EZL-70 User Manual

Version 2.5
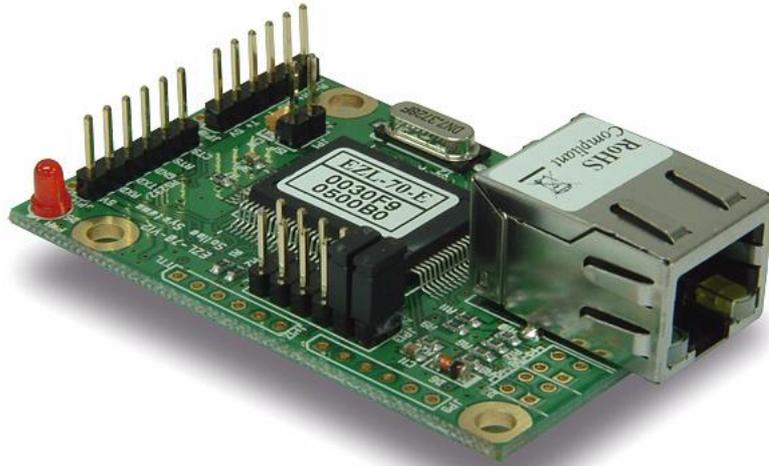
![Sollae logo] Sollae Systems

To all residents of the European Union

Important environmental information about this product

This symbol on this unit or the package indicates that disposal of this unit after its lifecycle could harm the environment. Do not dispose of the unit as unsorted municipal waste; it should be brought to a specialized company for recycling. It is your responsibility to return this unit to your local recycling service. Respect your local environmental regulation. If in doubt, contact your local waste disposal authorities.

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1. Overview

1.1.   Overview

Along with the development of the Internet, the demand for data communication functions has increased recently. Data communication over the Internet requires using TCP/IP, the Internet communication protocol. That is to say, in order to connect a system to the Internet, TCP/IP protocol must be implemented. It is possible to implement TCP/IP by directly implementing the protocol, porting public TCP/IP, or using Operating System (OS). However, all these methods impose burdens on the developer in time, cost, and technology.

ezTCP series, a Serial ↔ TCP/IP protocol converter product group of Sollae Systems, enables you to use TCP/IP communication (the Internet communication) function simply by "connecting the cable to a serial port". ezTCP sends data from the serial port to the Internet network after TCP/IP processing, and vice versa.

EZL-70 in ezTCP product group is a product that provides TCP/IP communication through Ethernet. In other words, like other ezTCP products, EZL-70 sends data from the serial port to the LAN after TCP/IP processing and vice versa.

It provides DHCP and PPPoE functions as well as TCP/UDP/IP, so that it can be applied to the cable network and the xDSL network.

EZL-70 is a modular and embedded type that supports RS232, RS422, RS485 and 5V level(TTL) interface, so it can be used various applications.

☞   *EZL-70(A) replaces EZL-70 because the EZL-70's CPU, ATmega64L, is discontinued. EZL-70(A) uses ATmega64A and is manufactured after the first half of 2010. The new product is the same with the previous one except for only few things. Those are amount of current consumption and electrical characteristics.*

1.2.　Components

● 　EZL-70 Body

1.3.　Specifications

Power	Input Voltage	5V (±5%)
	Current Consumption (typical)	EZL-70: 64 mA EZL-70(A): 59 mA
Dimension		64.4mm x 40mm x 17mm
Weight		About 20g
Interface	Serial	2.54mm pitch 1x6 connector (RS232, RS422, RS485, 5V level(TTL))
	Network	RJ-45 connector
Serial Port		UART (1,200bps ~ 115,200bps)
Network		10Base-T
Protocols		TCP, UDP, IP, ICMP, ARP, DHCP, PPPoE
Communication Mode	T2S	TCP Server Mode
	COD	TCP Client Mode
	ATC	TCP Server/Client Mode (AT command emulation)
	U2S	UDP
Utilities	ezConfig	Configuration utility via LAN
	ezTerm	Socket test utility
	hotflash	Firmware download utility via TFTP

☞　*You can download free utilities and firmware from* <u>*http://www.eztcp.com*</u>

1.4.   Dimension

The dimension of EZL-70 is followed. The unit is millimeters.

EZL-70 Dimension (unit: mm)
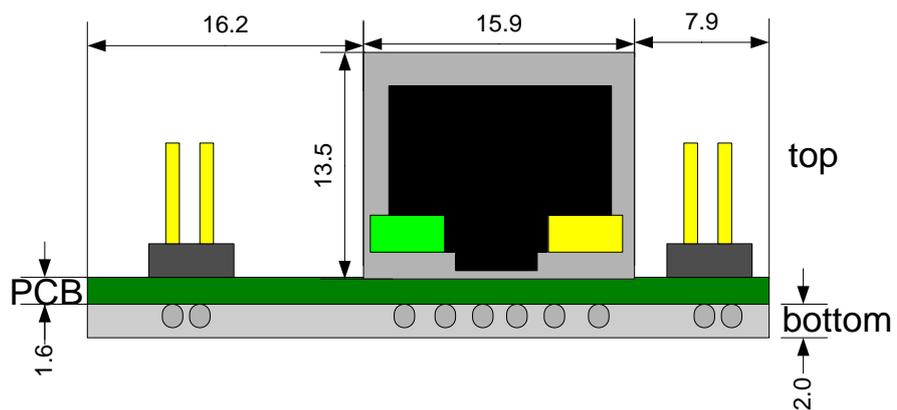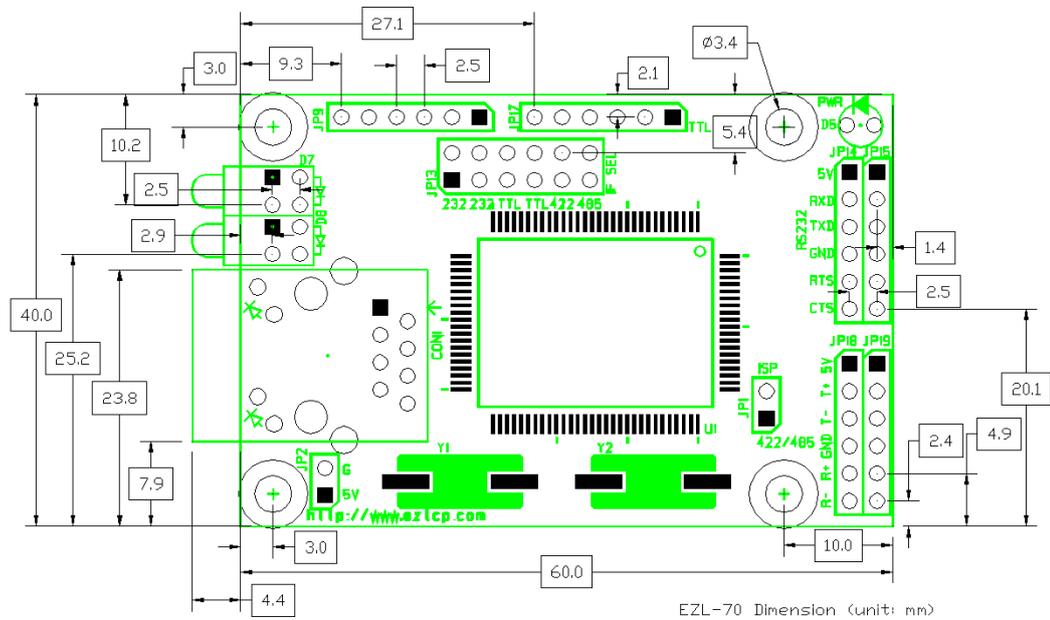
1.5.   Power

Power of EZL-70 can be provided from of VCC and GND pins of JP13, JP14, JP15, JP18, JP19, and JP2. The voltage should be 5V.

1.6.   Serial Interface

EZL-70 provides RS232, RS422, RS485, and 5V level(TTL) interfaces. Each interface is selected by JP13 jumper as follows.

1.6.1. RS232

RS232	RS232	TTL	TTL	RS422	RS485
■	■				

The RS232 ports are JP14 and JP15. JP14 is 1x6 2.54mm pitch male header. And JP15 isn't soldered so that user interfaces JP15 with user-own connector.

