

Application Note

AT Command (ATC) Mode

Version 2.1

☞ *Caution: Specifications of the product's functions may be changed without prior notice.*

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1 Overview

1.1 Introduction

“ATC – AT Command” is one of the communication modes of ezTCP. In this mode, you can configure ezTCP’s some environment variables and control the communication and connection with AT Command through the serial port.

The ezTCP can communicate with various hosts by repeating the process of connection and disconnection in AT command communication mode. Always excepting, it does not support TCP multiple connection and UDP communication.

1.2 AT Command

1.2.1 AT Command format

AT Command starts with ‘AT’ and it ends with ‘<CR>’.

The form is as the following.

AT	Command	<CR>(0x0d)
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Response messages form for AT Command is as the following

<CR>(0x0d)	<LF>(0x0a)	Response message	<CR>(0x0d)	<LF>(0x0a)
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☞ *When ezTCP power on, it echoes received AT Command and sends response messages as letter form. To avoid this echo, you can use “ATE0” command. And you can use “ATV0” command for numeric form response messages.*

1.2.2 Basic AT Command set

Command	Feature	Description
A	passive connection	Wait for connection request from remote hosts. If you send any serial data before the connection is established, ezTCP gives up waiting for connection and returns “NO CARRIER” response message.
D	active connection	ezTCP tries to connect to a remote host If you send any serial data before the connection is established, ezTCP gives up trying to connect and returns “NO CARRIER” response message.
E	echo	Decide whether to echo received AT Commands to serial port E0- No Echo, E1-Echo (default)
H	off-hook	TCP Connection Close
I	Information	Returns the information of ezTCP I3 – firmware revision, I7 – MAC address
O	Online	Go back On-line state from Command state
Q	Quiet Mode	Decide how to send response messages Q0 – sends response messages (default) Q1 – doesn't send response message
S	S Register	S2: Escape Code, default value 43 (0x2b, '+') S3: Carriage Return Code, default value 13 (0x0d) S4: Line Feed Code, default value 10 (0x0a) S5: Backspace Code, default value 8 (0x08) S9: Timeout for PING Test, default value 6 (6 sec) S12: Guard Time of Escape Code, default value 50 (500 ms)
V	enable response message	Response messages form V0 – Numerical V1 – Literal (default)
Z	reset	Reset AT Command settings

Table 1-1 basic AT command set

☞ *ATS Commands are available except for EZL-200F / 400S / 410*

1.2.3 Common Extended AT Command set

Command	Description	Note
+PLIP	local IP address	e.g.) at+plip=10.1.0.1<CR>
+PSM	subnet mask	e.g.) at+psm=255.255.255.0<CR>
+PGIP	default router	e.g.) at+pgip=10.1.0.254<CR>
+PNIP	domain name server	e.g.) at+pnip=8.8.8.8<CR>
+PLP	listening TCP port	e.g.) at+plp=1470<CR>
+PTO	timeout	Unit: sec
+PRIP	remote host's IP address	e.g.) at+prip=10.1.0.2<CR>
+PRHN	remote host's host(domain) name	e.g.) at+prhn="www.ezTCP.com"<CR>
+PRP	remote host's TCP port	e.g.) at+prp=1470<CR>
+PWP	write configuration	e.g.) at+pwp<CR>
+PRC	enable ezConfig function	1: ON, 0: OFF
+PARP	temporary obtain an IP address from the first received packet	1: ON, 0: OFF
+PDC	obtain an IP automatically via DHCP	1: ON, 0: OFF
+PPE	obtain an IP automatically via PPPoE	1: ON, 0: OFF
+PPID	PPPoE ID	e.g.) at+ppid="abcdefg"<CR>
+PPPW	PPPoE password	e.g.) at+pppw="0123456"<CR>
+PPNG	ping test	e.g.) at+ppng=10.1.0.2<CR>
+PSE	Sending Escape Character option	1: ON, 0: OFF
+PAN	obtain address of DNS automatically	1: ON, 0: OFF
+PRST	Reboot ezTCP	e.g.) at+prst<CR>
+PLS	Ethernet Link Status	e.g.) at+pls<CR> Unit: Mbps

