UM1695
User manual

Command set reference guide for "AT full stack" for SPWF01Sx series of Wi-Fi modules

Introduction

This document is a guide to the “AT full stack” command set, a firmware application embedded in the SPWF01Sx series of Wi-Fi modules.

The “AT full stack” command set is a user-friendly interface of a complete TCP/IP stack supporting both direct links with Wi-Fi enabled devices and infrastructure communication modes with an access point. Application utilities such as an http client and a web server are also featured in the software to allow easy integration with many Internet-based applications.

This document provides a detailed description of each command supported by the “AT full stack” interface. A description and explanation of configuration variables, status variables and asynchronous indication messages are also integrated into the document, respectively, in *Chapter 3*, *4* and *5*.

Contents

1 Overview 4

2 Command reference 6

2.1 AT: Attention 7
2.2 AT+CFUN: comm function 8
2.3 AT+S.HELP: display help text 8
2.4 AT+S.GCFG: get configuration value 10
2.5 AT+S.SCFG: set configuration value 10
2.6 AT+S.SSIDTXT: get/set a textual SSID 11
2.7 AT&V: display all configuration values 11
2.8 AT&F: restore factory default settings 13
2.9 AT&W: save current settings 13
2.10 AT+S.STS: report current status/statistics 14
2.11 AT+S.PEERS: dump contents of the peer table 15
2.12 AT+S.PING: send a ping to a specified host 16
2.13 AT+S.SOCKON: open a network socket 16
2.14 AT+S. SOCKW: write len bytes of data to socket 17
2.15 AT+S.SOCKQ: query pending data 17
2.16 AT+S. SOCKR: return len bytes of data from socket 17
2.17 AT+S.SOCKC: close socket 18
2.18 AT+S.TLSCERT: configure SSL/TLS certificates 18
2.19 AT+S.TLSCERT2: Cleanup SSL/TLS certificate resources 18
2.20 AT+S.TLSDOMAIN: set CA domain name. It must match the secured site name 18
2.21 AT+S.SETTIME: initiate module reference time 19
2.22 AT+S.SOCKD: enable/disable the socket server 19
2.23 AT+S.: command mode to data mode 19
2.24 AT+S.HTTPGET: issue an HTTP GET 20
2.25 AT+S.HTTPPOST: issue an HTTP POST 21
2.26 AT+S.FSC: create a file 22
2.27 AT+S.FSA: Append to an existing file 22

2.28 AT+S.FSD: delete an existing file 23
2.29 AT+S.FSL: list existing filename(s) 23
2.30 AT+S.FSP: Print the contents of an existing file 24
2.31 AT+S.WiFi: enable/disable Wi-Fi device 24
2.32 AT+S.ROAM: trigger Wi-Fi reassociation sequence 24
2.33 AT+S.GPIOC: configure general purpose inputs/outputs 25
2.34 AT+S.GPIOR: query general purpose input 25
2.35 AT+S.GPIOW: set general purpose output 26
2.36 AT+S.FWUPDATE: perform a firmware update 26
2.37 AT+S.HTTPDFSUPDATE: update static HTTPD filesystem 27
2.38 AT+S.HTTPDFSERASE: erase the external flash memory 27
2.39 AT+S.HTTPD: Disable/Enable web server 27
2.40 AT+S.SCAN: perform site survey (scan) 28
2.41 AT+S.ADC: Read ADC value on GPIO8 29
2.42 AT+S.DAC: enable/disable DAC on GPIO15 29
2.43 AT+S.PWM: set PWM on GPIO1 30

3 Configuration variable reference 31

4 Status variable reference 38

5 Asynchronous indication reference 41

6 Revision history 45

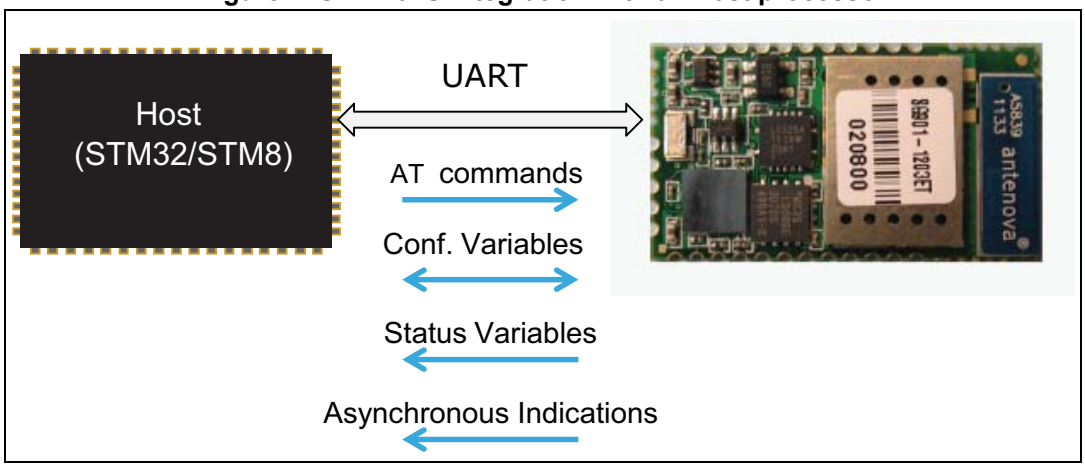
1 Overview

The “AT full stack” command interface described in this user guide consists of a set of:

- AT-style commands,
- configuration variables,
- status variables, and
- asynchronous indications (also known as unsolicited responses or WINDs).

The communication of commands, variables, and asynchronous indications is executed via the serial port and implies the integration of the SPWF01Sx modules with a host processor as indicated in *Figure 1*.

Figure 1. SPWF01S integration with an host processor



Asynchronous indications may arrive at any time (except as noted below), and have the format:

```
<cr><lf>+WIND:<number>:<descriptive string><cr><lf>
```

The <number> field of each asynchronous indication type is unique. The descriptive string may be safely ignored.

Immediately after reset, no commands should be sent and only asynchronous indications are present until the indication “<cr><lf>+WIND:0:Console active<cr><lf>” is received. After WIND:0 is received, AT commands may be sent to the SPWF device.

AT commands are always in the form of:

```
AT<cmd><cr>
<zero or more response lines>
<cr><lf><responsecode><cr><lf>
```

The AT command line, up to the terminating <cr>, is sent from the host. The (optional) response lines followed by <cr><lf><responsecode><cr><lf> are sent from the module.

The <response code> is one of the following:

```
OK
ERROR: <descriptive text>
```

The AT command handler allows for the AT commands to be entered in upper or lower case.

Command arguments are case sensitive.

The maximum command length is 512 characters.

Note that asynchronous indications are blocked from the time the initial “A” is sent to the module until the <responsecode> line is sent. Any indications generated from events during the processing of an AT command are queued for delivery after the command is complete.

2 Command reference

This chapter details each of the AT commands including brief descriptions of the behavior, syntax of the command, example of use and types of responses.

The commands described are those listed in *Table 1*.

Table key:

- S: command is supported in this release
- NS: command is not supported in this release
- New: command is introduced with this release
- Deprecated: command is deprecated in this release

Table 1. AT command list summary

"AT full stack" commands	Rel. 1.0	Rel. 2.0	Rel. 3.3	Rel. 3.4
AT	S	S	S	S
AT+CFUN	S	S	S(1)	S
AT+S.HELP	S	S	S	S
AT+S.GCFG	S	S	S	S
AT+S.SCFG	S	S	S	S
AT+S.SSIDTXT	S	S	S	S
AT&V	S	S	S	S
AT&F	S	S	S	S
AT&W	S	S	S	S
AT+S.NVW	S	S	Deprecated	NS
AT+S.STS	S	S	S	S
AT+S.PEERS	-	New	S	S
AT+S.PING	S	S	S	S
AT+S.SOCKON	S	S	S	S
AT+S.SOCKOS	S	S	Deprecated(2)	NS
AT+S.SOCKW	S	S	S	S
AT+S.SOCKQ	S	S	S	S
AT+S.SOCKR	S	S	S	S
AT+S.SOCKC	S	S	S	S
AT+S.SOCKD	-	-	New	S
AT+S.	-	-	New	S
AT+S.HTTPGET	S	S	S	S
AT+S.HTTPPOST	-	New	S	S
AT+S.FSC	S	S	S	S

Table 1. AT command list summary (continued)

"AT full stack" commands	Rel. 1.0	Rel. 2.0	Rel. 3.3	Rel. 3.4
AT+S.FSA	S	S	S	S
AT+S.FSD	S	S	S	S
AT+S.FSL	S	S	S	S
AT+S.FSP	S	S	S	S
AT+S.MFGTEST	S	S	Deprecated	NS
AT+S.PEMDATA	S	S	Deprecated	NS
AT+S.WIFI	S	S	S	S
AT+S.ROAM	S	S	S	S
AT+S.GPIOC	S	S	S	S
AT+S.GPIOR	S	S	S	S
AT+S.GPIOW	S	S	S	S
AT+S.FWUPDATE (3)	S	S	S	S
AT+S.HTTPDFSUPDATE (3)	S	S	S	S
AT+S.HTTPDFSERASE(3)	-	-	New	S
AT+S.HTTPD	-	-	New	S
AT+S.SCAN	-	New	S	S
AT+S.ADC	-	-	-	New
AT+S.DAC	-	-	-	New
AT+S.PWM	-	-	-	New
AT+S.TLSCERT	-	-	-	New
AT+S.TLSCERT2	-	-	-	New
AT+S.TLSDOMAIN	-	-	-	New
AT+S.SETTIME	-	-	-	New

1. Extended to manage low power configuration modes
2. The use of UART 2 and UART 3 interfaces is disabled
3. Command only supported on the HW versions SPWF01Sx.11

The following subsections cover each AT command in detail.