The pin specification is followed:

#	Name	Descriptions	I/O	Mandatory	Optional
1	VCC	VCC(5V)	Power	●	
2	RXD	Receiving data from serial device(RS232) It should be connected to TXD of serial device.	IN	●	
3	TXD	Transmitting data to serial device(RS232) It should be connected to RXD of serial device.	OUT	●	
4	GND	Ground	Power	●	
5	RTS	When RTS/CTS flow-control is used, indicating whether EZL-70 has receiving buffer or not to serial port. (RS232) It should be connected to CTS of serial device.	OUT		●
6	CTS	When RTS/CTS flow-control is used, EZL-70 checks receiving buffer of serial device (RS232) It should be connected to RTS of serial device.	IN		●

[JP14 and JP15]

1.6.2. RS422

RS422 communicates with differential voltage. The transmission and receiving lines are separated, so RS422 is full-duplex.

For RS422, JP13 should be as followed:

RS232	RS232	TTL	TTL	RS422	RS485
				■	

The RS422 ports are JP18 and JP19. JP18 is 1x6 2.54mm pitch male header. And JP19 isn't soldered so that user interfaces JP19 with user-own connector.

The pin specification is followed:

#	Name	Descriptions	I/O	Mandatory	Optional
1	VCC	VCC(5V)	Power	●	
2	T+	Differential output data +	OUT	●	
3	T-	Differential output data -	OUT	●	
4	GND	Ground	Power	●	
5	R+	Differential input data +	IN	●	
6	R-	Differential input data +	IN	●	

[JP18 and JP19]

1.6.3. RS485

RS485 communicates with differential voltage. The transmission and receiving lines are shared, so RS485 is half-duplex.

For RS485, JP13 should be as followed:

					■
RS232	RS232	TTL	TTL	RS422	RS485

The RS485 ports are JP18 and JP19. JP18 is 1x6 2.54mm pitch male header. And JP19 isn't soldered so that user interfaces JP19 with user-own connector.

The pin specification is followed:

#	Name	Descriptions	I/O	Mandatory	Optional
1	VCC	VCC(5V)	Power	●	
2	T+	Differential input/output data +	OUT	●	
3	T-	Differential input/output data -	OUT	●	
4	GND	Ground	Power	●	
5	R+	Not used (Do not connect)			
6	R-	Not used (Do not connect)			

[JP18 and JP19]

☞ *Even though the RS485 is known as a "two-wire" configuration, an additional ground connection should be implemented.*
If a signal ground is not used, there might be potential differences between nodes. And it could be electrical noise or damages the transceivers.

1.6.4. 5V level(TTL)

EZL-70 can communicate with 5V level(TTL). The below is the JP13 for 5V level(TTL).

RS232	RS232	TTL	TTL	RS422	RS485
		■	■		

The TTL port is JP17. JP17 is not soldered so that user interfaces it with user-own connector. The pin specification is followed:

#	Name	Descriptions	I/O	Mandatory	Optional
1	VCC	VCC(5V)	Power	●	
2	RXD	Receiving data from serial device(5V level(TTL)) It should be connected to TXD of serial device.	IN	●	
3	TXD	Transmitting data to serial device(5V level(TTL)) It should be connected to RXD of serial device.	OUT	●	
4	GND	Ground	Power	●	
5	RTS	When RTS/CTS flow-control is used, indicating whether EZL-70 has receiving buffer or not to serial port (5V level(TTL)) It should be connected to CTS of serial device.	OUT		●
6	CTS	When RTS/CTS flow-control is used, EZL-70 checks receiving buffer of serial device (5V level(TTL)) It should be connected to RTS of serial device.	IN		●

[JP17]

#	Name	Descriptions	I/O
1	VCC	Input Voltage: 4.75V~5.25V	Power
2	RXD	$V_{IL}(Max)=0.2V_{CC}V$, $V_{IL}(Min) = -0.5V$ $V_{IH}(Max)=V_{CC}+0.5V$, $V_{IH}(Min) = 0.6\ V_{CC}V$	IN
3	TXD	$V_{OL}(Max)= 0.7V$ (Condition: $I_{OL}=20mA$) $V_{OH}(Min)=4.0V$ (Condition: $I_{OH}=-20mA$)	OUT
4	GND	Ground	Power
5	RTS	$V_{OL}(Max)= 0.7V$ (Condition: $I_{OL}=20mA$) $V_{OH}(Min)=4.0V$ (Condition: $I_{OH}=-20mA$)	OUT
6	CTS	$V_{IL}(Max)=0.2V_{CC}V$, $V_{IL}(Min) = -0.5V$	IN

		$V_{IH}(Max)=V_{CC}+0.5V$, $V_{IH}(Min) = 0.6\ V_{CC}V$	

1.7.   ISP jumper

The firmware of EZL-70 can be downloaded through the Ethernet (LAN). To download its firmware, user should set ISP jumper and power on. Then the EZL-70 operates as ISP mode. The firmware is supplied from Sollae Systems.

1.8.   LED Interface

1.8.1. RJ45 and Power LED

There are yellow and green LEDs in the RJ-45 connector of EZL-70. The yellow LED indicates that IP address status of EZL-70 and packet transmissions from LAN port. And the green LED turns on when EZL-70 connected a hub and blinks when packet receptions.

Mode	Color	LED Status	Description
Normal mode	Red	On	Power is supplied
	Yellow	Blinks in every second	IP is allocated but TCP connection is not established.
		Blinks once after 4 times short blinking	IP is not allocated – Repetition of [after blinking 4 times for 150ms, turns off during 850ms]
		On	During TCP connection – LOW
		Blinks	Transmitting data to the LAN
	Green	On	When EZL-70 is connected to LAN
		Blinks	Receiving packets from the LAN
ISP mode	Red	On	Mode which is for a download Firmware through the LAN
	Yellow	Blinks rapidly	
	Green	Off	

1.8.2. LED interface – D7 and D8

User can interface user own LED. No additional LED is required, because 330ohm resistor is included in the EZL-70.

D7

D8

RJ-45
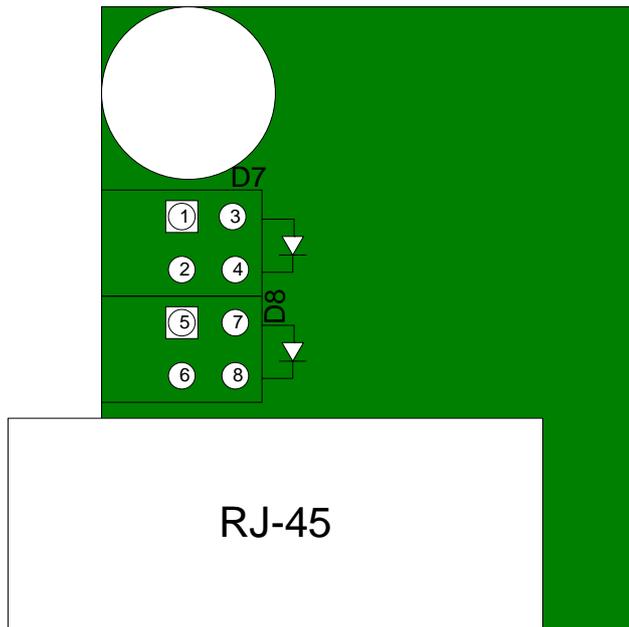
#	A/C	Name	Description
1	Anode	STS	IP is allocated but TCP connection is not established Blinks every 500ms
			IP is not allocated – Repeat of [after blinking 4 times for 150ms, turns off during 850ms]
2	Cathode		ON – During TCP connection
			ISP Mode – Blinks every 50ms
3	Anode	LINK	ON – when EZL-70 is connected to a hub
4	Cathode		
5	Anode	LAN	Blinking– when EZL-70 receives packet from the LAN
6	Cathode	RXD	
7	Anode	LAN TXD	Blinking– when EZL-70 transmits packet from the LAN

1.9.   Ethernet Address (MAC address)

Ethernet devices have unique 6 bytes-hardware address. The hardware address of EZL-70 is set in the factory. The hardware address cannot be modified.

The address is printed in top of EZL-70.

2. Installation and Test Run

The followings are described on the assumption that the serial interface is RS232.

