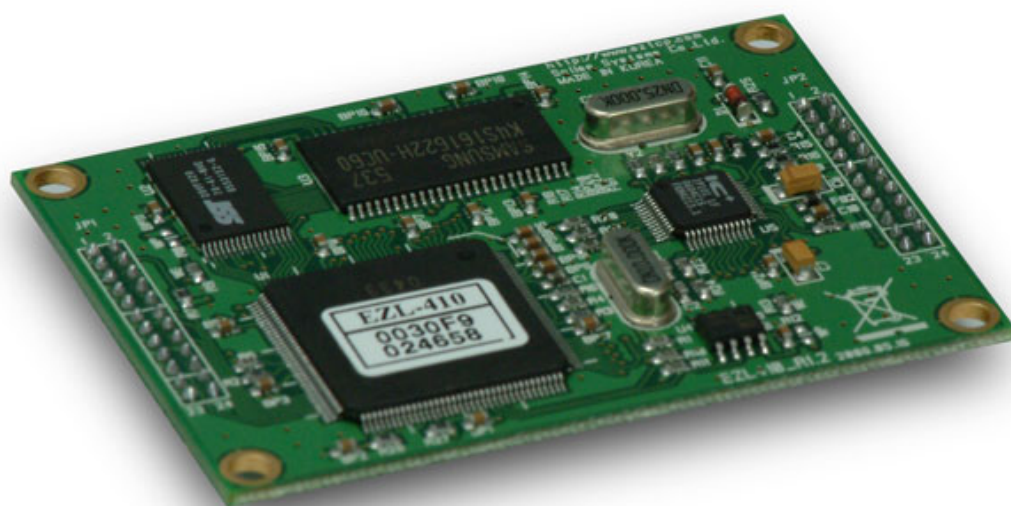


EZL-410 User's Manual

Version 1.2



Sollae Systems Inc.



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.

-Table of Content -

1. OVERVIEW.....	- 5 -
1.1. OVERVIEW	- 5 -
1.2. COMPONENTS.....	- 6 -
1.3. SPECIFICATIONS	- 6 -
1.3.1. <i>Dimension</i>	- 7 -
1.3.2. <i>Pin Configuration</i>	- 8 -
1.3.3. <i>Application Circuit</i>	- 10 -
1.3.4. <i>Network Interface</i>	- 11 -
1.3.5. <i>Serial Interface</i>	- 11 -
2. INSTALLATION AND TEST RUN	- 12 -
2.1. INSTALLATION METHOD.....	- 12 -
2.1.1. <i>Checking the Communication Environment</i>	- 12 -
2.1.2. <i>Connecting to the Network</i>	- 13 -
2.1.3. <i>Configuring the Environmental Variables</i>	- 13 -
2.2. TEST RUN.....	- 13 -
2.2.1. <i>Changing PC IP Address</i>	- 13 -
2.2.2. <i>Installing EZL-410</i>	- 13 -
2.2.3. <i>Connecting to Serial Port of PC</i>	- 13 -
2.2.4. <i>Communication Test</i>	- 13 -
3. CONFIGURING ENVIRONMENTAL VARIABLES.....	- 15 -
3.1. CONFIGURATION WITH EZCFGMP	- 15 -
3.1.1. <i>Local Search</i>	- 15 -
3.1.2. <i>Remote Search</i>	- 16 -
3.1.3. <i>The differences between LOCAL SEARCH and REMOTE SEARCH</i>	- 17 -
3.1.4. <i>Configuring with ezcfgmp</i>	- 17 -
3.2. CONFIGURATION BY CONSOLE	- 22 -
3.2.1. <i>Entering the Console of EZL-410</i>	- 22 -
3.2.2. <i>Menu Structure</i>	- 22 -
4. THE OPERATION MODE OF EZL-410.....	- 25 -
4.1. NORMAL COMMUNICATION MODE	- 25 -
4.2. ISP MODE	- 25 -
5. NORMAL COMMUNICATION MODE	- 28 -

5.1.	T2S	- 28 -
5.1.1.	<i>Communication</i>	- 28 -
5.1.2.	<i>Connection Termination and Keep Alive Function</i>	- 28 -
5.2.	ATC	- 29 -
5.3.	COD	- 30 -
5.3.1.	<i>Communication</i>	- 30 -
5.3.2.	<i>Connection Termination and Keep Alive Function</i>	- 30 -
5.3.3.	<i>Reconnection</i>	- 30 -
5.4.	U2S.....	- 31 -
6.	ATC MODE	- 32 -
6.1.	OVERVIEW	- 32 -
6.1.1.	<i>AT command format</i>	- 32 -
6.2.	BASIC AT COMMAND SET (EXAMPLE: ATA, ATD ETC.)	- 32 -
6.3.	EXTENDED AT COMMANDS (EXAMPLE: AT+PLIP ETC.)	- 33 -
6.4.	ONLINE STATE AND ONLINE COMMAND STATE	- 33 -
6.4.1.	<i>Changing Online State to Online Command State</i>	- 33 -
6.4.2.	<i>Changing Online Command State to Online State</i>	- 33 -
6.5.	EXAMPLE OF TCP CONNECTION	- 34 -
6.5.1.	<i>Example of Active Connection</i>	- 34 -
6.5.2.	<i>Example of passive Connection</i>	- 34 -
6.6.	EXAMPLE OF TCP DISCONNECTION	- 34 -
6.6.1.	<i>Example of active disconnection</i>	- 34 -
6.6.2.	<i>Example of passive disconnection</i>	- 35 -
7.	TECHNICAL SUPPORT, WARRANTY, AND NOTES ON OPERATION.....	- 36 -
7.1.	TECHNICAL SUPPORT	- 36 -
7.2.	WARRANTY	- 36 -
7.2.1.	<i>Refund</i>	- 36 -
7.2.2.	<i>Free Repair Services</i>	- 36 -
7.2.3.	<i>Charged Repair Services</i>	- 36 -
7.2.4.	<i>Notes on Operation</i>	- 36 -
8.	ORDERING INFORAMTION.....	- 38 -
9.	REVISION HISTORY	- 39 -

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-410 in ezTCP product group is a product that provides TCP/IP communication through wired or wireless LAN. In other words, like other ezTCP products, EZL-410 sends data from the serial port to the wired or wireless LAN after TCP/IP processing and vice versa.

EZL-410 has 4 serial ports therefore it provides TCP/IP function to 4 serial devices.

It provides not only DHCP but also PPPoE, so that it can be applied to the cable network and the xDSL network.

As EZL-410 provides SSL security function, it can be used in a system that requires a high level of security.

It is a modular type and 3.3V power is required.

1.2. Components

- EZL-410 Body
- EZL-410 EVB (option)
- 5V Power Adopter (Option)
- RS232C cable for PC connection (Option)