2.1 AT: Attention

AT, by itself, is a null command that always returns an OK result code. It is useful for testing the module interface for readiness.

Arguments:

```
none
```

Example:

```
AT<cr>
<cr><lf>OK<cr><lf>
```

2.2 AT+CFUN: comm function

AT+CFUN sets a power mode with default values as it is indicated in the table 2 and includes a reset of the device.

Arguments:

<num> 0 = switch to the active state and reset the device

1 = keep the current state and reset the device

2 = switch to the powersave state and reset the device

3 = switch to the sleep state and reset the device

4 = switch to the standby mode and reset the device

Table 2. Power states default configuration

Module states	Shortcut command	STM32 states	WLAN states	AT variables default values
Active	CFUN 0	Run	Rx Idle Rx Active Tx Active	at+s.scfg=sleep_enabled,0 at+s.scfg=wifi_powersave,0 at+s.scfg=standby_enabled,0
Power save	CFUN 2	Run	PS or Fast PS	at+s.scfg=sleep_enabled,0 at+s.scfg=wifi_powersave,1 at+s.scfg=wifi_operational_mode,11 at+s.scfg=wifi_beacon_wakeup,1 at+s.scfg=wifi_listen_interval,0
Sleep	CFUN 3	Stop	PS or Fast PS	at+s.scfg=sleep_enabled,1 at+s.scfg=wifi_powersave,1 at+s.scfg=wifi_operational_mode,11 at+s.scfg=wifi_beacon_wakeup,1 at+s.scfg=wifi_listen_interval,0
Standby	CFUN 4	Standby	Standby	At+s.scfg=standby_enabled,1 At+s.scfg=standby_time,10 at+s.scfg=sleep_enabled,0

Example:

```
AT+CFUN=1<cr>
<cr><lf>+WIND:2:Reset<cr><lf>
```

2.3 AT+S.HELP: display help text

AT+S.HELP prints a list of all commands supported with a brief help text for each command.

Arguments:

none

Example:

```
AT+S.HELP<cr>
# Recognized commands

#  AT -- Null cmd, always returns OK
#  AT+CFUN =<0|1|2|3|4> -- Enable common functionalities
#  AT+S. -- Switch to data mode
#  AT+S.HELP -- This text
#  AT&F -- Restore factory default settings
#  AT&V -- Dump all settings
#  AT&W -- Save current settings to flash
#  AT+S.GCFG =<key> -- Get config key
#  AT+S.SCFG =<key>,<value> -- Set config key
#  AT+S.STS [=<sts_var>] -- Report current status/statistics
#  AT+S.SETTIME =<time_in_sec> -- Set current time
#  AT+S.FSC =<fname>,<max_len>[,<http_header>] -- Create a file for httpd
use
#  AT+S.FSA =<fname>,<datalen><CR><data> -- Append to an existing file
#  AT+S.FSD =<fname> -- Delete an existing file
#  AT+S.FSL -- List existing filename(s)
#  AT+S.FSP =<fname>[,<offset>,<length>] -- Print the contents of an
existing file
#  AT+S.GPIOC =<num>,<in|out>[,<0|R|F|B>] -- Configure specified GPIO
[Optional IRQ]
#  AT+S.GPIOR =<num> -- Read specified GPIO
#  AT+S.GPIOW =<num>,<val> -- Write specified GPIO
#  AT+S.DAC =<0|value> -- Disable/Enable DAC on GPIO15
#  AT+S.ADC [=raw] -- Read [raw] ADC value on GPIO8
#  AT+S.PWM =frequency[,duty_cycle] -- Set PWM on GPIO1
#  AT+S.WIFI =<0|1> -- Disable/Enable WiFi
#  AT+S.ROAM -- Trigger a WiFi Roam
#  AT+S.SCAN [=<a|p>,<r>] -- Perform a scan <active/passive>,<duplicated
values filter off>. Default is active,filter on
#  AT+S.SSIDTXT [=<ssidtxt>] -- Set a textual SSID (not hex), otherwise
prints current SSID
#  AT+S.PEERS [=peer_number[,peer_var]] -- Dump contents of the peer table
#  AT+S.TLSCERT =<f_ca|f_cert|f_key>,<length> -- Configure SSL/TLS
certificates
#  AT+S.TLSCERT2 =clean,<f_ca|f_cert|f_key|f_domain|all> -- Cleanup SSL/TLS
certificates resources
#  AT+S.TLSDOMAIN =<f_domain>,<ca domain name> -- Set CA  domain name. It
must match the secured site name EXACTLY.
#  AT+S.SOCKD =<0|port>[,<t|u>] -- Disable/Enable socket server. Default is
TCP
#  AT+S.SOCKON =<hostname>,<port>,<t|u|s>[,ind] -- Open a network socket
#  AT+S.SOCKQ =<id> -- Query socket for pending data
```

```
#  AT+S.SOCKC =<id> -- Close socket
#  AT+S.SOCKW =<id>,<len> -- Write data to socket
#  AT+S.SOCKR =<id>,<len> -- Read data from socket
#  AT+S.HTTPD =<0|1> -- Disable/Enable web server
#  AT+S.HTTPGET =<hostname>,<path&queryopts>[,port] -- Http GET of the
given path to the specified host/port
#  AT+S.HTTPPOST =<hostname>,<path&queryopts>,<formcontent>[,port] -- Http
POST of the given path to the specified host/port
#  AT+S.HTTPDFSERASE -- Erase the external httpd filesystem
#  AT+S.HTTPDFSUPDATE =<hostname>,<path&queryopts>[,port] -- Download a new
httpd filesystem from the specified host/port
#  AT+S.FWUPDATE =<hostname>,<path&queryopts>[,port] -- Upgrade the onboard
firmware from the specified host/port
#  AT+S.PING =<hostname> -- Send a ping to a specified host

OK
```

2.4 AT+S.GCFG: get configuration value

AT+S.GCFG prints the value of one named configuration variable. See *Chapter 3: Configuration variable reference* for a list of available variables. AT&V provides the list of all variables and values on a running module.

Arguments:

`<key>`	Name of the configuration variable

Example:

```
AT+S.GCFG=ip_ipaddr<cr>
# ip_ipaddr = 192.168.0.50<cr><lf>
<cr><lf>OK<cr><lf
```

2.5 AT+S.SCFG: set configuration value

AT+S.SCFG sets the value of one named configuration variable.See *Chapter 3: Configuration variable reference* for a list of available variables. AT&V provides the list of all variables and values on a running module.

Arguments:

`<key>`	Name of the configuration variable
`<value>`	Value to store in the variable

Example:

```
AT+S.SCFG=ip_ipaddr,192.168.10.10<cr>
# ip_ipaddr = 192.168.10.10<cr><lf>
<cr><lf>OK<cr><lf>
```

2.6 AT+S.SSIDTXT: get/set a textual SSID

AT+S.SSIDTXT is a convenience command that, when called with no arguments, returns the current value of wifi_ssid and wifi_ssid_len configuration variables as a text string. All non-printable characters are displayed with the '.' character. When called with an argument, the wifi_ssid and wifi_ssid_len configuration variables are set to the specified text string.

IEEE 802.11 and some access point implementations allow SSID values consisting of non-

printable octet values, therefore the wifi_ssid variable is set and stored as a sequence of octets (specified in hexadecimal) and wifi_ssid_len cannot be set based on any given flag value or delimiter. This command is only present as a convenience for those circumstances where the SSID is known to consist of printable characters.

NOTE: due to the SPWF01SX command parser's use of the comma ',' character as an argument delimiter, any SSID containing a comma must be set as a sequence of hexadecimal octets using the AT+S.SCFG command.