2.1.   Installation Method

You can install EZL-70 in the following steps:

Title	Item	Sub-item	Description
Checking the communication environment	Check items	IP address environment	3.1.
		Serial port settings	3.1.
		Application program to be used	4.
Setting serial interface	Setting	Selecting the serial interface with JP13.	1.6.
Connecting to the network	Check method	Check if LINK LED is ON.	1.8.
Configuring the environmental variables	Configuration method	Set by ezConfig, a utility program for configuration through the network.	3.2.
		Set by AT commands in ATC mode	3.3.
	Configuration items	IP address related items	3.1.
		Serial port related items	3.1.
		Communication mode (Decided depending on application program)	4.
4. Application to the field			

2.1.1. Checking the Communication Environment

Before installing EZL-70, check the network environment where EZL-70 is to be installed, including the followings matters:

- IP address environment (Local IP, Subnet Mask, Gateway, etc.)
- Serial interface types of the equipment(RS232, RS422, RS485, 5V level(TTL))

- Serial port items of the equipment to which EZL-70 is going to be connected (Baud Rate, Data Bits, Parity, Stop Bit)
- Application program protocol to be used (TCP/UDP, Server/Client, etc.)

☞ *For application program protocol to be used, see "5. Normal Communication Mode".*

2.1.2. Selecting Serial Interface

EZL-70 can be interfaced with RS232, RS422, RS485 and 5V level(TTL) to the serial equipment. For each interface, user should set JP13 properly with jumpers.

☞ *For more information, refer to 1.6. Serial Interface.*

2.1.3. Connecting to the Network

Connect power to EZL-70, and connect EZL-70 directly to the Ethernet port of the PC where test is to be performed with a cross-over Ethernet cable.

2.1.4. Configuring the Environmental Variables

When network connection is completed, configure the environmental variables such as IP address related items, serial port related items, and communication mode related items through the LAN using "ezConfig," the environmental variable configuration program.

☞ *For environmental variable configuration, see "3.Configuring IP Address and Environmental Variables."*

2.2. Test

You can perform test run according to the following orders. The test run described here is based on the assumption that the IP address of the PC is set to 10.1.0.2.

2.2.1. Changing PC IP Address

You can change the IP address of your PC as follows:

IP Address	10.1.0.2
Subnet Mask	255.0.0.0

Gateway IP Address	0.0.0.0

2.2.2. Installation EZL-70

Connect RS232 cable between your PC and EZL-70, and the LAN cable to the hub to which the PC is connected or directly to the PC with a cross-over cable, and 5V power for power supply. If the LAN cable has been correctly connected when power is supplied, the red LED turns on, and the green LED turns on and the green LED blinks sometimes.

2.2.3. Configuring EZL-70

Configure EZL-70 setting using ezConfig, the ezTCP configuration program, as follows. Run ezConfig, and click [Search ezTCP] button in the ezConfig window. And, ezConfig program will search all ezTCP on the local network.

When ezTCP is searched, MAC address of the ezTCP is displayed on the [Search List] window (The MAC address is printed in top of EZL-70).
Select the corresponding MAC address, and set the same as shown in the following figure and click [Write] button to save the settings.
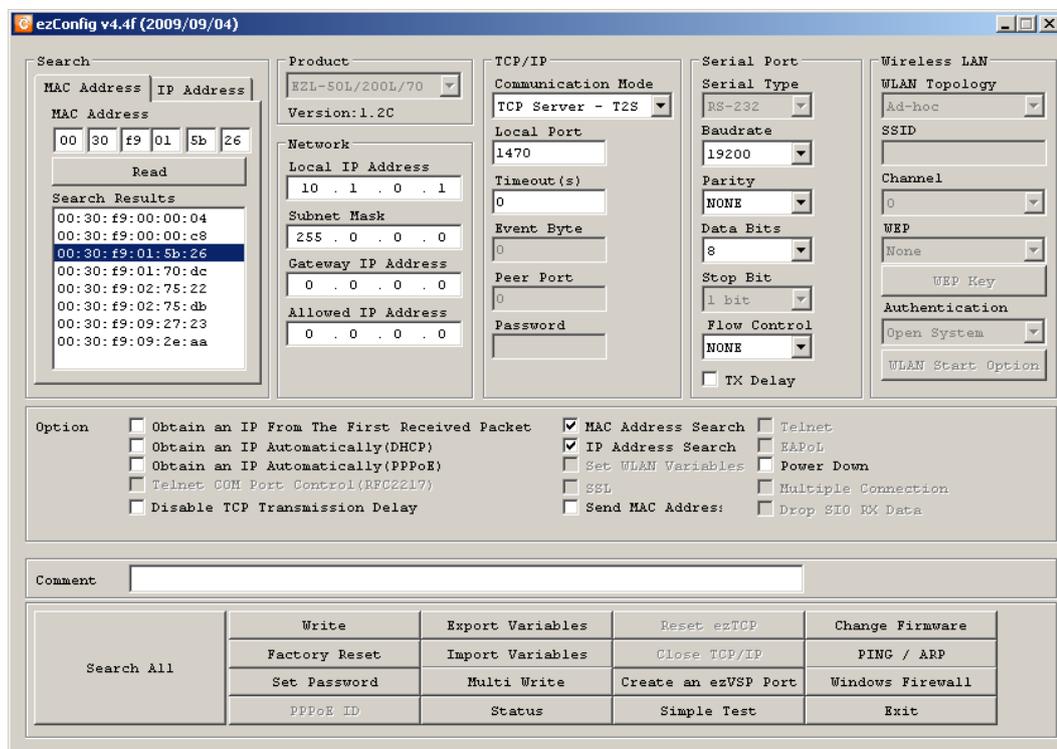
2.2.4. Connecting to the PC Serial Port

Connect the serial port of your PC and that of EZL-70, using the supplied serial communication cable. Then, run serial communication program such as Hyper Terminal or Tera Term. When the program is run, select the same serial port values as those set to EZL-70 [19,200bps, Data Bits: 8 bits, Stop Bit: 1 bit, Parity: None], which will finish the preparation for serial communication.

2.2.5. Communication Test

When the preparation for serial communication is finished, enter the following in the DOS window on your PC, to connect to TCP through Telnet program.

"Telnet 10.1.0.1 1470"

When TCP connection succeeds, Yellow LED of RJ-45 turns ON.

When this LED turns ON, enter "123" on the Telnet window, and "123" will appear on the hyper terminal. Enter "ABC" on the hyper terminal, and "ABC" will appear on the Telnet window. Otherwise, communication test fails.

3. Configuring IP Address and Environmental Variables

3.1.   IP Address and Environmental Variables

For TCP/IP communication, you must set IP address related items. In addition, you have to set serial port related items (Baud Rate, Data Bits, Parity, Flow Control and etc.) to EZL-70.

You can set the IP address and the serial port related items by using ezConfig, the supplied configuration utility which allows you to configure your EZL-70 over the network, or by using AT commands in ATC mode.

	Item	Description
IP Address-related Items	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of gateway
	Local Port	TCP listen port number in T2S mode Port number for waiting data in U2S mode
	Peer IP Address	IP address to connect/transmit in COD and U2S mode
	Peer Port	Port number to connect/transmit in COD and U2S mode
	Allowed IP Address	Allowed IP address in T2S mode
Serial Port	Baud Rate	1,200bps ~ 115,200bps
	Data Bits	7, 8
	Parity	None, Even, Odd, Mark, Space
	Stop Bit	1, 2
	Flow Control	NONE, RTS/CTS, XON/XOFF
Communication Mode	ezTCP Mode	Set communication Mode (T2S, ATC, COD, U2S)
Connect/Disconnect Event	Event Byte	Minimum number of bytes attempting to connect/transmit
	Timeout	Limit time to keep connection

Configuration Method Used	ezConfig	Enable ezConfig function.
	IP Address Search	Remote configuration function with UDP unicast
	Password	ezConfig password.
	ARP	Enable IP setting by ARP.
	Disable TCP Transmission Delay	Send serial data to the Ethernet with no delay
	Send MAC Address	Send the MAC address right after the connection is established
	Drop SIO RX Data	Does not send serial data which is received before the connection
Dynamic IP Address	DHCP	Select to receive EZL-70 IP address as DHCP.
	PPPoE	Select to receive EZL-70 IP address as PPPoE.
	PPPoE ID & Password	ID and password to be used for PPPoE

● Local IP Address

It represents the IP address of EZL-70. If you set DHCP or PPPoE is set, an IP address is automatically allocated. So, you cannot set the local IP address.

