CIE-H10 User's Manual

Version 1.5

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.

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1. Introduction

1.1. Introduction

The need for the data communication system via internet is rapidly increasing due to the development of internet through out the world. In order to send and receive data via internet, TCP/IP protocol must be used. Any machines that need an internet connection must implement TCP/IP protocol. In order for any device to implement TCP/IP protocol, the machine must either be able to implement TCP/IP protocol by itself, have an open TCP/IP source implanted, or must use an OS that is capable of implementing the protocol. However, the above options require a great deal of time, cost, and effort to make it work.

CIE-H10 uses MODBUS/TCP and HTTP to provide users with ability to control and monitor remote digital I/O controllers. Therefore, with CIE-H10, remote I/O devices can easily be controlled and monitored at the same time. Also, CIE-H10 provides the Macro functions to automatically change the output value via output port based on the input value from the input port.

Not only that CIE-H10 can control and monitor digital I/O controllers, it also provides with functions that can covert the serial data to TCP/IP data and vice versa. Therefore, one CIE-H10 can perform numerous functions at the same time.

Along with its strong TCP/IP/UDP functions, CIE-H10 also provides DHCP and PPPoE functions to be used in cable and xDSL networks. And it has DDNS(Dynamic DNS) function, so it can be used more easily in the internet.

It is also equipped with online debugging functions that will allow the users to quickly respond to the problems that might occur during the installation.

2. Product Specification

2.1. Components

- CIE-H10 body
- 5V Power Adapter (Option)
- RS232C Cable for PC (Option)
- Cross-over Ethernet cable (Option)
- Adapter for DIN rail (Option)

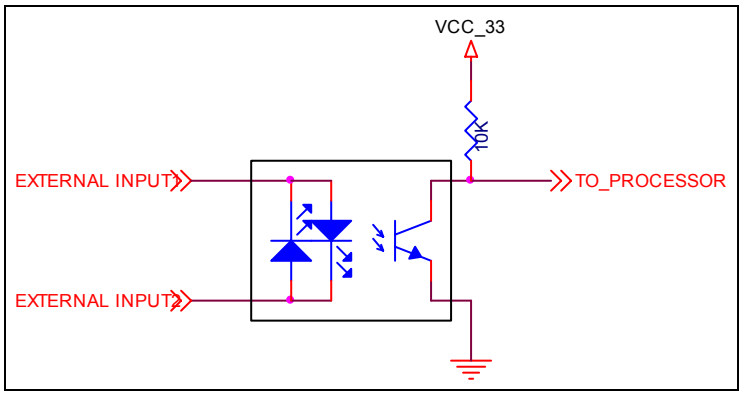
2.2. Product Specification

Power	Input Power	5V (±10%)
	Used Current	510mA typical
Product Size	153mm x 126mm x 32mm	
Weight	Approximately 530g	
Interface	Input Port	8 Port Photo coupler
	Output Port	8 Port Relay
	Serial	Dsub 9Pin male
	Network	10/100 Base-T (RJ45)
Network	Ethernet 10/100 M bit auto-sense Auto MDI/MDIX(Cable Auto-sensing)	
Protocol	TCP, UDP, IP, ICMP, ARP, DHCP, PPPoE DNS lookup Dynamic DNS(DDNS) Telnet COM Port Control Option(RFC2217) MODBUS/TCP, HTTP	
Diagnose	Online Debugging Function	
Environment	Follows Europe RoHS Regulation	
Certification	CE: F690501/SP-EMC000976 MIC: SLS-CIE-H10	
Communication Mode	Input/Output Port	Modbus/TCP – Slave/Master, Passive/Active Web Browser(HTTP) Macro Movement(Macro)
	Serial Port	TCP Server/Client, AT emulation, UDP
Programs	ezManager	Set up program via LAN
	Ezterm	Socket communication program for testing
	hotflash	Firmware download program using TFTP

2.3. Interface

2.3.1. Input Port

Since CIE-H10 input port is isolated by photocouplers, users may connect the machine regardless of its polarity. The circuit of the input port is shown in the below. It is the part where the [EXTERNAL INPUT1] and [EXTERNAL INPUT2] are interfaced with the user device.



The specifications of the input port are as the following:

Max. Input Voltage	DC24V		
V_{IH}	Min. 1.8V	H	1
V_{IL}	Max. 1.2V	L	0

Since the input port is interfaced with a 5mm terminal block, use a (-) shaped screwdriver to connect it with the user device.

- Valid Time

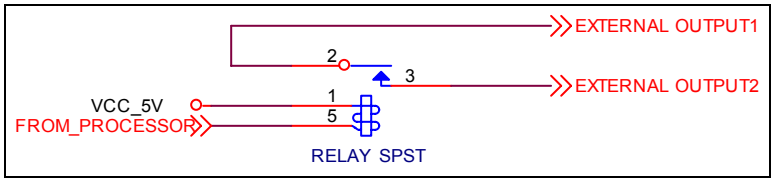
CIE-H10 will only recognize input port signals that last for the [Valid Time] set by the user. If the signal is not maintained during the designated [Valid Time], the input signal will be ignored.

The [Valid Time] is used for Modbus/TCP, Macro, HTTP, and other functions provided by CIE-H10. The unit used for the [Valid Time] is 1ms. However, since the accuracy is only guaranteed in 10ms, the designated values will round down in units of 10ms according to the designated values by the users.

2.3.2. Output Port

CIE-H10 output port is interfaced via relay as shown below. It is the part where the

[EXTERNAL OUTPUT1] and [EXTERNAL OUTPUT2] are interfaced with the user device.



The output port will perform the following actions

Value	Relay contact
0	OFF
1	ON

The allowed electrical current based on voltage conditions of the output port are as the following:

Voltage Condition	Allowed electrical current
DC28V	5A
AC125V	10A
AC250V	5A

Since the output port is interfaced with a 5mm terminal block, use a (-) shaped screwdriver to connect it with the user device.

- Delay

CIE-H10 will send output value to the output port after waiting for [Delay] ms.
In order to do so, the signal value must last for [Delay] seconds. If the output value does not last for the [Delay] seconds, CIE-H10 will not send that signal to the output port.
If the [Delay] value is set as 0, CIE-H10 will send the output value to the output port immediately.
The [Delay] is used for Modbus/TCP, Macro, HTTP, and other functions provided by CIE-H10. The unit used for the [Delay] is 1ms. However, since the accuracy is only guaranteed in 10ms, the designated values will round down in units of 10ms according to the designated values by the users.

2.3.3. RS232 Port (DB9M)

CIE-H10 has an RS232 port for user serial device. CIE-H10 converts serial data from user device to TCP/IP and transmits to Ethernet port. And CIE-H10 convert TCP/IP data from Ethernet port to user serial device and it transmits raw data to user device.

- Pin Assignment

number	name	description	level	Dir.	Etc.
1	DCD	Data Carrier Detect	RS232	Input	option
2	RXD	Receive Data	RS232	Input	required
3	TXD	Transmit Data	RS232	Output	required
4	DTR	Data Terminal Ready	RS232	Output	option
5	GND	Ground	Ground	-	required
6	DSR	Data Set Ready	RS232	Input	option
7	RTS	Request To Send	RS232	Output	option
8	CTS	Clear To Send	RS232	Input	option
9	RI	Ring Indicator	RS232	Input	option

- Data bits, Parity, and Stop bit

Item	Configurable Value
Data bit	8, 7, 6, 5
Parity	None, Even, Odd
Stop bit	1, 1.5, 2

- Flow Control

CIE-H10 support None and RTS/CTS Hardware Flow Control.

- Telnet COM Port Control Option

CIE-H10 has Telnet COM Port Control Option function that is specified by RFC2217. If the Telnet COM Port Control Option is enabled, CIE-H10 sends the CTS, DSR control signal to the communication counter part, and CIE-H10 sets its serial port items(RTS, DTR, Baudrate, databits, parity, stop bit) after getting information from the communication counter part.

2.3.4. Ethernet Interface

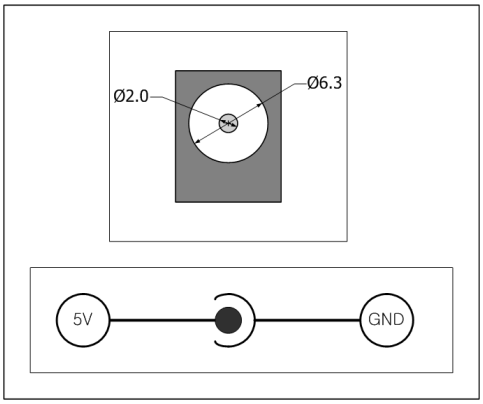
Since part of CIE-H10 network is composed of Ethernet, UTP cable may be connected. The

Ethernet portion will automatically sense 10Mbit and 100Mbit Ethernet and connect itself. It also provides auto MDI/MDIX function that can automatically sense 1:1 cable or cross over cable.

Each Ethernet device has its own unique hardware address. The hardware address of CIE-H10 is set in the factory before being shipped to the market. (The hardware address is also known as the MAC address.)

2.3.5. Power

DC5V is used for the power. The specifications of the power plug are as the following:



2.3.6. System LED

CIE-H10 has numerous lamps to show the current system status.

Each lamp shows the following status:

Name	Color	LED Status	Details
PWR	Red	On	When the power is on
STS	Yellow	Flicker with 1s interval	When the IP address is set as a fixed IP address, or when the dynamic IP is allocated
		Flicker for 4 times within 1s	When the dynamic IP address is not allocated
		Off	ISP mode
LINK	Green	On	When connected to 100 M network
		Flicker	When there is data in LAN while being connected to 100 M network
	Red	On	When connected to 10 M network
		Flicker	When there is data in LAN while being connected to 10 M network
RXD	Yellow	Flicker	When receiving Ethernet packet
TXD	Green	Flicker	When sending Ethernet packet
DI	Yellow	On	Input ON(High) signal to input port
DO	Green	On	Output ON signal from output port relay

2.3.7. ISP Switch

There is an ISP switch located on the side of the product. It is a switch that will allow CIE-H10 to perform in ISP mode. If the switch is pressed more than 100ms or the power is turned on as the switch is pressed, CIE-H10 will be activated in ISP mode.

3. Test Operation

3.1. Installation procedure

CIE-H10 can be installed with the following procedure.

Large category	Small category	Details
1. Communication Environment Confirm	Confirm categories	IP address environment
		Modbus/TCP, HTTP, Macro
		Serial port value
		Application program
2. Network Connection	Confirm method	Check for LINK LED light
3. Environmental factor setup	Setup Method	Network Setup utility, ezManager
4. Test Operation	Confirm method	Check with ezManager or Web browser(HTTP)
5. Operation		

3.1.1. Communication Environment Confirm

Check IP address, network environment, serial port value, protocols used in controlling digital I/O devices and other application programs before installing CIE-H10.

3.1.2. Network Connection

After connecting CIE-H10 to the power, directly connect it with PC's Ethernet port or connect it with the network (hub) that the PC is connected to. When the LINK LED is on, the network is established.

However, since CIE-H10 is only physically connected, IP related values must be designated to perform ping test and IP communication.

3.1.3. Environmental Factor Setup

When network connection is established, ezManager program will be used to perform setup via LAN.

3.1.4. Test Operation

With ezManager provided by Sollae Systems or with web browser, the test operation may be performed. For more details, please refer to 3.2 test operation.

3.2. Test operation

The test operation may be performed according to the following procedure. The test operation suggested in this manual is based on the assumption that IP of PC is set as 10.1.0.2.

