EX-9000A/AB-MTCP
DIO series

Data Acquisition Modules
User's Manual

Web site: www.topsccc.com

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Chapter 1 Ethernet-enabled DA&C I/O Modules

EX-9000A/AB-MTCP is based on the popular Ethernet networking standards used today in most business environments. Users can easily add EX-9000A-MTCP I/O modules to existing Ethernet networks or use EX-9000A/AB-MTCP modules in new Ethernet-enabled Manufacturing networks. EX-9000A/AB-MTCP module features a 10/100 Mbps Ethernet chip and supports industrial popular Modus/TCP protocol over TCP/IP for data connection. EX-9000A/AB-MTCP also supports UDP protocol over Ethernet networking. With UDP/IP, EX-9000A/AB-MTCP I/O modules can actively send I/O data stream to 8 Ethernet nodes. Through Ethernet networking HMI/SCADA system and controller can access or gather real-time data from EX-9000A/AB-MTCP Ethernet enabled DA&C modules. And, these real-time data can be integrated with business system to create valuable, competitive business information immediately.

1.1 Intelligent I/O Modules

Enhancing from traditional I/O modules, EX-9000A/AB-MTCP I/O modules have pre-built intelligent mathematic functions to empower the system capacity. The Digital Input modules provide Counter, Totalizer functions; the Digital Output modules provide pulse output and ***DIO Synchronization (Mirror Local DI to DO)***; the Analog Input modules provide the Max./Min./Average data calculation; the Analog Output modules provide the PID loop control function.

1.2 Mixed I/O in One Module to fit all applications

EX-9000A/AB-MTCP mixed I/O module design concept provides the most cost-effective I/O usage for application system. The most common used I/O type for single function unit are collected in ONE module. This design concept not only save I/O usage and spare modules cost but also speed up I/O relative operations. For small DA&C system or standalone control unit in a middle or large scale, EX-9000A-MTCP mixed I/O design can easily fit application needs by one or two modules only. With additional embedded control modules, EX-9000A/AB-MTCP can easily create a localized, less complex, and more distributed I/O architecture.

1.3 Industrial standard Modbus/TCP protocol supported for open connectivity

EX-9000A/AB-MTCP modules support the popular industrial standard, Modbus/TCP protocol, to connect with Ethernet Controller or HMI/SCADA software built with Modbus/TCP driver. ExpertDAQ also provides OPC server for Modbus/TCP to integrate EX-9000A/AB-MTCP I/O real-time data value with OPC client enabled software. Users don’t need to take care of special driver’s development.

1.4 Software Support

Based on the Modbus/TCP standard, the EX-9000A/AB-MTCP firmware is a built-in Modbus/TCP server. Therefore, ExpertDAQ provides the necessary DLL drivers, and Windows Utility for users for client data for the EX-9000A/AB-MTCP. Users can configure this DA&C system via Windows Utility; integrate with HMI software package via Modbus/TCP driver or Modbus/TCP OPC Server. Even more, you can use the DLL driver and ActiveX to develop your own applications.

1.5 Common technical specification of EX-9000A/AB-MTCP

- Ethernet: 10 BASE-T IEEE 802.3 100 BASE-TX IEEE 802.3u
- Wiring: UTP, category 5 or greater
- Bus Connection: RJ45 modular jack
- Comm. Protocol: Modbus/TCP on TCP/IP and UDP
- Data Transfer Rate: Up to 100 Mbps
- Unregulated 10 to 30VDC
- Protection: Over-voltage and power reversal
- Status Indicator: Power, CPU, Communication (Link, Collide, 10/100 Mbps, Tx, Rx)
- Case: ABS with captive mounting hardware
- Plug-in Screw Terminal Block: Accepts 0.5 mm 2 to 2.5 mm 2 , 1 - #12 or 2 - #14 to #22 AWG
- Operating Temperature: - 10 to 70º C (14 to 158º F)
- Storage Temperature: - 25 to 85º C (-13 to 185º F)
- Humidity: 5 to 95%, non-condensing
- Atmosphere: No corrosive gases

NOTE:
Equipment will operate below 30% humidity. However, static electricity problems occur much more frequently at lower humidity levels. Make sure you take adequate precautions when you touch the equipment. Consider using ground straps, anti-static floor coverings, etc. if you use the equipment in low humidity environments.

1.6 Product Warranty (1 years)

ExpertDAQ warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for one year from the date of purchase. This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by ExpertDAQ, or which have been subject to misuse, abuse, accident or improper installation. ExpertDAQ assumes no liability under the terms of this warranty as a consequence of such events.

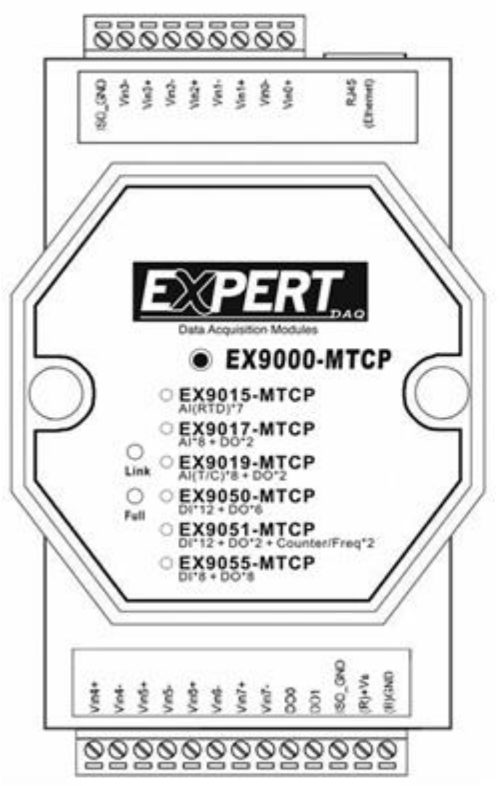
Because of ExpertDAQ’s high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an ExpertDAQ product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

1.7 LED & Dimensions

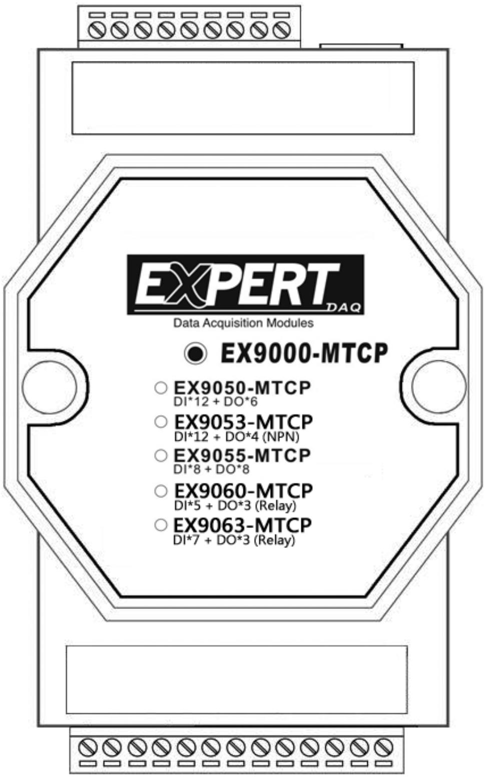
The following diagrams show the dimensions & LED of the EX-9000A/AB-MTCP I/O module in millimeters.

1.7.1 LED Status:

- **Red indicator. one is for Power-LED ; Link & full (EX9015MTCP/EX9017MTCP/ EX9050MTCP/EX9051MTCP/EX9055MTCP) for normal on whenever EX9000-MTCP module is running.**



- **LED Status: There are four flash types of the Power-LED (Status LED indicator) on the front panel of Expert DAQ EX9050A/AB-MTCP EX9051A/AB-MTCP EX9053A-MTCP EX9055A/AB-MTCP EX9060A-MTCP/EX9063A-MTCP.**



No.	Color	LED Status	Definition
1	RED+Green	On	(Status) EX9000A/AB-MTCP module is initializing.
2	RED	On	(Status) EX9000A/AB-MTCP module is running.
3	RED	Blinking	(Status) Host WtachDog timeout.
4	Green	On	(LINK) On whenever the Ethernet is connected
5	Green	Blinking	(COM) Blinks whenever EX9000A/AB-MTCP module is transmitting or receiving data via Ethernet.

1.7.2 Initializing a Module

All ExpertDAQ modules in an Ethernet network must have a *unique IP* address. Therefore, to configure the brand-new ExpertDAQ before using is necessary.

1.7.3 Factory default settings:

♦ IP Address :	10.0.0.1
♦ Subnet Mask:	255.0.0.0
♦ Gateway:	10.0.0.1
♦ DHCP:	Disabled
♦ Web Server:	Disabled
♦ Module ID:	00
♦ Password:	00000000

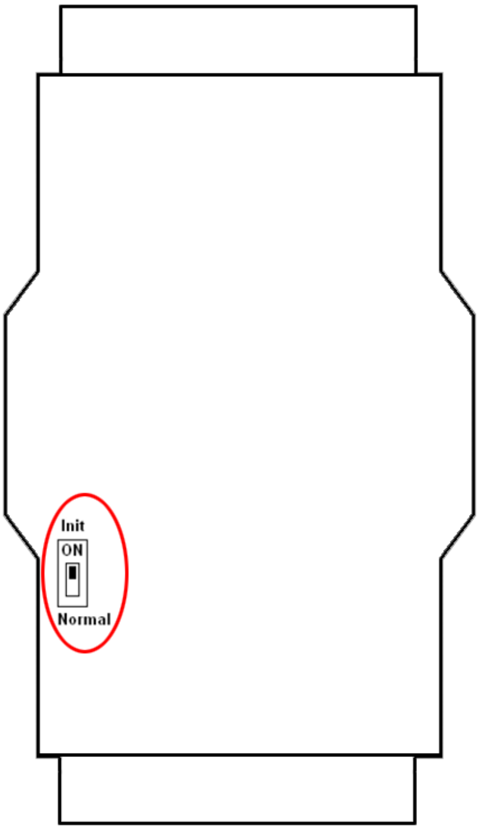
1.7.4 INIT* State settings:

- The EX9000MTCP I/O modules must be set at "***INIT" State*** when you want to change the default settings, such as the *IP address, DIO mode status* etc. All EX9000-MTCP I/O modules have an special slide-switch as **INIT-SWITCH *(ref. Back Side)12.1***. The module will be in *Default State* if the INIT switch set to "INIT" mode when power ON. Under this state, the default configuration is set as following :