Arguments:

`<ssid>` Textual SSID [1-32 characters]

Example:

```
AT+S.SSIDTXT=AnSSID<cr>
<cr><lf>OK<cr><lf>
AT+S.GCFG=wifi_ssid<cr>
#  wifi_ssid = 41:6E:53:53:49:44:00:00:00:00:00:00:00:00:00:00:00:00:
00:00:00:00:00:00:00:00:00:00:00:00:00:00<cr><lf>
<cr><lf>OK<cr><lf>
AT+S.GCFG=wifi_ssid_len<cr>
#  wifi_ssid_len = 6<cr><lf>
<cr><lf>OK<cr><lf>
```

Example:

```
AT+S.SSIDTXT<cr>
SSID = 'AnSSID'<cr>
<cr><lf>OK<cr><lf>
```

2.7 AT&V: display all configuration values

AT&V prints the name and value of all configuration variables in the module.

Arguments:

```
none
```

Example:

```
AT&V<cr>
# Dumping All Configuration Keys:
#  nv_manuf = ST
#  nv_model = SPWF01S
#  nv_serial = 0813015002
#  nv_wifi_macaddr = 00:80:E1:AA:B9:BA
#  blink_led = 0
```

```
#  wind_off_low = 0x00000000
#  wind_off_medium = 0x00000000
#  wind_off_high = 0x00000000
#  user_desc = anonymous
#  escape_seq = at+s.
#  localecho1 = 0
#  console1_speed = 115200
#  console1_hwfc = 0
#  console1_enabled = 1
#  sleep_enabled = 0
#  standby_enabled = 0
#  standby_time = 10
#  wifi_tx_msdu_lifetime = 0
#  wifi_rx_msdu_lifetime = 0
#  wifi_operational_mode = 0x00000011
#  wifi_beacon_wakeup = 1
#  wifi_beacon_interval = 100
#  wifi_listen_interval = 0
#  wifi_rts_threshold = 3000
#  wifi_ssid =
53:54:54:65:73:74:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
:00:00:00:00:00:00:00
#  wifi_ssid_len = 6
#  wifi_txfail_thresh = 5
#  wifi_ht_mode = 0
#  wifi_channelnum = 6
#  wifi_opr_rate_mask = 0x00003FCF
#  wifi_bas_rate_mask = 0x0000000F
#  wifi_mode = 1
#  wifi_auth_type = 0
#  wifi_atim_window = 0
#  wifi_powersave = 0
#  wifi_tx_power = 18
#  wifi_rssi_thresh = 0
#  wifi_rssi_hyst = 0
#  wifi_ap_idle_timeout = 120
#  wifi_beacon_loss_thresh = 10
#  wifi_priv_mode = 0
#  wifi_wep_keys[0] = 00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
#  wifi_wep_keys[1] = 00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
#  wifi_wep_keys[2] = 00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
#  wifi_wep_keys[3] = 00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
#  wifi_wep_key_lens = 00:00:00:00
#  wifi_wep_default_key = 0
```

```
#  wifi_wpa_psk_raw =
00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
:00:00:00:00:00:00:00:00
#  wifi_wpa_psk_text =
#  ip_use_dhcp = 1
#  ip_use_httpd = 1
#  ip_mtu = 1500
#  ip_hostname = iwm-AA-B9-BA
#  ip_apdomainname = captiveportal.net
#  ip_apredirect = firstset.html
#  ip_ipaddr = 192.168.0.50
#  ip_netmask = 255.255.255.0
#  ip_gw = 192.168.0.1
#  ip_dns = 192.168.0.1
#  ip_http_get_recv_timeout = 3000
#  ip_wait_timeout = 12000
#  ip_dhcp_timeout = 20
#  ip_sockd_timeout = 250

OK
```

2.8 AT&F: restore factory default settings

AT&F restores the factory default values of the configuration variables and writes them to non-volatile storage. Running this command is mandatory after every FW update.

Note: To perform the HW factory reset of the variables, the pin GPIO0 must be high during the powerup operation.

Arguments:

```
none
```

Example:

```
AT&F<cr>
<cr><lf>OK<cr><lf>
```

2.9 AT&W: save current settings

AT&W stores the current RAM-based settings to non-volatile storage.

Arguments:

```
none
```

Example:

```
AT&W<cr>
<cr><lf>OK<cr><lf>
```

2.10 AT+S.STS: report current status/statistics

AT+S.STS displays the current values of all the status variables.

Arguments (optional):

<sts_var>: displays the current value of the specified variable

Example:

```
AT+S.STS<cr>
# Status & Statistics:
#  version = ******-*******-SPWF01S
#  reset_reason = 4
#  conf_flag = 5
#  system_uptime = 2083
#  system_sleeptime = 0
#  gpio_enable = 0
#  captiveportal = 0
#  wifi_state=10
#  wifi_bssid = 00:00:00:00:00:00
#  wifi_aid = 0
#  wifi_channelnum = 0
#  wifi_sup_rate_mask=0x003FFFCF
#  wifi_bas_rate_mask=0x0000000F
#  wifi_chan_activity2 = 0x00003FFE
#  wifi_max_tx_power=18
#  wifi_reg_country = DK
#  wifi_dtim_period = 0
#  wifi_sleeping = 0
#  wifi_num_assoc = 0
#  ip_ipaddr = 0.0.0.0
#  ip_netmask = 0.0.0.0
#  ip_gw = 0.0.0.0
#  ip_dns = 0.0.0.0
#  ip_sock_open = 0
#  ip_sockd_port = 0
#  free_heap = 24176
#  min_heap = 23088
#  current_time = 2083

OK

AT+S.STS=system_uptime<cr>
#  system_uptime = 7001

OK
```

2.11 AT+S.PEERS: dump contents of the peer table

AT+S.PEERS displays the current values of the peer table. These values are useful to know additional information about the module connected to the AP or about the client connected to the module configured in Mini AP mode.

Arguments (optional):

<peer_number>: identifier of the peer

<peer_var>: displays the current value of the specified peer variable

Example:

```
AT+S.PEERS<cr>
-  Module connected to the AP

# Size of peer table: 1
#  0.link_id = 0
#  0.state = 4
#  0.addr = 02:62:1F:51:8F:08
#  0.last_rx = 6424
#  0.last_tx = 6379
#  0.rx_drops = 0
#  0.tx_drops = 0
#  0.rx_pkts = 64213
#  0.tx_pkts = 73426
#  0.tx_errs = 5
#  0.rate_mask = 0x00003FCF
#  0.cur_rate_idx = 13
#  0.cur_rate_ok = 4
#  0.cur_rate_fail = 0
#  0.tx_consec_fail = 0
#  0.rx_seqnum = 0x0000F510
#  0.rx_seqnum_mc = 0x00004F80
#  0.rx_rssi = -33
#  0.rx_rateidx = 0
#  0.setprot = 3
#  0.listen_interval = 0
#  0.capinfo = 0x00000411

OK

AT+S.PEERS=0,rx_rssi<cr>

#  0.rx_rssi = -33

OK
```

2.12 AT+S.PING: send a ping to a specified host

AT+S.PING issues a single ICMP ECHO request to the given host.

Arguments:

<hostname> Target host. DNS resolvable name or IP address.

Example:

```
AT+S.PING=192.168.1.254<cr>
#PING: sendto 192.168.1.254<cr><lf>
<cr><lf>OK<cr><lf>

AT+S.PING=example.com<cr>
#PING: sendto 192.0.43.10<cr><lf>
<cr><lf>OK<cr><lf>

AT+S.PING=nonexistent.example.com<cr>
<cr><lf>ERROR: DNS lookup failure<cr><lf>

AT+S.PING=192.168.1.1<cr>
#PING: sendto 192.168.1.1<cr><lf>
<cr><lf>ERROR: Timed out<cr><lf>
```

2.13 AT+S.SOCKON: open a network socket

AT+S. SOCKON opens a TCP/UDP socket to “myserver” on port “xxxx”

Arguments:

```
<hostname>: target host. DNS resolvable name or IP address
<port>: TCP/UDP socket port
<protocol>: t for TCP socket, u for UDP socket, s for secure socket
ind: indicate when data has arrived (optional); this option requires to read
the socket when a pending indication message is received.
```

Note: *- Up to 8 TCP or UDP sockets can be opened contemporary. In this case it is strictly suggested to immediately empty the buffer (using sockr command) when a pending data is received.*

- Up to 4 consecutive 730 Bytes “Pending data” messages (w/o SOCKR) are guaranteed. To prevent data loss, it is suggested to empty the buffer by using the AT+S.SOCKR command and to avoid exceeding 4 indications.

- When a socket client receives an indication about socket server gone (only for TCP sockets, WIND:58), the socket connection is not automatically closed. Moreover, both for TCP and UDP sockets, flushing pending data (using the AT+S.READ command) is mandatory before closing the socket connection (AT+S.SOCKC). If the buffer is not erased, the “ERROR: Pending data” is raised.