● Subnet Mask

Set subnet mask of the network where EZL-70 is installed

● Gateway IP Address

Set the gateway IP address of the network where EZL-70 is installed.

● Allowed IP Address

It is a permitted IP address of foreign host when EZL-70 operates as a server (T2S mode). The only host that is written in this item can connect to EZL-70. If Allowed IP Address is 0.0.0.0, all hosts can connect to the EZL-70.

● Local Port

Port number, which is used as TCP port number waiting to be connected when EZL-70 operates as TCP server or as the port number waiting for UDP data when it operates in U2S mode.

● Peer Port

Local port number of the server to connect when EZL-70 operates as TCP client or to transmit UDP data when it operates as U2S

● Serial Type

It cannot be set in ezConfig. User can set it by JP13 (RS232, RS422, RS485).

● Baud Rate

Select a serial port speed (1,200 bps ～ 115,200bps).

● Data Bits

Select a data bit length of the serial port (7 bits or 8 bits)

● Parity

Select a parity bit of the serial port (None, Even, Odd, Mark, Space).

● Stop Bit

Select a stop bit length of the serial port (1 bit or 2 bits).

● Flow Control

Select flow control for the serial port (None, RTS/CTS, XON/XOFF).

● ezTCP Mode

Select the communication mode of EZL-70 (T2S, ATC, COD and U2S).

● Event Byte

It decides a point of time to start connection when EZL-70 operates as COD. EZL-70 starts to connect to the host (Peer IP Address and Peer Port) of the designated host upon receiving as many data as specified by [Event Byte] from the serial port.

- Block size

Decide the size of UDP packet to be sent at a time when EZL-70 operates as U2S. (Unit: Byte)

- Timeout (Unit: second)

When EZL-70 operates as TCP such as T2S, COD and ATC, connection is closed if data communication is not continued as long as the time set to this item unless this item is set to 0. The maximum value is 600 seconds.

- Block Interval

When EZL-70 operates as UDP like U2S, it transmits data in blocks by gathering data for the time set to this item (Unit: 10ms)

- MAC Address Search

You can use ezConfig utility only this item is enabled.

(If this item is not enabled, you cannot set EZL-70 using ezConfig. Therefore, it is recommended to enable this all the times.)

To enable ezConfig, set this item in ISP mode.

- IP Address Search

If this item is set, EZL-70 in other network can be configured by ezConfig. IP Address Search function is performed in the [IP ADDRESS] tab.

- Password

Set a password for configuring with ezConfig. If user forgot the password, the user can delete the password in ISP mode.

- Obtain an IP From the First Received Packet (ARP)

When this item is selected, EZL-70 uses the destination IP address of the first packet coming to its MAC address as its own IP address temporarily.

- Obtain an IP Automatically (DHCP)

Set to receive an IP address as DHCP.

- Obtain an IP Automatically (PPPoE)

Set to receive an IP address as PPPoE.

●   TX Delay

Give delay to between each data on serial port. This option is useful to serial devices that have no buffer system or slow baud rate (delay: 200μs, maximum baud rate 19,200bps).

●   Disable TCP Transmission Delay

Normally, EZL-70does not send immediately after receiving data from its serial port. EZL-70 checks the serial buffer at regular intervals. At that time, it sends the data to the network side, if there are data. However, when you use this option, EZL-70 sends data from serial port to the network immediately. Because of this, it may cause inefficiency with each TCP header when the data comes frequently.

●   Send MAC Address

This option is for identifying multiple EZL-70 using MAC addresses. A MAC address is unique ID which is allowed only one network device. By using this option, EZL-70sends its MAC address to the remote host right after the connection is established. Therefore, the server can distinguish each ezTCP using that information.

☞   *For the details of this option, please refer to the document which is named "Sending MAC Address Function" on our website.*

●   Drop SIO RX Data

When EZL-70is set TCP client mode, the data which is received from serial port before the connection is made will be transmitted to the network. Users can ignore these data by using this option. If this option is checked and [Event Byte] is set to zero (0), EZL-70 drops the data which is received before the connection. This means EZL-70sends serial data after the connection is established.

●   Comment

Store comments (maximum 32 bytes) of user on the product. This item helps the user distinguish each EZL-70 more easily.

3.2.   Configuration by ezConfig

3.2.1. ezConfig Menu

The basic environmental variables (IP address related items, serial port items, and etc.) can be set by ezConfig which is an integrated management tool for Windows.

ezConfig can be operated in Microsoft Windows platform (Windows 98, 98 SE, 2000, ME, XP, Vista) but may malfunction in older OS versions. Following is the screen shot of ezConfig which is just launched.
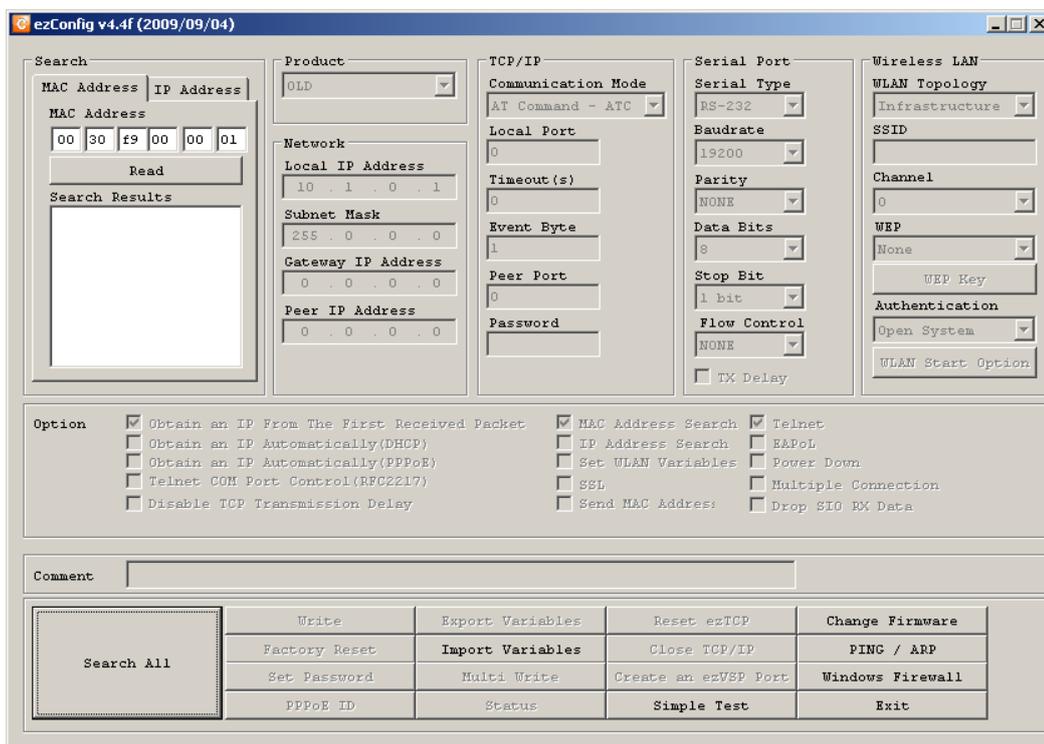
☞   *ezConfig can set not only EZL-70's environmental variables but also other ezTCP series.*

ezConfig configures ezTCP by Ethernet, there are two way to configure.

The first way is UDP broadcast. When using UDP broadcast, user can search all ezTCP in the same network without knowledge of IP address. But beware that it can be used in the 'same network'. This method performed in the [MAC ADDRESS] tab of ezConfig version above 4.0.

The second way is UDP unicast that communicates by IP address. As it configured with IP address, EZL-70 is configured any place if they are connected with network. This method performed in the [REMOET] tab of ezConfig version above 4.0.

(ezConfig below version 4.0 supports only UDP broadcast)

	MAC Address	IP Address
communication	UDP broadcast	UDP unicast (port: 50005)
search	With MAC address	with IP address
location	In the same network with EZL-70	Can be used in a different network

☞ *For the details of buttons and functions, please refer to the document named "ezConfig user's manual" on our web site.*

3.3. AT command

In ATC mode, the user can set environment variables through the serial port using AT command.