1.3. Specifications

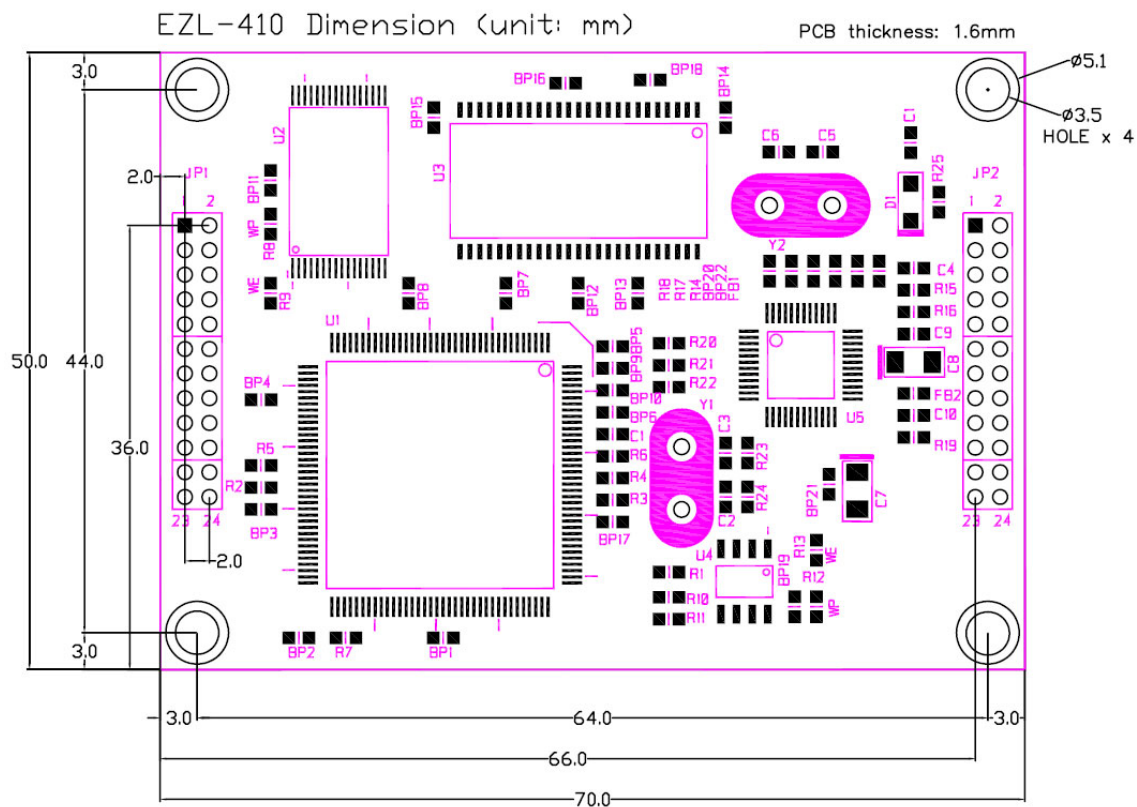
Power	Input Voltage	3.3V ($\pm 10\%$)
	Current	300mA typical
Dimension	70mm x 50mm x 9mm	
Weight	About 18g	
Interface	Serial	2x12 2.0mm pitch header
	Network	2x12 2.0mm pitch header (10/100Base-TX)
Serial Port	3.3V TTL (600bps ~ 115200 bps)	
Network	10/100Base-TX	
Protocols	TCP, UDP, IP, ICMP, ARP, DHCP, PPPoE, SSL	
Communication Mode	T2S	TCP Server Mode
	COD	TCP Client Mode
	ATC	TCP Server/Client Mode (AT command emulation)
	U2S	UDP
Utilities	ezcfgmp	Configuration Utility via LAN
	ezterm	Socket Test Program
	Hotflash	Firmware download utility via TFTP



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

1.3.1. Dimension

EZL-410 is a modular type and it has two 2mm pitch 2x12 male headers (JP1, JP2).



1.3.2. Pin Configuration

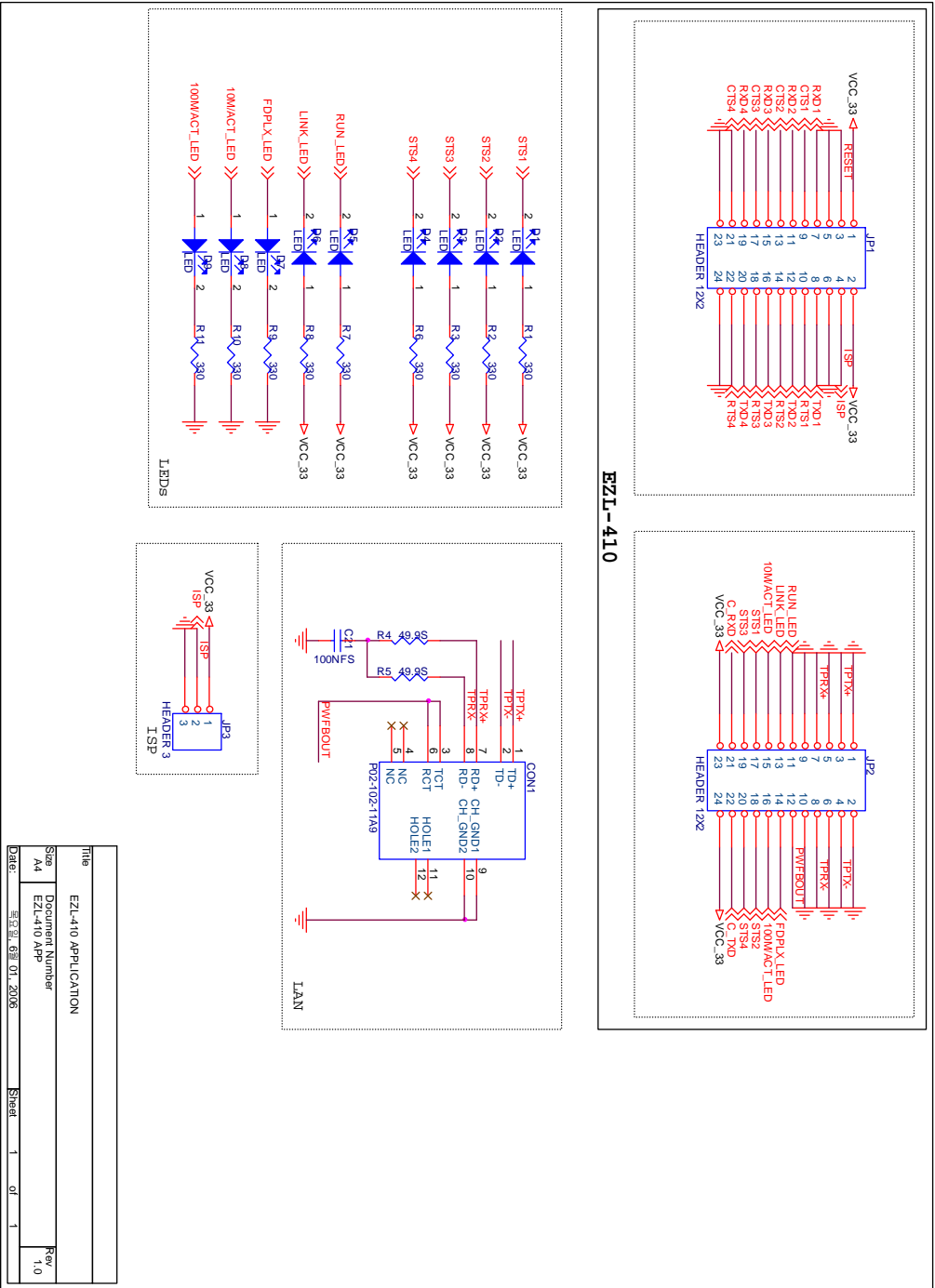
- JP1

Num	Name	I/O	Descriptions
1	VCC_33	PWR	3.3V Power
2	VCC_33	PWR	3.3V Power
3	RESET#	I	Reset (Active Low)
4	ISP#	I	Low: Firmware download mode when EZL-410 boots up High: Normal mode (Internally pull-up)
5	GND	GND	Ground
6	GND	GND	Ground
7	RXD1	I	Receive Data from Serial Port 1 (COM1)
8	TXD1	O	Transmit Data to Serial Port 1 (COM1)
9	CTS1	I	Clear To Send 1 (COM1)
10	RTS1	O	Request To Send 1 (COM1)
11	RXD2	I	Receive Data from Serial Port 2 (COM2)
12	TXD2	O	Transmit Data to Serial Port 2 (COM2)
13	CTS2	I	Clear To Send 2 (COM2)
14	RTS2	O	Request To Send 2 (COM2)
15	RXD3	I	Receive Data from Serial Port 3 (COM3)
16	TXD3	O	Transmit Data to Serial Port 3 (COM3)
17	CTS3	I	Clear To Send 3 (COM3)
18	RTS3	O	Request To Send 3 (COM3)
19	RXD4	I	Receive Data from Serial Port 4 (COM4)
20	TXD4	O	Transmit Data to Serial Port 4 (COM4)
21	CTS4	I	Clear To Send 4 (COM4)
22	RTS4	O	Request To Send 4 (COM4)
23	GND	GND	Ground
24	GND	GND	Ground