Example:

```
AT+S.SOCKON=myserver,1234,t<cr>
ID: 00<cr><lf>
<cr><lf> OK<cr><lf>

AT+S.SOCKON=myserver,456,u,ind<cr>
ID: 01<cr><lf>
<cr><lf> OK<cr><lf>
```

2.14 AT+S. SOCKW: write len bytes of data to socket

AT+S. SOCKW allows to write data to socket. This command accepts data after the <cr> at the end of the command line. The host is expected to supply <len> characters of data after the end of the command line.

Note: When the ok token has not been received is really important to handle properly the error stage. In fact, the "at+sockw" command is not reentrant. If bytes are lost during data transfer over the UART, the module remains in waiting stage for incoming bytes.

Arguments:

```
<ID>: socket identifier
<len>: data length to send (in bytes), up to 4096 bytes
```

Example:

```
AT+S.SOCKW=00,11<cr>
Test_socket
<cr><lf> OK<cr><lf>
```

2.15 AT+S.SOCKQ: query pending data

AT+S.SOCKQ returns the number of bytes of data waiting on socket.

Arguments:

```
<ID>: socket identifier
```

Example:

```
AT+S.SOCKQ=01<cr>
<cr><lf>
DATALEN: 12
<cr><lf> OK<cr><lf>
```

2.16 AT+S. SOCKR: return len bytes of data from socket

AT+S. SOCKR allows to read data from socket.

Arguments:

```
<ID>: socket identifier
<len>: data length to read
```

Example:

```
AT+S.SOCKR=01,12<cr>
Test_socket1
<cr><lf> OK<cr><lf>
```

2.17 AT+S.SOCKC: close socket

The SOCKC command allows to close socket.

Note: Both for TCP and UDP sockets, flushing pending data (using the AT+S.READ command) is mandatory before closing the socket connection (AT+S.SOCKC). If the buffer is not erased, the "ERROR: Pending data" is raised.

Arguments:

```
<ID>: socket identifier
```

Example:

```
AT+S.SOCKC=00<cr>
<cr><lf> OK<cr><lf>
```

2.18 AT+S.TLSCERT: configure SSL/TLS certificates

AT+S.TLSCERT allows to store the certificates in the Flash memory of the module.

Note: Refer to the SSL/TLS Application Note for details

Arguments:

```
<f_ca|f_cert|f_key>: store the CA certificate, the client certificate or
the key file (PEM format)
<length>: size of the certificate
```

2.19 AT+S.TLSCERT2: Cleanup SSL/TLS certificate resources

AT+S.TLSCERT2 allows to clean the certificates in the flash memory of the module.

Note: Refer to the SSL/TLS Application Note for details

Arguments:

```
<f_ca|f_cert|f_key|f_domain|all>: clean the CA certificate, the client
certificate, the key file, the server domain or all
```

2.20 AT+S.TLSDOMAIN: set CA domain name. It must match the secured site name

The TLSDOMAIN command allows to store the Certification Authority domain name in the Flash memory of the module.

Note: Refer to the SSL/TLS Application Note for details

Arguments:

```
<f_domain>: store the CA domain in the flash memory
<ca domain name>: domain name of the Certification Authority
```

2.21 AT+S.SETTIME: initiate module reference time

The SETTIME command allows to set the reference time used for secure socket connections. The module reference time must be initialized after each module reset. The time refers to UTC format and must be expressed as the time in seconds since 1970-Jan-01.

Note: Refer to the SSL/TLS Application Note for details

Arguments:

```
<time_in_sec>: set the reference time in seconds
```

2.22 AT+S.SOCKD: enable/disable the socket server

The SOCKD command enables the socket server listening on incoming connection on the "xxx"port. When the port argument is equal to zero, the command is used to turn off the socket server.

Arguments:

```
<port>: server listening port (from 1 to 65634, 0 to disable the socket server)
<protocol> t for TCP, u for UDP protocol. Default is TCP.
```

Example:

```
- Listening on port 32000 using TCP.

AT+S.SOCKD=32000<CR>

<CR><LF>
OK<CR><LF>
- Listening on port 32000 using UDP
AT+S.SOCKD=32000,u<CR>
<CR><LF>
OK<CR><LF>
- Turn off the socket server

AT+S.SOCKD=0<CR>

<CR><LF>
OK<CR><LF>
```

2.23 AT+S.: command mode to data mode

The AT+S. command allows switching from command mode to data mode.

Arguments:

```
<none>
```

Note: The switch from data mode to command mode switch can be done by using the "at+s." escape sequence. This sequence can be customized by using the escape_seq configuration variable. ***The sequence is case-sensitive and it must be sent in a single complete packet with no CR or LF in the sequence****.*

Example:

```
+WIND:59:Back to Command Mode<CR><LF>

AT+S.<CR>

<CR><LF>
+WIND:60:Now in Data Mode<CR><LF>
```

2.24 AT+S.HTTPGET: issue an HTTP GET

AT+S.HTTPGET performs a single HTTP GET request to the named host and path. The GET request and server response are printed on the module's console. Any url-encoding required for special characters in the <path&queryopts> argument must be performed by the host prior to command submission.

Note: NOTE: the <cr><lf> pairs in the example responses below are part of the data sent from the server and not inserted by the module.

Arguments:

`<hostname>`	Target host. DNS resolvable name or IP address.
`<path&queryopts>`	document path and optional query arguments
`<port>`	Target host port. Optional.

Example:

```
AT+S.HTTPGET=host.example.com,/index.html<cr>
GET /index.html HTTP/1.0
User-Agent: SPWF01S
Host: 192.168.0.103
Connection: close


HTTP/1.0 200 OK
Server: lwIP/1.3.1 (http://savannah.nongnu.org/projects/lwip)
Content-type: text/html

<html>
<head><title>SPWF01Sx.11</title></head>
<body bgcolor="white" text="black">
<h1>ST SPWF01Sx.11 WiFi Module</h1>
<p>
Welcome to the ST SPWF01Sx.11 WiFi Module.
</p>
```

```
<p>
This page was delivered from the SPWF01Sx.11 internal HTTP server.
</p>
<p>
<a href=/config.shtml>SPWF01Sx.11 Configuration Settings Page</a>
</p>
<p>
<a href=/status.shtml>SPWF01Sx.11 Status Page</a>
</p>

</body>
</html>

OK


AT+S.HTTPGET=nonexistent.example.com,/<cr>
<cr><lf>ERROR: host not found<cr><lf>
```

2.25 AT+S.HTTPPOST: issue an HTTP POST

The HTTP POST performs a post of the given path to the specified host. The module can be only used as an HTTP POST client.

Arguments:

```
<hostname>: target host. DNS resolvable name or IP address
<path&queryopts>: document path
<formcontent>: form to be submitted
<port>:target host port. Optional
```

Example:

```
at+s.httppost=posttestserver.com,/post.php,name=demo&email=mymail&subject=
subj&body=message<CR>
HTTP/1.1 200 OK<CR><LF>
Date: Wed, 22 Jan 2014 15:36:18 GMT<CR><LF>
Server: Apache<CR><LF>
Access-Control-Allow-Origin: *<CR><LF>
Vary: Accept-Encoding<CR><LF>
Content-Length: 141<CR><LF>
Connection: close<CR><LF>
Content-Type: text/html<CR><LF>
<CR><LF>
Successfully dumped 4 post variables.<LF>
View it at
http://www.posttestserver.com/data/2014/01/22/07.36.181370961643<LF>
Post body was 0 chars long.<CR><LF>
<CR><LF>
```

```
OK<CR><LF>
```

2.26 AT+S.FSC: create a file

AT+S.FSC creates a “file” inside the RAM of the module for delivery by the http server. The <name> argument establishes the URL path that must be used in the HTTP GET from a remote client to access this file. The file must include a complete HTTP response header plus the document content that will be delivered to the client. The software includes some statically-defined pages that cannot be removed but they can be overridden by creating a file of the same name.

To add content to a file see AT+S.FSA below.

Warning: Space for files is allocated from available RAM in the module and extremely limited. Minimize the requirement for these as much as possible.

Arguments:

`<fname>`	Filename
`<max_len>`	Amount of space to allocate for file, max = 4096 bytes
`<http_header>`	0=HTML header automatically added
	1=HTML header not added (as by default)

Example:

```
AT+S.FSC=/new.html,1024<cr>
<cr><lf>OK<cr><lf>
```

2.27 AT+S.FSA: Append to an existing file

AT+S.FSA appends blocks of data to an existing file. This command accepts data after the <cr> at the end of the command line. The host is expected to supply <datalen> characters of data after the end of the command line.

Arguments:

`<fname>`	Filename
`max-len`	Amount of bytes to be appended to an existing file. The limit of bytes that can be appended depends on the space allocated during the file creation.