Table 1-2 common extended AT command set

- ☞ *When values for this category is changed, it must be saved with "AT+PWP" command.*
- ☞ *For EZL-50 / 50A / 50R, values of +PRIP and +PRP are not saved by AT+PWP command.*

● Available common extended AT commands by products

Command	CSE-M32/H20/H21 CSE-M73/H25 CSE-M53/H53/H55 CSE-M53N/H53N/H55N CIE-H10/M10 CSW-H80	CSW-M83 CSW-M85 CSW-H85K CSW-H85F	EZL-50L EZL-50M EZL-70 EZL-200L	EZL-200F EZL-220	EZL-80 EZL-80C	EZL-410 EZL-400S
+PLIP	O	O	O	O	O	X
+PSM	O	O	O	O	O	X
+PGIP	O	O	O	O	O	X
+PNIP	O	O	X	X	X	X
+PLP	O	O	O	O	O	O
+PTO	O	O	O	O	O	O
+PRIP	O	O	O	O	O	O
+PRP	O	O	O	O	O	O
+PARP	O	O	O	O	O	X
+PDC	O	O	O	O	O	X
+PPE	O	X	X	O	X	X
+PPID	O	X	X	X	X	X
+PPPW	O	X	X	X	X	X
+PAN	O	O	X	X	X	X
+PWP	O	O	O	O	O	X
+PRHN	O	O	X	X	X	X
+PPNG	O	O	O	X	O	X
+PSE	O	O	O	X	X	X
+PRST	O	O	X	X	X	X
+PLS	Δ	X	X	X	X	X
+PRC	X	X	O	O	O	X

Table 1-3 available common extended AT commands by products

☞ *“AT+PLS” command is only supported with CSE-M73 and CSE-H25.*



1.2.4 Wi-Fi Extended AT Command Set

Command	Description	Note
+WCCT	Wi-Fi Topology	0: Ad-hoc, 1: Infrastructure, 2: Soft AP
+WSSID	SSID	e.g) at+wssid="sollae"<CR>
+WANT	Antenna	0: Internal, 1: External
+WAUTH	Authentication	1: Open, 2: Shared Key, 3: Both
+WEP	WEP mode	0: Disable, 1: 64 bit, 2: 128 bit
+WID	Key ID	1, 2, 3, 4
+WKEY	WEP Key (HEX)	64bit-10chars / 128bit-26chars e.g) at+wkey=6162636465<CR>
+WPA	WPA mode	0: Disable, 1: EAP-TLS, 2: WPA-PSK, 3: EAP-TTLS, 4: WPA2-PSK, 5: EAP-PEAP
+WCIP	Encryption	1: TKIP, 2: CCMP(AES)
+WPP	WPA Passphrase	e.g.) at+wpp="0123456789"
+WPSK	compute PSK	Compute PSK by combination of SSID and WPA passphrase. (Requires 4~5 seconds)
+WLS	Link Speed	Unit: CSW-M83 - 1Mbps CSW-M85 / H85K / H85F - 100Kbps
+WLQ	Link Quality	Unit: %
+WRSSI	RSSI	Unit: dBm
+WUID	WPA-Enterprise User ID	e.g.) at+wuid="user"<CR>
+WUPW	WPA Enterprise User Password	e.g.) at+wupw="password"<CR>

Table 1-4 Wi-Fi extended AT command set

☞ *Note that AT+WPP command is required to apply a new PSK key which is computed by the +WPSK command.*

- Available Wi-Fi extended AT commands by products

Division	CSW-H80	CSW-M83	CSW-M85	CSW-H85K/H85F
+WCCT	X	O	O	O
+WSSID	X	O	O	O
+WANT	X	X	O	X
+WAUTH	X	O	X	X
+WEP	X	O	O	O
+WKEY	X	O	O	O
+WPA	X	O	O	O
+WCIP	X	O	X	X
+WPP	X	O	O	O
+WPSK	X	O	O	O
+WLS	X	O(Mbps)	O(100Kbps)	O(100Kbps)
+WLQ	X	O	O	O
+WRSSI	X	O	O	O
+WUID	X	X	O	O
+WUPW	X	X	O	O