3.2.1. PC IP Address change

Change IP address of PC as the following:

IP address	10.1.0.2
Sub net mask	255.0.0.0
Gateway IP address	-

3.2.2. CIE-H10 Installation

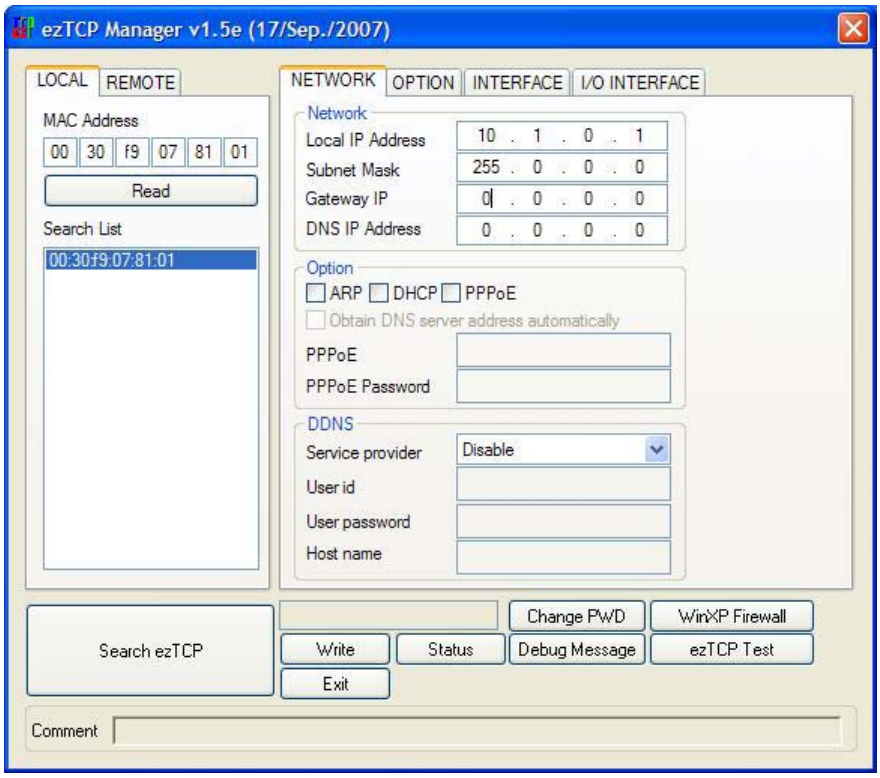
Connect LAN cable directly to the LAN port of CIE-H10 or connect it to the hub where PC is connected to. Also, provide power to CIE-H10 using CIE-H10 power adapter. When the power is connected, the LINK LED will light up when a proper connection to the LAN cable is established.

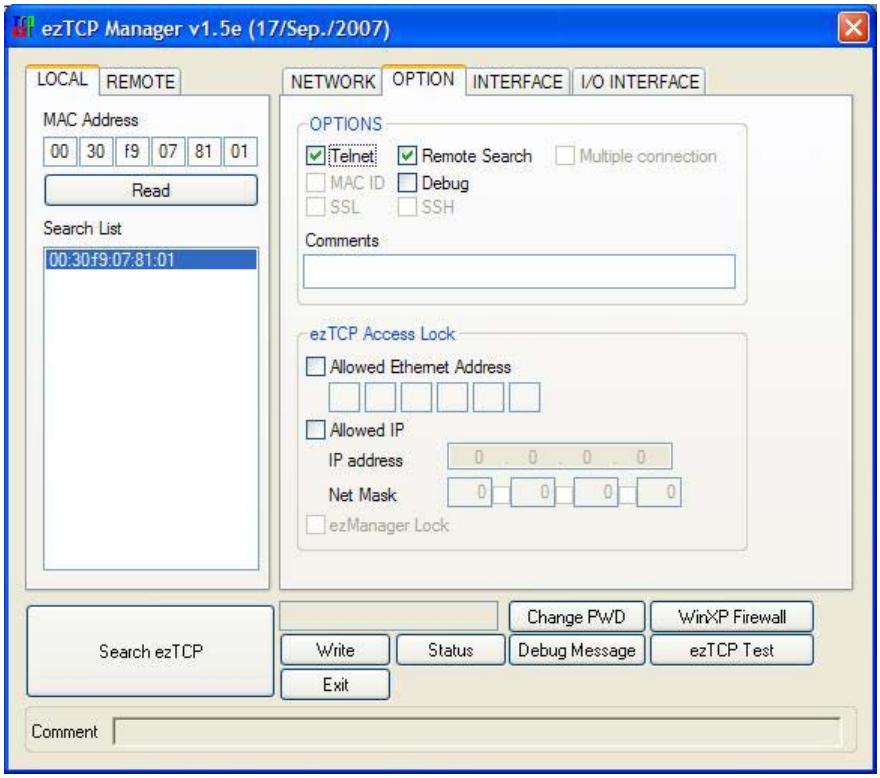
3.2.3. CIE-H10 Setup

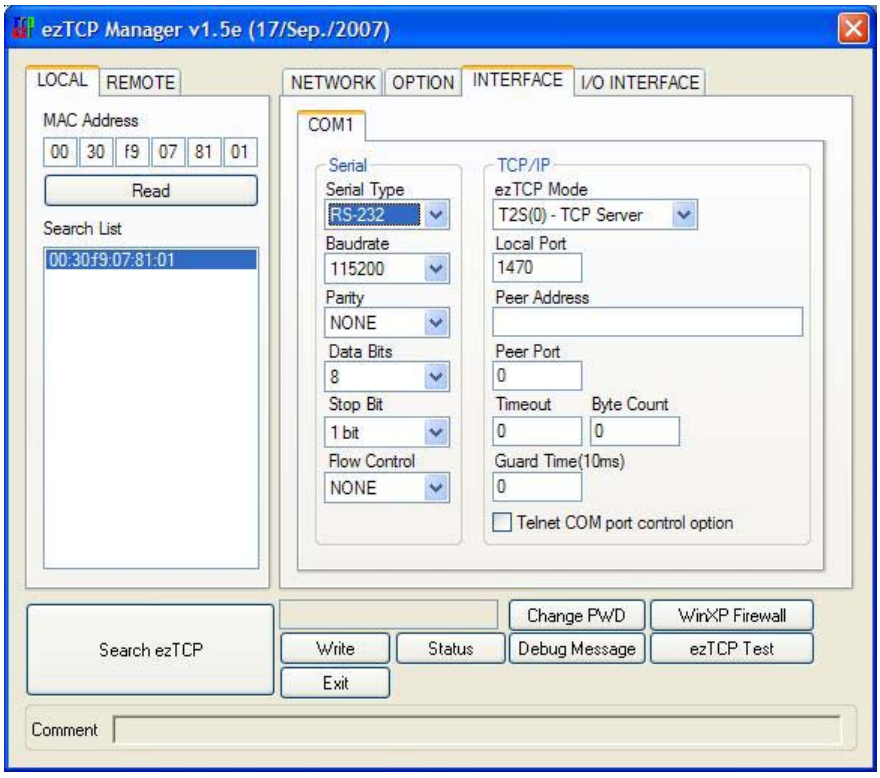
Using ezManager, change the settings of CIE-H10. Start ezManager and click [Search ezTCP] button on the ezManager window. Then, ezManager will search for every ezTCP on the local network.

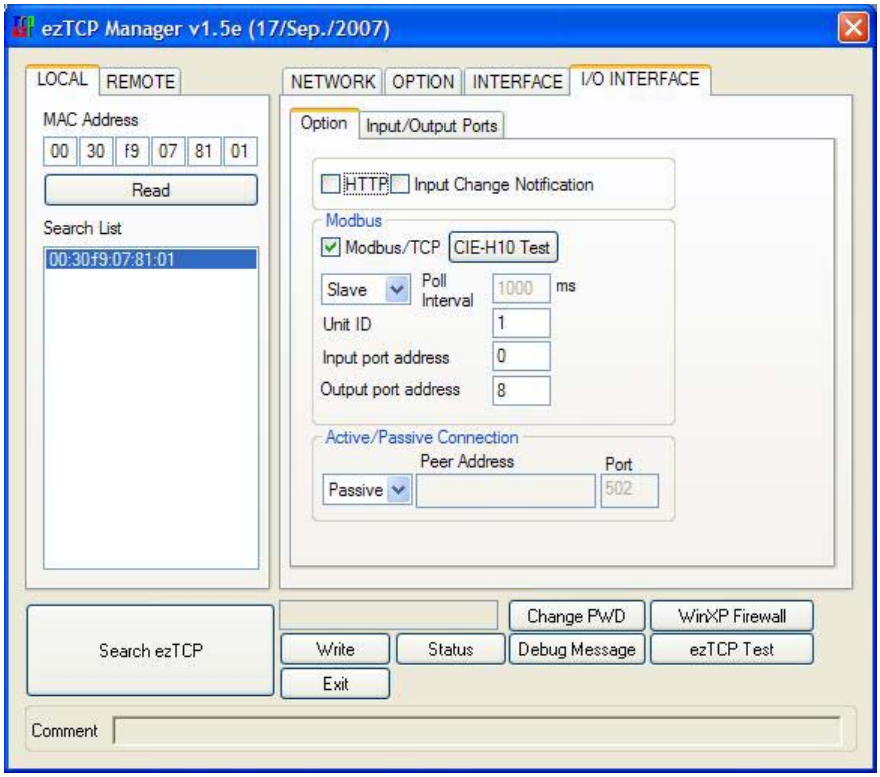
When there is no result, click [WinXP Firewall] button on the ezManager window to check for firewall setting value. If there is a firewall, the program cannot perform the search.

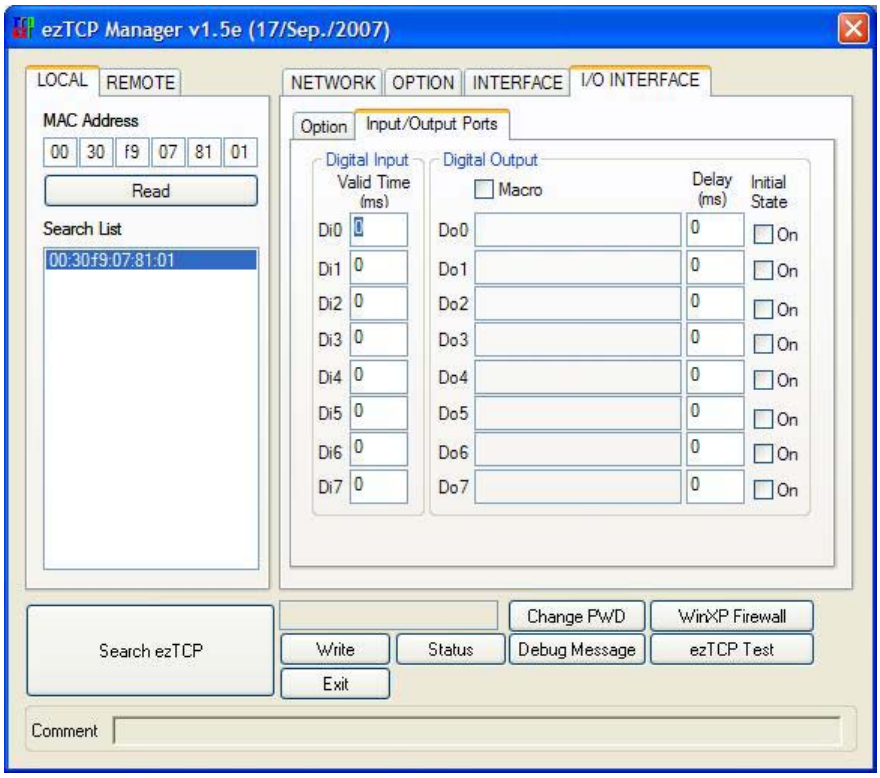
When CIE-H10 is found, the MAC address of CIE-H10 will be shown on the [Search Results] window. (The MAC address is also written on the bottom of the product case.) Select the MAC address and set its value as same as the values shown in the photos below. Then, click [Save] to save the setting values.