Example:

```
AT+S.FSA=/data.json,165<cr>
HTTP/1.0 200 OK<cr><lf>
Server: MyProduct<cr><lf>
```

```
Connection: close<cr><lf>
Content-Type: application/json<cr><lf>
<cr><lf>
<cr><lf>
{<cr><lf>
        "device" {<cr><lf>
                "name" : "SPWF01SX.11",<cr><lf>
                "serial" : "802.11n"<cr><lf>
        }<cr><lf>
}<cr><lf>
<cr><lf>OK<cr><lf>
```

2.28 AT+S.FSD: delete an existing file

AT+S.FSD deletes an existing file by name. Static files may not be deleted, only overridden.

Arguments:

`<fname>` Filename

Example:

```
AT+S.FSD=/data.json<cr>
<cr><lf>OK<cr><lf>
```

2.29 AT+S.FSL: list existing filename(s)

AT+S.FSL lists the types (I=Internal Flash Memory, D=RAM Memory, E=External Flash Memory), sizes, and names of all the existing files.

Note: Internal Flash pages: HTML header automatically added, RAM memory pages: HTML header added/not added depending on the <http_header> parameter, External Flash pages: HTML header added by default (it can be disabled acting on httpd_gen.c included in the FW package, commenting the "#define APPEND_HEADER")

Arguments:

`none`

Example:

```
D 1965 /wifidemo.html
 I 461 /input_demo.shtml
 I 180 /message.shtml
 I 384 /output_demo.html
 I 614 /index.html
 I 157 /peers.shtml
 I 193 /config.shtml
 I 174 /status.shtml
 I 212 /404.html
 I 2022 /firstset.html
```

```
 I 2898 /remote.html

OK
```

2.30 AT+S.FSP: Print the contents of an existing file

AT+S.FSP prints the contents of an existing file.

Arguments:

<fname>	Filename
<offset>	Offset from where the file is printed.Optional.
<len>	Lenght in bytes. Mandatory if Offset is specified.

Example:

```
AT+S.FSP=/t2.json<cr>
HTTP/1.0 200 OK<cr><lf>
Server: MyProduct<cr><lf>
Connection: close<cr><lf>
Content-Type: application/json<cr><lf>
<cr><lf>
<cr><lf>
{<cr><lf>
        "device" {<cr><lf>
                "name" : "SPWF01SX.11",<cr><lf>
                "serial" : "802.11n"<cr><lf>
        }<cr><lf>
}<cr><lf>
<cr><lf>OK<cr><lf>
```

2.31 AT+S.WiFi: enable/disable Wi-Fi device

AT+S.WIFI allows the radio to be enabled or disabled at runtime. Please note that the configuration variable wifi_mode controls the state of the radio at powerup.

Arguments:

0 or 1, for disabled or enabled, respectively.

Example:

```
AT+S.WIFI=0<cr>
<cr><lf>OK<cr><lf>
```

2.32 AT+S.ROAM: trigger Wi-Fi reassociation sequence

AT+S.ROAM tells the module to disassociate from its current access point and to re-acquire the network. This is particularly useful if the network settings have been changed and a

reboot is not desired. The function is not active when the module is configured in Mini AP mode.

Arguments:

none

Example:

```
AT+S.ROAM<cr>
<cr><lf>OK<cr><lf>
```

2.33 AT+S.GPIOC: configure general purpose inputs/outputs

AT+S.GPIOC is used to configure the function of the various GPIOs on the module. GPIOs can be configured as inputs or outputs. Additionally, inputs can be configured to generate an indication when their state changes.

Hint.

Use an external pull up/pull down connected to a given GPIO to prevent unwanted commutations.

Arguments:

<num>	GPIO Number (0-15 on the SPWF01SX.11)
<direction>	“in” or “out”
<interrupt>	Optional parameter:
0	Off
R	Rising edge
F	Falling edge
B	Both rising and falling edges

Example:

```
AT+S.GPIOC=7,out<cr>
<cr><lf>OK<cr><lf>

AT+S.GPIOC=11,in,B<cr>
<cr><lf>OK<cr><lf>
```

2.34 AT+S.GPIOR: query general purpose input

AT+S.GPIOR is used to read the value and the direction of a previously-configured GPIO.

Arguments:

```
<num>  GPIO Number (0-15 on SPWF01SX)
```

Example:

```
at+s.gpior=4<CR>

GPIO 4 = 0,in<CR><LF>
<CR><LF>
OK<CR><LF>
```

2.35 AT+S.GPIOW: set general purpose output

AT+S.GPIOW is used to set the value of a previously-configured GPIO.

Arguments:

<num>	GPIO Number (0-15 on the SPWF01SX)
<value>	0 or 1 for off and on, respectively

Example:

```
AT+S.GPIOW=7,1<cr>
<cr><lf>OK<cr><lf>
```

2.36 AT+S.FWUPDATE: perform a firmware update

AT+S.FWUPDATE downloads an updated firmware image via a single HTTP GET request to the named host and path, much like the AT+S.HTTPGET command. The SPWF01SX.11 will validate the firmware image it downloads, load it into a staging area, then prompt the user to issue a reset command in order to complete the update. A restoring of factory default settings (AT&F) is mandatory after every FW update.

Note: Command only enabled on the module's versions SPWF01Sx.1y

Arguments:

<hostname>	Target host. DNS resolvable name or IP address
<path&queryopts>	document path and optional query arguments
<port>	Target host port. Optional

Example:

```
AT+S.FWUPDATE=host.example.com,/1203-120918_01.ota<cr>
Staging F/W update for 'SPWF01SX.11' version '1203-120918_01'
F/W length 276824 @ 0x00002800 (offset 0x00000000, block len 4096)
Write len 4096 -> 0x0
Write len 4096 -> 0x1000
Write len 4096 -> 0x2000
Write len 4096 -> 0x3000
```

(note - deleted extra output for clarity)

```
Write len 4096 -> 0x41000
```

```
Write len 4096 -> 0x42000
Write len 2476 -> 0x43000 (final)
Wrote 276904 bytes
Complete! Update will be applied on next reboot. (at+cfun=1)
AT+CFUN=1<cr>
+WIND:2:RESET
+WIND:17:Validating F/W update
+WIND:17:Performing F/W update
```

(note - at this point the LEDS will blink rapidly until update is complete)

```
+WIND:17:F/W update complete!
+WIND:1:Poweron (1203-120918_01)
```

2.37 AT+S.HTTPDFSUPDATE: update static HTTPD filesystem

AT+S.HTTPDFSUPDATE downloads an updated file system via a single HTTP GET request to the named host and path, much like the AT+S.HTTPGET command. The SPWF01SX.11 will validate the image it downloads, Flashes the contents and then prompts the user to issue a reset command in order to complete the file system update.

Arguments:

`<hostname>`	Target host. DNS resolvable name or IP address
`<path&queryopts>`	document path and optional query arguments
`<port>`	Target host port

Example:

```
AT+S.HTTPDFSUPDATE=host.example.com,/custom_httpdfs.img<cr>
Image length 777 (offset 0x00080000, block len 4096)
Write len 784 -> 0x80000 (final)
Wrote 780 bytes
Complete! Please reboot
OK
```

2.38 AT+S.HTTPDFSERASE: erase the external flash memory

The HTTPDFSERASE allows to erase the content of the external flash.

Arguments:

`<none>`

2.39 AT+S.HTTPD: Disable/Enable web server

The HTTPD command enables or disables the module's web server.

Note: Command only available on the module's versions SPWF01Sx.1y

Arguments:

`<on/off>: 0 to disable, 1 to enable`

Example:

```
AT+S.HTTPD=0<CR>

<CR><LF>
OK<CR><LF>
```

2.40 AT+S.SCAN: perform site survey (scan)

AT+S.SCAN performs an immediate scan for available networks. Infrastructure (AP) and IBSS(Ad-Hoc) networks are both reported. Network type, Channel, BSSID, SSID, Signal strength (RSSI), and 802.11 capabilities are all reported. The module supports the active/passive scan and the filtered/unfiltered scan. Default is active and filtered.

Note: The automatic scan, performed by the module to connect to the Access Point, is passive by default. This is done to avoid violating spectral emission. The switch to active scan only happens when the module finds an AP advertising the country IE. Therefore, the current scan policy is not compatible with band-steering mode.