● JP2

Num	Name	I/O	Descriptions
1	GND	GND	Ground
2	GND	GND	Ground
3	TPTX+	O	Ethernet Out+
4	TPTX-	O	Ethernet Out-
5	GND	GND	Ground
6	GND	GND	Ground
7	TPRX+	I	Ethernet In+
8	TPRX-	I	Ethernet In-
9	GND	GND	Ground
10	GND	GND	Ground
11	RUN_LED	O	Status of EZL-410 LED (Active Low)
12	PWFBOUT	O	Should be connected as example
13	LINK_LED	O	Ethernet LINK(Active Low)
14	FDPLX_LED	O	Full duplex LED (Active High)
15	10M/ACT_LED	O	10M activity LED (Active High)
16	100M/ACT_LED	O	100M activity LED (Active High)
17	STS1	O	Status 1 (Low when TCP connected to serial 1 port)
18	STS2	O	Status 2 (Low when TCP connected to serial 2 port)
19	STS3	O	Status 3 (Low when TCP connected to serial 3 port)
20	STS4	O	Status 4 (Low when TCP connected to serial 4 port)
21	C_RXD	I	Debugging Console (Factory use only)
22	C_TXD	O	Debugging Console (Factory use only)
23	VCC_33	PWR	3.3V Power
24	VCC_33	PWR	3.3V Power

1.3.3. Application Circuit



1.3.4. Network Interface

EZL-410 senses the network speed (100M bps or 10M bps). And it senses 1:1 ethernet cable and cross over cable automatically (auto MDI/MDIX).

EZL-410 requires simple circuit for Ethernet interface. Refer to 1.3.3.

All Ethernet devices has its hardware address (MAC address). EZL-410 also has a hardware address. The address is set in our factory.

1.3.5. Serial Interface

EZL-410 supports 4 serial ports. The serial port of EZL-410 is 3.3V level. To communicate with 5V device or RS232/RS422/RS485, additional circuits are required.

User can set IP addresses to each serial port separately or set an IP address for all serial ports.

2. Installation and Test Run

2.1. Installation Method

You can install EZL-410 in the following steps.

Title	Item	Sub-item	Description
1. Checking the communication environment	Check items	Network environment	3.1.4.
		Serial port settings	3.1.4.
		Application program to be used	4.
2. Connecting to the network	Check method	Check if LINK LED is ON.	1.3.4.
3. Configuring the environmental variables	Configuration method	Set by ezcfgmp, a utility program for configuration through the network.	3.1.
		Setting in console	3.2.
		By arp (Temporarily set IP address only)	
	Configuration items	IP address related items	3.1.4.
		Serial port related items	3.1.4.
		Communication mode (Decided depending on application program)	5.
4. Application to the field			

2.1.1. Checking the Communication Environment

Before installing EZL-410, check the network environment where EZL-410 is to be installed, including the followings matters:

- IP address environment (local IP, subnet mask, gateway, etc.)
- Serial port type of the equipment to which EZL-410 is going to be connected (RS232, RS422, RS485)
- Serial port items of the equipment to which EZL-410 is going to be connected (baud rate, data bit, parity, stop bit)
- Application program protocol to be used (TCP/UDP, server/client, SSL, etc.)

☞ For application program protocol to be used, see “5. Normal Communication Mode”.

2.1.2. Connecting to the Network

Connect EZL-410 to a hub that user want to connect.

2.1.3. 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 by ezcfgmp or console.

☞ *For environmental variable configuration, see “3. Configuring Environmental Variables.”*

2.2. Test Run

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 and user uses an EZL-410-EVB that is an evaluation board for EZL-410.

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. Installing EZL-410

Connect the EZL-410 with the PC through the crossed LAN cable.(When connecting through a hub, use a one-to-one cable for this connection.) If Link LED of the LAN is on, the connection is OK.

2.2.3. Connecting to Serial Port of PC

Connect the EZL-410 with the PC through the RS232 cable. And run a serial communication utility – for example: Hyper Terminal or Tera Term Pro. And set the configuration of the utility to [19200bps, 8 data bits, 1 stop bit, no flow-control] as same as configuration values of EZL-410.

Then the preparation of test is completed.

2.2.4. 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"

Enter "123" on the Telnet window, and "123" will appear on the serial communication utility. Enter "ABC" on the serial communication utility, and "ABC" will appear on the Telnet window. Otherwise, communication test fails.

3. Configuring Environmental Variables

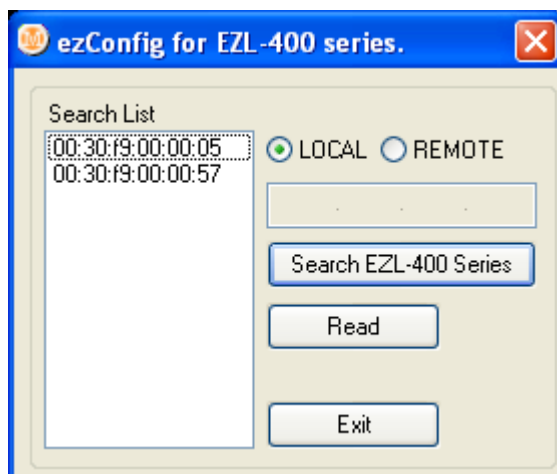
3.1. Configuration with ezcfgmp

The Ezcfgmp is configuration utility of EZL-410 via the network. There are two methods of communication for EZL-410 – LOCAL SEARCH and REMOTE SEARCH. The LOCAL SEARCH method searches EZL-410 in the local network with UDP local broadcast. And the REMOTE SEARCH method searches EZL-410 in any network with IP address if the network is connected to the user's network.

3.1.1. Local Search



The LOCAL SEARCH method use UDP local broadcast with MAC address. So its benefit is that user can search EZL-410 although the user doesn't know the IP address of EZL-410. For LOCAL SEARCH, user should select [LOCAL] radio button and press [Search EZL-400 Series]. Then the ezcfgmp searches all EZL-410es in the local network. The found EZL-410es appear in the [Search List] window in form of its MAC address.

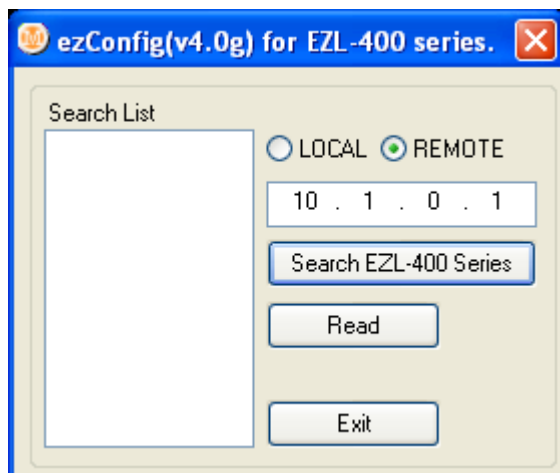


If user clicks the MAC address of among the EZL-410es and press [Read] button, the main windows will be appeared.

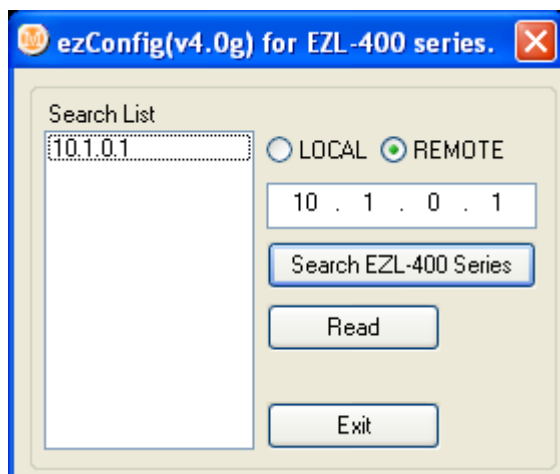
It is impossible to search EZL-410 outside of the network (router).

3.1.2. Remote Search

The REMOTE SEARCH method searches EZL-410 with the IP address. The [Remote Search] item should be activated for this method.



For the REMOTE SEARCH, user should select the [REMOTE] radio button in the initial window and input an IP address and press [Search EZL-400 Series], then the ezcfgmp searches EZL-410 with the IP address.



The found EZL-410 is appeared in the [Search List] window. If the user double-clicks the IP address or presses [Read] button, the main window is appeared.