Table 1-5 available Wi-Fi extended AT commands by products

1.2.5 IPv6 Extended AT Command Set

Command	Description	Note
+PIP6	IPv6	0: Disable, 1: Enable
+PEUI	EUI-64 creation	0: MAC address, 1: Random
+PGUA	Global Unicast Address	0: Auto, 1: Static
+PLIP6	Local IPv6 Address	e.g.) at+plip6="2001::1234:5678"<CR>
+PPFX	Length of Prefix	e.g.) at+ppfx=64<CR>
+PGIP6	Gateway IPv6 Address	
+PRIP6	Peer IPv6 Address	

Table 1-6 IPv6 extended AT command set

☞ *IPv6 Extended AT Command can be configured in case of support to IPv6.*

1.2.6 Response messages

Literal Response (ATV1 - default setting)	Numerical Response (ATV0)	Description
OK	0	Command OK
ERROR	4	Command Error
CONNECT	1	TCP Connected
NO CARRIER	3	TCP Disconnected
NO ANSWER	8	No response from the remote host(PING test)
Set values	Set values	Response for query of currently setting values (Ex. AT+PRIP?)

Table 1-3 response messages

2 Operation State

2.1 On-line State and Command State

ATC mode has Command State and On-line State.

Command State	When TCP connection is not established, AT commands can be used.
On-line State	During TCP connection, all of the data are converted to TCP/IP format.

Table 2-1 Two states in ATC mode

- **Command State**
The ezTCP is Command State right after power on. Incoming serial data is treated as AT command
- **On-line State**
When TCP connection is established, it automatically operates in On-line State. Incoming serial data is sent to the remote host.

2.1.1 Changing to Command State from On-line State

In order to change to Command State from On-line State, Escape Code (default: '+') must be sent 3 times according to the below sequence.

☞ *You can set if the “+++” data is sent or not with AT+PSE command.*

From last sent data to first '+' input	More than 500ms
'+' input interval	0~500ms
Delay time after last '+' input	More than 500ms

Table 2-2 turn to the Command State

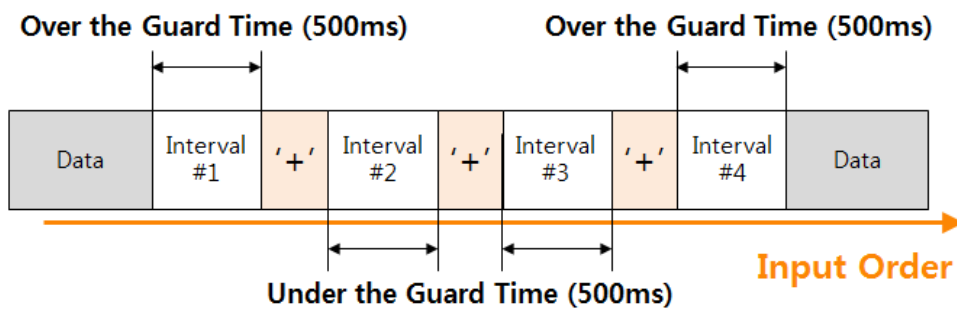


Figure 2-1 using Escape Codes

☞ *The guard time can be changed with ATS command. (except for EZL-200F / 400S / 410)*

2.1.2 Changing to On-line State from Command State

When the device is changed to Command State from On-line State during TCP connection, ATO command is used to go back On-line State.