Arguments:

```
<a|p>: Perform an active scan (a) or a passive scan (p)
<r>:  duplicated networks are displayed (unfiltered)
```

Example:

```
AT+S.SCAN<cr>
1:<HT> BSS 00:18:74:D3:53:C0 CHAN: 01 RSSI: -85 SSID: 'Ambu2' CAPS: 0431
WPA2 <CR><LF>
2:<HT> BSS 00:18:74:D3:53:C3 CHAN: 01 RSSI: -85 SSID: 'PAWAM' CAPS: 0431 WPA
<CR><LF>
3:<HT> BSS 00:18:74:D3:53:C1 CHAN: 01 RSSI: -85 SSID: 'AmbuM' CAPS: 0431
WPA2 <CR><LF>
4:<HT> BSS 00:18:74:D3:53:C2 CHAN: 01 RSSI: -84 SSID: 'Guest' CAPS: 0421
<CR><LF>
5:<HT> BSS C8:D3:A3:15:98:14 CHAN: 05 RSSI: -79 SSID: 'AmbuITguest' CAPS:
0431 WPA WPA2 WPS <CR><LF>
6:<HT> BSS 02:62:1F:51:8F:0B CHAN: 06 RSSI: -41 SSID: 'ciscosb2' CAPS: 0411
WPA WPA2 <CR><LF>
```

```
7:<HT> BSS 00:18:0A:31:EA:78 CHAN: 11 RSSI: -89 SSID: 'ZyckoItalyWiFi'
CAPS: 0531 WPA WPA2 <CR><LF>
8:<HT> BSS 00:1F:33:FE:66:17 CHAN: 11 RSSI: -91 SSID: 'TRI_AGRATE' CAPS:
0411 WPA2 <CR><LF>
<CR><LF>
OK<CR><LF>

AT+S.SCAN=a,r<cr>
1:<HT> BSS 00:18:74:D3:53:C0 CHAN: 01 RSSI: -81 SSID: 'Ambu2' CAPS: 0431
WPA2 <CR><LF>
2:<HT> BSS 00:18:74:D3:53:C1 CHAN: 01 RSSI: -80 SSID: 'AmbuM' CAPS: 0431
WPA2 <CR><LF>
3:<HT> BSS 00:18:74:D3:53:C2 CHAN: 01 RSSI: -81 SSID: 'Guest' CAPS: 0421
<CR><LF>
4:<HT> BSS 00:18:74:D3:53:C3 CHAN: 01 RSSI: -81 SSID: 'PAWAM' CAPS: 0431 WPA
<CR><LF>
5:<HT> BSS 00:18:74:D3:53:C1 CHAN: 01 RSSI: -81 SSID: 'AmbuM' CAPS: 0431
WPA2 <CR><LF>
6:<HT> BSS 00:18:74:D3:53:C0 CHAN: 01 RSSI: -81 SSID: 'Ambu2' CAPS: 0431
WPA2 <CR><LF>
7:<HT> BSS 00:18:74:D3:53:C3 CHAN: 01 RSSI: -80 SSID: 'PAWAM' CAPS: 0431 WPA
<CR><LF>
8:<HT> BSS 00:18:74:D3:53:C1 CHAN: 01 RSSI: -81 SSID: 'AmbuM' CAPS: 0431
WPA2 <CR><LF>
9:<HT> BSS C8:D3:A3:15:98:14 CHAN: 05 RSSI: -79 SSID: 'AmbuITguest' CAPS:
0431 WPA WPA2 WPS <CR><LF>
10:<HT> BSS 02:62:1F:51:8F:0B CHAN: 06 RSSI: -39 SSID: 'ciscosb2' CAPS:
0411 WPA WPA2 <CR><LF>
11:<HT> BSS 02:62:1F:51:8F:0B CHAN: 06 RSSI: -45 SSID: 'ciscosb2' CAPS:
0411 WPA WPA2 <CR><LF>
12:<HT> BSS 00:1F:33:FE:66:17 CHAN: 11 RSSI: -91 SSID: 'TRI_AGRATE' CAPS:
0411 WPA2 <CR><LF>
<CR><LF>
OK<CR><LF>
```

2.41 AT+S.ADC: Read ADC value on GPIO8

AT+S.ADC returns ADC value on GPIO8, between 0 and 2500 mV.

Note: Measurement accuracy is around 10 mV

Arguments:

`<raw>: returns raw ADC value on GPIO8 unprocessed (between 0 and 4096). This argument is optional and when it is not specified the value is returned processed (between 0 and 2500 mV)`

2.42 AT+S.DAC: enable/disable DAC on GPIO15

The DAC command enables DAC on GPIO15.

Arguments:

<Value>: must be set in mV (between 1 and 2500), 0 disables DAC on GPIO15

2.43 AT+S.PWM: set PWM on GPIO1

The PWM command enables PWM on GPIO1 with a specified frequency and duty-cycle.

Note: The max frequency value (10 KHz) allows user to set any duty-cycle between 0 and 100

Arguments:

<frequency>: value between 1 and 10 KHz, 0 disables PWM on GPI01

<Duty-Cycle>: value between 0 and 100 (default=50%)

3 Configuration variable reference

The configuration variable space is split into two areas: production data (PDATA) and configuration data. The production data space contains factory-set variables that can be modified in RAM (AT+S.SCFG) but cannot be saved to non-volatile storage. The configuration data space contains variables that can be written in RAM (AT+S.SCFG) and written to non-volatile storage (AT&W). Additionally, the non-volatile values can be restored to their factory state using the AT&F command.

Variables have the following types:

Table 3. Variable types

Type code	Description
TEXT[<len>]	Printable text up to <len> characters
HEX[<len>]	Octets, specified in hexadecimal, up to <len> octets
INT	Integer
IP	IP address or netmask, specified as a dotted-quad

The following table lists the production data variables:

Table 4. Production data variables

Variable	Sample Value	Type	Description
nv_manuf	ST	TEXT[32]	Manufacturer ID string
nv_model	SPWF01Sxyz	TEXT[32]	Manufacturer model string
nv_serial	1214003	TEXT[32]	Manufacturer serial number
nv_wifi_macaddr	02:4D:53:4D:00:01	HEX[6]	Manufacturer assigned 802.11 MAC Address

The following table lists the configuration data variables:

Table 5. Configuration data variables

Variable	Sample value	Type	Description
blink_led	0	INT	Enable/disable the blinking LED (default=0). In MiniAP, the blinking indicates the number of clients associated to the module.
wind_off_low	0x00000000	INT	Wind 0:31 mask 0xFFFFFFFF are disabled all the 32 Wind indicator
wind_off_medium	0x00000000	INT	Wind 32:63 mask
wind_off_high	0x00000000	INT	Wind 64:95 mask
user_desc	anonymous	TEXT[64]	Free form textual field for host use (used as basic authentication during Mini AP configuration)
escape_seq	at+s.	TEXT[7]	Escape sequence from data mode to command mode (max 7 chars)
localecho1	1	INT	Echo command input: 0=off, 1=on
console1_speed	115200	INT	Serial port speed: from 9600 to 921600, default: 115200
console1_hwfc	0	INT	Hardware flow control: 0=off, 1=on
console1_enabled	1	INT	Enable console on UART1
sleep_enabled	0	INT	Enable/disable the sleep mode
standby_enabled	0	INT	Enable/disable the standby mode
standby_time	10	INT	Standby mode time, in seconds. Up to 2^{32}-1 sec
wifi_tx_msdu_lifetime	0	INT	MSDU lifetime. From 0 to 2^32-1 TUs (1 TUs= 1024µs). Zero is default (automatic)
wifi_rx_msdu_lifetime	0	INT	MSDU lifetime. From 0 to 2^32-1 TUs (1 TUs= 1024µs). Zero is default (automatic)
wifi_operational_mode	0x00000011	INT	Allows choosing Doze (11) or quiescent (12) power device modes

Table 5. Configuration data variables (continued)

Variable	Sample value	Type	Description
wifi_beacon_wakeup	1	INT	Set the wakeup interval of the WLAN device, from 1 to 255 if wifi_listen_interval = 0; from 1 to 65535 if wifi_listen_interval = 1
wifi_beacon_interval	100	INT	Beaconing interval in MiniAP mode, from 0 to 2^16-1
wifi_listen_interval	0	INT	Define the wakeup mode (0 = sleep up to the beacon_wakeup specified, 1 = sleep at least to the beacon_wakeup specified)
wifi_rts_threshold	3000	INT	Frame size over which RTS/CTS is used. Limit: from 0 to 3000
wifi_ssid	50:72:6F:64:75: 63:74:69:6F:6E: 31:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00:00	HEX[32]	Desired SSID specified in hex. All 32 octets should be written. Note that wifi_ssid_len must also be set.
wifi_ssid_len	11	INT	Length of the actual SSID in the 32 byte buffer
wifi_txfail_thresh	5	INT	Maximum number of lost packets before disassociation
wifi_ht_mode	0	INT	Reserved
wifi_channelnum	6	INT	Channel number to use for MiniAP operation. The user must properly set the channel number to not violate IEEE 802.11 Wi-Fi/WLAN standards.