♦ IP Address :	10.0.0.1
♦ Subnet Mask:	255.0.0.0
♦ Gateway:	10.0.0.1

♦	DHCP:	Disabled
♦	Web Server:	Disabled
♦	Module ID:	00
♦	Password:	00000000

Note: Each module must has a unique ID number to be identified when the DHCP enabled, because you would not know the module IP address when DHCP enabled, but if with the different ID number.You can call provided function call(TCP_GetIPFromID() in TCPDAQ.dll) to get correct IP address for each ID number

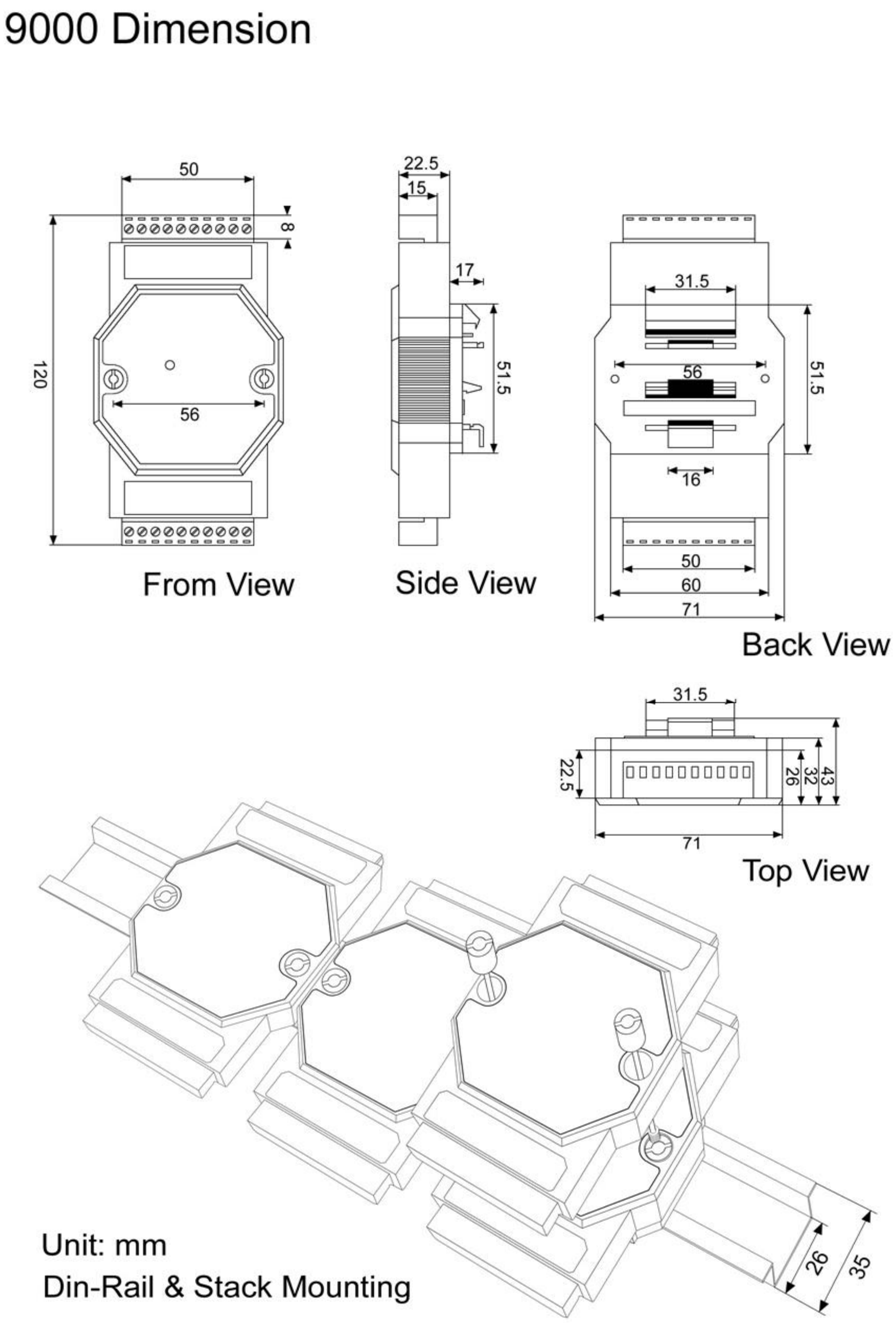


1.7.5 Dimensions

The following diagrams show the dimensions of the EX9000A/AB-MTCP I/O module in millimeters.

EX9000A/AB-MTCP I/O Modules support Din-Rail & Wall Mount.

EX9000A/AB-MTCP IO Modules support stack Mounting also.



1.8 Summary of DIO modules

The EX-9000A/AB-MTCP provides a series of digital input or output modules to sense the digital signal or to control the remote devices.

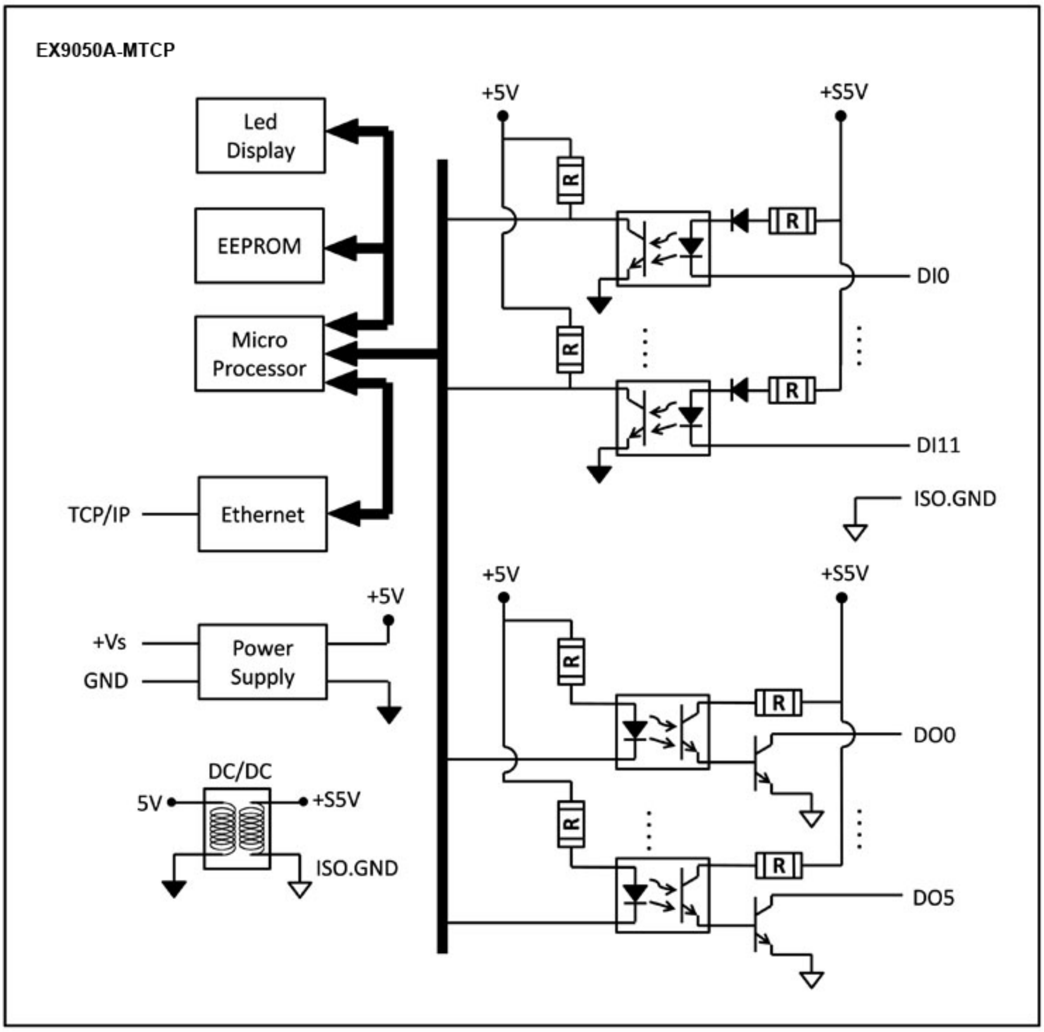
DC Input and DC Output modules				
Module	**DI ch.**	**Input type**	**DO ch.**	**Output type**
9050A-MTCP	12	Isolated single ended with Dry Contact *(common ground)*.	6	Isolation with Open collector (NPN)
9050AB-MTCP	12	Isolated single ended with Wet Contact (*common source or ground*)	6	Isolation with Open collector (NPN)
9051A-MTCP	12	Isolated single ended with Dry Contact *(common groung)*	2	Isolation with Open collector (NPN)
	2	Iso. with differential counter input		
9051AB-MTCP	12	Isolated single ended with Wet Contact *(common source)*	2	Isolation with Open collector (NPN)
	2	Iso. with differential counter input		
9055A-MTCP	8	Isolated single ended with Dry Contact *(common ground)*.	8	Isolated with open drain (P-MOSFET), (3A/per channel) (total amount of DO channels max. 8A).
9055AB-MTCP	8	Isolated single ended with Dry/Wet Contact*(common source or ground)*	8	Isolated with open drain (P-MOSFET), (3A/per channel) (total amount of DO channels max. 8A).
9053A-MTCP	12	Isolated single ended with Dry/Wet Contact*(common source or ground)*	4	Isolation with Open collector (NPN)
9060A-MTCP	5	Isolated single ended with Dry/Wet Contact(common source or ground)	3	Relay output 0.6A@125VAC/2A@30VDC. RL1(Form A), RL2,RL3(Form C)
9061A 9461	6	Isolated single ended with Dry Contact (common source).	6	Relay output 0.6A@125VAC/2A@30VDC (Form A)
9063A-MTCP	7	Isolated single ended with Dry/Wet Contact(common source or ground)	3	Relay output 5A@250VAC/5A@30VDC. (Form A)
9066A 9466	6	Isolated single ended with Dry Contact (common source).	6	5A@250VAC/5A@30VDC. (Form A)