☞ **For more information, See "6. ATC Mode".**

3.4. Setting IP Address-related Items by DHCP

Under environment with a network operating a DHCP server, DHCP protocol allows the user to automatically set the IP address, subnet mask, gateway, and name server of ezTCP. Using DHCP automatic setup function requires the user to check [DHCP] item on ezConfig.

3.5. Setting IP Address-related Items by PPPoE

PPPoE is used in most ADSL and VDSL. To use PPPoE function, PPPoE function should be enabled and PPPoE ID and PPPoE password should be configured. The local IP address of EZL-70 is assigned automatically in PPPoE environment.

☞ *Some ADSL or VDSL modem use DHCP. Please contact your ISP (Internet Service Provider).*

4. Operation Mode

4.1.　Operation Mode Overview

4.1.1. Overview

EZL-70 can operate in one of two modes (normal, ISP). Normal mode is ordinary data communication mode; and ISP mode is used to download EZL-70 firmware through the Ethernet (TFTP).

4.2.　How to Initiate Each Operation Mode

4.2.1. How to Initiate Normal Mode

Normal mode is a mode in which EZL-70 performs its original functions. If ISP jumper (JP1) isn't set (is open) and EZL-70 boots up, EZL-70 operates in normal mode.

☞　*For more information, see "5. Normal Communication Mode".*

4.2.2. Entering ISP Mode

Supply power or reset to EZL-70 with ISP jumper (JP1) is set. If EZL-70 operates as ISP Mode, the yellow LED blinks rapidly.

4.2.3. Comparison of Operation Modes

The following table is the comparison of the above described operation modes.

Mode	How to Initiate	Description	Serial Port
Normal	Supply power or reset with ISP(JP1) is open	Normal data communication mode T2S, ATC, COD, U2S	User setting
ISP	Supply power or reset with ISP(JP1) is set	Download firmware through the Ethernet	19,200bps,N,8,1

4.3.　Normal Communication Mode

EZL-70 operates normally in the Normal Communication Mode.

Normal communication mode can be classified into four modes – T2S, ATC, COD, and U2S – each of which is described in the following table.

Communication Mode	Protocol	Connection	Need for User Equipment Software Modification	Configuration of Environmental Variables through Serial Port	Topology
T2S	TCP	Passive Connection	Not needed	Impossible	1:1
ATC	TCP	Active/Passive Connection	Needed	Possible	1:1
COD	TCP	Active Connection	Not needed	Impossible	1:1
U2S	UDP	No Connection	Not needed	Impossible	N:M

TCP protocol requires connection process. The connection is always established as 1:1 connection. At this time, the host waiting for connection (passive connection) is called a server and the one attempting to connect (active connection) is called a client.

On the other hand, UDP communicates by block unit without connection process. As UDP does not require connection, numbers of hosts can communicate at the same time.

☞   *For more information on communication modes, refer to the next chapter.*

4.4.   ISP Mode

In ISP mode, you can download the latest firmware (EZL-70 operation software) provided by our company.

The following section describes how to download firmware in ISP mode.

● Supply power or reset to EZL-70 with ISP jumper set. If EZL-70 operates as ISP Mode, the yellow LED blinks rapidly.

● Run hotflash that is supplied by Sollae Systems.
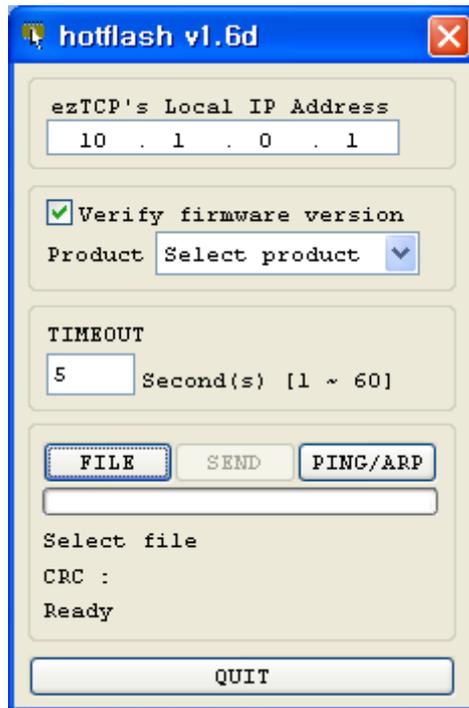
- Select a firmware [FILE] and [Product], and input the IP address of EZL-70. After uncheck [Verify firmware version] option, press [SEND] button. Then the firmware will be transferred by Ethernet.
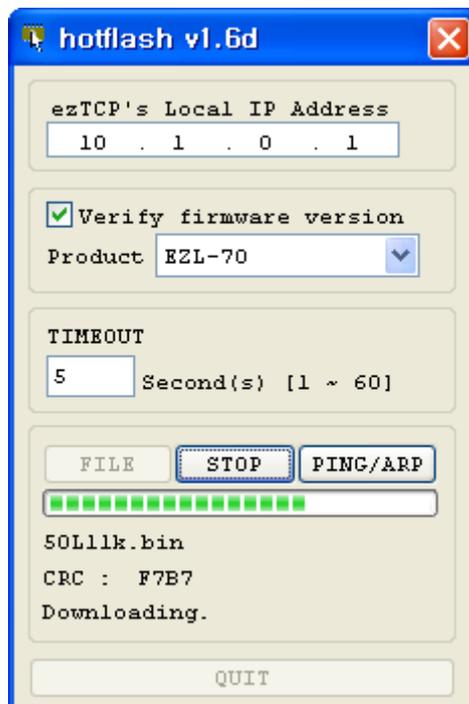
- After completion, a message that informs the firmware was downloaded successfully. And EZL-70 reboots automatically and run in Normal Mode. In Normal Mode, the yellow LED is blinked every 1 second.
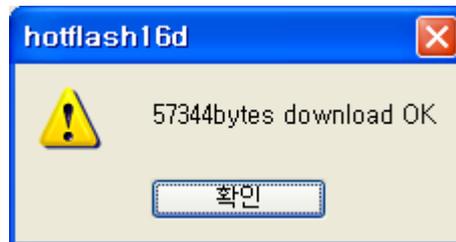
- After completion download, reset after ISP jumper open.

5. Normal Communication Mode

5.1.   T2S – TCP Server

When a host connects to predefined local port, the EZL-70 accepts a TCP connection. When the EZL-70 accepts TCP connection, then the TCP connection is established. After connection is established, TCP/IP processing is performed on the data coming to the serial port, which is then transmitted to the remote host. And the TCP/IP data coming from the remote host is TCP/IP-processed and transmitted to the serial port to establish data communication. (Data coming to the serial port before TCP connection is established will be ignored.)

To limit the peer host, user should set [Allowed IP Address]. The only pre-defined host can be accessible. If [Allowed IP Address] is 0.0.0.0, any host can connect to EZL-70.

<T2S connection sequence>
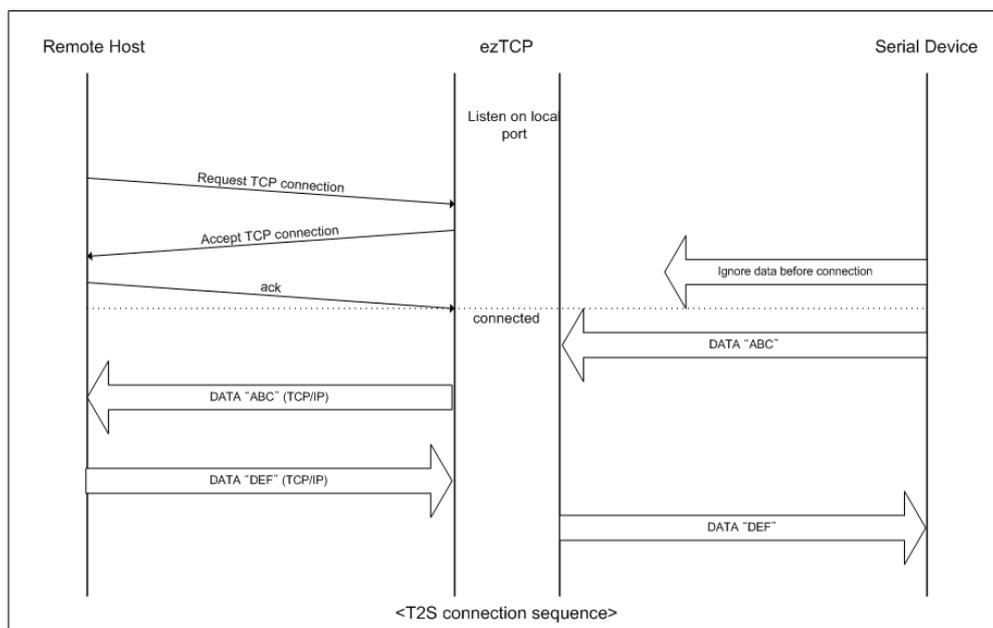
Set the following for T2S mode:

	Item	Description
IP Address Relate Items	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of Gateway
	Local Port	Port number for waiting to be connected
	Allowed IP Address	Allowed host to connect (if set to 0.0.0.0, any host can connect)
Serial Port	Baud Rate	Serial port speed (bps)
	Data Bits	Data Bits
	Parity	Parity
	Stop Bit	Stop Bit
	Flow Control	Flow control
Communication Mode	ezTCP Mode	Communication Mode (T2S(0))
Disconnection	Timeout	Limit time to keep connection
Configuration Method	ezConfig	Enable ezConfig function.
	Password	ezConfig password.
Dynamic IP	DHCP	Select to receive IP address as DHCP.
	PPPoE	Select to receive IP address as PPPoE.

5.2.   ATC

In ATC mode, the user can control the EZL-70 in a similar way to controlling the modem using AT command. In ATC mode, only a TCP connection is possible and both the server and the client can be configured.

In ATC mode, the AT command allows the user to set environment variables including the IP address and control TCP connection and disconnection.

<ATC connection sequence - active connection>

<ATC connection sequence - passive connection>
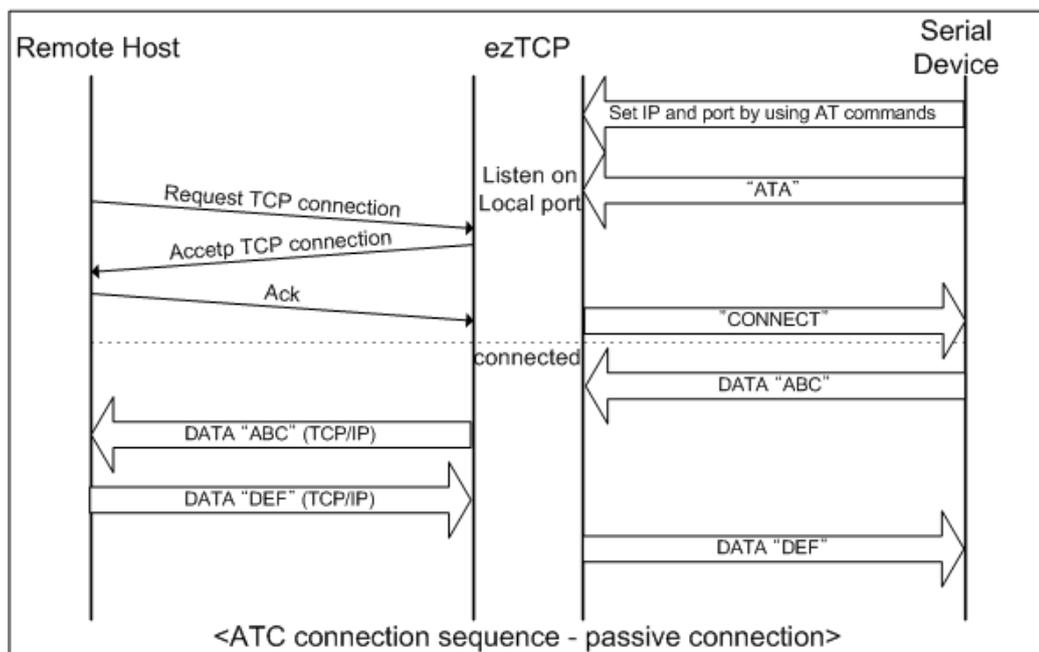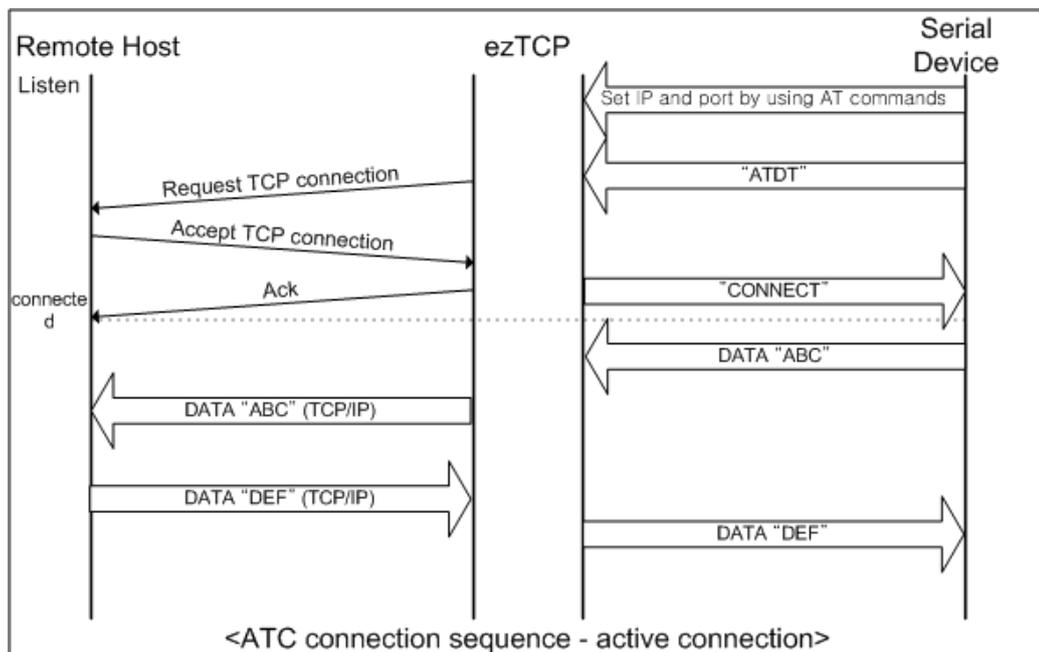
Set the following for ATC mode.

	Item	Description
IP Address Relate Items	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of Gateway
	Local Port	Port number for waiting to be connected in Server mode
	Peer IP Address	Peer IP address to connect
	Peer Port	Peer port number to connect
Serial Port	Baud Rate	Serial port speed (bps)
	Data Bits	Data Bits
	Parity	Parity
	Stop Bit	Stop Bit
	Flow Control	Flow control
Communication Mode	ezTCP Mode	Communication mode(ATC(1))
Disconnection	Timeout	Limit time to keep connection
Configuration Method	MAC Address Search	Enable ezConfig function.
	Password	ezConfig password.
Dynamic IP	DHCP	Select to receive IP address as DHCP.
	PPPoE	Select to receive IP address as PPPoE.

☞ *See "6. ATC Mode" for more information.*

5.3.   COD – TCP Client

In COD mode, the EZL-70 functions as a client.

When data of the pre-specified size [Event Byte] comes to the serial port, the EZL-70 attempts a TCP connection to the TCP port [Peer Port] of the preset host IP [Peer IP Address]. If the remote host accepts the TCP connection, TCP connection will be established. Data coming to the serial port after connection establishment is TCP/IP-processed and transmitted to the remote host. And, data coming from the remote host is TCP/IP-processed and transmitted to the serial port for data communication.