Table 5. Configuration data variables (continued)

Variable	Sample value	Type	Description
wifi_opr_rate_mask	0xFFFFFFFF	INT	BIT0: 1 Mbps BIT1: 2 Mbps BIT2: 5.5 Mbps BIT3: 11 Mbps BIT6: 6 Mbps BIT7: 9 Mbps BIT8: 12 Mbps BIT9: 18 Mbps BIT10: 24 Mbps BIT11: 36 Mbps BIT12: 48 Mbps BIT13: 54 Mbps BIT14: MCS0 (6.5Mbps) BIT15: MCS1 (13Mbps) BIT16: MCS2 (19.5Mbps) BIT17: MCS3 (26Mbps) BIT18: MCS4 (39Mbps) BIT19: MCS5 (52Mbps) BIT20: MCS6 (58.5Mbps) BIT21: MCS7 (65Mbps)
wifi_bas_rate_mask	0x0000000F	INT	Basic data rate mask, 0x0000000f is [1,2,5.5,11]
wifi_mode	1	INT	Radio Mode. 0=IDLE, 1=STA (Supported Security Modes: OPEN, WEP OpenSystem, WEP SharedKey, WPA/WPA2), 2=IBSS (Supported Security Modes: OPEN, WEP OpenSystem, WEP SharedKey); 3=MiniAP (Supported Security Modes: OPEN, WEP OpenSystem - Supported Classes: b,g)
wifi_auth_type	0	INT	Authentication type used in IBSS mode: 0=OpenSystem, 1=SharedKey
wifi_powersave	1	INT	Allows choosing between Active (0), PS (1) or Fast-PS (2)
wifi_tx_power	18	INT	Transmit power [from 0 to 18], in dBm

Table 5. Configuration data variables (continued)

Variable	Sample value	Type	Description
wifi_rssi_thresh	-50	INT	Low signal strength threshold
wifi_rssi_hyst	10	INT	Amount of change in RSSI to trigger signal state change
wifi_ap_idle_timeout	120	INT	Seconds of inactivity to trigger disassociate of the client
wifi_beacon_loss_thresh	10	INT	Number of consecutive loss beacon to detect the AP disassociation
wifi_priv_mode	2	INT	Privacy Mode: 0=none, 1=WEP, 2=WPA-Personal (TKIP/AES) or WPA2-Personal (TKIP/AES)
wifi_wep_keys[0]	00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00	HEX[16]	WEP key buffer
wifi_wep_keys[1]	00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00	HEX[16]	WEP key buffer
wifi_wep_keys[2]	00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00	HEX[16]	WEP key buffer
wifi_wep_keys[3]	00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00	HEX[16]	WEP key buffer
wifi_wep_key_lens	00:00:00:00	HEX[4]	Four octets specifying the length of the actual key data in each WEP key buffer.
wifi_wep_default_key	0	INT	Default WEP key used for authentication
wifi_wpa_psk_raw	00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00:00:00:00:00: 00:00	HEX[32]	Pre-calculated PSK key

Table 5. Configuration data variables (continued)

Variable	Sample value	Type	Description
wifi_wpa_psk_text	a_psk_pass	TEXT[64]	WPA(2) PSK passphrase, if set the actual PSK will be generated from this. Used in STA, IBSS and MiniAP.
ip_use_dhcp	1	INT	DHCP server on/off. Used in STA, IBSS and MiniAP. 0=off (in STA mode: the variables ip_ipaddr, ip_netmask and ip_gw must be properly set to connect to the AP), 1=on (in STA mode: the ipaddr, netmask and gw will be provided by the AP), 2=on&customize (in MiniAP mode: user can customize the ip_ipaddr of the MiniAP, the ip_address of the client is automatically assigned by the MiniAP)
ip_use_httpd	1	INT	HTTP server on/off. 0=off, 1=on
ip_mtu	1500	INT	IP maximum transmission unit size. Limit: from 634 to 2412 (1500 for maximum compatibility with Ethernet networks)
ip_hostname	iwm-02-09-97	TEXT[32]	IP local hostname
ip_apdomainname	captiveportal.net	TEXT[32]	IP domain name in Mini AP mode. If the AP domain name is not quickly opened, it's suggested to turn off an eventual proxy server (check the connection settings of the device or the browser preferences).
ip_apredirect	firstset.html	TEXT[16]	Default homepage opening the ip_apdomainname in miniAP
ip_ipaddr	192.168.0.50	IP	IP address for static usage (DHCP off)
ip_netmask	255.255.255.0	IP	IP netmask for static usage (DHCP off)
ip_gw	192.168.0.1	IP	IP default gateway for static usage (DHCP off)

Table 5. Configuration data variables (continued)

Variable	Sample value	Type	Description
ip_dns	192.168.0.1	IP	IP DNS server for static usage (DHCP off)
ip_http_get_recv_timeout	1000	INT	HTTP_GET connection timeout in milliseconds
ip_wait_timeout	12000	INT	Amount of time in time_wait state
ip_dhcp_timeout	20	INT	DHCP client timeout, in seconds
ip_sockd_timeout	250	INT	Socket server - buffer timeout management (from 5 ms to 250 ms) Warning: 250 ms is suggested to avoid data loss

4 Status variable reference

Table 6. Status variable

Variable	Sample value	Description
version	140128-caf4b79-SPWF01S	SPWF01S Software Version
reset_reason	2	H/W reported reason for last reset 0 = POWER_ON 1 = WATCHDOG 2 = SOFT RESET 3 = LOW POWER
conf_flag	5	Module HW revision
system_uptime	22006	System running time in seconds
system_sleeptime	500	System sleeping time in seconds
gpio_enable	0	Interrupt-enabled GPIO bitmask, expressed in base 10
captiveportal	1	Mini AP enabled/disabled
wifi_state	10	0= Hardware power up 1=Hardware failure 2=Radio task terminated by user 3=Radio idle 4=Scan in progress 5=Scan complete 6=Join in progress 7=Joined 8=Access point started 9=802.11 handshake complete 10=Ready to transmit data (i.e. “Link Up”)
wifi_bssid	00:18:F8:3C:D9:18	BSSID of current association
wifi_aid	0	Association ID of current association
wifi_channelnum	11	Current radio channel number
wifi_sup_rate_mask	0x003FFFCF	Radio: supported data rate mask
wifi_bas_rate_mask	0x0000000F	AP reported: basic data rate mask
wifi_chan_activity2	0x00003FFF	Channels where we are allowed to transmit. Channel mask. i.e. 0x00003FFF => from channel 0 to channel 13
wifi_max_tx_power	18	max allowed transmit power for the defined reg domain
wifi_reg_country	IT	Current regulatory domain
wifi_dtim_period	1	AP reported DTIM period (used in STA mode)
wifi_sleeping	0	Radio sleeping state (0 = active, 1 = sleep)

Table 6. Status variable (continued)

Variable	Sample value	Description
wifi_num_assoc	1	Number of the client associated to the module
ip_ipaddr	192.168.121.184	Current IP address
ip_netmask	255.255.252.0	Current IP netmask
ip_gw	192.168.123.20	Current IP default gateway
ip_dns	192.168.123.20	Current IP DNS server
ip_sock_open	0	Bitmask of Socket Client ID currently opened, expressed in base 10 (ip_sock_open=13 (00001101 in binary), means that socket#0 socket#2 and socket#3 are currently opened)
ip_sockd_port	0	Socket server port opened
free_heap	30472	Current free heap space
min_heap	26552	Minimum free heap space thus far
current_time	90643	Current time in seconds

Table 7. Peers table

Variable	Sample value	Description
link_id	0	Identifier of the client
state	4	0 = Hardware Power Up 1 = HW link initialization 2 = Client Link identifier allocated 3 = Authenticated 4 = Associated 5 = Peer lost beacons 6 = Peer in power save state
addr	90:18:7C:96:0D:0B	MAC address of the client
last_rx	21244	Timestamp of last received packet
last_tx	21244	Timestamp of last transmitted packet
rx_drops	0	Count of frames dropped during reception
tx_drops	1	Count of frames dropped during transmission
rx_pkts	50	Count of received frames
tx_pkts	44	Count of transmitted frames
tx_errs	0	Count of errors detected during frame transmit
rate_mask	0x00003FCF	AP reported Operational data rate mask
cur_rate_idx	3	Most significant byte of the rate_mask
cur_rate_ok	5	Counter to perform rate step up
cur_rate_fail	0	Counter to perform rate step down
tx_consec_fail	0	Counter to perform disassociation

Table 7. Peers table (continued)

Variable	Sample value	Description
rx_seqnum	0x0000AF40	Sequence number of last RX directed frame
rx_seqnum_mc	0x00000000	Sequence number of last RX multicast frame
rx_rssi	-37	Signal strength of last received packet
rx_rateidx	0	Rate index of last received packet
setprot	0	Bitmask to indicate protection for TX (bit 1) and/or RX (bit 0) IEEE 802.11 frames
listen_interval	10	AP reported listen interval
capinfo	0x00000000	Information about the AP capabilities