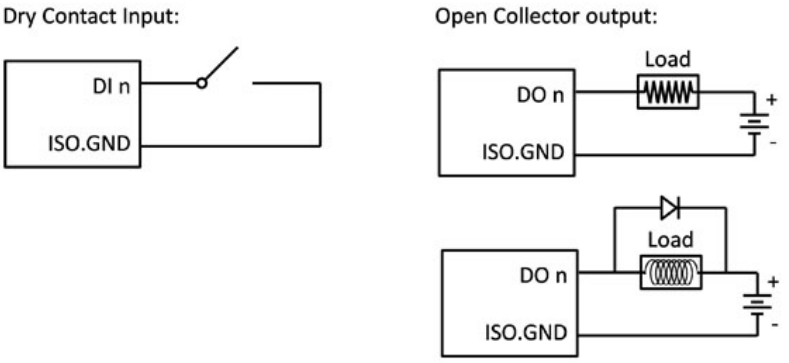
Chapter 2 Block diagram & Wire Connection of DIO modules

2.1 EX-9050A/AB-MTCP

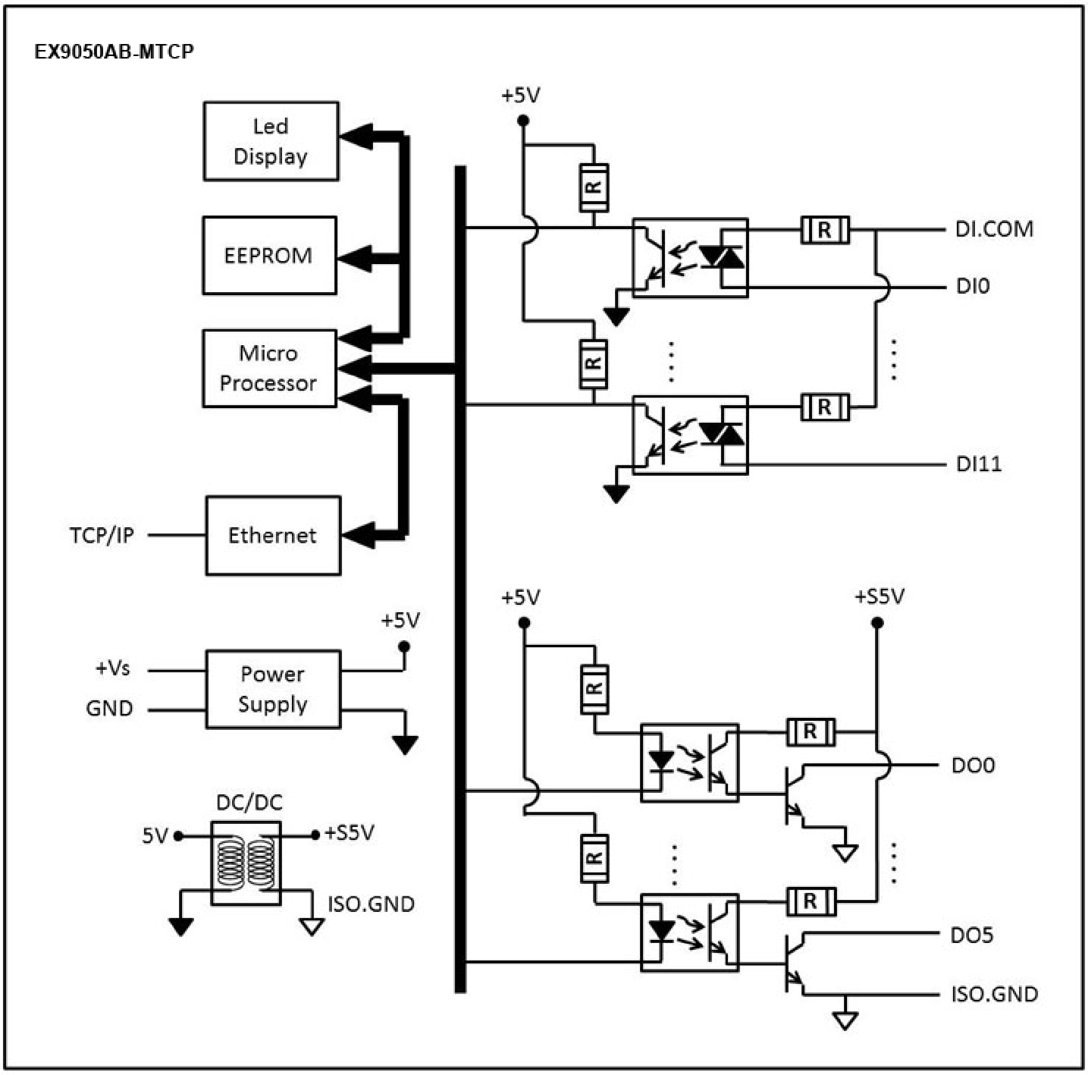
2.1.1 Block diagram & Wire Connection

EX9050A-MTCP: Dry Connection

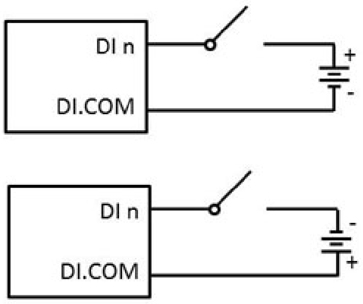




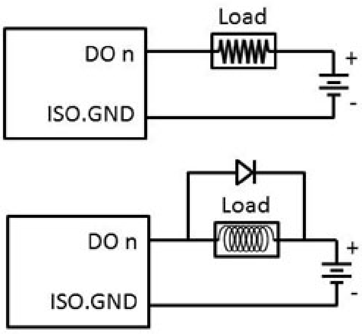
EX9050AB-MTCP: Wet Connection



Wet Contact Input:



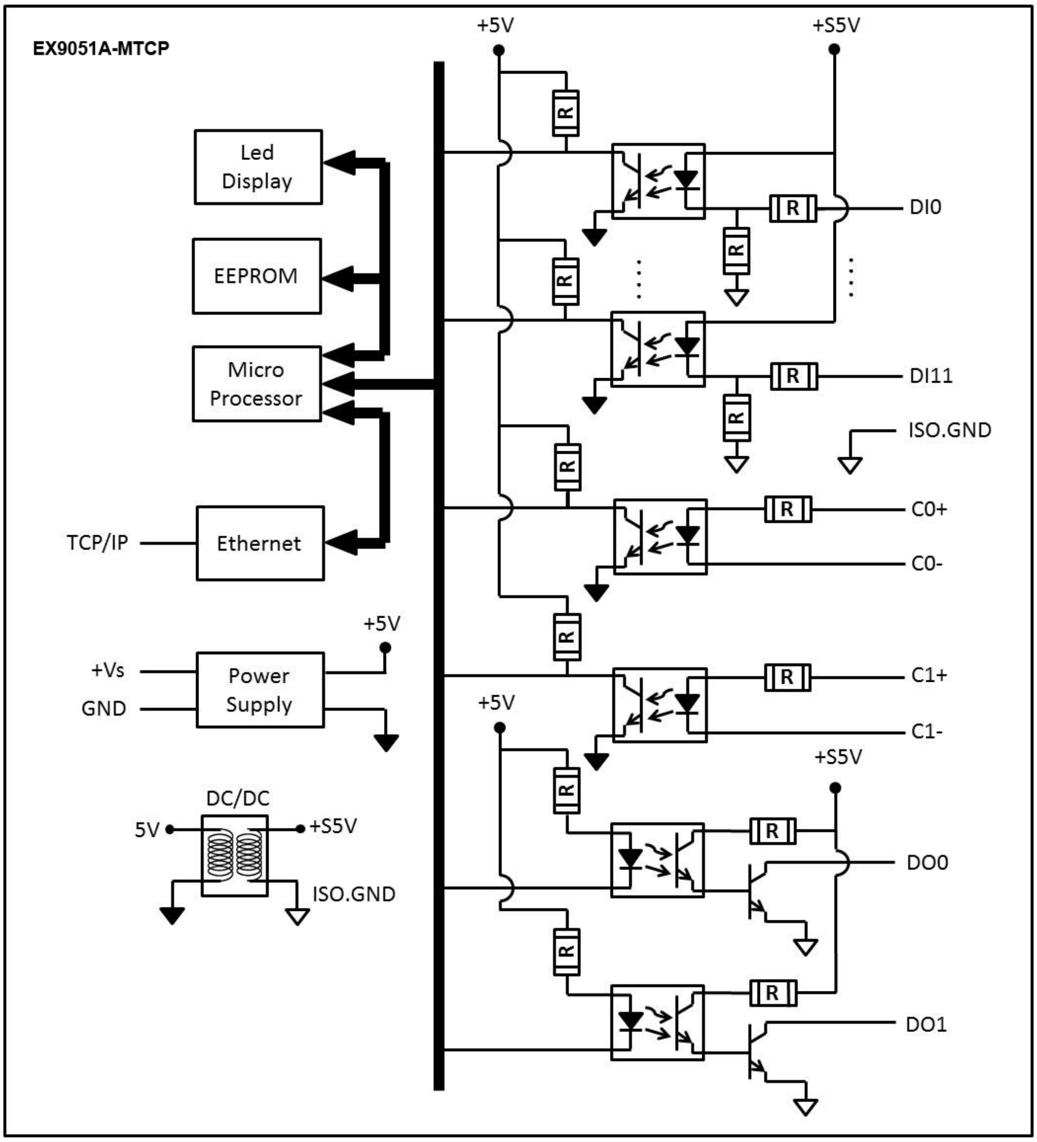
Open Collector output:



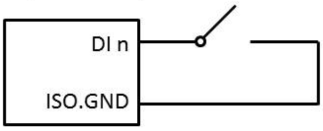
2.2 EX-9051A/AB-MTCP

2.2.1 Block diagram & Wire Connection

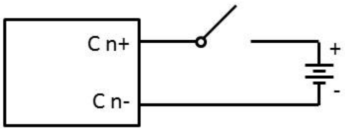
EX9051A-MTCP: Dry Contact



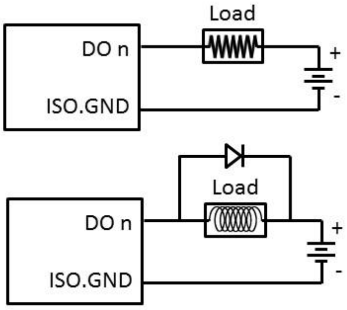
Dry Contact Input:



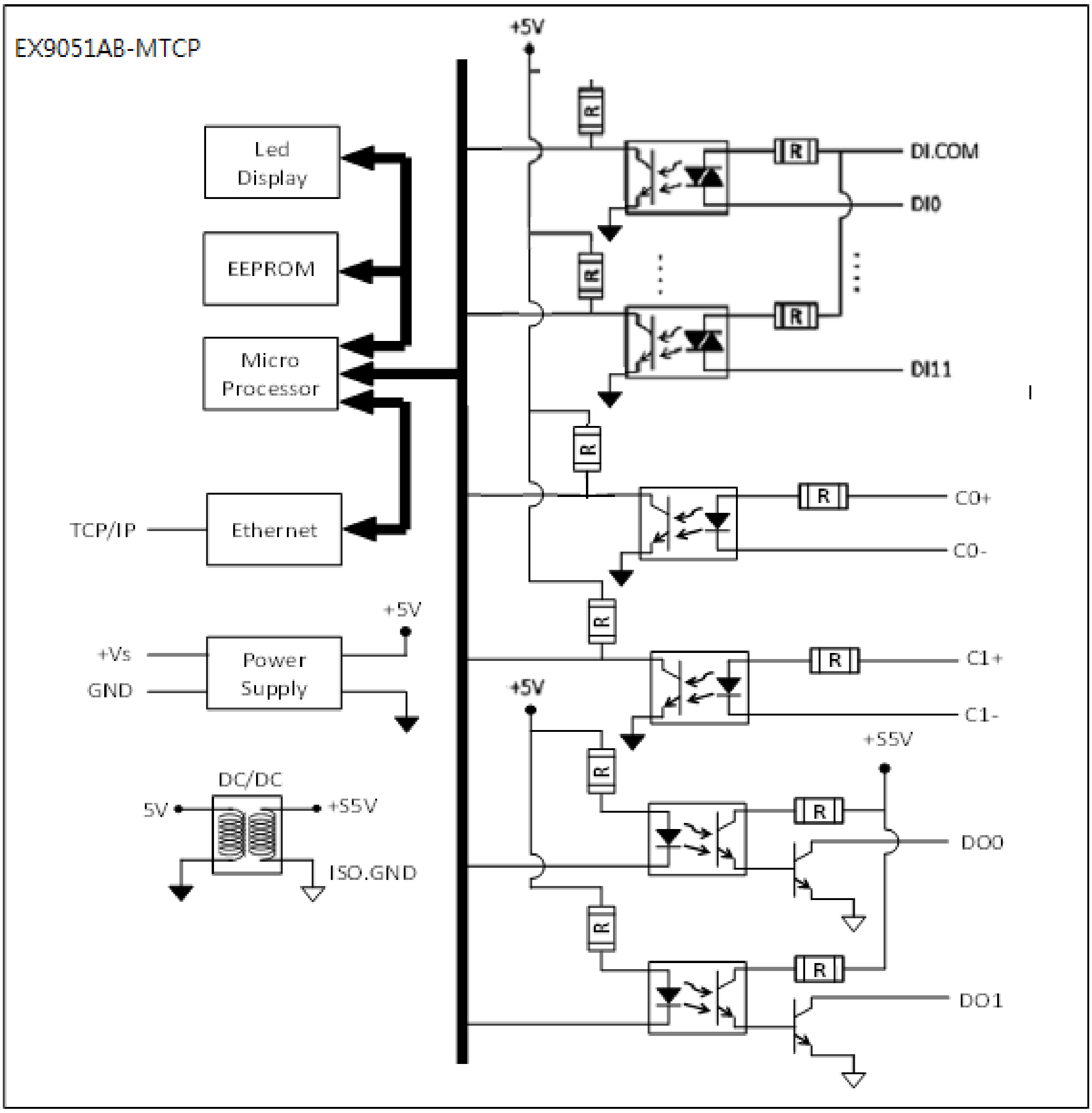
Counter:

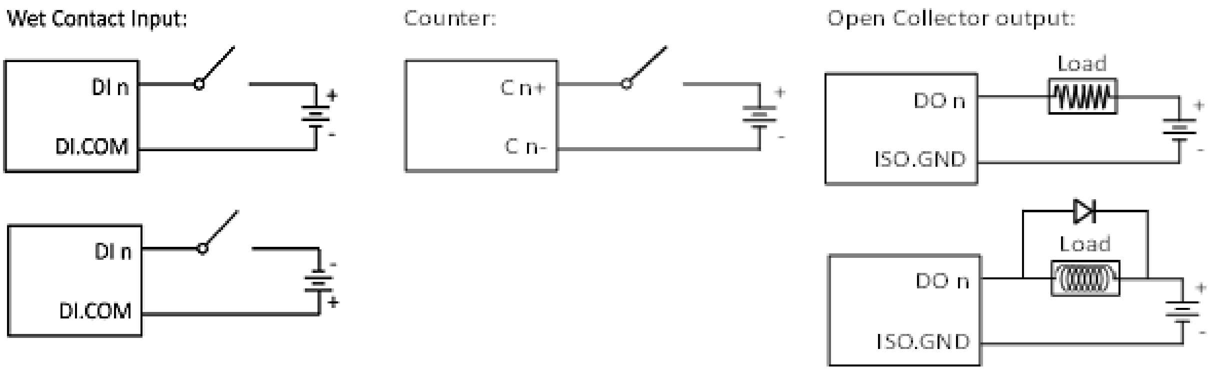


Open Collector output:



EX9051AB-MTCP: Wet Contact

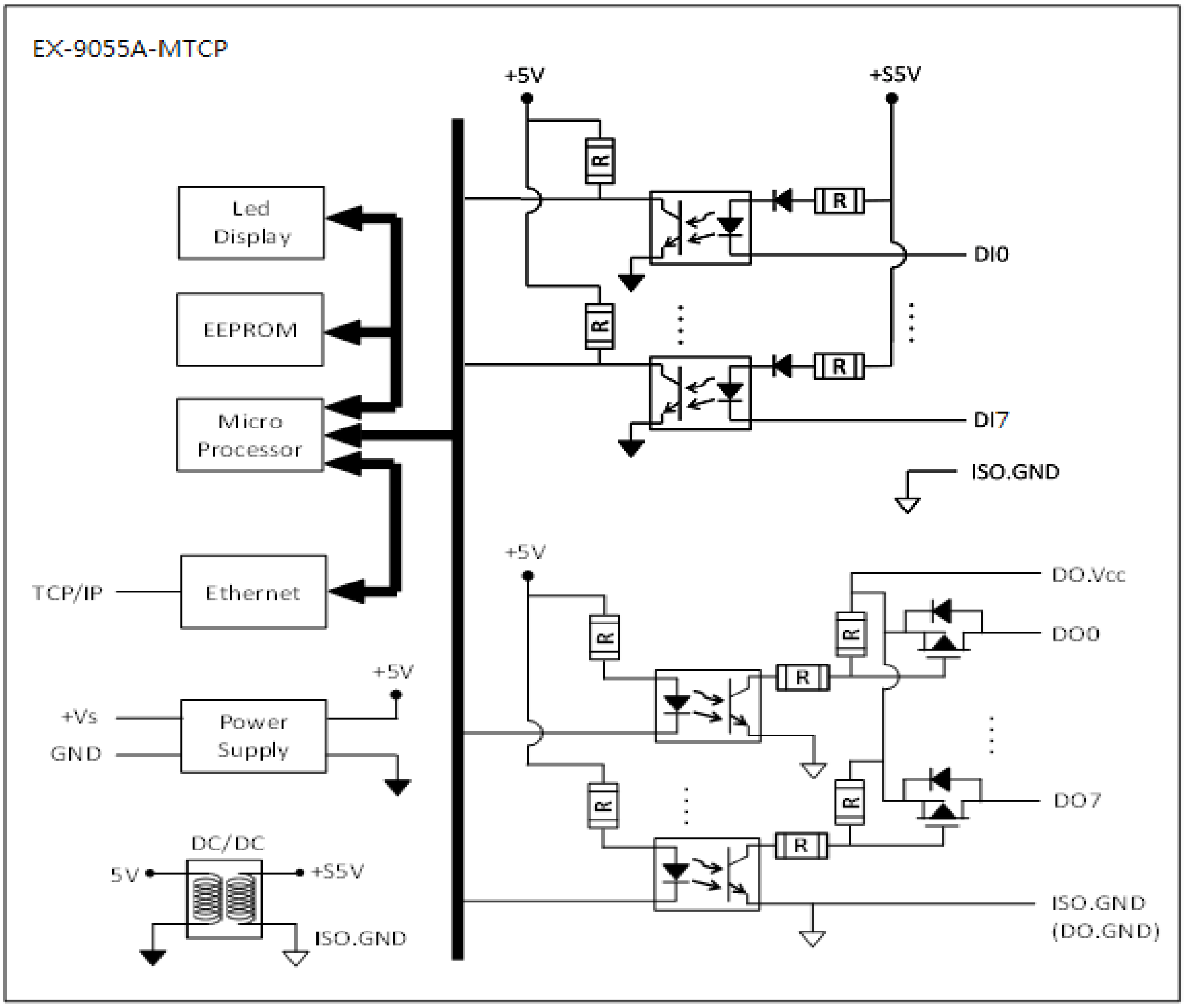




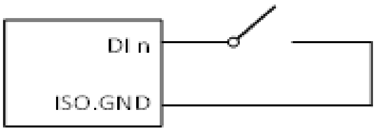
2.3 EX-9055A/AB-MTCP

2.3.1 Block diagram & Wire Connection

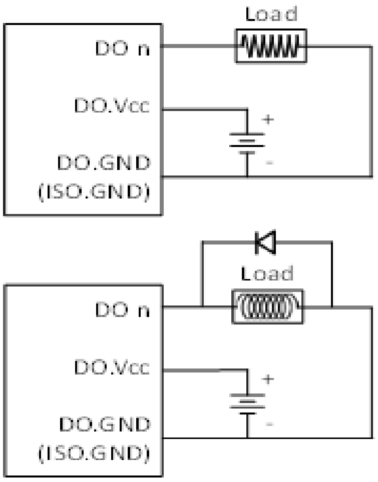
EX9055A-MTCP: Dry Contact



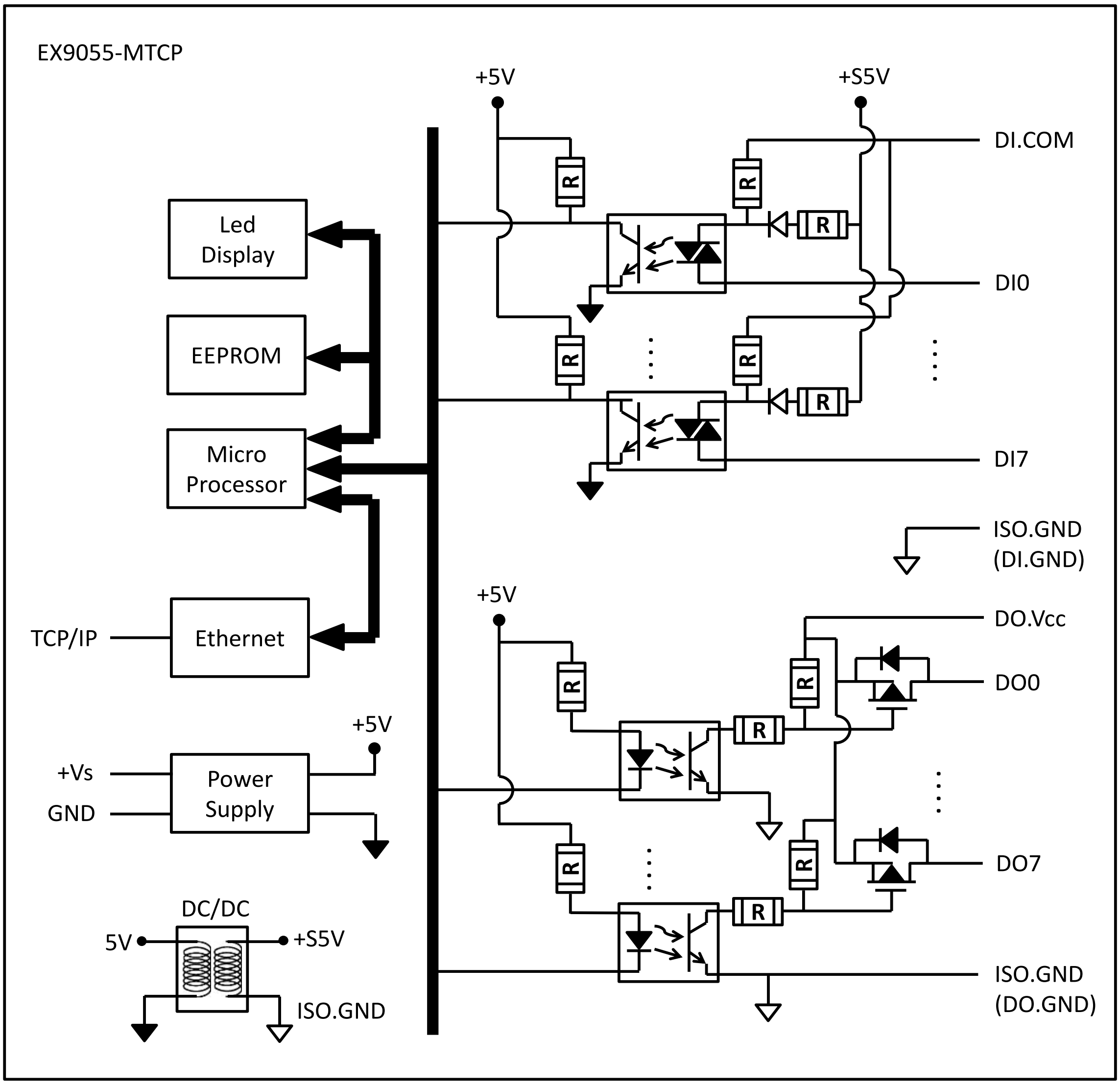
Dry Contact Input:



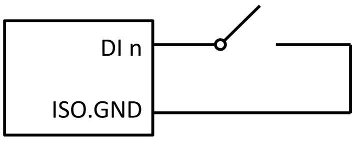
Open Drain (P-MOSFET) output:



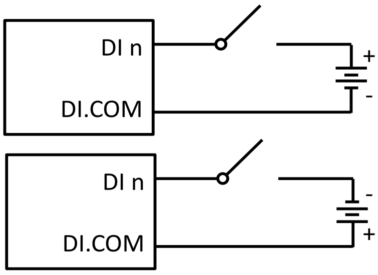
EX9055AB-MTCP: Dry/ Wet Contact **(To use Wet Contact , the DI.GND pin must be opened).**



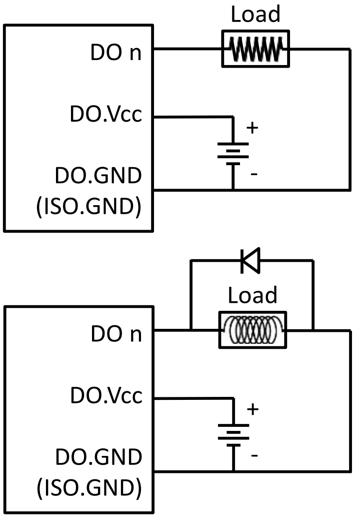
Dry Contact Input:



Wet Contact Input:



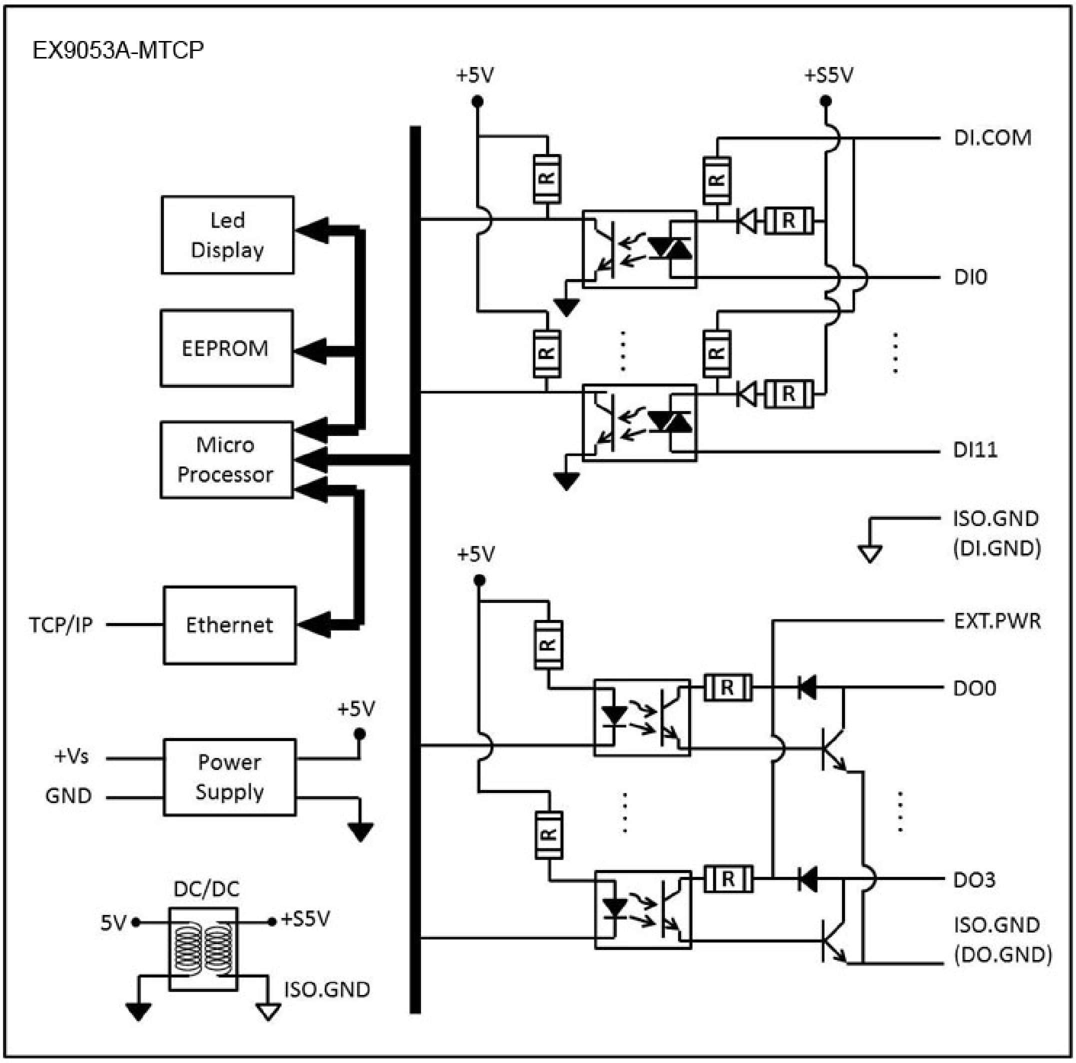
Open Drain (P-MOSFET) output:



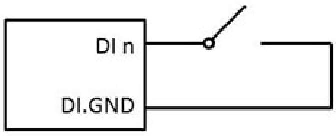
2.4 EX-9053A-MTCP

2.4.1 Block diagram & Wire Connection

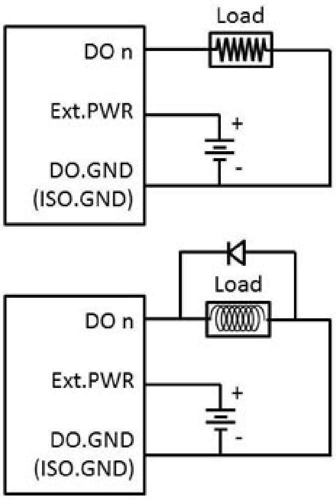
EX9053A-MTCP: Dry/ Wet Contact**(To use Wet Contact , the DI.GND pin must be opened).**



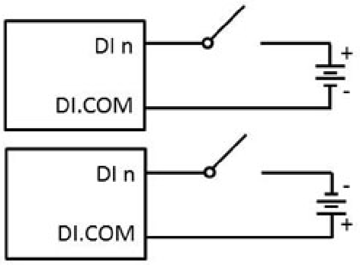
Dry Contact Input:



Open Collector Output:



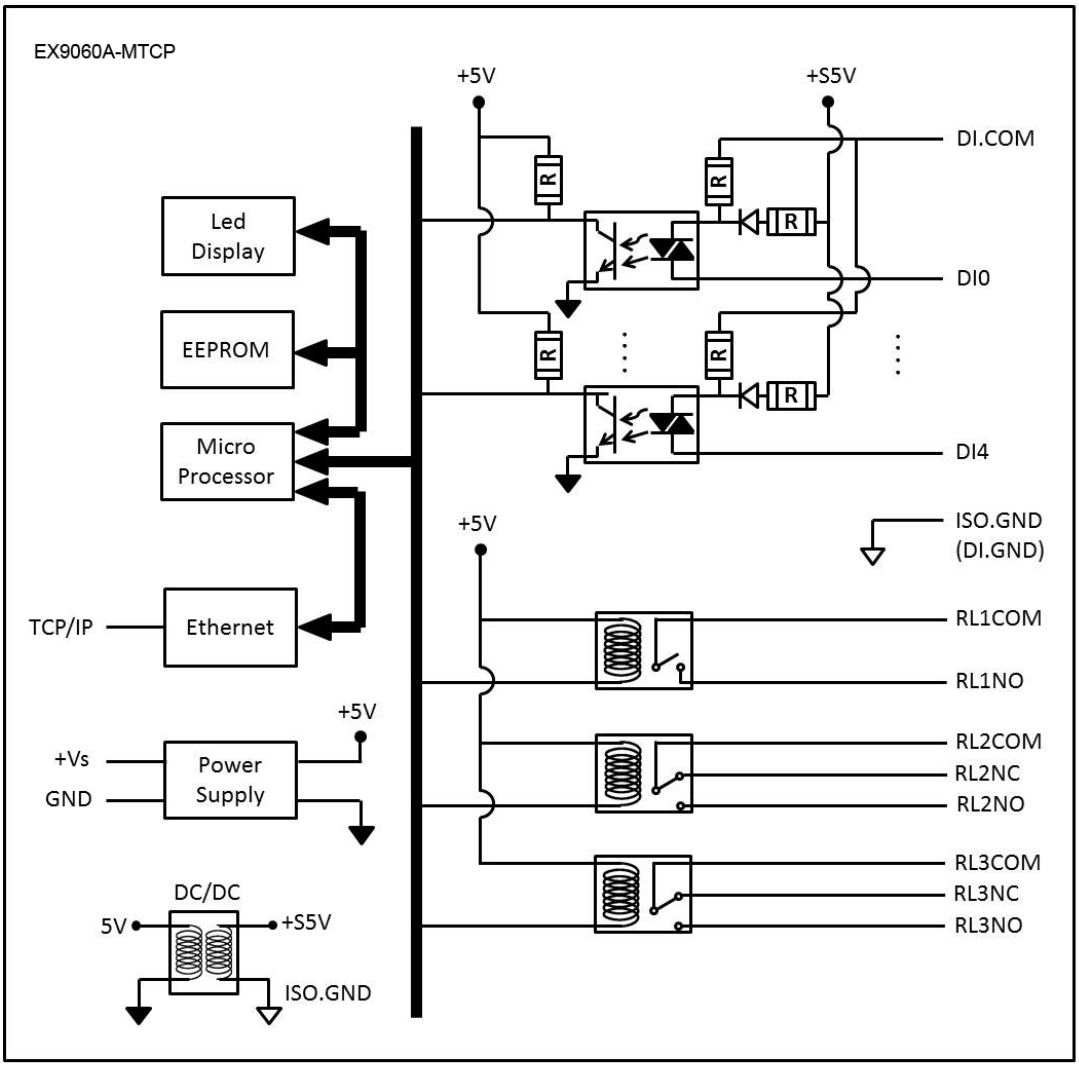
Wet Contact Input:



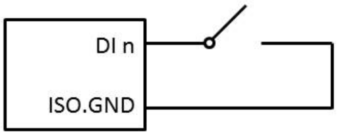
2.5 EX-9060A-MTCP

2.5.1 Block Diagram

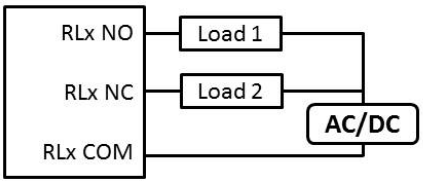
EX9060A-MTCP: Dry/ Wet Contact**(To use Wet Contact , the DI.GND pin must be opened).**



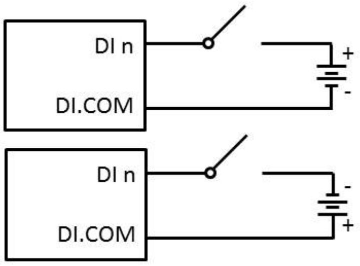
Dry Contact Input:



Relay output



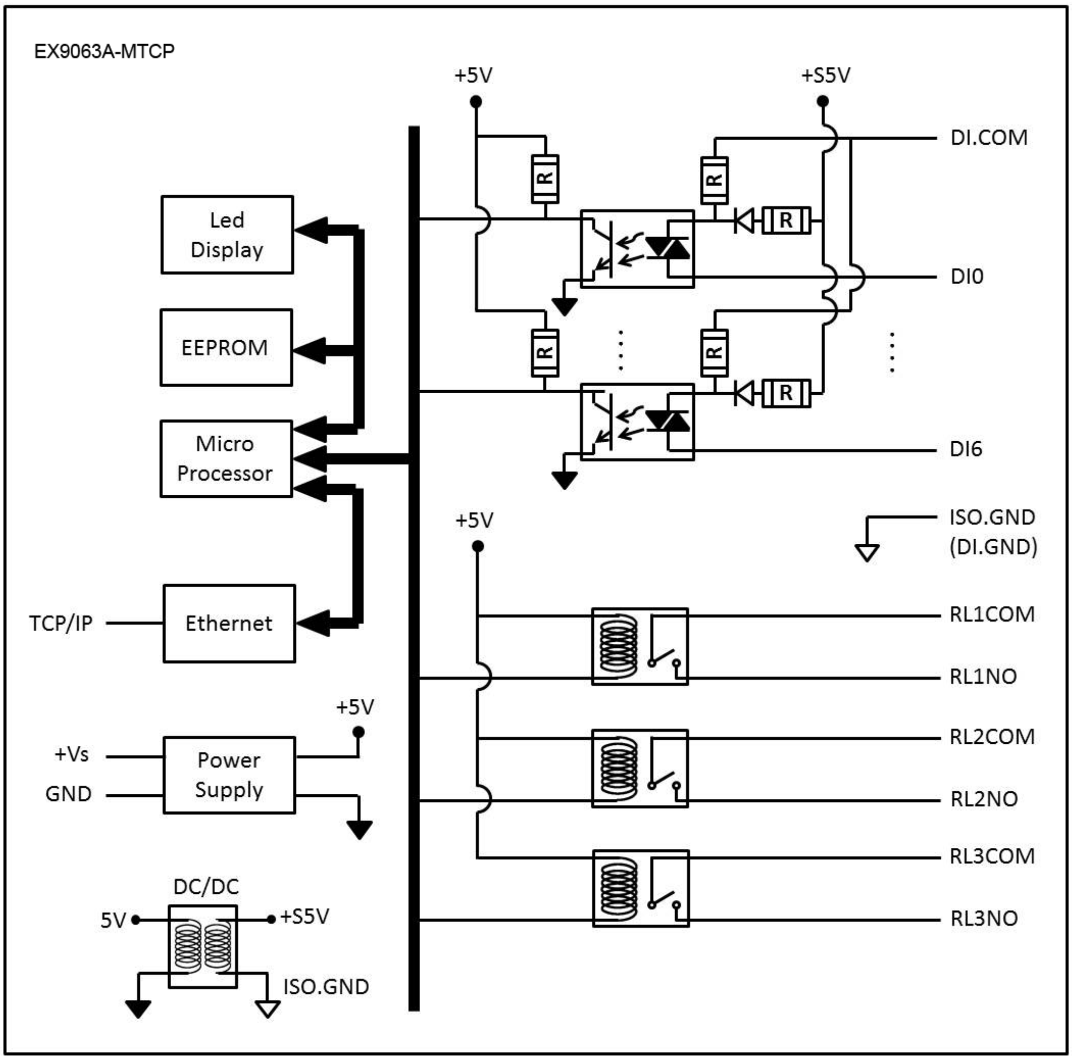
Wet Contact Input:



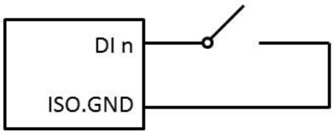
2.6 EX-9063A-MTCP

2.6.1 Block diagram & Wire Connection

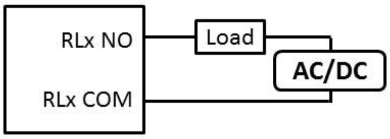
EX9063A-MTCP: Dry / Wet Conntact**(To use Wet Contact , the DI.GND pin must be opened).**



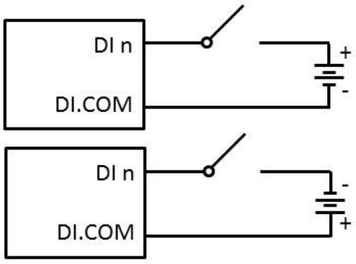
Dry Contact Input:



Relay output

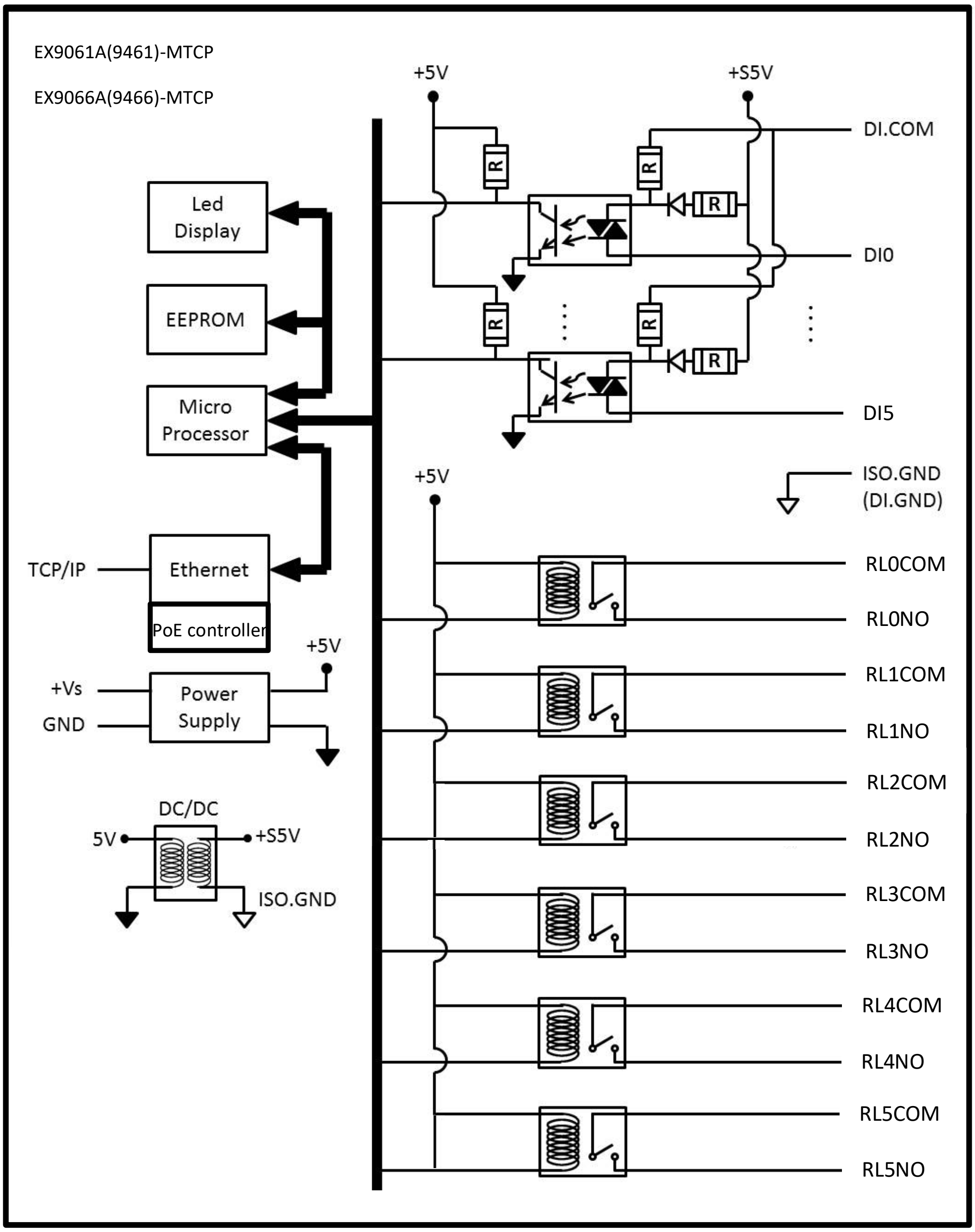


Wet Contact Input:

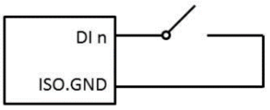


2.7 EX-9061A(9461) / 9066A(9466)-MTCP

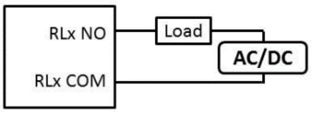
2.7.1 Block Diagram



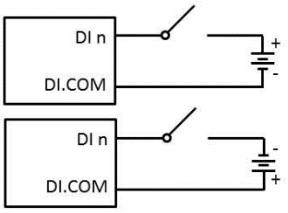
Dry Contact Input:



Relay output



Wet Contact Input:



Chapter 3 System Requirements

- IBM PC compatible computer with 486 CPU (Pentium is recommended)
- Microsoft 95/98/2000/NT 4.0 (SP3 or SP4)/XP/Win 7,8,10 or higher versions
- At least 32 MB RAM
- 20 MB of hard disk space available
- VGA color monitor
- 2x or higher speed CD-ROM
- Mouse or other pointing devices
- 10 or 100 Mbps Ethernet Card
- 10 or 100 Mbps Ethernet Hub (at least 2 ports)
- Two Ethernet Cable with RJ-45 connector
- Power supply for EX-9000A-MTCP (+10 to +30 V unregulated),

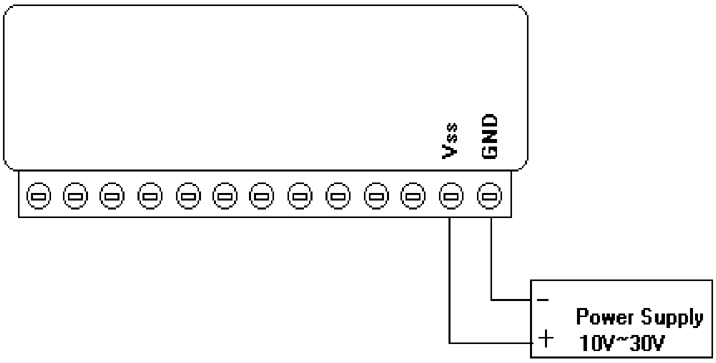
3.1 Wiring and Connections

This section provides basic information on wiring the power supply, I/O units, and network connection.

3.2 Power supply wiring

Although the EX-9000A/AB-MTCP/TCP systems are designed for a standard industrial unregulated 24 V DC power supply, they accept any power unit that supplies within the range of +10 to +30 VDC. The power supply ripple must be limited to 200 mV peak-to-peak, and the immediate ripple voltage should be maintained between +10 and +30 VDC. Screw terminals +Vs and GND are for power supply wiring.

Note: The wires used should be sized at least 2 mm.



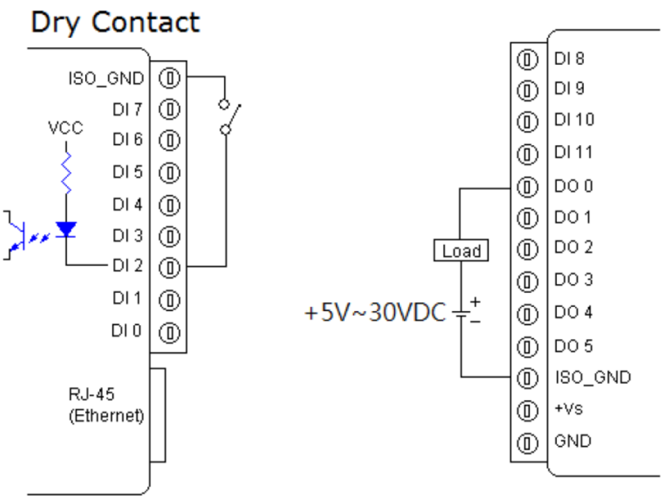
Chapter 4 Specification and wiring

4.1 EX-9050A-MTCP 12 D/ and 6 DO channels Digital I/O Module

The EX-9050A-MTCP is a high-density I/O module built-in a 10/100 based-T interface for seamless Ethernet connectivity. It provides ***12 digital input and 6 digital output channels*** with 3750VRMS Isolating protection. All of the Digital Input channels support input latch function for important signal handling. Mean while, these DI channels allow to be used as 500Hz counter. Opposite to the intelligent DI functions, the EX-9050A-MTCP Digital Output channels also support pulse output function, *Auto-Off Time of digital output* and *DIO Synchronization* function.

4.1.1 Specification

- ◆ Digital input : Isolated single ended with common ground(Dry Contact*)*.
  - ✓ Channel : 12 channels (DI0~DI11).
  - ✓ Input Level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Dry Contact : Single ended with common ground.
    - ➢ Logic level 0 (active), Close to GND.
    - ➢ Logic level 1 (inactive), Open.
  - ✓ Counter mode : Supports 500Hz counter(by software,32-bit + 1-bit overflow)
  - ✓ Optical Isolation Voltage : 3750Vrms
- ◆ Digital Output : Isolated Open collector (NPN) output channels.
  - ✓ Channel : 6 channels (DO0~DO5) .
  - ✓ Logical level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Open Collector : +5V~30V/500 mA max. load
  - ✓ Pulse Output : Each channel supports 500Hz pulse output
  - ✓ Optical Isolation Voltage : 3750Vrms
- ◆ Display : 1 2 digital inputs & 6 digital output status LED
- ◆ Power requirements : Unregulated +10 ~ +30 VDC
- ◆ Power Consumption : 1.8 W (Typical)



Digital Input Digital Output

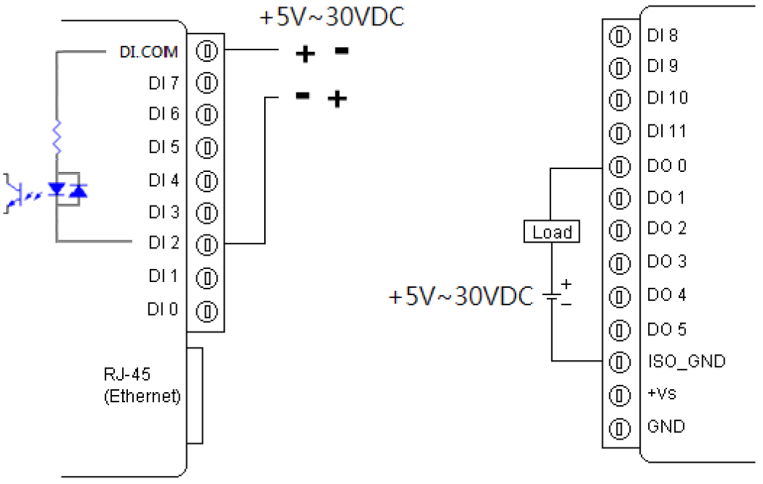
4.2 EX-9050AB-MTCP 12 DI and 6 DO channels DIO Module

The EX-9050AB-MTCP is a high-density I/O module built-in a 10/100 based-T interface for seamless Ethernet connectivity. It provides ***12 digital input and 6 digital output channels*** with 3750VRMS Isolating protection. All of the Digital Input channels support input latch function for important signal handling. Mean while, these DI channels allow to be used as 500Hz counter. Opposite to the intelligent DI functions, the EX-9050AB-MTCP Digital Output channels also support pulse output function, *Auto-Off Time of digital output* and *DIO Synchronization* function.