When it doesn't work because of firewall, the user should open UDP 50005 port, because the REMOTE SEARCH of the ezcfgmp uses UDP 50005 port.

3.1.3. The differences between LOCAL SEARCH and REMOTE SEARCH

The following table shows the differences between LOCAL SEARCH and REMOTE SEARCH.

	LOCAL SEARCH	REMOTE SEARCH
Communication Method	UDP broadcast	UDP Unicast
Limitation	Inner local network	All regions connected with networks
Differentiation	MAC Address	IP Address
UDP Port Number	Random	50005
Advantage	Possible Searching and Configuration although user doesn't know the IP address	Possible Searching and Configuration if the network is connected
Defect	It can be used in the local network	1. User should know the IP address 2. Firewall problems can be occurred

3.1.4. Configuring with ezcfgmp

The following is the main window of the ezcfgmp. User can configure the EZL-410 in the main window more easily.

ezConfig(v4.0g) for EZL-400 series.

ezTCP Basic Settings

MAC Address: 00:30:f9:00:00:57 Unique IP Address: 10 . 1 . 0 . 1 Subnet Mask: 255 . 0 . 0 . 0 Gateway IP Address: 0 . 0 . 0 . 0

Multi IP: No IPv4 Type: Static IPv6 Type: Disable EAPoL: Disable Password: ☒ ARP ☒ TELNET ☐ HTTP ☐ SSL ☒ Remote Search

Multi Port Network Settings

Port	MUX Type	Local IP Address	Local Port	Peer IP Address	Peer Port	Timeout
COM1	T2S(0)	0 . 0 . 0 . 0	14700	0 . 0 . 0 . 0	1470	0
COM2	T2S(0)	0 . 0 . 0 . 0	14701	0 . 0 . 0 . 0	1470	0
COM3	T2S(0)	0 . 0 . 0 . 0	14702	0 . 0 . 0 . 0	1470	0
COM4	T2S(0)	0 . 0 . 0 . 0	14703	0 . 0 . 0 . 0	1470	0

Multi Port Serial Settings

Port	Baud Rate	Parity Bit	Data Bits	Stop Bit	Flow Control	Water Mark
COM1	19200	None	8	1	None	0
COM2	19200	None	8	1	None	0
COM3	19200	None	8	1	None	0
COM4	19200	None	8	1	None	0

Comment:

Read Status WLAN Setting PPPoE ID Change PWD Write Close

- MAC Address

It is the MAC address of EZL-410. This value is set in the factory and it cannot be altered.

- Unique IP Address

EZL-410 can use one IP address for four COM ports or the IP addresses can be set to each COM ports differently.

This item is for that EZL-410 uses only one IP address.

The [Multi IP] item is for whether EZL-410 user only one IP address or not.

- Subnet Mask

This item is for subnet mask of the network.

- Gateway IP Address

This item is for the gateway's IP address of the network.

- Multi IP

If this item is set as [Yes], each COM ports can have their own IP addresses. The IP addresses of each COM ports are configured in the [Local IP Address]. In this time, user should set its IP addresses as same subnet mask.

- IPv4 Type

User can select IP address types – static IP, DHCP, and PPPoE.

- IPv6 Type

It is reserved.

- EAPoL

It is reserved.

- Password

Password is used for that user configures EZL-410 with ezcfgmp or logins via telnet client. If EZL-410 is set with a password, user should input the password in this item to configure the EZL-410.

For changing the password, use [Change PWD].

- ARP

Sets whether to or not to set IP address using ARP protocol. When this item is selected, EZL-410 uses the destination IP address of the first packet coming to its MAC address as its own IP address temporarily.

- TELNET

Only when this item is enabled, you can log in Telnet, to control or monitor EZL-410 through the console.

- HTTP

It is reserved.

- SSL

This item shows whether SSL is enabled or not. But it can't be set with ezcfgmp but console with "env ext".

- REMOTE Search

To enable a REMOTE SEARCH function, set this item.

- MUX Type

This item is for setting the communication mode of EZL-410 among T2S, ATC, COD, and U2S.

- Local IP Address

If EZL-410 is set as multi IP address, this item is for the IP address of each COM ports. Each IP addresses should be in a same subnet.

- Local Port

It defines local ports of each COM ports.

- Peer IP Address

It defines peer IP addresses of each COM ports.

- Peer Port

It defines peer port of each COM ports.

- Timeout

When EZL-410 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 (unit: second)

- Baud Rate

It defines the speed of each COM ports.

- Parity

It defines Parity bit of each COM ports.

- Data Bits

It defines the length of Data bits of each COM ports.

- Stop Bit

It defines Stop bit of each COM ports.

- Flow Control

Selects flow control for the serial port (None, RTS/CTS).

- Water Mark

It defines a point of time to start connection when EZL-410 operates as COD. EZL-410 starts to connect to the host (Peer IP Address and Peer Port) of the designated host upon receiving as many data as specified by [Water Mark] bytes from the serial port.

- Comments

It Stores maximum 32 bytes user comment on the product. This item helps the user distinguishes each EZL-410 more easily.

- Read

User can read the environmental variables of EZL-410 by this button.

- Status

User can read current status of EZL-410 by this button for example version, total running time, and IP address, and total communication size.

- WLAN Setting

It is reserved.

- PPPoE, EAPoL ID

It defines ID of PPPoE or EAPoL, if EZL-410 is set as PPPoE or EAPoL.

- Change PWD

User can change the password of EZL-410 with this button.

- Write

User can write the setting values to EZL-410 with this button.

- Close

User can close main window of ezcfgmp.

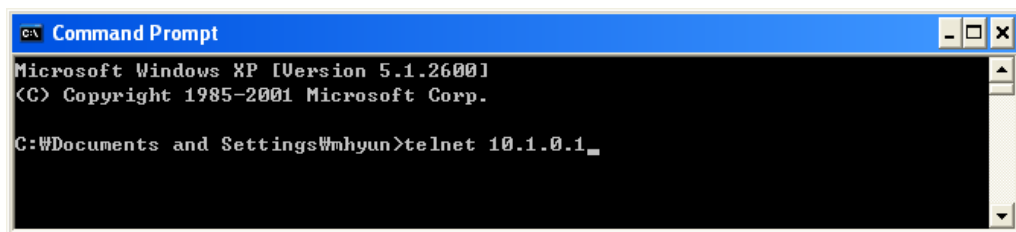
3.2. Configuration by Console

3.2.1. Entering the Console of EZL-410

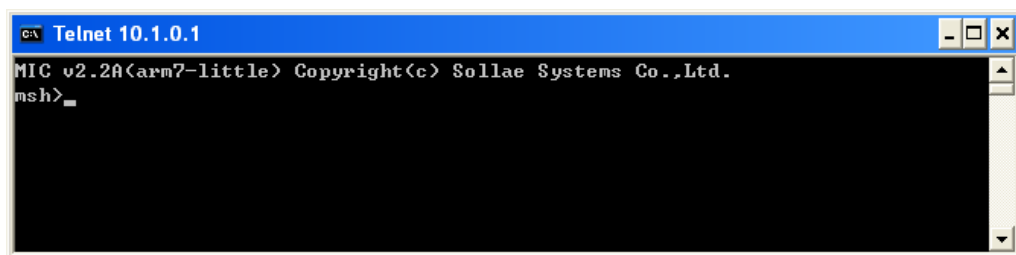
There are two methods to enter the console of EZL-410.

- Connecting by telnet

Input data in the command prompt of Windows as follows. The IP address should be the IP address of EZL-410.



If the connection is completed, the following message will be shown.



The telnet function should be set for telnet login.

3.2.2. Menu Structure

The commands to set the environmental variables of EZL-410 in Console Mode are 'env config' and 'env ext'.

If user inputs 'env config' in the Console Mode, the following will be shown.