ezTCP Manager v1.5e (17/Sep./2007)
LOCAL
REMOTE
MAC Address
00 30 f9 07 81 01
Read
Search List
00:30:f9:07:81:01
NETWORK
OPTION
INTERFACE
I/O INTERFACE
Network
Local IP Address 10 . 1 . 0 . 1
Subnet Mask 255 . 0 . 0 . 0
Gateway IP 0 . 0 . 0 . 0
DNS IP Address 0 . 0 . 0 . 0
Option
ARP DHCP PPPoE
Obtain DNS server address automatically
PPPoE
PPPoE Password
DDNS
Service provider Disable
User id
User password
Host name
Search ezTCP
Change PWD
WinXP Firewall
Write
Status
Debug Message
ezTCP Test
Exit
Comment


ezTCP Manager v1.5e (17/Sep./2007)
LOCAL
REMOTE
MAC Address
00 30 f9 07 81 01
Read
Search List
00:30:f9:07:81:01
NETWORK
OPTION
INTERFACE
I/O INTERFACE
OPTIONS
Telnet
Remote Search
Multiple connection
MAC ID
Debug
SSL
SSH
Comments
ezTCP Access Lock
Allowed Ethernet Address
Allowed IP
IP address 0 . 0 . 0 . 0
Net Mask 0 0 0 0
ezManager Lock
Search ezTCP
Change PWD
WinXP Firewall
Write
Status
Debug Message
ezTCP Test
Exit
Comment

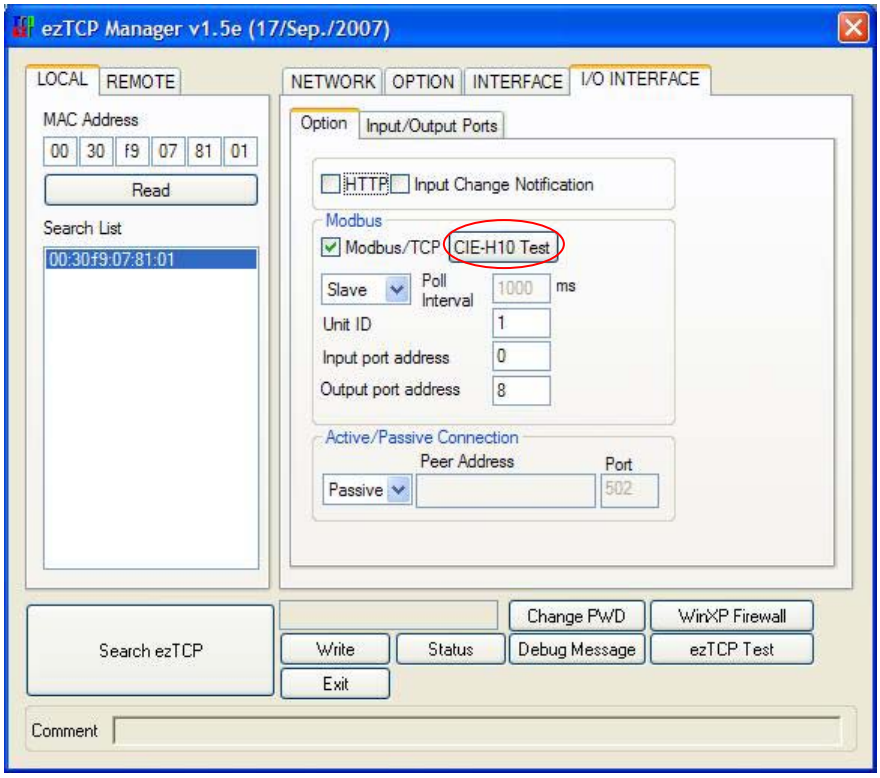

ezTCP Manager v1.5e (17/Sep./2007)
LOCAL
REMOTE
MAC Address
00 30 f9 07 81 01
Read
Search List
00:30:f9:07:81:01
NETWORK
OPTION
INTERFACE
I/O INTERFACE
COM1
Serial
Serial Type
RS-232
Baudrate
115200
Parity
NONE
Data Bits
8
Stop Bit
1 bit
Flow Control
NONE
TCP/IP
ezTCP Mode
T2S(0) - TCP Server
Local Port
1470
Peer Address
Peer Port
0
Timeout
Byte Count
0
0
Guard Time(10ms)
0
Telnet COM port control option
Search ezTCP
Change PWD
WinXP Firewall
Write
Status
Debug Message
ezTCP Test
Exit
Comment


ezTCP Manager v1.5e (17/Sep./2007)
LOCAL
REMOTE
MAC Address
00 30 f9 07 81 01
Read
Search List
00:30:f9:07:81:01
NETWORK
OPTION
INTERFACE
I/O INTERFACE
Option
Input/Output Ports
HTTP
Input Change Notification
Modbus
Modbus/TCP
CIE-H10 Test
Slave
Poll Interval
1000
ms
Unit ID
1
Input port address
0
Output port address
8
Active/Passive Connection
Peer Address
Port
Passive
502
Search ezTCP
Change PWD
WinXP Firewall
Write
Status
Debug Message
ezTCP Test
Exit
Comment

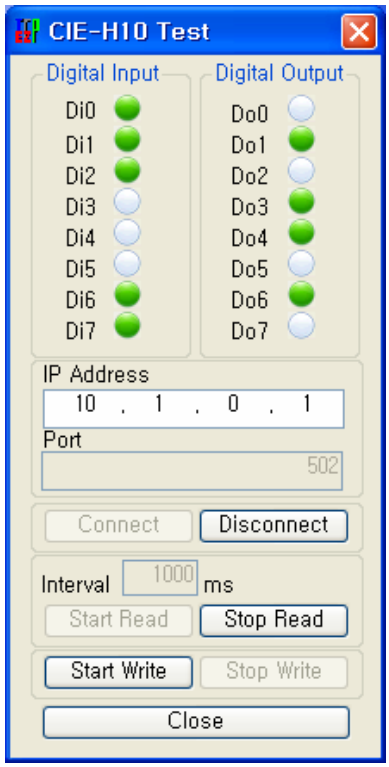


3.2.4. Modbus/TCP Test

It is a test of CIE-H10 to perform control and monitor functions using Modbus/TCP. This test should be performed with Modbus/TCP program provided by Sollae Systems.



After having settings as same as the settings shown above, click on the [CIE-H10 TEST] button. A new window on the ezManager will pop up.



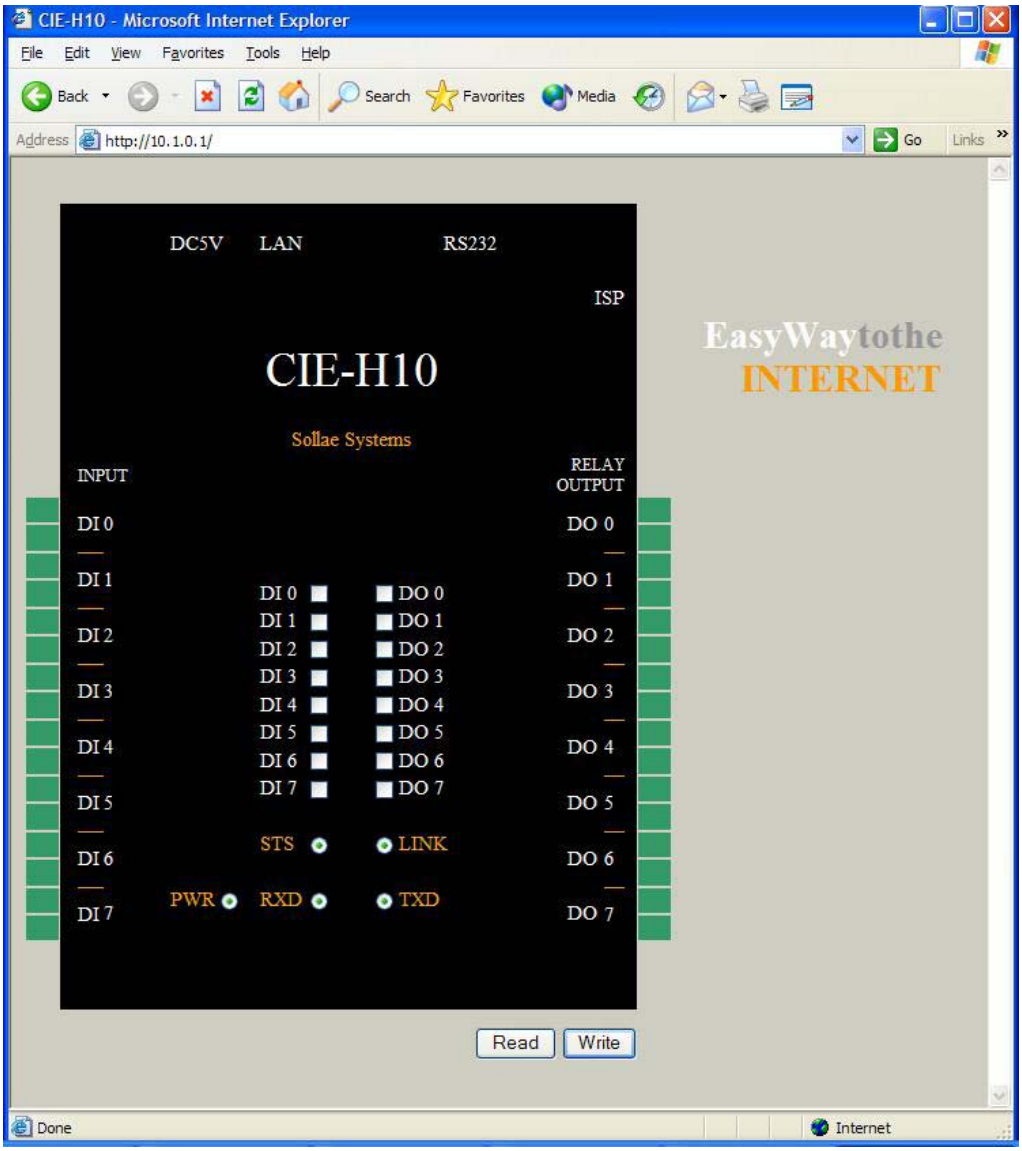
- Click [Connect] button to connect to CIE-H10 by TCP connection
- In order to check for the [Digital Output] port, click on Do0 to Do7 buttons of the [Digital Output] to check for output values being sent.
- When the [Start Write] button is clicked, previously designated values will be sent to the [Digital Output] port periodically.
- In order to check for the [Digital Input] port, click [Start Read] button to read values off of the [Digital Input] port every period designated by the [Interval] value.

3.2.5. Test using Web Browser (HTTP)

Start the web browser as shown below and write http:// and IP address in the address window to connect to the CIE-H10 web browser. It will allow users to monitor and control CIE-H10.

Click on the [Read] button to read input/output values.

Designate output values on the CIE-H10's output port (DO0 – DO7) and click [Write] button to apply setting values to the CIE-H10's output port. Then, the CIE-H10's input port value will be read as well.


CIE-H10 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://10.1.0.1/
Go Links
DC5V
LAN
RS232
ISP
CIE-H10
Sollae Systems
EasyWaytothe
INTERNET
INPUT
RELAY
OUTPUT
DI 0
DI 1
DI 2
DI 3
DI 4
DI 5
DI 6
DI 7
DO 0
DO 1
DO 2
DO 3
DO 4
DO 5
DO 6
DO 7
STS
LINK
PWR
RXD
TXD
Read
Write
Done
Internet

4. IP Address and Setting Values

4.1. IP address and setting values

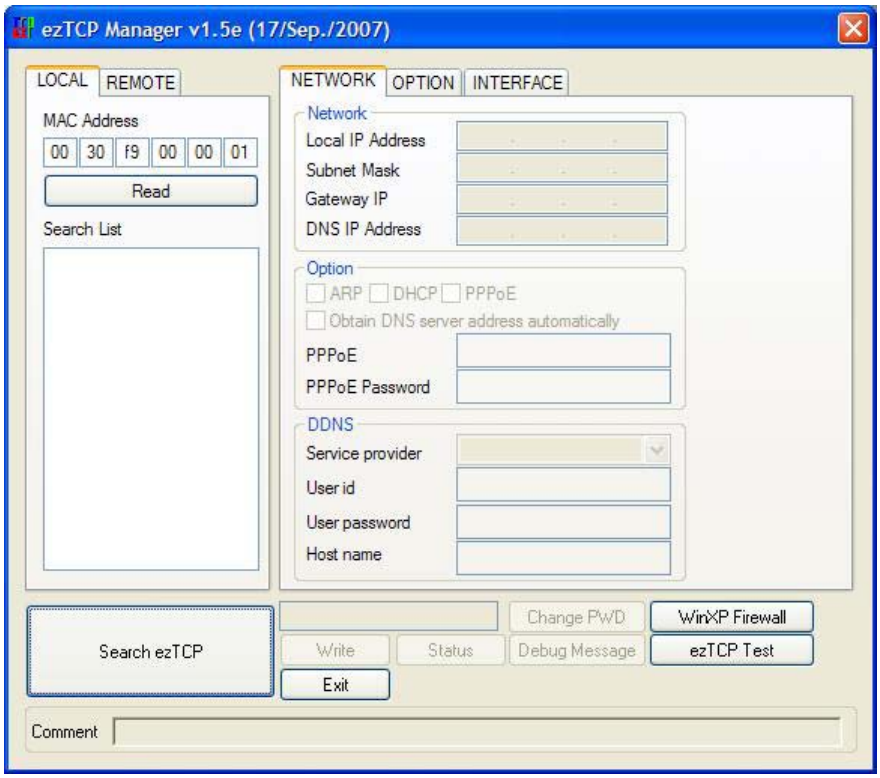
In order to perform TCP/IP communication, the settings related to the IP address must be designated.