2.1.3 An example of Changing states

Data (▶: Command, ◀: Response message)		Description	
Data Communication (During TCP connection)			
	+++	▶	Change to Command State
◀	<CR><LF>OK<CR><LF>		Conversion to Command State complete
~ Command State (wait for user AT command) ~			
	ATO<CR>	▶	Go back On-line State
◀	<CR><LF>CONNECT<CR><LF>		Conversion to On-line State complete

Table 2-3 an example of changing states

2.2 Configuration with AT Commands

2.2.1 an Example of TCP/IP Configuration

Data (▶ : Command, ◀ : Response message)		Description
	AT+PLIP=10.1.0.1<CR>	▶ LOCAL IP address setting
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+PGIP=10.1.0.254<CR>	▶ GATEWAY IP address setting
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+PSM=255.255.255.0<CR>	▶ SUBNET MASK setting
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+PLP=1470<CR>	▶ LOCAL PORT setting
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+PTO=10<CR>	▶ TIME OUT setting
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+PWP<CR>	▶ Save setting values to EEPROM (Saved even after reset)
◀	<CR><LF>OK<CR><LF>	Command process OK
◀	<CR><LF>NO CARRIER<CR><LF>	System reset

Table 2-4 an example of TCP/IP configuration

2.2.2 An Example of S Register Configuration

Data (▶: Command, ◀: Response message)		Description
	ATZ<CR>	▶ Initializing Basic Command set
◀	<CR><LF>OK<CR><LF>	Command process OK
	ATS2?<CR>	▶ Print Escape Code
◀	<CR><LF>43<CR><LF>	43 = 0x2b = '+'
◀	<CR><LF>OK<CR><LF>	Command process OK
	ATS2=33<CR>	▶ Change the Escape Code to 33 (33 = 0x21 = '!')
◀	<CR><LF>OK<CR><LF>	Command process OK
	ATS3?<CR>	▶ Print Carriage Return Code
◀	<CR><LF>13<CR><LF>	13 = 0x0d
◀	<CR><LF>OK<CR><LF>	Command process OK
	ATS4?5?<CR>	▶ Print Line Feed and Backspace code
◀	<CR><LF>10<CR><LF>	10 = 0x0a
◀	<CR><LF>8<CR><LF>	8 = 0x08
◀	<CR><LF>OK<CR><LF>	Command process OK
	ATS9?<CR>	▶ Print Timeout for PING Test
◀	<CR><LF>6<CR><LF>	6 seconds
◀	<CR><LF>OK<CR><LF>	Command process OK
	ATS9=3<CR>	▶ Change Timeout to 3 seconds
◀	<CR><LF>OK<CR><LF>	Command process OK
	ATS12?<CR>	▶ Print Guard Time for Escape Code
◀	<CR><LF>50<CR><LF>	500ms (unit: 10ms)
◀	<CR><LF>OK<CR><LF>	Command process OK
	ATS12=100<CR>	▶ Change Guard Time to 1000ms (1sec)
◀	<CR><LF>OK<CR><LF>	Command process OK

Table 2-5 an example of S register configuration

☞ *ATS Commands are available except for EZL-200F / 400S / 410*

2.3 TCP Connection

2.3.1 Active connection – TCP Client

ezTCP operates as TCP client like “TCP Client - COD” communication mode. In the below table, the processes of connecting to a TCP server which has an IP address of 10.1.0.2 and Port number of 1470 are shown.

Data (▶ : Command, ◀ : Response message)		Description
	AT+PRIP=10.1.0.2<CR>	▶ Setting the remote IP address to connect
◀	<CR><LF>OK<CR><LF>	Command process Ok
	AT+PRP=1470<CR>	▶ Setting the remote port number to connect
◀	<CR><LF>OK<CR><LF>	Command process Ok
	ATD<CR>	▶ Connecting to the remote host
Try connection to the remote host		
◀	<CR><LF>CONNECT<CR><LF>	TCP connection success
Data Communication		

Table 2-6 active connection

2.3.2 Passive connection – TCP Server

The ezTCP operates as TCP server like “TCP Server – T2S” communication mode. The below is the example of setting TCP server on 1470 port.