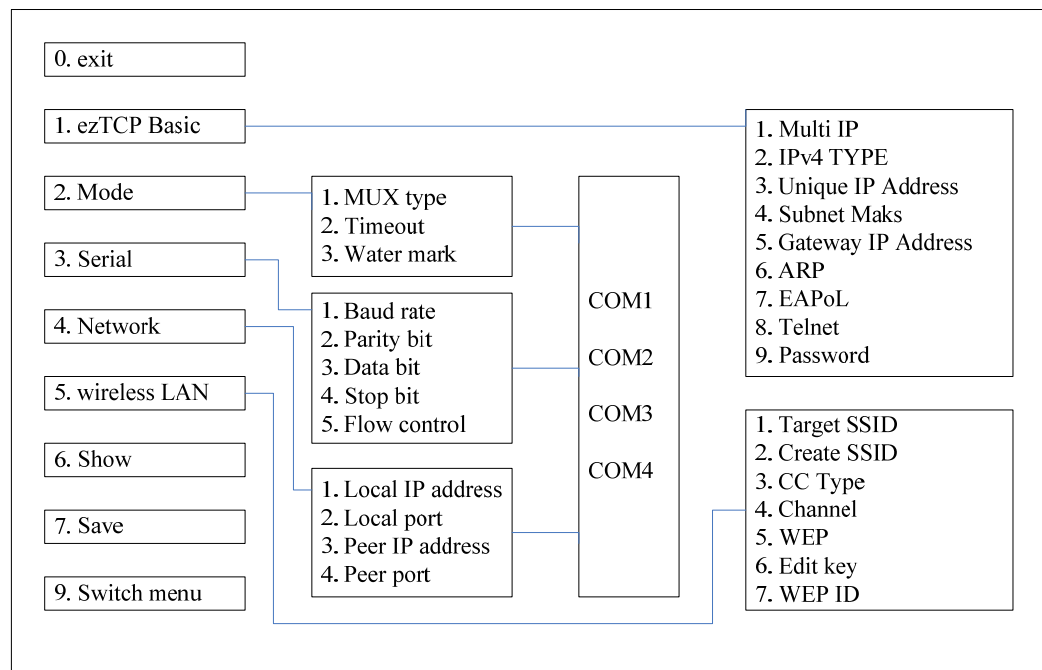
```

Teraterm Pro 19200bps - COM1 VT
File Edit Setup Control Window Help
MIC v2.2A(arm7-little) Copyright(c) Sollae Systems Co.,Ltd.
msh>env config

-----
ezTCP configuration
-----
0. exit
1. ezTCP basic configurations
2. mode configurations
3. serial configurations
4. network configurations
5. wireless lan configuratinos
6. show modified configurations
7. save configurations
9. switch to port by port menu
-----
select menu(0-9) : 

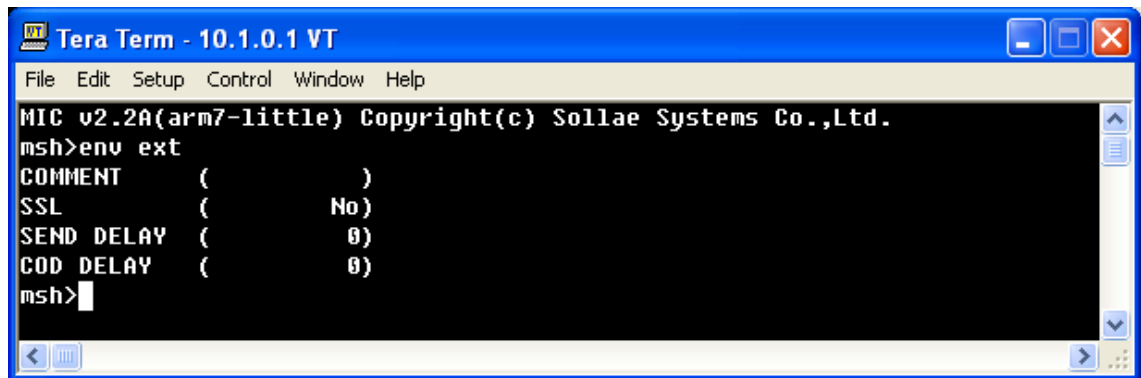
```

Its structure is followed:



✓ 5. wireless LAN menu has no concern with EZL-410. Do not set it.

If user inputs 'env ext' in the Console Mode, the following screen will be shown.



```
Tera Term - 10.1.0.1 VT
File Edit Setup Control Window Help
MIC v2.2A(arm7-little) Copyright(c) Sollae Systems Co.,Ltd.
msh>env ext
COMMENT      (      )
SSL           (      No)
SEND DELAY   (      0)
COD DELAY    (      0)
msh>
```

- COMMENT

It is same to [Comment] of ezConfigmp. User can differentiate EZL-410s with this value.

- SSL

SSL(Secure Socket Layer) is a security protocol. SSL operates over TCP, so it cannot used U2S mode(UDP). For more information, refer to other application note in our web site.

- SEND DELAY

UDP transmits data in type of block but TCP transmits data in stream type. So data order is important in TCP and block is meaningless in TCP. Basically EZL-410 gathers data from its serial port about 20 ms and send it to its network. (The gathering data time is called as nagle time.)

So if user programmed his software to process in block, the communication would be failed. The best way to solve this problem is to program to process in stream.

But if user can't modify his software, adjust this parameter. The unit is ms.

✓ EZL-410 sends data based on nagle timer, but if there is any packet loss in the network, EZL-410 might send more data than user expected. Because EZL-410 sends both loss data and new incoming data.

- COD DELAY

EZL-410 connect to the server as soon as it powers on if the [Water Mark] is 0. After disconnecting the connection, EZL-410 reconnect after 10 second. To change reconnection time, use this parameter (unit: second)

4. The Operation Mode of EZL-410

EZL-410 can operate in one of two modes (Normal Communication Mode, ISP Mode). Normal Communication Mode is ordinary data communication mode; ISP Mode is used to download its firmware from COM1 port. (User can upgrade EZL-410's firmware with hotflash(TFTP client) via Ethernet after login and pf command.)

4.1. Normal Communication Mode

Normal communication mode is suitable for the purpose of using EZL-410.

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

Each COM ports operate independently according to [MUX Type].

	T2S	ATC	COD	U2S
Protocol	TCP	TCP	TCP	UDP
Function	Server	Server/Client	Server	-
Topology	1:1	1:1	1:1	N:M

☞ For more information about Normal Communication Mode, refer to next chapter.

4.2. ISP Mode

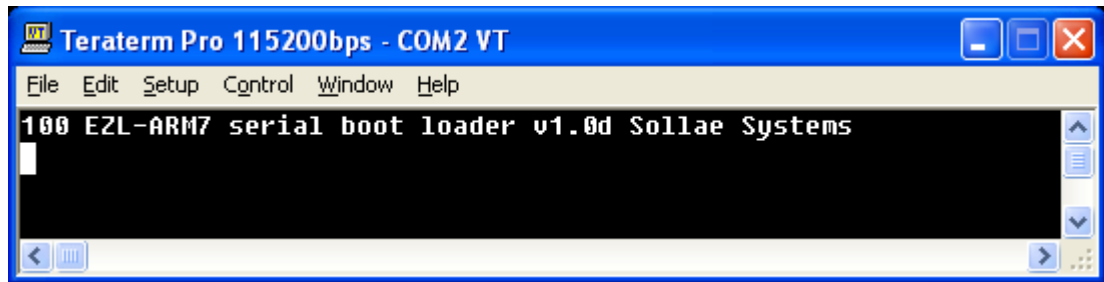
The ISP Mode is that user download EZL-410's firmware via the COM1 port. The settings of COM1 port in the ISP Mode are followed:

Buadrate	115200 bps
Data bits	8 bits
Stop bit	1 bit
Parity bit	None
Flow Control	None

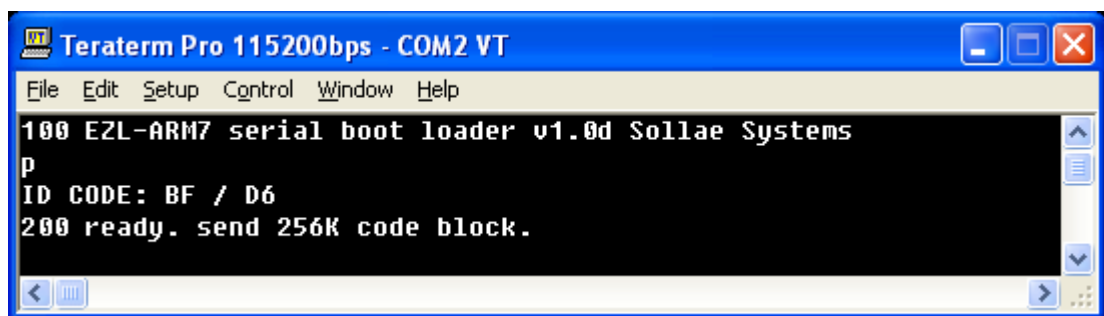
The following is firmware download sequence:

- Reset or Power on EZL-410 after pulling down ISP pin(JP1 #4), then EZL-410 operates as ISP mode.