IP address and serial port related settings may be designated by the network set up utility provided by Sollae Systems, ezManager.

4.2. Settings by ezManager

4.2.1. ezManager

The basic settings of CIE-H10 (IP address settings and serial port settings) can be designated by an application utility for Windows, ezManager. ezManager can be operated in Windows platform (Windows 98, 98SE, 2000 pro, ME, XP pro/home) but may malfunction in older OS versions. The following window is the window that pops up when the user starts ezManager for the first time.



ezManager communicates with CIE-H10 via UDP broadcast. The port used during the communication is 50005 and the UDP port used during the debugging process is 50006. If the firewall functions are being used, the firewall functions for the 50005 and 50006 port must be turned off.

4.2.2. ezManager Buttons

Search ezTCP	Search for all CIE-H10s series connected to the local network. The search results will be shown on the [Search Result] box. Using mouse or cursor, the desired products may be selected. The values shown on the box are MAC addresses of each ezTCP, and the selected ezTCP's setting values will be shown on the right. (The MAC address of CIE-H10 is written on the bottom of the product)
Read	Input 6 digit number written on the CIE-H10 product sticker to the MAC ADDRESS input box or Input CIE-H10's IP address in the IP address category on the REMOTE tab. This will allow the user to read setting values for a specific CIE-H10. When there are too many ezTCPs connected to the network and it is hard to find a desired ezTCP from the LIST box, this button may be conveniently used.
Save	After changing the settings, save the changes to ezTCP. CIE-H10 will automatically reset after the save. Therefore, pressing this button may cause system shutdown during normal use.
Change PWD	CIE-H10 provides user authentication function in order to prevent other people from changing its settings. The authentication process is done using a password and this button will allow users to change the password. If the password for the ezManager is already designated, the program will ask the user to input password as the button is clicked. The designated password will also be used when connected to the web (HTTP). The ID is 'admin'.
Status	User can check the status values of CIE-H10 during its operation. When the button is clicked, a new window will pop up and show operation time, current IP address, data amount via serial port and other information. Clicking each devices of the [Search List] will also yield the same information.
Debug Message	This will be used to read debugging messages from CIE-H10. In order to use this function, activate [Debug] option under [OPTION] tab. When the debugging is over, please deactivate the [Debug] option to minimize network load.
WinXP Firewall	When the PC's firewall is activated, ezManager may not be operated properly. By clicking this button, the user can easily check their Windows firewall status.
Exit	Exit ezManager

4.2.3. ezManager Settings

NETWORK	
Network	
Local IP Address	CIE-H10's IP address
Subnet Mask	Subnet Mast
Gateway IP Address	Gateway's IP address
DNS IP Address	Name Server's IP address
Option	
DHCP	Decide whether to receive CIE-H10 IP address via DHCP
PPPoE	Decide whether to receive CIE-H10 IP address via PPPoE
PPPoE ID & Password	ID and Password that will be used in PPPoE
ARP	ARP Function activation status (Conditionally required for DHCP)
Obtain DNS server address automatically	If CIE-H10's IP address is set as a dynamic IP (DHCP or PPPoE), it will automatically receive DNS server address. If this check box is not activated, the IP address designated in the [DNS IP Address] will be used as the DNS server address.
DDNS	
Service Provider	Set a DDNS service provider. CIE-H10 supports only Dyndns(www.dyndns.com).
User ID	The user account which was registered to the service provider
User Password	The password of user account which was registered to the service provider
Host Name	The hostname of CIE-H10. For example: cieh10.dyndns.com

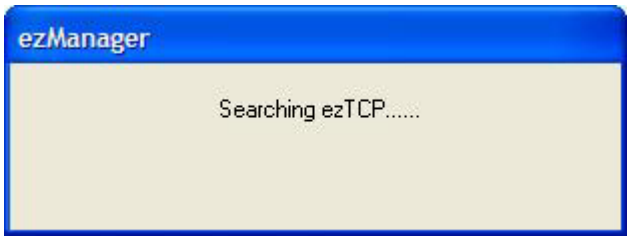
OPTION	
Remote Search	Use IP address to check for device settings in the ezManager's REMOTE tab
Telnet	Enable telnet login

Debug	Used for CIE-H10 online debugging
Comments	Allows users to make comments about the products
Allowed Ethernet Address	Only allow hosts with Ethernet Address designated in ezManager's 'Allowed Ethernet Address' to be connected to CIE-H10.
Allowed IP address	Only allow hosts with IP Address and address range designated in ezManager's 'Allowed IP' to be connected to CIE-H10
ezManager Lock	Hosts designated in [Allowed Ethernet address] and [Allowed IP Address] may search the CIE-H10 through ezManager.

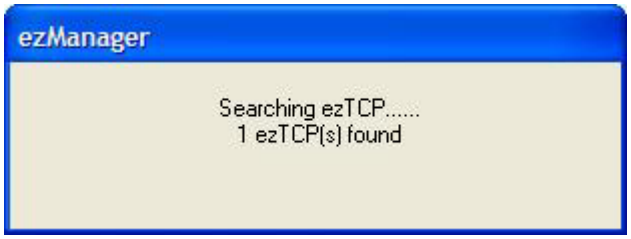
4.2.4. ezManager Operation Example

ezManager can be used to change IP address related settings of ezTCP. The Following example will show you how to read CIE-H10's setting values and change those settings. Please follow this procedure to change the setting values of CIE-H10.

- When ezManager's [Read], or [Search ezTCP] button is clicked, the following window will pop up.



- When ezTCP that is connected to the network is found, the following message will pop up. If it says that there is no response from ezTCP, check for ezTCP's power, LAN cable connection, or [Windows Firewall] status before clicking [Search ezTCP] or [Read] button again. The protocol and the port used by ezManager are UDP port 50005. The debugging port is 50006.



- If 1 ore more ezTCP is found, MAC address will be shown in the ezManager's [Search Result] box. Check to make sure that the MAC address shown in the [Search Result] window is as same as the MAC address written on the product's sticker.
- Use PING command in Windows' DOS window to confirm CIE-H10's IP address. The following message will be shown after the PING command when the correct IP address is designated. If it reads "Request timed out", check to make sure correct IP address setting values.
-

```
C:\>ping 10.1.0.1
Pinging 10.1.0.1 with 32 bytes of data:
Reply from 10.1.0.1: bytes=32 time=1ms TTL=64
Reply from 10.1.0.1: bytes=32 time=1ms TTL=64
Reply from 10.1.0.1: bytes=32 time=1ms TTL=64
Reply from 10.1.0.1: bytes=32 time=1ms TTL=64
```

<When IP address is 10.1.0.1 >

√ ***In order for the PING command to perform properly, CIE-H10 and PC's IP address, subnet mask, and gateway IP address must be adequately set for the network environment.***

4.3. IP Address Related Categories Settings via DHCP

In the network environment composing DHCP server, settings related to CIE-H10's IP address, subnet mask, gateway, and name servers can be automatically designated using DHCP protocol. In order to do so, user must check [DHCP] category on ezManager. Depending on DHCP server type, [ARP] category should also be checked as well.

4.4. IP Address settings via PPPoE

Usually, PPPoE is used in ADSL or VDSL environment. In order to use PPPoE, PPPoE function must be activated and PPPoE's ID and password must be designated accordingly. Like DHCP, PPPoE automatically receives IP address.

√ ***Some ADSL or VDSL environment uses DHCP based on the modem type. Please contact your internet service for further information.***

4.5. DDNS (Dynamic DNS)

In internet environment, most host get IP addresses dynamically. In this case, it is very hard to communicate to the host because the IP address is changed dynamically.

The DDNS function solves this problem. If the CIE-H10 obtains its IP address, it notice to the service provider. Then the service provider serves DNS service.

So, even though user doesn't know the CIE-H10's IP address, user can connect to the CIE-H10 by the host name (after DNS looking up.)

The DDNS service provider that the CIE-H10 supports is only Dyndns(http://www.dyndns.com) currently.

5. I/O Interface

In CIE-H10, there are 8 input ports interfaced by photo couplers and 8 output ports interfaced by relays.

These I/O ports can be controlled by three methods: Modbus/TCP, Macro, and Web (HTTP).

Modbus/TCP	Modbus/TCP protocol is used to communicate with CIE-H10. When CIE-H10 is in Slave/Passive mode, it operates as a normal Modbus/TCP device. Master operation may be activated by other settings. It also can establish TCP Active connection.
Macro	It is a mode that allows the users automatically controls output port's value based on input port status by setting Macro values prior to CIE-H10 operation. During Macro operation, current status values may be read using HTTP or Modbus/TCP, but output values may not be controlled.
Web(HTTP)	HTTP may be controlled and monitored using web browser. Connect to CIE-H10's IP address via web browser to access CIE-H10's control and monitor web page. This webpage shows current status values. By clicking [Read] button, current input/output values will be read. Also, change check box values of output port and click [Write] to change output port value.

5.1. Modbus/TCP

Since CIE-H10's input and output port is operated based on Modbus/TCP, CIE-H10 can be controlled and monitored using Modbus/TCP Manager.

Currently, CIE-H10 only supports Read Multiple (Function Code: 3) and Write Multiple (Function Code: 16) codes from Modbus/TCP Function Code.

Also, along with Modbus/TCP, CIE-H10's Active TCP connection, Modbus/TCP master, and Input Change Notification functions may be used to apply the product to many other fields.

When the Macro function is activated, users can only read current values using Modbus/TCP but is not able to output values via output port.

5.1.1. Modbus/TCP Setting Values

Modbus/TCP	Using Modbus/TCP, monitor and control CIE-H10.
Slave	Like Modbus/TCP's standard protocol, CIE-H10 will operate in Slave mode. When CIE-H10 receives Modbus/TCP query from Master, it will process the designated query. However, in order for CIE-H10 to process the inputted query, the query must match [Unit ID] and [Input port address]/ [Output port address].
Master	CIE-H10 is operated in master mode. When CIE-H10 connects with designated address, it will send Read Multiple queries to previously designated slave's [Unit ID] and [Input port address] every [Poll Interval]. The response value will be outputted via CIE-H10's output port and master's [Input Port] value will be sent via Write Multiple to the slave. Using this function, remote input port's value may be sent to slave's output port (I/O Tunneling).
Poll Interval	Interval in between CIE-H10's queries as master (Unit: ms)
Unit ID	Slave mode: CIE-H10의 Unit ID Master mode: CIE-H10 and remote device Unit ID
Input port Address	Slave mode: CIE-H10 Input port address. Master mode: Slave device Input port address. Input port Address and Output port Address must differ by a number larger than 8.
Output port Address	Slave mode: Output port address. Master mode: Slave Output port address. Address and Output port Address must differ by a number larger than 8.
Passive	CIE-H10 establishes TCP connection passively. When remote host connects to previously designated [Port], CIE-H10 will allow TCP connection. In order to communicate using Modbus/TCP, this category must be selected.
Active	CIE-H10 establishes TCP connection to previously designated IP address (Peer Address) and Port.
Peer Address	IP address when CIE-H10 performs active connection
Port	Passive connection mode: Local Port number that will receive

	connection Active connection mode: Peer Port number that will establish TCP connection
Input Change Notification	As long as there is no query from the Master, standard Modbus/TCP will not send current status to the remote host. When CIE-H10's input port value is changed while this category is selected, it will send Read Multiple response packet to the Master without receiving queries from the Master. This function may be used to quickly send CIE-H10's Input Port status.
Initial State	Output port value when CIE-H10 is booted.

