXXXXXXX	ATNCTCP=
UDP disconnection	ERROR: UDP Client receive error Close UDP Socket handle = 0xXXXXXXXX	ATNCUDP=
TCP disconnection	ERROR: tcp server rx error! Close TCP Socket handle = 0xXXXXXXXX	ATNSTCP=
UDP disconnection	ERROR: udp server rx error! Close UDP Socket handle = 0xXXXXXXXX	ATNSUDP=

XD

4. Online Mode

4.1. UART reception buffer

In the online mode, the size of UART reception buffer can be changed by the "ATBSIZE=" command. When data is input to UART of SX-ULPAN-2402 during the online mode, it will be stored to the UART reception buffer.

When the received data of UART exceeds the buffer size and it is unable to store it to the buffer, the buffer data already stored until then will be sent to network. After it is sent, the buffer will be cleared, and the excessed data will be stored to the beginning of buffer.

4.2. Timeout

In the online mode, the timeout period to store the UART reception buffer can be changed by the "ATTO=" command.

When the timeout period has passed since the data is input to UART of SX-ULPAN-2402, the buffer data stored until then will be sent to network.

If the next data is input to UART within a timeout period, the timeout period will be reset.

4.3. Network reception buffer

The reception buffer size for wireless network of SX-ULPAN-2402 is 1024Byte.

There is no command to change the size. It is a fixed value.

When data is received via network and then stored to the buffer, it will immediately be output to UART. There is no wait time of timeout then.

XE

4.4. +++ escape

If '+'(1Byte) is input to UART of SX-ULPAN-2402 during the online mode, the buffer data stored until then will be sent to network, and whether to treat it as escape command will be determined.

Since the received '+' is not stored to the buffer, '+' will not be sent to network even after the timeout period has passed since it is received.

If '+' is received for 3 times keeping interval of 1500 msec or longer on each of them, the online command mode will be switched on. The received three '+' will not be treated as data and not be sent to network.

If data other than '+' is received or data is received earlier than '+' by 1000 msec, '+' will be included as data and such data will be sent to network.

In case a margin error occurs on a time of UART process, 1000-1500 msec is set as margin so that such time can surely be treated as escape command or data.