<COD connection sequence – Conn.Byte: 3>
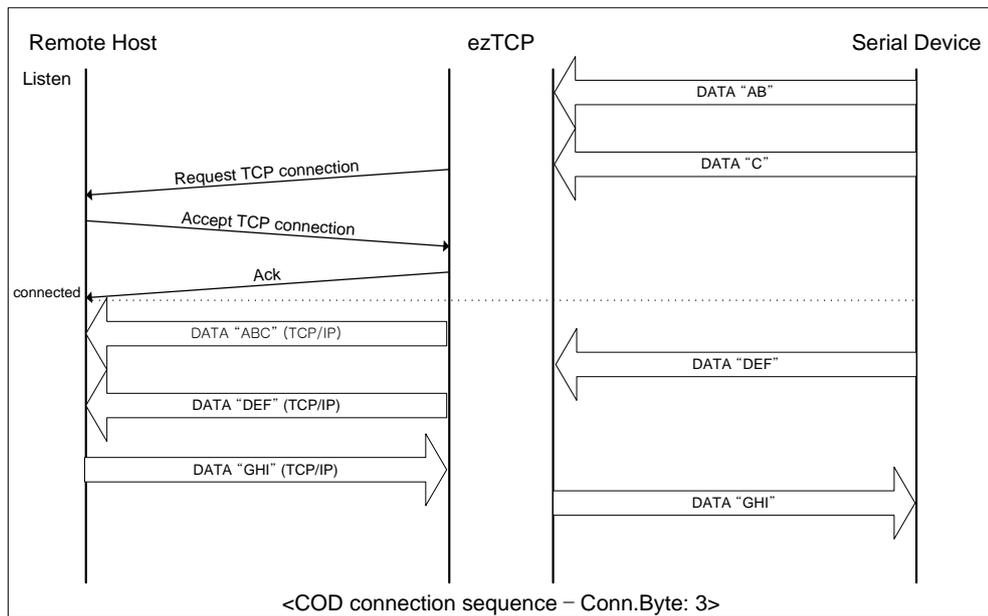
Set the following for COD mode.

	Item	Description
IP Address Related Item	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of Gateway
	Peer IP Address	Peer IP address to connect
	Peer Port	Peer port number to connect
Serial Port	Baud Rate	Serial port speed (bps)
	Data Bits	Data Bits
	Parity	Parity
	Stop Bit	Stop Bit
	Flow Control	Flow control
Communication Mode	ezTCP Mode	Communication mode(COD(2))
Connection/ Disconnection	Event Byte	Bytes for starting to connect
	Timeout	Limit time to keep connection
Configuration Method	ezConfig	Enable ezConfig function.
	Password	ezConfig password
Dynamic IP Address	DHCP	Select to receive IP address as DHCP.
	PPPoE	Select to receive IP address as PPPoE.

5.4.   U2S – UDP

U2S mode allows for UDP communication.

In UDP mode, data are transmitted in blocks, which require dividing data coming to the serial port into blocks before transmitting data. A procedure for dividing data into blocks is as follows:

If data of pre-specified bytes [Block Size] comes to the serial port of the ezTCP or if a specified period of time [Block Interval] elapses after first data reception, all data received for the same period is recognized as one block which is then transmitted to the UDP. The [Block Interval] unit is 10ms. If [Block Interval] is set to 2, the time period is between 20ms and 30ms.

Since UDP communication does not require a connection procedure, the user can establish N-to-M communication via multicast and broadcast.

<U2S Transmission sequence - Block:3, Interval: 1>
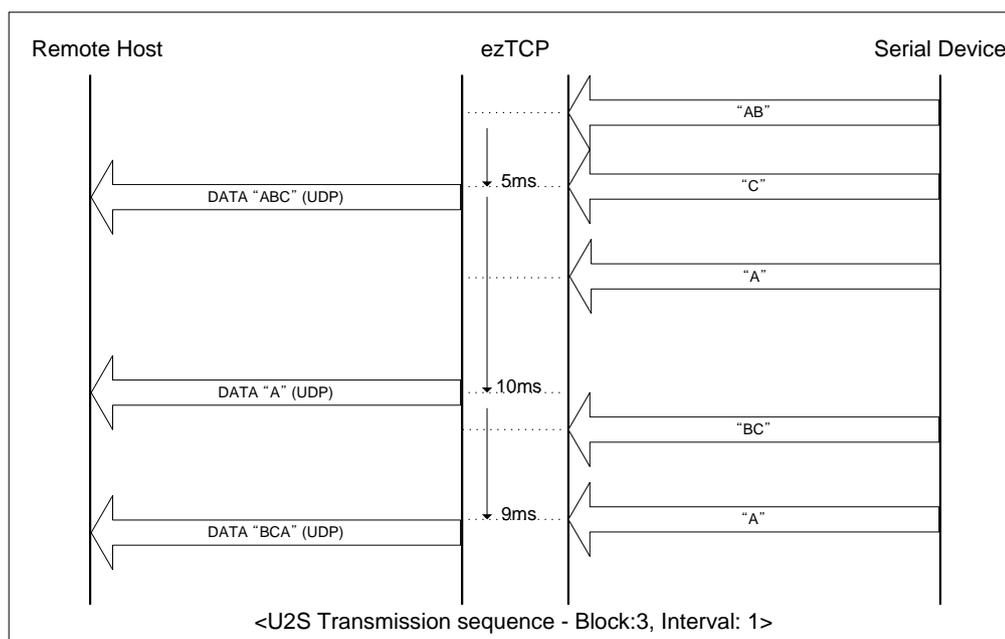
Set the following for U2S mode.

	Item	Description
IP address Related Item	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of Gateway
	Local Port	Port number for UDP data receiving
	Peer IP Address	Peer IP address to transmit
	Peer Port	Peer port number to transmit
Serial Port	Baud Rate	Serial port speed (bps)
	Data Bits	Data Bits
	Parity	Parity
	Stop Bit	Stop Bit
	Flow Control	Flow control
Communication Mode	ezTCP Mode	Communication mode(U2S(3))
Packets	Block Size	UDP block size to transmit (unit: byte)
	Block Interval	Data gathering time from serial port to transmit as UDP (unit:10ms)
Configuration Method	ezConfig	Enable ezConfig function.
	Password	ezConfig password.

In addition, if you set the peer IP address and peer port to 0, EZL-70 automatically use the source IP address and port information in the latest received UDP packet as the peer IP and port. This function is available on 1.2A or subsequently released firmware version.

6. ATC Mode

6.1.   Overview

EZL-70 can be controlled by AT commands in ATC mode. For example, the peer host IP address can be set by AT+PRIP command and connect to the host by ATD command.

Therefore, EZL-70 communicates several hosts alternatively.

And also, it provides passive connection function by ATA command.

6.1.1. AT command format

AT Command starts with 'AT' and it ends with '<CR>'.

AT command form is as the following

AT	Command	<CR>(0x0d)

Result code for AT command is as the following

<CR>(0x0d)	<LF>(0x0a)	Result Code	<CR>(0x0d)	<LF>(0x0a)

Result Code – default settings is the 'ATV1'.

ATV1	ATV0	Description
OK	0	Command OK
CONNECT	1	TCP Connected
NO CARRIER	3	TCP Disconnected
ERROR	4	Command Error
NO ANSWER	8	No response from the remote host(PING)
Setting values	Setting values	Query currently setting values (Example: 192.168.1.200 For AT+PRIP? Commands)

6.2.   Basic AT Command Set (Example: ATA, ATD etc.)

Command	Description	Comments
A	Passive connection	Wait for connection request from the remote host (The remote host → EZL-70)
D	Active connection	EZL-70 connects to the remote host (EZL-70 → The remote host)

E	Echo / No Echo	Decide whether to echo commands to serial port (E0 – No Echo, E1 – Echo)
H	Off hook	TCP Connection Close
I	Information	Returns the information of EZL-70 ATI3: Firmware version ATI7: MAC address
O	Return Online	Go back On-line state from Command state
Q	Quiet Mode	Decide whether to return result codes (Q0: Displays result codes Q1: Disable response to serial port)
S	S Register	S2: Escape Code(default: 43) S3: Carriage Return Code(default: 13) S4: Line Feed Code(default: 10) S5: Backspace Code(default: 8) S9: PING Test timeout(default: 6) S12: Escape Code Guard Time(default: 50)
V	Type of result codes	Result codes form (Numeric form – V0,Letter form – V1)
Z	Reset	Reset

6.3.　　Extended AT Command Set (Example: AT+PLIP etc.)

Command	Description	Comments
+PLIP	Local IP address	
+PSM	Subnet Mask	
+PGIP	Gateway IP address	default router
+PLP	(TCP)Listening Port	
+PTO	Time Out	
+PRIP	Remote host IP address	
+PRP	Remote host (TCP)port	
+PWP	Write Parameters to EEPROM	Save currently setting values
+PPNG	PING	PING Test
+PRC	Enable ezConfig function	ON: 1, OFF: 0
+PARP	Obtain an IP from the first received packet	ON: 1, OFF: 0

+PDC	Obtain an IP automatically (DHCP)	ON: 1, OFF: 0
+PSE	Set sending +++ Data	ON: 1, OFF: 0

When values for this category is changed, it must be saved with AT+PWP command.