5.1.2. Standard Modbus/TCP

Standard Modbus TCP will allow users to use Modbus/TCP Manager to control and monitor devices that supports Modbus/TCP.

In order to operate in standard Modbus/TCP, select Modbus/TCP mode as [Slave] mode, change TCP connection as [Passive], and set TCP port number as 502.

Modbus/TCP Mode	Slave
TCP Connection	Passive
TCP Port	502

Also, adequate CIE-H10's [Unit ID], [Input port address], and [Output port address] must be selected.

In the case of CIE-H10, [Input port Address] and [Output port Address] must differ by a number larger than 8.

5.1.3. Modbus/TCP Master Mode

CIE-H10 operates as Modbus/TCP Master and reads input port values off of remote Modbus/TCP Slave and uses those values in CIE-H10 output port. Then, CIE-H10 sends its input port value to remote slave device as [Write Multiple] Function Code.

When connecting to Modbus/TCP device, the TCP connection must be in [Active] setting.

Using this function, CIE-H10 input values can be sent to the remote slave device and remote slave input port values may be outputted by CIE-H10's output port.

5.1.4. TCP Connection Mode

Standard Modbus TCP allows user Manger to establish TCP connection to Modbus/TCP device's 502 port.

However, depending on the network status, Modbus/TCP device may have to establish connection to the Manager. In this special case, CIE-H10 can be changed into Active mode to actively connect to the remote host.

Passive	Standard Modbus/TCP Remote host connects to CIE-H10 Port number that will receive connection must be designated
Active	CIE-H10 connects to remote host IP address or host name and port number of the desired host must be designated

5.1.5. Initial Output Value

Initial value for CIE-H10 output port after booting may be designated. Depending on the [Initial State] value during the boot, output port will be activated.

5.2. Macro Mode

When users designated different macros for each output port, CIE-H10 can output various results via output port using input values and designated macros.

It is a mode that can be used to activate various devices based on signals from various sensors. .

Check Macro check box in ezManager to activate CIE-H10 macro mode.

5.2.1. Operator

The algorithm used in the Macro mode is Boolean Algebra. In this case, the AND, OR, NOT are used as operators. Parenthesis may also be used.

The priority of operators is in the following order: parenthesis > NOT > AND > OR.

Each operator is represented by the following symbols.

Parenthesis	Open – (Close -)	Since calculations within the parenthesis have the highest priority, they will be calculated first. Parenthesis may be nested used.
NOT	/	Operand that follows NOT operator is toggled. (If operand is 0, it will be changed to 1. If it is 1, it will be changed to 0.)
AND	*	If Operand values that surrounds AND operator all 1, the result value will be 1. If either one of them is 0, the result will be 0 as well.

OR	+	If Operand values that surrounds AND operator all 0, the result value will be 0. If either one of them is 1, the result will be 1

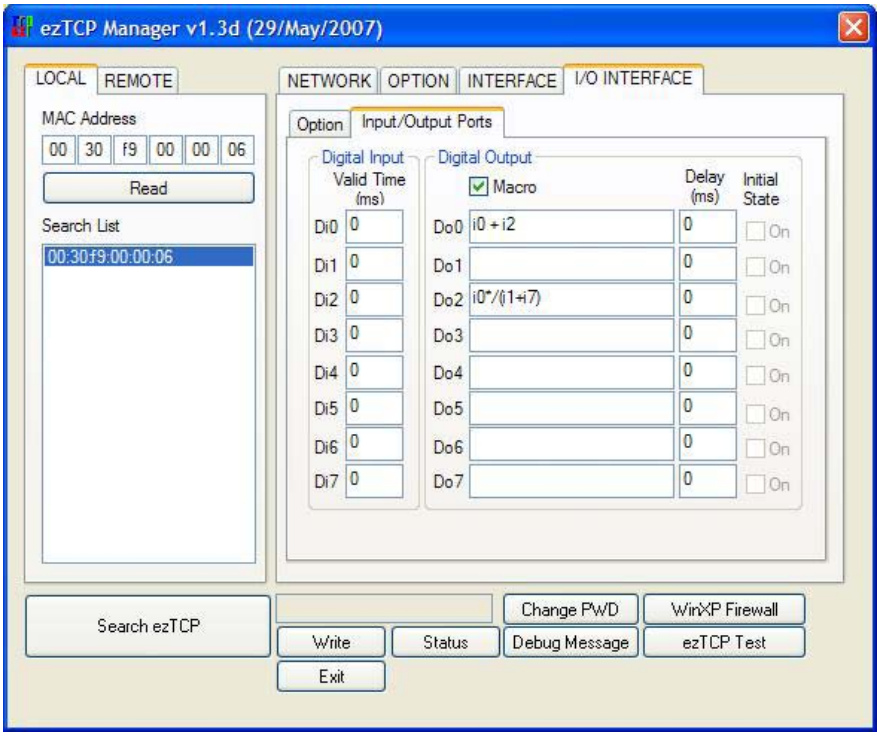
5.2.2. Operand

Operands used in macro mode are each input port. Each input port is designated with i0 ~ i7 symbol based on their sequence.

Since capital letters are not recognized, they can also be written as I0 ~I7.

5.2.3. Example of Equation

Let's assume that the equation settings are the same as the following.



In this case, the equations for two output port are as the following.

Do0	i0 + i1	Perform OR for i0 and i1. Spaces in between two operands may be ignored
Do2	i0*/(i1+i7)	Perform NOT with value from performing OR for i1 and i7. Then, perform AND with that value and i0

Based on input values from three input ports, the output values are as the following.

Output ports that equations are not applied will be maintained as 0 (OFF).

Input port value			Output port value							
i0	i1	i7	Do0	Do1	Do2	Do3	Do4	Do5	Do6	Do7
0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	0
0	1	0	1	0	0	0	0	0	0	0
0	1	1	1	0	0	0	0	0	0	0
1	0	0	1	0	1	0	0	0	0	0
1	0	1	1	0	0	0	0	0	0	0
1	1	0	1	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

5.3. Monitor and control using Web (HTTP)

When HTTP check box in ezManager is selected, CIE-H10 input/output port values may be monitored and controlled using web browser.

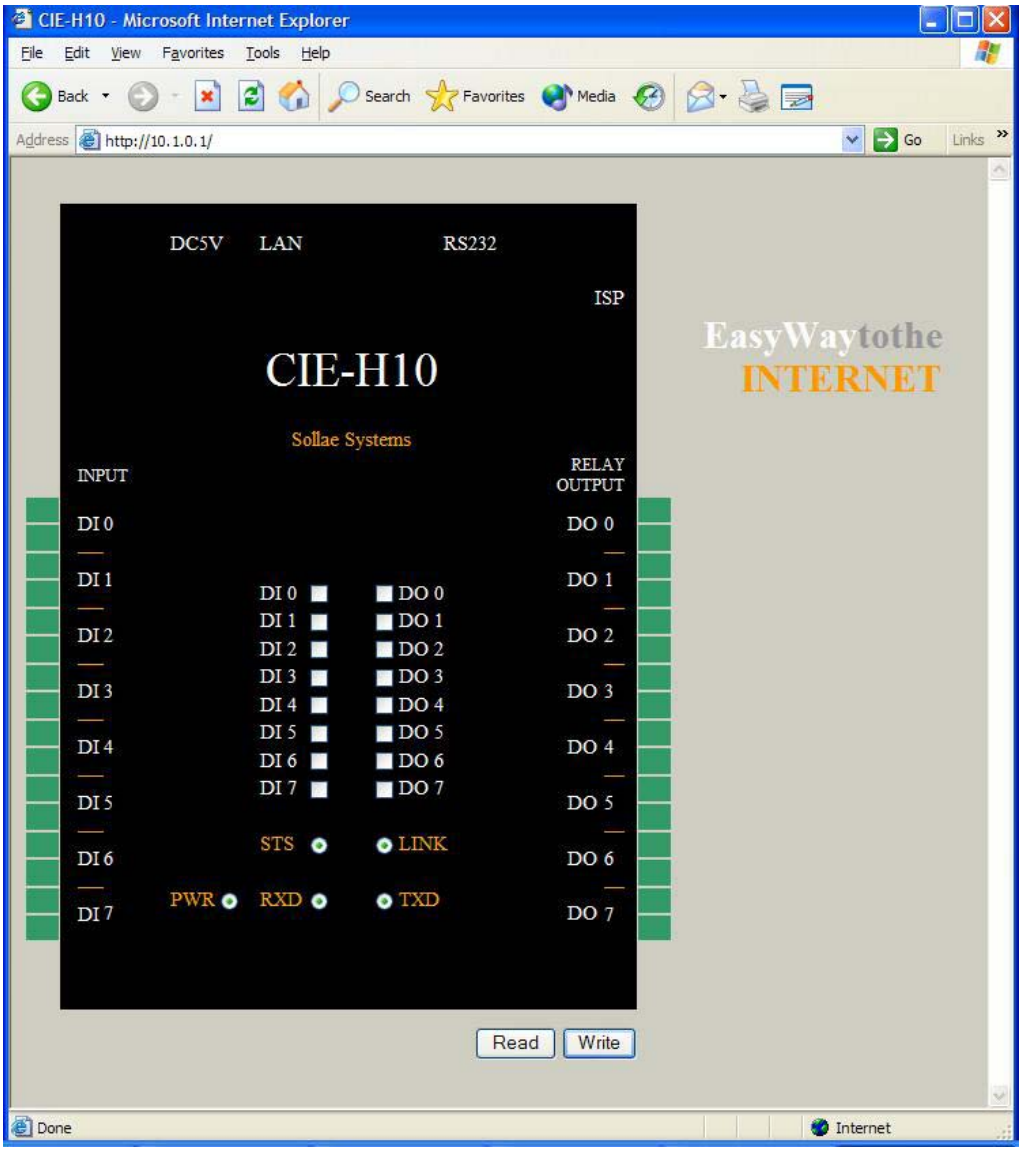
5.3.1. Connect to Web

After starting the web browser, type in CIE-H10's IP address after typing http:// in the address window to connect to CIE-H10.

If passwords for CIE-H10 are designated, the following window will pop up.

In this case, enter admin for ID and designated password.

This is the initial window when users connect to CIE-H10.



5.3.2. Read/Write Using Web

Current input ports values will be shown in DI0 –D17 check boxes, and output port values will be shown in DO0 – DO7 check boxes. These values represent CIE-H10 status the moment web browser is connected to CIE-H10 and will not change automatically as the CIE-H10's status changes. Therefore, users must click [Read] in order to read current updated values.

In order to output values designated by the users, designate output values for the desired output port and click [Write].

If the macro function is activated, users cannot control device's output port using HTTP. Users may only read input/output port values.

6. Serial Interface

CIE-H10 provides RS232↔TCP/IP conversion function along with input/output port monitor and control function. Using this function, existing serial devices may be easily connected to the TCP/IP network. Also, TCP server, TCP client, AT command emulation, UDP, and many other devices are supported to provide various applications to the users.