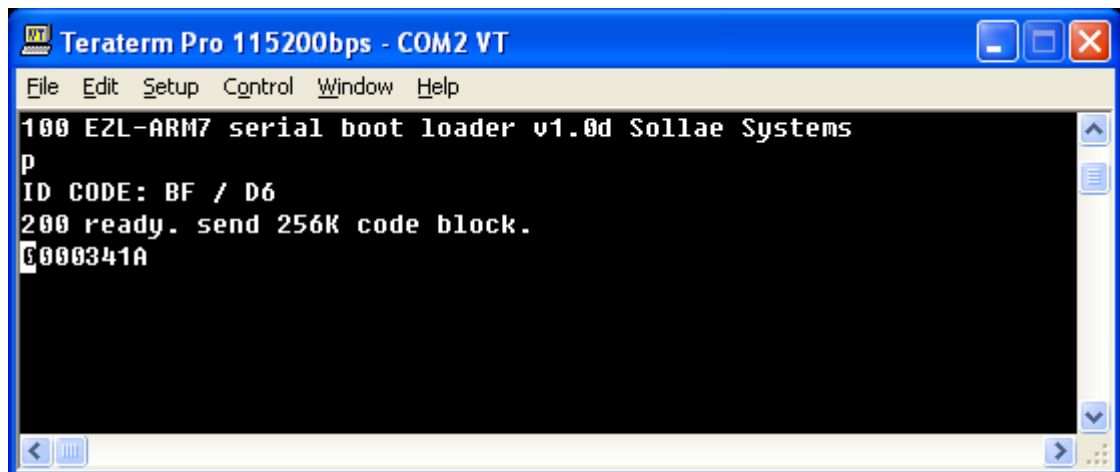
When it enters ISP mode, the following message is shown.



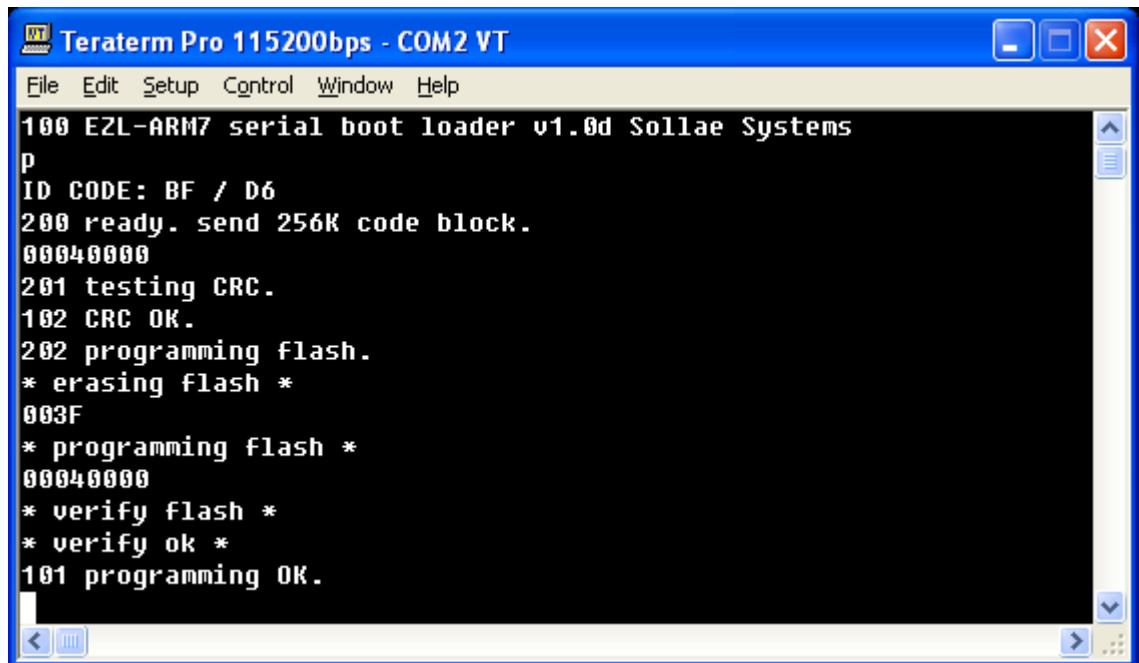
- Input 'p' that is download command, then some messages are shown as followed:



- In this time, if user send binary firmware that is supplied by us, then the following message is shown.



- After firmware download is completed, EZL-410 checks its CRC. If there's no error, EZL-410 save the firmware its flash memory. And then it outputs the following messages.



The screenshot shows a terminal window titled "Teraterm Pro 115200bps - COM2 VT". The window has a menu bar with "File", "Edit", "Setup", "Control", "Window", and "Help". The terminal output is as follows:

```
100 EZL-ARM7 serial boot loader v1.0d Sollae Systems
p
ID CODE: BF / D6
200 ready. send 256K code block.
00040000
201 testing CRC.
102 CRC OK.
202 programming flash.
* erasing flash *
003F
* programming flash *
00040000
* verify flash *
* verify ok *
101 programming OK.
```

- After completing firmware download, pull up or open the ISP# pin. And reset or reconnect its power. Then EZL-410 runs with new firmware.

☞ *For download method with telnet via Ethernet, please refer to other application note.*

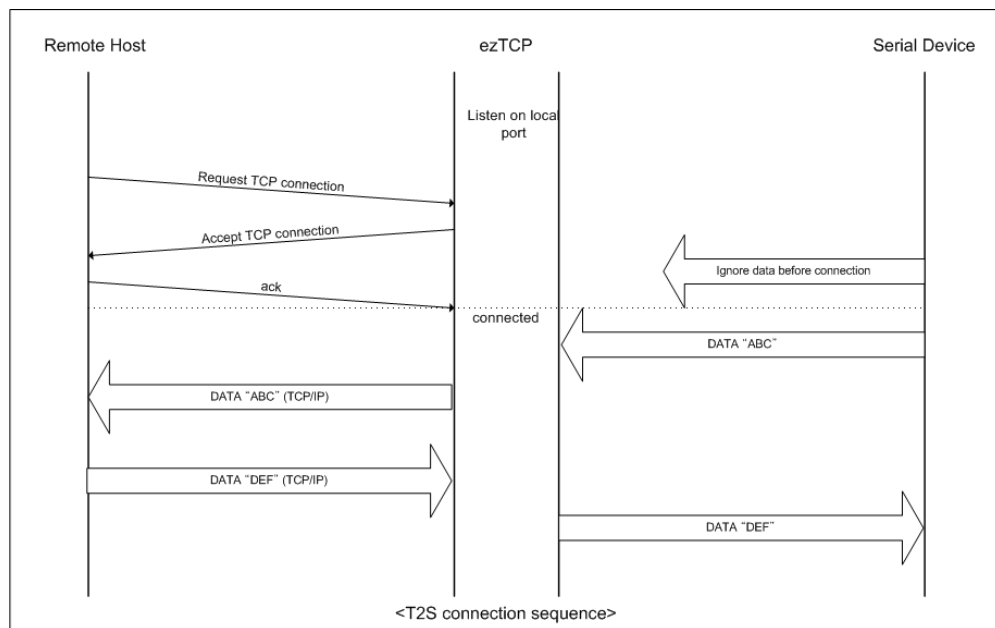
5. Normal Communication Mode

5.1. T2S

5.1.1. Communication

In T2S mode, the EZL-410 functions as a server.