5 Asynchronous indication reference

SPWF01SX modules can output asynchronous indications at any time except while an AT command is in progress. The format for all asynchronous indications is:

`<cr><lf>+WIND:<num>:<description><cr><lf>`

Table 8. Asynchronous indication messages

Indication	Notes
+WIND:0:Console active	Console task is running and can accept AT commands
+WIND:1:Poweron (%s)	Initial powerup indication, with f/w version
+WIND:2:RESET	System reset is being asserted/triggered
+WIND:3:Watchdog Running	Watchdog task initialized and running
+WIND:4:Heap too small	Selected heap allocation is too small for normal operation
+WIND:5:WiFi Hardware Failure: %d	WiFi Radio Failure, reset pending
+WIND:6:Watchdog Terminating, reset pending	Watchdog reset asserted
+WIND:7:SysTickConfigure	Failure to configure System Tick Clock
+WIND:8:Hard Fault	OS hard fault detected
+WIND:9:StackOverflow	OS stack overflow detected
+WIND:10:MallocFailed (%d/%d)	OS heap allocation failed (RequiredSize/FreeSpace)
+WIND:11:<error>	Radio Initialization failure
+WIND:12:WiFi PS Mode Failure: %s:%d	Radio Failed to enter power saving state (%s=step, %d=state)
+WIND:13:<copyright information>	Copyright information of SPWF01SX
+WIND:14:WiFi BSS Regained	Radio regained association after loss
+WIND:15:WiFi Signal LOW (%d)	Radio low signal threshold triggered
+WIND:16:WiFi Signal OK (%d)	Radio signal level recovered
+WIND:17:F/W update <state>	Firmware update in progress
+WIND:18:Keytype %d Not implemented	Encryption key type not recognized
+WIND:19:WiFi Join: %m	BSS join successful, %m=BSSID
+WIND:20:JOINFAILED: %04x	BSS join failed, %x = status code
+WIND:21:WiFi Scanning	Radio is scanning for a BSS that matches the currently configured SSID. (Note: WIND hidden when fast reconnect(1) is performed)
+WIND:22:SCANBLEWUP	Radio failed to accept scan command
+WIND:23:SCANFAILED: %04x	Radio failed to execute scan command
+WIND:24:WiFi Up: %i	Radio has successfully connected to a BSS and initialized the IP stack. %i=IP Address

Table 8. Asynchronous indication messages (continued)

Indication	Notes
+WIND:25:WiFi Association with '%s' successful	Radio successfully associated to the “%s” BSS
+WIND:26:WiFi Started AP with network “%d”	Radio successfully started the Mini AP, where %d=network SSID
+WIND:27:STARTFAILED: %04x	Radio failed to start the Mini AP,%x=status code
+WIND:28:Station %m Associated: %d	Client associated to the module in Mini AP,%m=BSSID, %d=peers assoc status (0=default, 1=client re-association)
+WIND:29:DHCP reply for %i/%m	DHCP reply sent for the client,%i = client IP address,%m = client MAC Address
+WIND:30:WiFi BSS Lost	Beacon missed from the BSS
+WIND:31:WiFi EXCEPTION: <data>	Radio reported an internal exception. Radio is non-functional from this point; User must reboot the module.
+WIND:32:WiFi Hardware Started	Radio reports successful internal initialization
+WIND:33:WiFi Network Lost	Connection to BSS lost due to excessive beacon misses
+WIND:34:WiFi Unhandled Event: %d	Unhandled internal event occurred,%d=identifier of the event occurred
+WIND:35:Scan Complete:0x%x	Scan Complete indication,%x=result code (0: scan ok; 1: scan error). Note: WIND hidden when fast reconnect(1) is performed).
+WIND:36:WiFi UNHANDLED IND (%02x) : <hexdata>	Unparsed radio indication occurred
+WIND:37:WiFi UNHANDLED (%d) : <hexdata>	Unhandled radio response message received
+WIND:38:WiFi: Powered Down	Radio and radio thread shut down
+WIND:39:HW in miniAP mode (GPIO7 Low)	Module started in miniAP mode (SSID = iwm-XX-YY-ZZ, where XXYYZZ are the last 6 digits of MAC Address)
+WIND:40:WiFi Deauthentication: %d	Radio: Access point sent deauthentication, :%d=reason code (802.11 Deauthentication Reason Code)
+WIND:41:WiFi Disassociation: %d	Radio: Access point sent disassociation, :%d=reason code (802.11 Disassociation Reason Code)
+WIND:42:RX_MGMT: %04x	Unhandled management frame subtype received
+WIND:43:RX_DATA: %04x	Unhandled data frame subtype received
+WIND:44:RX_UNK: %04x	Unhandled frame type received
+WIND:45:DOT11 AUTHILLEGAL	Illegal authentication type detected
+WIND:46:WPA: Crunching PSK...	Creating PSK from PSK passphrase
+WIND:47:WPA:%s	Factory Debug
+WIND:48:WPAC:%s	Factory Debug
+WIND:49:WPA:Terminated: %d	WPA supplicant thread terminated

Table 8. Asynchronous indication messages (continued)

Indication	Notes
+WIND:50:WPA Supplicant failed to initialize.	WPA supplicant thread initialization failed
+WIND:51:WPA Handshake Complete	WPA 4-way handshake successful
+WIND:52:GPIO%d %d	GPIO line changed state (%d=GPIO changed, %d=GPIO logic state
+WIND:53:Wakeup (GPIO6 High)	Device woken up from sleep from external signal
+WIND:54:ETF %04d	Factory Debug
+WIND:55:Pending Data:%d:%d	Pending data from the socket, %d =socket identifier:%d=pending byte available for reading
+WIND:56:Insert message to client:%d	Input_demo indicator, displayed when the “input_demo.shtml” page is requested by a client, %d is the Nth input SSI into html page
+WIND:57:<data>	Firstset indicator, displayed during the remote configuration of the module
+WIND:58:Socket Closed:%d"	Socket closed, %d = identifier of the socket
+WIND:59:Back to Command Mode	Command mode is active (after the escape sequence)
+WIND:60:Now in Data Mode	Data mode is active
+WIND:61:Incoming Socket Client:%i	Socket client is connected to the module, %i = client IP address
+WIND:62:Socket Client Gone:%i	Socket client disconnected, %i = client IP address
+WIND:63:Sockd Dropping Data:%d:%d	Data dropped due to low memory, %d=bytes dropped, %d=free heap
+WIND:64:Sockd Pending Data:%c:%d:%e	Data pending while module is in command mode, %c = number of message received, %d = bytes received in the last message, %e = tot bytes received
+WIND:65:HW Factory Reset (GPIO0 High)	Factory variables are restored via GPIO0
+WIND:66:Low Power mode enabled:%d	Power Save Mode enabled, %d = 1 for PS or 2 for Fast-PS
+WIND:67:Going into Standby:%d	Standby mode enabled, %d is time in sec
+WIND:68:Resuming from Standby	Standby mode disabled
+WIND:69:Going into DeepSleep	Sleep mode enabled
+WIND:70:Resuming from DeepSleep	Sleep mode disabled
+WIND:71:DNS reply for %d	DNS reply from MiniAP to the client, %d = client IP address
+WIND:72:Station %m Disassociated: %d"	Client dissociated to the module in Mini AP, %m=BSSID, %d=reason code (802.11 Deauthentication Reason Code)
+WIND:73:System Configuration Updated (Run AT&W to Save it)	The configuration variables have been updated, it needs an AT&W to save it (this WIND is usually shown when an old FW version is updated)

Table 8. Asynchronous indication messages (continued)

Indication	Notes
+WIND:74:Rejected found Network	A new scan needs to be scheduled due to a mismatch between SPWF configuration variables and Access Point configuration
+WIND:75:Rejected Association:yyy	Indicates an association failure (yyy=low memory, reject status code)
+WIND:76:Authentication Timed Out	Indicates that the authentication process is timed out
+WIND:77:Association Timed Out	Indicates that the association process is timed out
+WIND:78:MIC Failure	Michael MIC error is detected by the local driver

1. Fast reconnect feature: allows fast reconnect to the last associated AP

6 Revision history

Table 9. Document revision history

Date	Revision	Changes
05-Dec-2013	1	Initial release.
23-Jun-2014	2	Major review for alignment with commands and variables introduced in the release 3.1 of “AT full stack”
08-Oct-2014	3	Minor changes.
28-Nov-2014	4	– Deleted the Appendix A. – Minor changes related to fix introduced in the release 3.3.
21-May-2015	5	Changes throughout the document related to features introduced in release 3.4 of the “AT full stack”. (see *Table 1*).

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