6.1. Serial communication mode

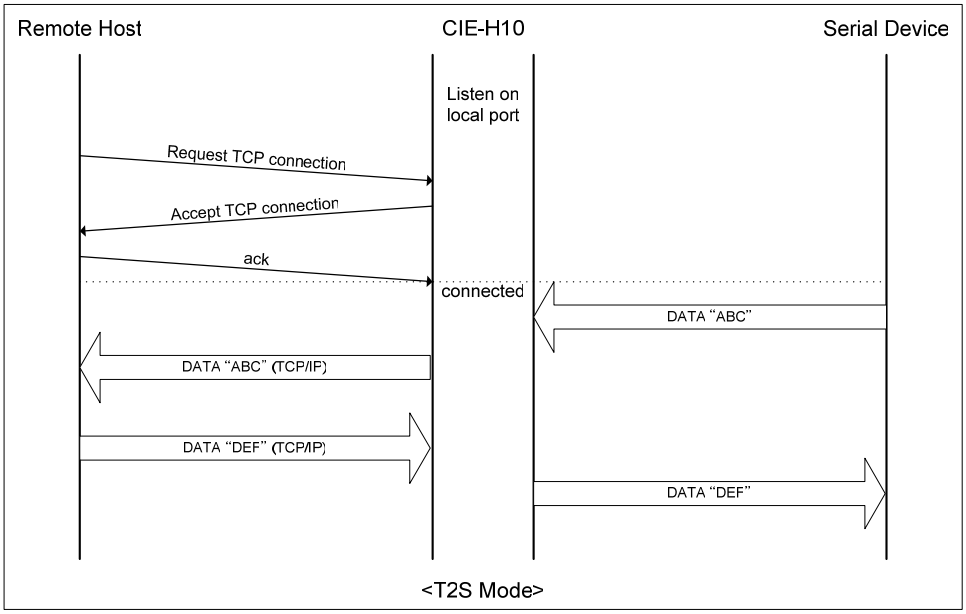
CIE-H10 has 4 serial communication modes. The following chart is a brief explanation for each communication mode.

Communication mode	Protocol	Connection	Need for User Device S/W Modification	Designation of Environmental Factor via Serial Port	Topology
T2S	TCP	Passive Connection	Not required	Not possible	1:1
ATC	TCP	Active/Passive	required	possible	1:1
COD	TCP	Active connection	Not required	Not possible	1:1
U2S	UDP	No connection	Not required	Not possible	N:M

6.2. T2S Mode

T2S is the mode that CIE-H10's serial port operates as a server.

When TCP connection comes through previously designated [Local Port] from remote host, CIE-H10 will accept TCP connection. When CIE-H10 accepts the connection, TCP connection is established. After establishing connection, data that comes through serial port will be sent to the remote host after TCP/IP process, and TCP/IP data that comes from the remote host will be sent to the serial port after TCP/IP process to establish data communication.



<T2S Mode>

6.2.1. Connection

When remote host connects to previously designated CIE-H10, user devices that are connected to CIE-H10 can establish full duplex data communication with remote host.

6.2.2. Serial Data before TCP Connection

Data before TCP connection will be handled based on the [Byte Count] settings. If the [Byte Count] is 0, the data that comes to CIE-H10's serial port will not be recognized. If it is not 0, the serial data before TCP connection will be temporarily saved to be sent to the host after the connection.

6.2.3. Data Communication

When the TCP connection is established, the data communication in between the host and the serial device will be established. Then, CIE-H10 will send data according to the [Guard Time]. In other words, when the data comes through CIE-H10's serial port, it

will be temporarily saved in the buffer. Then, when there is no incoming data during the designated [Guard Time], CIE-H10 will send the saved data. If the [Guard Time] is 0, CIE-H10 will send serial port's data immediately. The unit used for the [Guard Time] is 10m seconds and its minimum value is 40m seconds. Therefore, the user must set the number that is greater than 4.

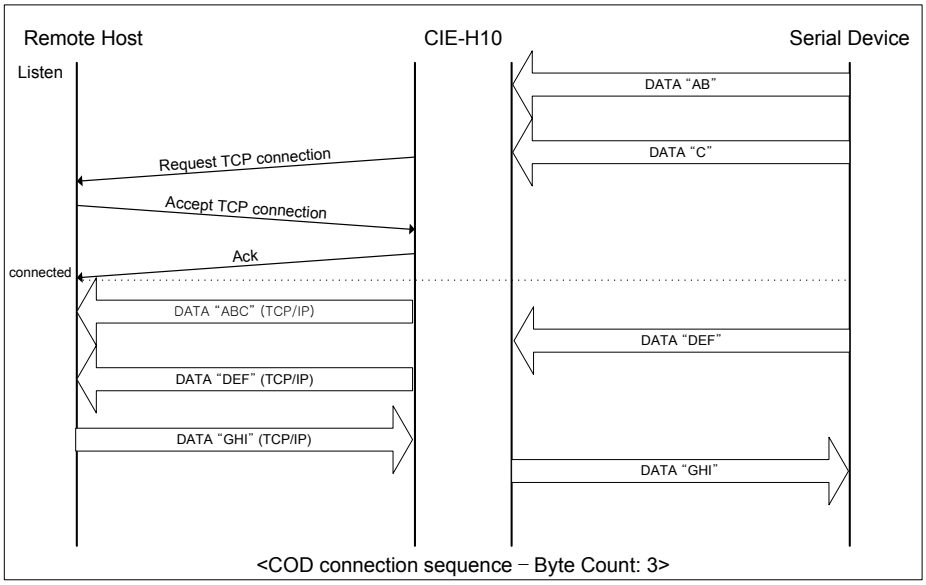
6.2.4. Connection Termination

When the connected host terminates the connection, or there is no data communication during the designated [Timeout], the TCP connection will be automatically terminated. The unit used for [Timeout] is 1 second.

6.3. COD

COD mode is the mode that CIE-H10 operates as a client.

When previously designated [byte count] data comes through the serial port, CIE-H10 will try to connect to the previously selected [Peer IP Address] host's TCP port [peer port] via TCP connection. When the remote host accepts the TCP connection, the TCP connection will be established. After the connection is established, the data that comes through the serial port will be sent to the remote host after TCP/IP handling. The TCP/IP data that comes from the remote host will be sent to the serial port after TCP/IP handling to form data communication.



<COD connection sequence – Byte Count: 3>

6.3.1. Serial Data before Connection

Data before TCP connection will be handled based on the [Byte Count] settings. If the [Byte Count] is 0, the data that comes to CIE-H10's serial port will not be recognized. If it is not 0, the serial data before TCP connection will be temporarily saved to be sent to the host after the connection.

6.3.2. Data Communication

When the TCP connection is established, the data communication in between the host and the serial device will be established. Then, CIE-H10 will send data according to the [Guard Time]. In other words, when the data comes through CIE-H10's serial port, it will be temporarily saved in the buffer. Then, when there is no incoming data during the designated [Guard Time], CIE-H10 will send the saved data. If the [Guard Time] is 0, CIE-H10 will send serial port's data immediately. The unit used for the [Guard Time] is 10m seconds and its minimum value is 40m seconds. Therefore, the user must set the number that is greater than 4.

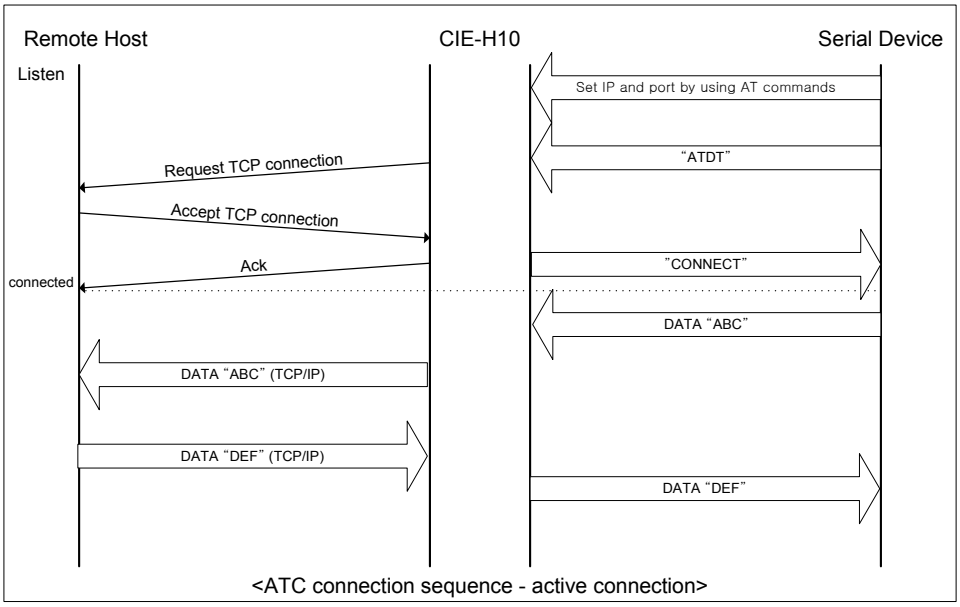
6.3.3. Connection Termination

When the connected host terminates the connection, or there is no data communication during the designated [Timeout], the TCP connection will be automatically terminated. The unit used for [Timeout] is 1 second.

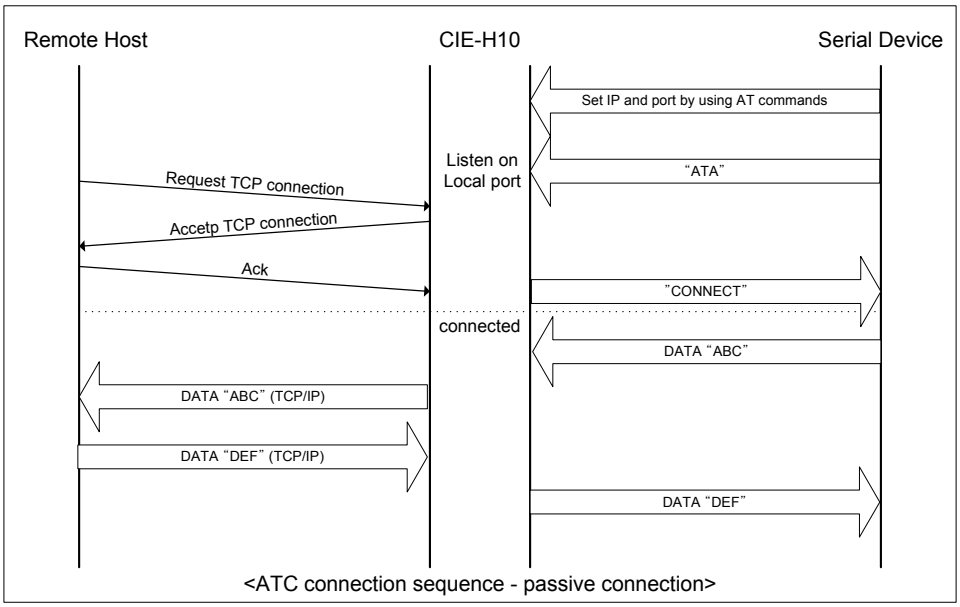
6.4. ATC

ATC mode allows users to use AT commands to control CIE-H10 like modem control. In ATC mode, only TCP connection is allowed.