When a host connects to predefined local port, the EZL-410 accepts a TCP connection. When the EZL-410 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.)

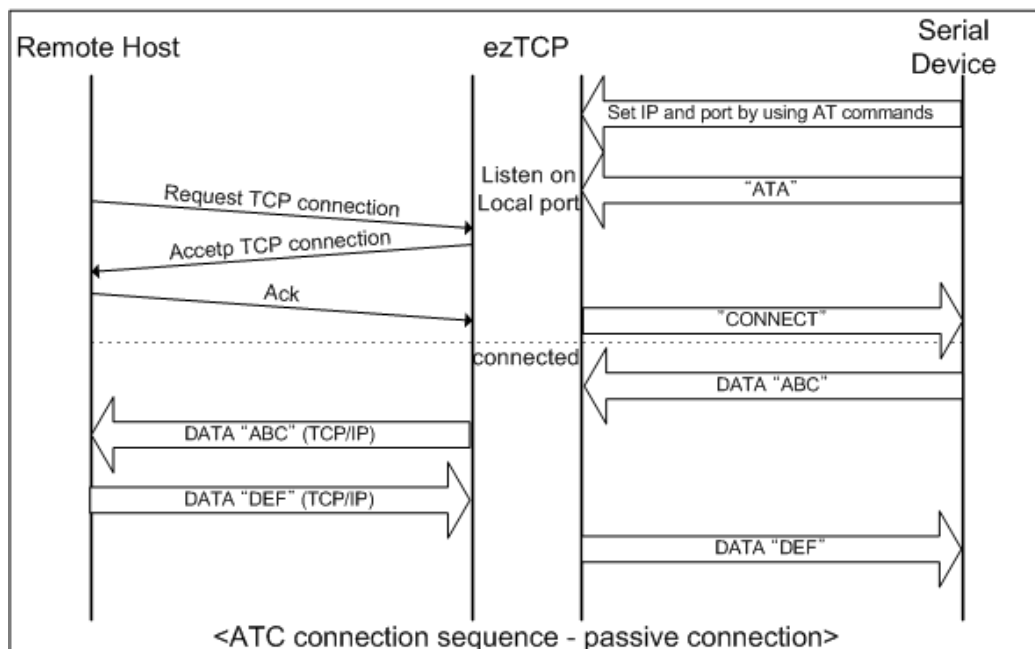
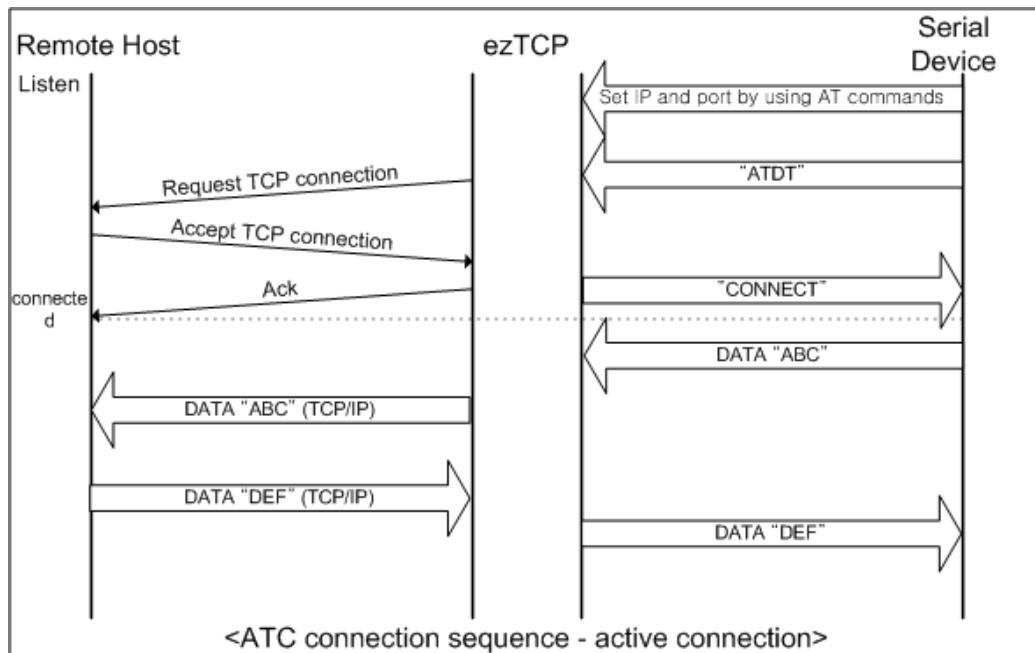


5.1.2. Connection Termination and Keep Alive Function

If [Timeout] is set, EZL-410 terminates the connection if there is no data transmission for pre-defined time ([Timeout] sec). If [Timeout] is set to 0, EZL-410 sends a keep alive packet every 5 seconds. If there is no response 10 consecutive times from the foreign host, EZL-410 terminates the connection.

5.2. ATC

In ATC mode, the user can control the EZL-410 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.



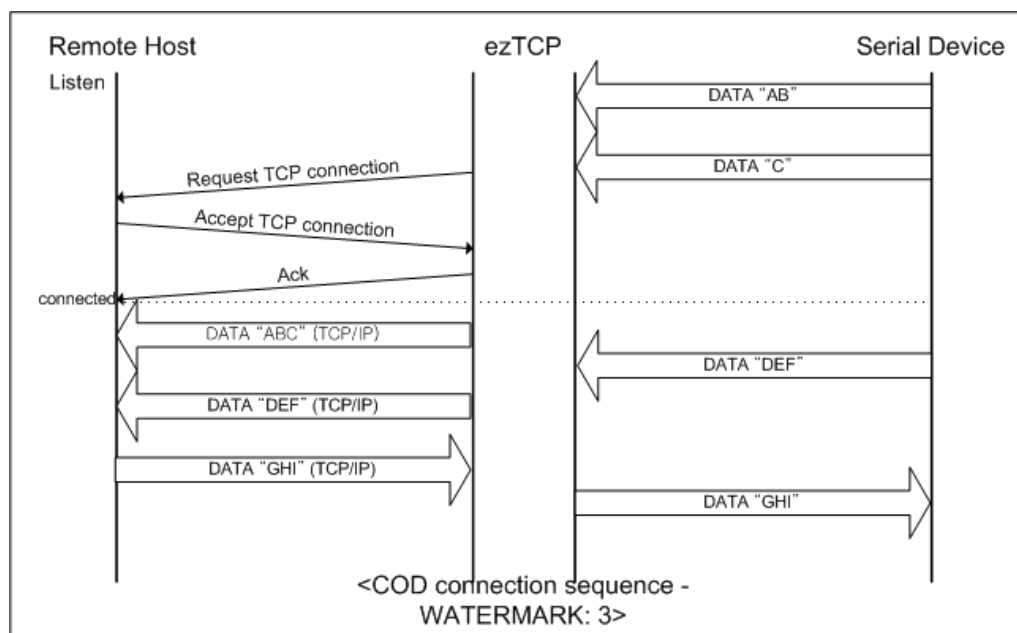
☞ Refer to “6. ATC Mode” for more information.

5.3. COD

5.3.1. Communication

In COD mode, the EZL-410 functions as a client.

When data of the pre-specified size [Water Mark] comes to the serial port, the EZL-410 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.



5.3.2. Connection Termination and Keep Alive Function

If [Timeout] is set, EZL-410 terminates the connection if there is no data transmission for pre-defined time ([Timeout] sec). If [Timeout] is set to 0, EZL-410 sends a keep alive packet every 5 seconds. If there is no response 10 consecutive times from the foreign host, EZL-410 terminates the connection.

5.3.3. Reconnection

After disconnection, EZL-410 doesn't attempt to connect for 10 seconds.