6.4.   On-line State and Command State

The ezTCP can operate in either Command State or On-line State.

- ● 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 changes to On-line State. Incoming serial data is sent to the remote host.

In On-line State, user cannot send AT commands. In order to use AT commands during TCP connection, user must change to Command State.

☞   *For more details about state change, refer 6.4.1~2.*

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

6.4.1. 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.

Users can decide to send +++ data 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

	Commands		Description
Data Communication (During TCP connection)			
	[guard time]+++[guard time]	▶	Change to Command State from On-line State
◀	<CR><LF>OK<CR><LF>		Conversion to Command State

			complete

6.4.2. 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.

	Commands		Description
	Data Communication (During TCP connection)		
	[guard time]+++[guard time]	▶	Change to Command State from On-line State
◀	<CR><LF>OK<CR><LF>		Command State
	~ Command State(wait for user AT command) ~		
	ATO<CR>	▶	Go back On-line State
◀	<CR><LF>CONNECT<CR><LF>		On-line State

6.5.   Configure with Basic AT Commands

	Commands		Description
	ATS2?<CR>	▶	Escape Code?
◀	<CR><LF>43<CR><LF>		'+'(=43 = 0x2b)
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATS2=61<CR>	▶	Change the Escape Code to '='(= 61)
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATS12=40<CR>	▶	Change the Escape Code Guard Time to 40(400ms)
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATI3<CR>	▶	Return firmware version
◀	<CR><LF>Sollae Systems Co.,Ltd. ezTCP/LAN Atmega Rev.1.1K<CR><LF>		
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATI7<CR>	▶	Return the MAC address of EZL-70
◀	<CR><LF>0:30:F9:0:0:1<CR><LF>		Return the MAC address of EZL-70

◄	\<CR\>\<LF\>OK\<CR\>\<LF\>		Command process OK
	ATV0\<CR\>	►	Return result code in Number
◄	\<CR\>\<LF\>0\<CR\>\<LF\>		Command process OK
	ATQ1\<CR\>	►	No result code
No result code			
	ATZ\<CR\>	►	Reset
◄	\<CR\>\<LF\>OK\<CR\>\<LF\>		Command process OK

6.6.　　Configure with Extended AT Commands

	Commands		Description
	AT+PLIP=192.168.1.200\<CR\>	►	LOCAL 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+PGIP=192.168.1.254\<CR\>	►	GATEWAY IP address 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

6.7.　　Example of TCP Connection

6.7.1. Example for Active Connection – TCP Client

The ezTCP operates as TCP client like COD(2) ezTCP Mode. The below is the process of connecting to TCP server (IP address: 192.168.1.201, Port number: 1470)

	Commands		Description

	Commands		Description
	AT+PRIP=192.168.1.201<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
	ATDT<CR>	▶	Connecting to the remote host
Attempt connection to the remote host			
◀	<CR><LF>CONNECT<CR><LF>		TCP connection success
Data Communication			

6.7.2. Example for passive Connection – TCP Server

The ezTCP operates as TCP server like T2S(0) ezTCP Mode. The below is the example of setting as TCP server on 1470 port.

	Commands		Description
	AT+PLP=1470<CR>	▶	Set LOCAL PORT to listen
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATA<CR>	▶	Wait for connection request
Wait for connection request from the remote host			
The remote host connects to EZL-70			
◀	<CR><LF>CONNECT<CR><LF>		TCP Connection OK
Data Communication			

6.8. Example for TCP Disconnection

6.8.1. Example for active disconnection

When EZL-70 attempts to close the connection,

	Commands		Description
Data Communication (During TCP connection)			
	[guard time]+++[guard time]	▶	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

6.8.2. Example for passive disconnection

When the remote host attempts to close the connection,

	Commands		Description
Data Communication (During TCP connection)			
The remote host attempts to close the connection			
◀	<CR><LF>NO CARRIER<CR><LF>		TCP connection is closed

6.9. Example of PING Test

	Commands		Description
	AT+PLIP=192.168.1.200<CR>	▶	LOCAL 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+PGIP=192.168.1.254<CR>	▶	GATEWAY IP address setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PPNG=218.49.xxx.xxx<CR>	▶	Start PING Test
◀	<CR><LF>NO ANSWER<CR><LF>		No response from the remote host
	ATS9=3<CR>	▶	Change timeout of PING Test 6s (default setting) -> 3s
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PPNG=218.49.xxx.xxx<CR>	▶	Start PING Test
◀	<CR><LF>OK<CR><LF>		Receive the response from the remote host

7. Technical Support, Warranty, and Precautions

7.1.　Technical Support

If there are any questions regarding the product, please use FAQ or Q/A board in Sollae Systems' homepage. Also, feel free to contact us by email

Customer support homepage address: http://www.eztcp.com/en/support/

Email address: support@sollae.co.kr

7.2.　Warranty

7.2.1. Refund

If user demands refund within 2 weeks of purchase, the product will be refunded

7.2.2. Free A/S

If product malfunctions within 2 year of purchase, repair and product exchange will be done without charge.

7.2.3. Charged A/S

Products after 2 year of purchase or product malfunctions due to user's miss care will be repaired and exchanged with charge.

7.3.　Precautions

● If the product is modified, it is no longer guaranteed.

● Specifications of the product may be changed without prior notice.

● If the product is used for functions that are not covered by the product, the product is no longer guaranteed as well.

● All kind of Reverse Engineering is prohibited.

● It prohibits the use of firmware and provided applications for other purpose.

● Do not use the product in extreme temperature or vibration conditions.

● Do not use the product in highly humid and oily environment.

● Do not use the product in combustible or corrosive gas environment.

● The product functions are not guaranteed in environments with too much noise.

● Do not use this product for special cases requiring high quality and reliability such as space raveling, airplane, medicine, nuclear power, transportation, and other safety devices.

● If accidents or loss may occur using this product, Sollae Systems will not be liable for any compensation.

8. Ordering Information

Product	Description	Etc.
EZL-70-BO	RoHS Compliant	
EZL-70(A)-BO	RoHS Compliant	

9. Revision History

Date	Version	Comments	Author
Apr.20.2006	1.1	○ Initial Release	
May.29.2008	1.2	○ Add AT command(+ppng) ○ Modify T2S, ATC, COD and U2S description ○ Correct Some expressions and Screenshots	
Oct.27.2008	1.3	○ Add features description(Slow TX, Reset, Close TCP) ○ Add ezConfig button description ○ Modify Ordering Information ○ Add description of ATC active/passive connection ○ Modify description of the firmware download ○ Correct Some Expressions and Screenshots	
Nov.11.2008	1.4	○ Slow TX → TX Delay ○ Add "Create ezVSP's port" button description ○ Correct Screenshots of ezConfig	
Feb.18.2009	1.5	○ Add description about U2S echo ○ Correct some expressions	
Feb.25.2009	1.6	○ Add DC Electric Characteristics	
Mar.31.2009	1.7	○ Modify the table of 1.8.1 RJ45, Power LED ○ Correct some expressions ○ Modify home page link of 8.1 Technical Support ○ Correct descriptions of ATC mode	
Sep.24.2009	1.8	○ Modified related figure with ezConfig (4.4f) ○ Add descriptions of 3 functions including Send MAC Address ○ Remove the description about button of ezConfig ○ Add the description of AT+PSE command ○ Correct some expressions ○ Added Mark and Space parity	
Jan.15.2010	1.9	○ The option of 2 stop bits has been added	Roy LEE
Mar.26.2010	2.0	○ Some wrong expressions have been corrected	Roy LEE

Apr.14.2010	2.1	◯ Description of timeout option has been added	Roy LEE
Oct.01.2010	2.2	◯ Contents about EZL-70(A) have been added	Roy LEE
Mar.14.2013	2.3	◯ Description of RS485 Ground has been added	Lisa Shin
Dec.26.2013	2.4	◯ Correct some expressions	Lisa Shin
2018.04.17	2.5	◯ Modify the description of serial	Peter Lee