In ATC mode, AT commands can be used to change environmental factor values and IP address. Also, it allows users to establish and terminate TCP connection



<ATC connection sequence - active connection>



<ATC connection sequence - passive connection>

☞ *Detailed information on AT commands are given in the next chapter*

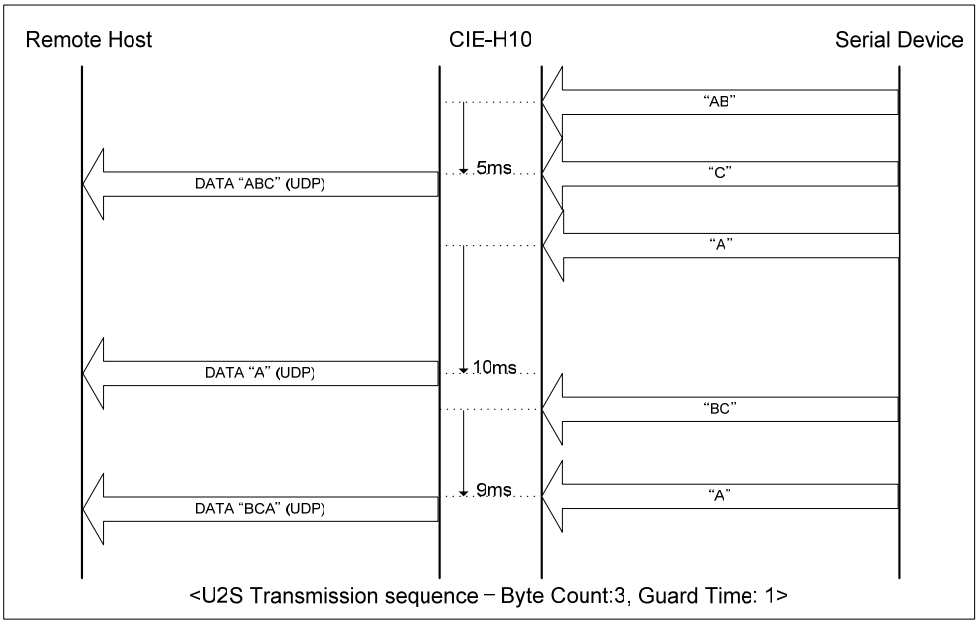
6.5. U2S

U2S is a mode that performs UDP communication.

In UDP communication, data is sent in block units. Therefore, data that comes through CIE-H10's serial port must be classified in block units to send it elsewhere. The block unit classification process is performed as the following.

When the amount of received data via CIE-H10 serial port is as same as previously designated data byte count, [Byte Count], or the duration of the data exceeds [Guard Time], the incoming data will be recognized as one block. This block will be sent to UDP. [Timeout] is in 10ms.

Since UDP communication does not involve establishing connection, N: M communication may be performed using broadcast. Therefore, it can be conveniently in changing RS 485 multi drop type network to Ethernet.



<U2S Transmission sequence – Byte Count:3, Guard Time: 1>

7. ATC Mode

7.1. Outline

In ATC mode, users can use AT commands to control and monitor CIE-H10. For example, AT+PRIP command can be used to designated an IP address and ATD command to establish connection to that IP address.

Therefore, multiple communications with different hosts can be established after one another. Also, ATA command allows users to perform manual connection.

7.1.1. AT Command Form

AT command starts with AT and ends with <CR>.

AT command form is as the following

AT	Command	<CR>(0x0d)

Response code for AT command is as the following

<CR>(0x0d)	<LF>(0x0a)	Response Message	<CR>(0x0d)	<LF>(0x0a)

Response message

When it is ATV1 (Initial Status	When it is ATV0	Details
OK	0	Command OK
CONNECT	1	TCP Connection Established
NO CARRIER	3	TCP Connection Termination
ERROR	4	Command Error
Designated Value	Designated Value	Query designated value (Example: AT+PRIIP?)

7.2. Basic AT Command (Ex: ATA, ATD etc)

Command	Function	Details
A	passive connection	Wait for connection (Host → CIE-H10 Connection)
D	active connection	CIE-H10 to Host connection
E	echo	Decide whether to echo inputted letters (E0-not echo, E1-echo)

H	off-hook	Forced Connection Termination
I	Info	Output CIE-H10 related information ATI3: Firmware version ATI7: MAC address
O	Online	Convert to Online from AT commands status
V	enable result code	Result code form (Number-V0, Letter-V1)
Z	reset	reset

7.3. Expanded AT Commands (Ex: AT+PLIP etc.)

Command	Function	Details
+PLIP	local IP address	When values for this category is changed, it must be saved with AT+PWP command.
+PSM	subnet mask	
+PGIP	default router	
+PLP	listening TCP port	
+PTO	Timeout	
+PRIP	Remote IP address	
+PRP	Remote machine TCP port	
+PWP	Write configuration	Save setting value
+PARP	Whether to use IP setting method using ARP	ON: 1, OFF: 0
+PDC	DHCP	ON: 1, OFF: 0

7.4. Online Status and AT Command Status

When connection cannot be established in AT mode, the device is in AT command mode. In AT command mode, AT commands may be used.

When TCP connection is established, the device is in online status. In online status, AT commands may not be used. In order to use AT commands during TCP connection, use ATO command to change into AT command status.

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

7.4.1. Method to change to AT Command Status from Online Status

In order to change to AT command status from online status, +++ must be sent according to the below time format.

When sending +++, +++ is sent to the host.

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

7.4.2. Method to change to Online Status from AT Command Status

When the device is changed to AT command status from online status during TCP connection, ATO command may be used to change it back to online status.

7.5. Example for Settings done by AT Commands

	Data		Details
	AT+PLIP=192.168.1.200<CR>	▶	LOCAL IP address 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+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

7.6. Example for Connection

7.6.1. Example for Active Connection

	Data		Details

	AT+PRIP=192.168.1.201<CR>	▶	Designate IP address that is to be connected
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PRP=1470<CR>	▶	Designate PORT number that is to be connected
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATDT<CR>	▶	Connect to outer host command
Attempt connection to outer host			
◀	<CR><LF>CONNECT<CR><LF>		Successful TCP connection to outer host
Data output/input			

7.6.2. Example for Passive Connection

	Data		Details
	AT+PLP=1470<CR>	▶	LOCAL PORT setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATA<CR>	▶	Wait for connection command
Wait for connection from outer host			
Connection from outer host			
◀	<CR><LF>CONNECT<CR><LF>		TCP Connection OK
Data output/input			

7.7. Example for Connection Termination

7.7.1. Example for Active Connection Termination

This is the connection termination process when CIE-H10 actively terminates connection first.

	Data		Details
Data output/input (During TCP connection)			
	[guard time]+++[guard time]	▶	Convert to AT command status from online status
◀	<CR><LF>OK<CR><LF>		Conversion to AT command status complete
	ATH	▶	TCP connection termination command
◀	<CR><LF>OK<CR><LF>		TCP connection termination

7.7.2. Example for Passive Connection Termination

When outer host attempts to terminate connection first

	Data		Details
Data output/input (During TCP connection)			
Outer host attempts to terminate connection first			
◀	<CR><LF>NO CARRIER<CR><LF>		TCP connection termination

8. Security Function

CIE-H10 provides users with password, MAC address access restriction, IP address restriction, and other security functions.

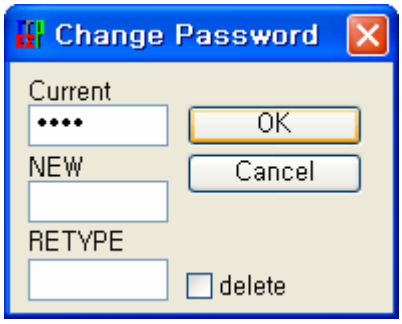
8.1. Password

When password for CIE-H10 is designated, password is required when users are attempting to change CIE-H10 settings. Also, when connecting to CIE-H10 via web browser to monitor and control input/output port, users must insert the designated password.

8.1.1. Set and Delete Password

Password for CIE-H10 can be designated in ezManager. Click [Change PWD] button in ezManager and enter desired password in the window.

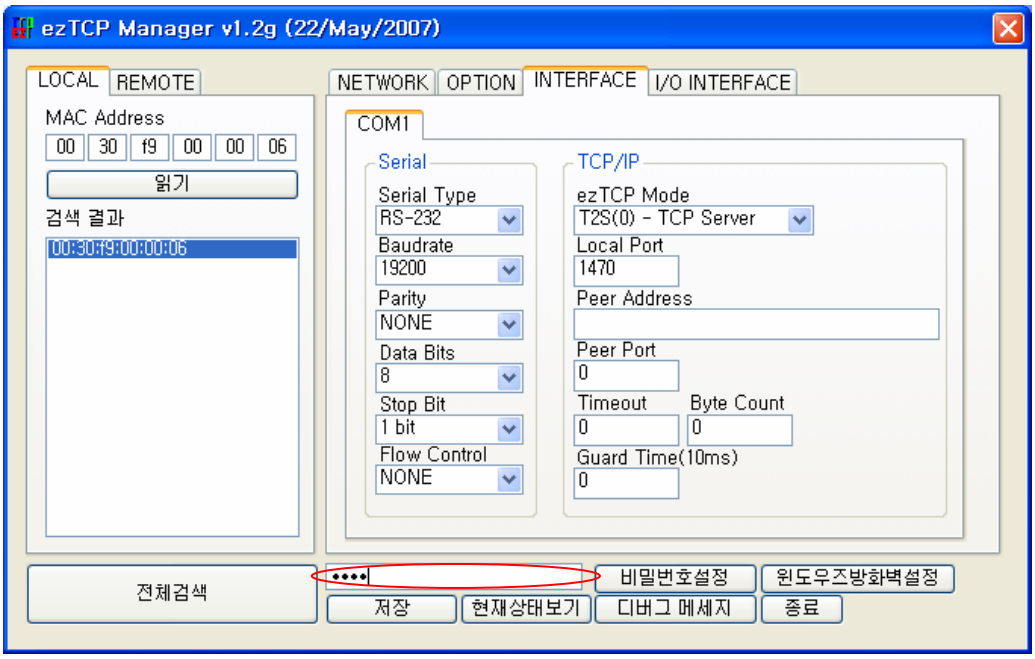
Enter current password in the [Current] window and click [OK] after checking the [delete] check box to delete currently designated password.



Current	When there is currently designated password, enter current password in this window.
NEW	Enter new password.
RETYPE	Retype new password.
delete	Check the [delete] check box after entering current password in the [Current] window to delete current password.
OK	Delete current password or set new password
Cancel	Cancel current operation and close the window.

8.1.2. CIE-H10 settings with Designated Password

In order to save environmental factor values to CIE-H10 that has designated password, enter password in the window next to [Change PWD] and click [Save]



8.1.3. Connect via Web Browser

When connecting to CIE-H10 that has designated password via web browser, password must be entered. Enter admin for ID and enter designated CIE-H10 password in the password window.

8.1.4. When Password is Lost

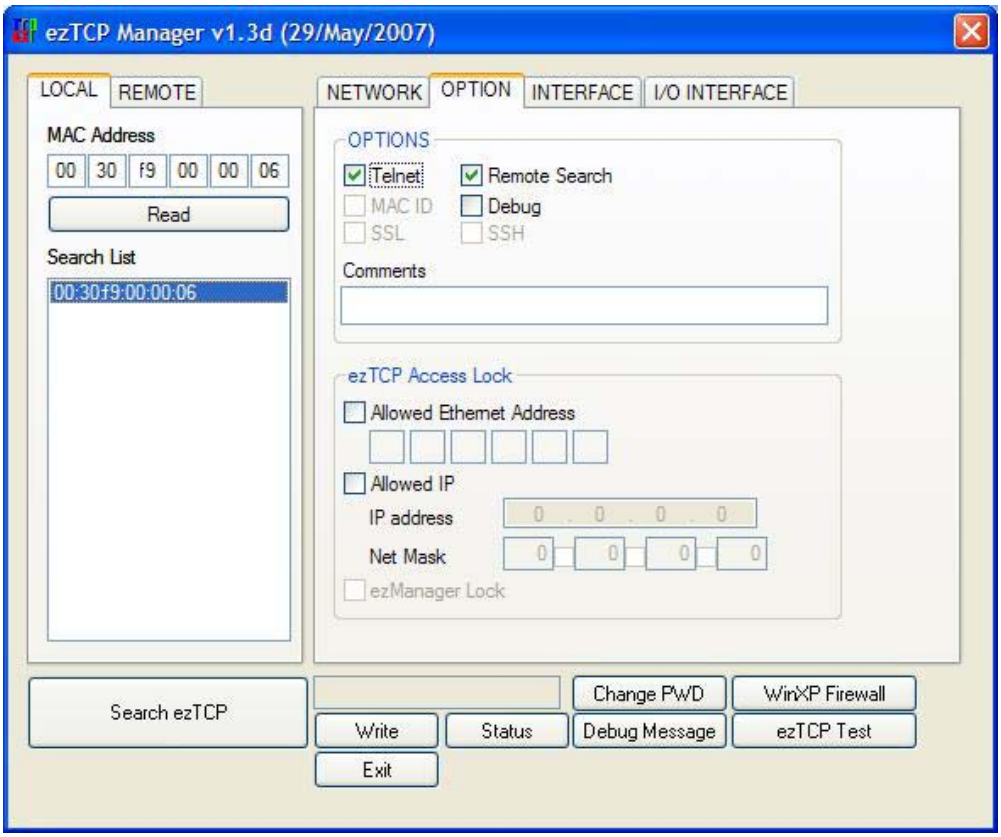
When designated password is lost, ezManager cannot be used to manage CIE-H10.