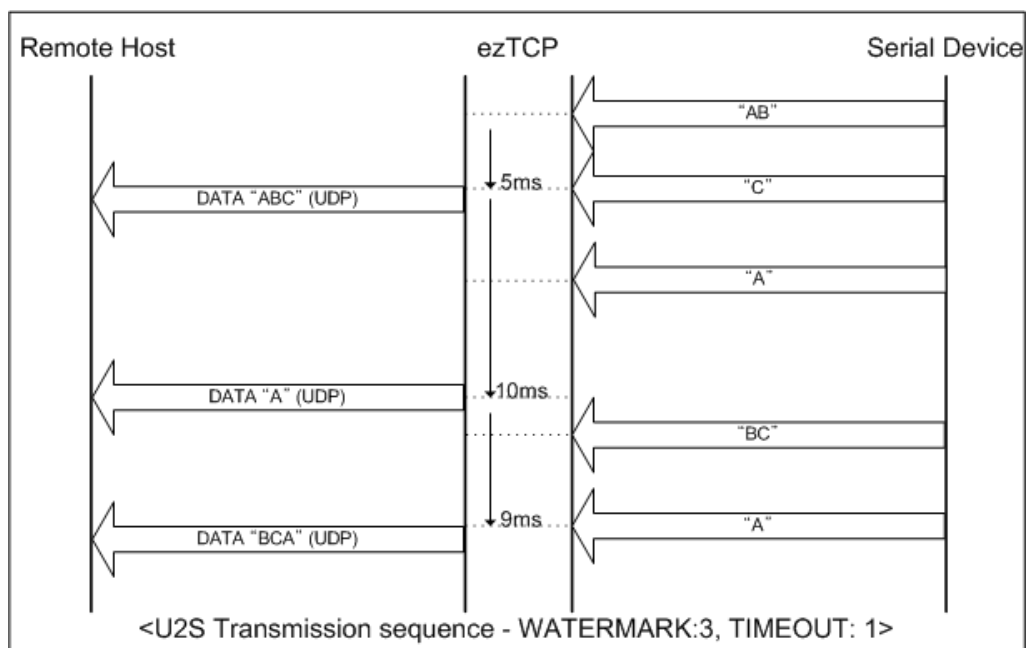
5.4. U2S

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 [Water Mark] comes to the serial port of the EZL-410 or if a specified period of time [Timeout] 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 [Timeout] unit is 10ms. If [Timeout] 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 broadcast.



✓ SSL protocol cannot be used in U2S, because SSL works over TCP.

6. ATC Mode

6.1. Overview

EZL-410 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-410 communicates several hosts alternatively.

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

6.1.1. AT command format

AT commands start with AT, and end <CR>.

AT command format is followed.

AT	Command	<CR>(0x0d)
----	---------	------------

The response code to AT command is followed.

Response message	<CR>(0x0d)	<LF>(0x0a)
------------------	------------	------------

Response Message

When ATV1 (initial setting)	When ATV0	Description
OK	0	command OK
CONNECT	1	TCP connected
NO CARRIER	3	TCP disconnected
ERROR	4	Command error
Set value	Set value	When query set value (example: AT+PRIP?)

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

Command	Function	Description
A	passive connection	Listen connection (host → EZL-410 connection)
D	active connection	Connecting to host from EZL-410
E	echo	Echo (E0 - no echo, E1=echo)
H	off-hook	disconnection
I	Inquiry	Output EZL-410 related-information
O	Online	To online mode
V	enable result code	Result code (numeric-V0, alphabetic-V1)

Z	reset	Reset
---	-------	-------

6.3. Extended AT Commands (Example: AT+PLIP etc.)

Command	Function	Description
+PLP	listening TCP port	
+PTO	timeout	
+PRIP	Remote machine IP address	
+PRP	Remote machine TCP port	

6.4. Online State and Online Command State

It is online command mode when TCP is being disconnected. AT commands can be used in online command mode. After TCP connection, AT commands cannot be used. To use AT commands during the connection, change state to online command state.

Online Command State	During TCP disconnected, AT commands can be used To use AT commands during the connection, required escape sequence
Online State	During TCP connected, all serial data to EZL-410 convert TCP and send to the network.

6.4.1. Changing Online State to Online Command State

To change online state to online command state during the connection, +++ string should be transmitted to EZL-410 as following time interval.

When transmitting +++ string to EZL-410, +++ string will be sent to peer host.

The time from final data the first '+' data of '+++' string	No data over 500ms(guard time)
time intervals between '+'s	0~500ms
Time interval after receiving last '+'	No data over 500ms (guard time)

6.4.2. Changing Online Command State to Online State

If EZL-410's state is in online command state during TCP connection, EZL-410's state can be changed into online state by an ATO command.

6.5. Example of TCP Connection

6.5.1. Example of Active Connection

	Serial Port		Description
	AT+PRIP=192.168.1.201<CR>	►	Setting remote IP address to connect
◄	<CR><LF>OK<CR><LF>		Command OK
	AT+PRP=1470<CR>	►	Setting remote port number to connect
◄	<CR><LF>OK<CR><LF>		Command OK
	ATDT<CR>	►	Connecting to the host
Attempting to connect to the host			
◄	<CR><LF>CONNECT<CR><LF>		TCP connection success
Data Communication			

6.5.2. Example of passive Connection

	Serial Port		Description
	AT+PLP=1470<CR>	►	Set LOCAL PORT to listen
◄	<CR><LF>OK<CR><LF>		Command OK
	ATA<CR>	►	Passive connection command
Listen on local port from a host			
A host connects to EZL-410			
◄	<CR><LF>CONNECT<CR><LF>		TCP connection OK
Data Communication			

6.6. Example of TCP Disconnection

6.6.1. Example of active disconnection

EZL-410 disconnects the connection.

	Serial Port		Description
Data Communication(during TCP connection)			
	[guard time]+++[guard time]	►	Changing online state to online command state
◄	<CR><LF>OK<CR><LF>		Changed to online command state
	ATH	►	TCP disconnection command
◄	<CR><LF>OK<CR><LF>		Command OK

6.6.2. Example of passive disconnection

The remote host disconnects the connection.

	Serial Port		Description
Data Communication(during TCP connection)			
The remote host disconnect the connection			
◀	<CR><LF>NO CARRIER<CR><LF>		TCP disconnected

7. Technical Support, Warranty, and Notes on Operation

7.1. Technical Support

If you have any question regarding operation of the product, visit Customer Support FAQ corner and the message board on Sollae Systems' web site or send us an email at the following address: support@eztcp.com

Website Address for Customer Support:

<http://www.sollae.co.kr>

7.2. Warranty

7.2.1. Refund

Upon the customer's request to refund the product within two weeks after purchase, Sollae Systems will refund the product.

7.2.2. Free Repair Services

For product failures occurring within one year after purchase, Sollae Systems provides free repair services or exchange the product. However, if the product failure is due to user's fault, repair service fees will be charged or the product will be replaced at user's expense.

7.2.3. Charged Repair Services

For product failures occurring after the warranty period (one year) or resulting from user's fault, repair service fees will be charged and the product will be replaced at user's expense.

7.2.4. Notes on Operation

- Sollae Systems is not responsible for product failures occurring due to user's alternation of the product.
- Specifications of the product are subject to change without prior notice for performance improvement.

- Sollae Systems does not guarantee successful operation of the product if the product was used under conditions deviating from the product specifications.
- Reverse engineering of firmware and applications provided by Sollae Systems is prohibited.
- Use of firmware and applications provided by Sollae Systems for purposes other than those for which they were designed is prohibited.
- Do not use the product in an extremely cold or hot place or in a place where vibration is severe.
- Do not use the product in an environment in which humidity is high or a lot of oil exists.
- Do not use the product where there is caustic or combustible gas.
- Sollae Systems does not guarantee normal operation of the product under the conditions a lot of noise exists.
- Do not use the product for a purpose that requires exceptional quality and reliability relating to user's injuries or accidents - aerospace, aviation, health care, nuclear power, transportation, and safety purposes.
- Sollae Systems is not responsible for any accident or damage occurring while using the product.

8. Ordering Information

EZL-410	
EZL-410-E	RoHS compliant

9. Revision History

Date	Version	Comments
Jun.29.2005	1.0	The first release
Jul.23.2007	1.1	Support serial Baudrate 600bps
Nov.26.2007	1.2	Correcting error of pin specification of JP2 (#23, #24)