Data (▶ : Command, ◀ : Response message)		Description
	AT+PLP=1470<CR>	▶ LOCAL PORT setting
◀	OK<CR><LF>	Command process OK
	ATA<CR>	▶ TCP Listen
Wait for connection request from the remote host		
A remote host connects to ezTCP.		
◀	CONNECT<CR><LF>	TCP connection OK
Data Communication		

Table 2-7 passive connection

2.4 TCP disconnection

2.4.1 Active disconnection

When ezTCP tries to close TCP connection,

Data (▶: Command, ◀: Response message)		Description
Data Communication (During TCP connection)		
	+++	▶ Change to Command State from On-line State
◀	<CR><LF>OK<CR><LF>	Changed to Command State
	ATH<CR>	▶ Close TCP connection
◀	<CR><LF>OK<CR><LF>	Command process OK

Table 2-8 active disconnection

2.4.2 Passive disconnection

When the remote host tries to close the connection

Date (▶: Command, ◀: Response message)		Description
Data Communication (During TCP connection)		
The remote host request to close the connection		
◀	<CR><LF>NO CARRIER<CR><LF>	TCP connection is closed

Table 2-9 passive disconnection

2.5 Wi-Fi Configuration

2.5.1 Wi-Fi connection

Date (▶: Command, ◀: Response message)		Description
	AT+WCCT=1<CR>	▶ Wi-Fi Topology (1: Infrastructure)
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+WSSID="sollae"<CR>	▶ Wi-Fi SSID
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+WANT=0<CR>	▶ Select an Antenna (0: Internal)
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+WPA=4<CR>	▶ Set the WPA (4: WPA2-PSK)
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+WCIP=2<CR>	▶ Select the Encryption (2: AES)
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+WPP="0123456789"<CR>	▶ Set the WPA passphrase
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+ WPSK<CR>	▶ compute PSK
◀	<CR><LF>OK<CR><LF>	Command process OK
	AT+PWP<CR>	▶ Write the configuration
◀	<CR><LF>OK<CR><LF>	Command process OK
◀	NO CARRIER<CR><LF>	
Wi-Fi connection is Established		
	AT+WRSSI<CR>	▶ View RSSI
◀	-17<CR><LF>	-17dBm
◀	<CR><LF>OK<CR><LF>	Command process OK

Table 2-10 Wi-Fi connection

3 Revision History

Date	Version	Comments	Author
2004.08.16	1.0	○ Initial Release	
2008.10.28	1.1	○ Rebuild	
2009.02.19	1.2	○ Add Basic Command 'Q' ○ Add Return Code 'NO ANSWER' ○ Add detail description for operation state and example	
2009.12.09	1.3	○ Style of this document has been changed. ○ Form of Revision History has been modified. ○ Some extended AT command have been added. ○ Description about Available AT commands by products has been added. ○ Figures of each examples have been added.	Roy LEE
2011.04.26	1.4	○ ATS command has been added ○ CSE-H55 has been added	Roy LEE
2012.02.06	1.5	○ Add Wi-Fi extended AT command set ○ Add IPv6 extended AT command set	Roy LEE
2012.03.30	1.6	○ Add AT commands(+PRST, +PLS)	Andy LEE
2012.04.18	1.7	○ Update the products list for ATS command ○ Add AT commands(+WID) ○ Modify +WKEY example ○ Modify +WEP bit ○ Add +WPSK example ○ Modify the typo	Amy KIM
2012.07.05	1.8	○ Update 'Available common extended AT commands by products' ○ Add default value of Basic AT Commands ○ More detailed examples of Basic AT Commands ○ Change sub-title to 'Application Note'	Andy LEE
2012.07.31	1.9	○ Add captions to every table ○ Modify WLAN extended AT commands(Table 1-3, 1-6) ○ Modify table 1-5	Roy LEE
2012.09.20	2.0	○ Modify description of +WPP and +WPSK commands ○ Remove duplicated figures ○ Correct some errors and expressions	Roy LEE
2012.12.02	2.1	○ Update 'Available common extended AT commands by products'	Andy LEE