In this case, pres CIE-H10's ISP button for 100ms to operate CIE-H10 in ISP mode.

In ISP mode, all of the security functions are disabled. It allows users to delete currently designated password.

8.2. Connection Restriction Function

When [ezTCP Access Lock] is selected in ezManager, host connection can be restricted. This function is applicable to Modbus/TCP, HTTP, telnet, and other TCP connections.



8.2.1. Allowed Ethernet Address

Host's MAC address that attempts to establish connection to CIE-H10 may be restricted. When this category is selected, hosts with designated MAC address may only connect to CIE-H10.

8.2.2. Allowed IP Address

When this category is selected, host connections can be restricted based on designated [IP address] and [Net Mask] setting values.

When [Allowed IP Address] is selected, [Allowed IP] and [Net Mask] category may be bit AND to identify allowed hosts.

(Ex)

Allowed IP	Net Mask	Allowed Hosts
10.1.0.1	255.0.0.0	10.1.0.1 ~ 10.255.255.254
10.1.0.1	255.255.255.0	10.1.0.1 ~ 10.1.0.254
192.168.1.4	255.255.255.255	192.168.1.4

8.2.3. ezManager Lock

When [ezManager Lock] is selected, ezManager can only be used in hosts designated by [Allowed Ethernet Address] or [Allowed IP].

Beware that if this category is selected, changing device settings may become difficult.

9. Debugging

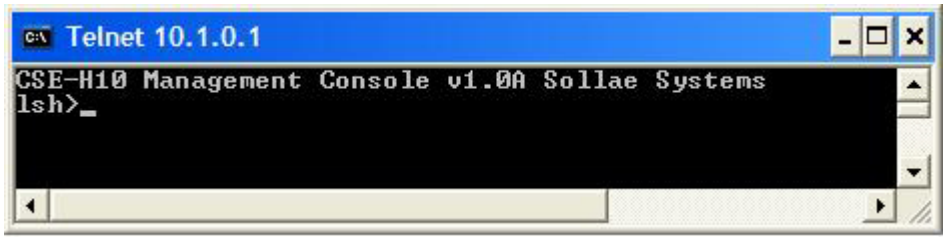
If user logs in the CIE-H10, user can monitor CIE-H10 status. And if user sets the debugging option, user can gets debugging data with ezManager.

9.1. Telnet

9.1.1. Telnet Login

If the [Telnet] parameter is set, user can log in the CIE-H10. User can monitor the status of the serial ports and the network.

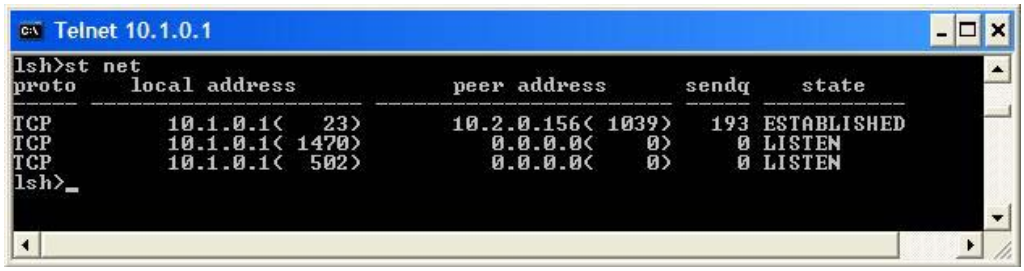
If user inputs " telnet [CIE-H10 IP Address]", user can log in the CIE-H10 with telnet. Then the following message will be shown.



9.1.2. Commands

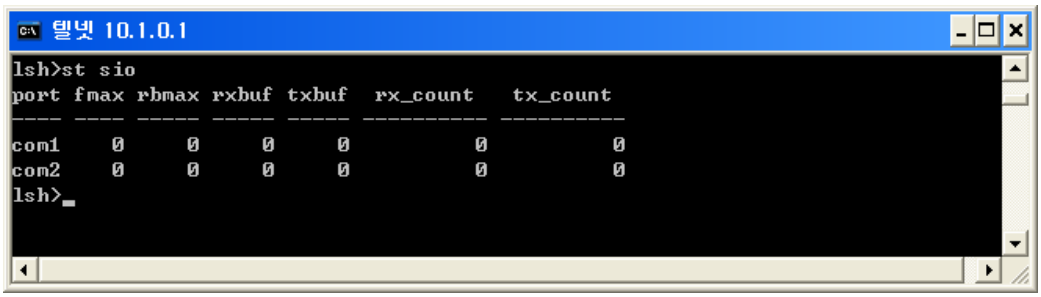
- Network Status

User can monitor network status of CIE-H10 with the "st net" command.



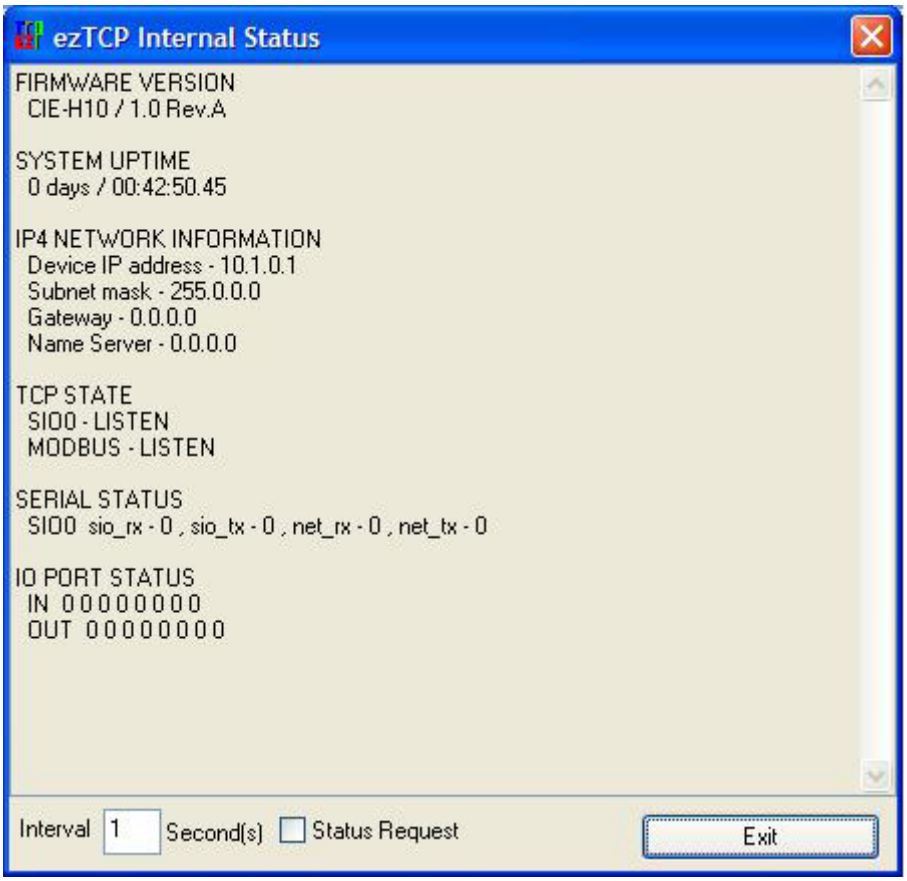
- Serial Ports' Status

User can monitor the statuses of the serial port with the "st sio" command. The tx_count and the rx_count are the total data sizes to/from the serial port. The com1 is the CIE-H10's serial port, and the com2 must be ignored.



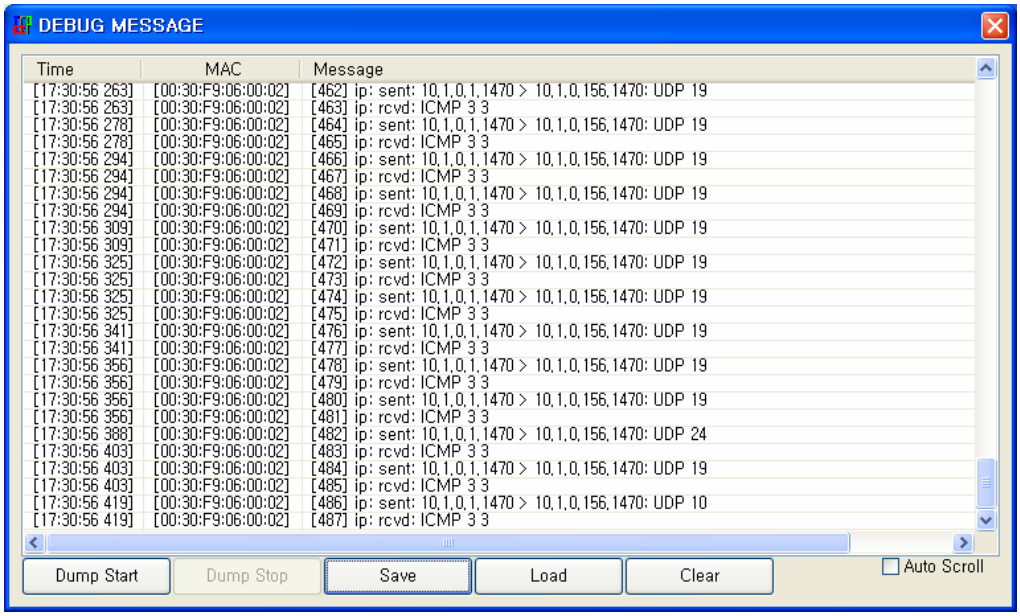
9.2. Status of ezManger

If the [Status] is pressed, user can monitor the current status of the CIE-H10 with ezManager. If user sets [Status Request] option, the status data will be updated periodically.



9.3. Remote Debugging

If the [Debug] field in the [OPTION] tab of the ezManager, CIE-H10 transmits debugging messages with UDP port 50006. Then user can get the messages with new window if user presses [Debug Message] button as followed:



This function is very useful when there are any problems when user install the CIE-H10 in the user site.

10. Technical Support/Guarantee Period/Precautions

10.1. Technical Support

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

Customer support homepage address: http://www.sollae.co.kr/Support
email address: support@sollae.co.kr

10.2. Guarantee

10.2.1. Refund

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

10.2.2. Compensated A/S

If product malfunctions within 1 year of purchase, repair and product exchange will be done without charge. However, product malfunctions due to user's miss care will be repaired with charge.

10.2.3. Non-compensated A/S

Products after 1 year of purchase or product malfunctions due to user's miss care will be repaired and exchanged with charge.

10.3. Precautions

- If the product is modified, the product is no longer guaranteed.
- The specifications of the product may be altered without notice.
- If the product is used for functions that are not covered by the product, the product is no longer guaranteed as well.
- Reverse engineering of provided applications and firmware is prohibited.
- Firmware and provided applications may not be used for other purposes that its original 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.
- Please do not use this product for special cases requiring special 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.

11. Revision History

Date	Version	Comment
Mar.22.2007	0.5	Initial touch
Jun.11.2007	1.0	Initial Release
Jun.28.2007	1.1	Add Security Function
Jun.29.2007	1.2	Correct Maximum Input Port Voltage
Jul.16.2007	1.3	Change English Expressions by JJS
Sep.03.2007	1.4	Add Telnet COM Port Control Option
Sep.19.2007	1.5	Add DDNS(Dynamic DNS)