4.2.1 Specification

- Digital Input : Isolated single ended with common source/ground (Web Contact).
  - ✓ Channel : 12 channels (DI0~DI11).
  - ✓ Input level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Wet Contact : Single ended with common source/ground.
    - ➢ Logic level 0 (active), +2 Vac max.
    - ➢ Logic level 1 (inactive), +5V to +30VDC max.
  - ✓ Input Impedance : 2K ohm (Wet Contact)
  - ✓ Counter mode : Supports 500Hz soft counter (by software, 32-bit + 1-bit overflow)
  - ✓ Optical Isolation Voltage : 3750 Vrms
- Digital Output : isolated Open collector (NPN) output channels.
  - ✓ Channel : 6 channels (DO0~DO5) .
  - ✓ Logical level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Open Collector : +5V~30V/500 mA max. load
  - ✓ Pulse Output : Each channel supports 500Hz pulse output
  - ✓ Optical Isolation Voltage : 3750Vrms
- Display : 12 digital inputs & 6 digital output status LED
- Power requirements : Unregulated +10 ~ +30 VDC
- Power Consumption : 1.8 W (Typical)

Wet Contact



Digital Input Digital Output

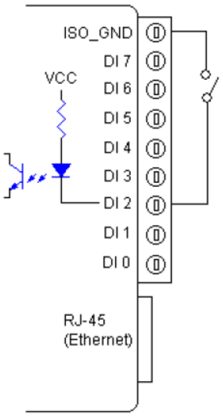
4.3 EX-9051A-MTCP 12 DI , 2 DO and 2 Counter chs DIO Module

The EX-9051A-MTCP provides *12 digital input(Dry contact), 2 digital output, and 2 counter* channels with 3750VRMS Isolating protection. All of the Digital Input channels support input latch function for important signal handling. Mean while, these DI(0~11)/C0~C1 allow to be used as 500Hz/4.5KHz counter. Opposite to the intelligent DI functions, the EX-9051A-MTCP Digital Output channels also support pulse output function, *Auto-Off Time of digital output* and *DIO Synchronization* function.

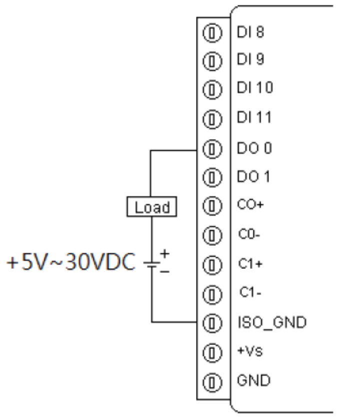
4.3.1 Specification

- ◆ Digital Input : Isolated single ended with common ground (Dry Contact).
  - ✓ Channel : 12 channels (DI0~DI11)
  - ✓ Input level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Dry contact : Single ended with common ground.
    - ➢ Logic level 0 (active) ,Close to GND.
    - ➢ Logic level 1 (inactive) ,Open.
  - ✓ Counter : 500Hz software counter(32-bit + 1-bit overflow)
  - ✓ Optical Isolation Voltage : 3750Vrms
- ◆ Digital Output : Isolated Open collector (NPN) output channels.
  - ✓ Channel : 2 channels (DO0~DO1) .
  - ✓ Logical level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Open Collector : +5V~30V / 500 mA max. load
  - ✓ Pulse Output : Each channel supports 500Hz pulse output
  - ✓ Optical Isolation Voltage: 3750Vrms
- ◆ Counter : 2 channel *hardware* differential input counter
  - ✓ Channel : 2 (C0=DI12, C1=DI13)
  - ✓ Input logic level : 30VDC max.
    - ➢ Logic level 1 (active),+5V to 30VDC max.
    - ➢ Logic level 0 (inactive) ,+2 Vac max.
  - ✓ Maximum Count : 4,294,967,285 (32-bit + 1-bit overflow)
  - ✓ Input Impedance : 2K ohm(Wet Contact)
  - ✓ Input frequency : 4500 Hz max.
  - ✓ Optical Isolation Voltage: 3750Vrms
- ◆ Display : 12 digital inputs, 2 Counter & 2 digital output status LED
- ◆ Power requirements : Unregulated +10 ~ +30 VDC
- ◆ Power Consumption : 1.8 W (Typical)

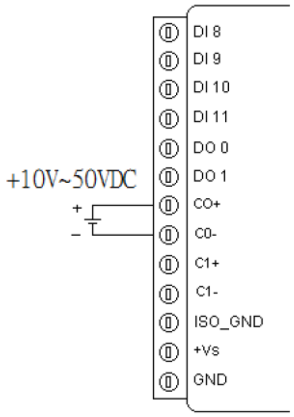
Dry Contact



Digital Input



Digital Output



Counter

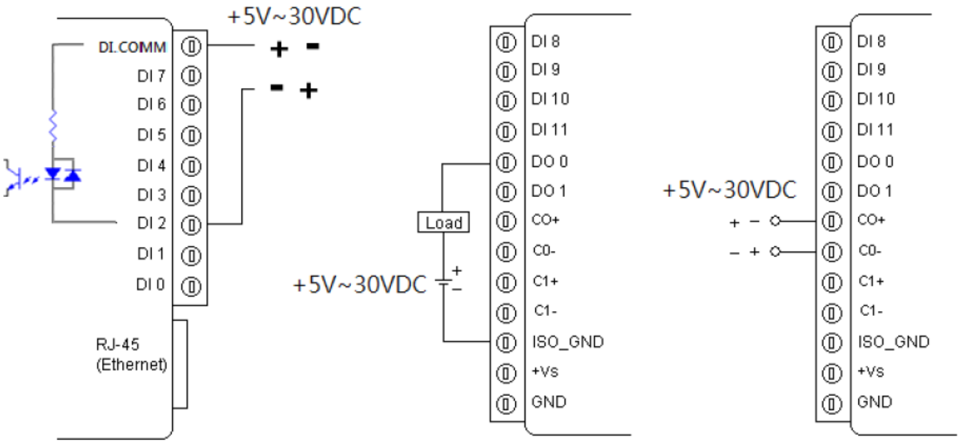
4.4 EX-9051AB-MTCP 12 DI , 2 DO and 2 Counter chs DIO Module

The EX-9051AB-MTCP provides *12 digital input(Wet contact), 2 digital output, and 2 counter* channels with 3750VRMS Isolating protection. All of the Digital Input channels support input latch function for important signal handling. Mean while, these DI(0~11)/C0~C1 allow to be used as 500Hz/4.5KHz counter. Opposite to the intelligent DI functions, the EX-9051AB-MTCP Digital Output channels also support pulse output function, *Auto-Off Time of digital output* and *DIO Synchronization* function.

4.4.1 Specification

- ◆ Digital Input : Isolated single ended digital input with common source/ground
  - ✓ Channel : 12 channels (DI0~DI11)
  - ✓ Input level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Wet Contact : Single ended digital input with common source/ground.
    - ➢ Logic level 0 (active) , +2 Vdc max.
    - ➢ Logic level 1 (inactive) , +5V to +30VDC max.
  - ✓ Counter : 500Hz software counter (32-bit + 1-bit overflow)
  - ✓ Impedance : 2K ohm (Wet Contact)
  - ✓ Optical Isolation Voltage: 3750Vrms
- ◆ Digital Output : Isolated Open collector (NPN) output channels.
  - ✓ Channel : 2 channels (DO0~DO1) .
  - ✓ Logic level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Open Collector : +5V~30V / 500 mA max. load (NPN)
  - ✓ Pulse Output : Each channel supports 500Hz pulse output
  - ✓ Optical Isolation Voltage: 3750Vrms
- ◆ Counter : 2 channel hardware differential counter input
  - ✓ Channel : 2 (C0=DI12, C1=DI13)
  - ✓ Input level : 30VDC max.
    - ➢ Logic level 1 (active),+5V to 30VDC max.
    - ➢ Logic level 0 (inactive) ,+2 Vac max.
  - ✓ Maximum Count : 4,294,967,285 (32-bit + 1-bit overflow)
  - ✓ Input Impedance : 2K ohm(Wet Contact)
  - ✓ Input frequency : 4500 Hz max.
  - ✓ Optical Isolation Voltage: 3750Vrms
- ◆ Display : 12 digital inputs, 2 Counter & 2 digital output status LED
- ◆ Power requirements : Unregulated +10 ~ +30 VDC
- ◆ Power Consumption : 1.8 W (Typical)

Wet Contact



Digital Input Digital Output Counter

4.5 EX-9055A-MTCP 8 DI and 8 DO channels Digital I/O Module

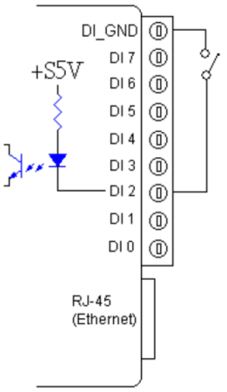
The EX-9055A-MTCP is a high-density digital I/O module designed with a 10/100 based-T interface for seamless Ethernet connectivity. It provides *8 digital input channels(Dry Contact), and 8 digital output* channels**.** All of the digital input channels support the input latch function for important signal handling. The digital output channels support source type output. Opposite to the intelligent DI functions, the EX-9055A-MTCP Digital Output channels also support pulse output function, *Auto-Off Time of digital output* and *DIO Synchronization* function.

4.5.1 Specification

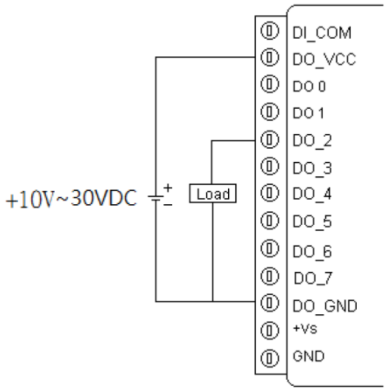
- **Digital input** : Isolated single ended with common ground (Dry Contact).
  - ✓ Channel : 8 channels (DI0~DI7).
  - ✓ Input Level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Dry Contact : Single ended with common ground.
    - ➢ Logic level 1(active) : Close to DI.GND
    - ➢ Logic level 0 (inactive): Open
  - ✓ Counter : 500Hz software counter(32-bit + 1-bit overflow)
  - ✓ Optical Isolation Voltage: 3750Vrms
- **Digital Output** : Isolated open drain (P-MOSFET) output channels.
  - ✓ Channel : 8 channels (DO0~DO7) .
  - ✓ Logical level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Load voltage : +5V ~ +30Vdc
  - ✓ Load current : 3 A/ channel Max.(total output channels maximum 8A).
  - ✓ Pulse Output : Each channel supports 500Hz pulse output
  - ✓ Optical Isolation Voltage: 3750Vrms
- **Display** : 8 digital inputs & 8 digital outputs status LED
- **Power requirements** : Unregulated +10 ~ +30 VDC
- **Power Consumption** : 1.8 W (Typical)

4.6

Dry Contact



Digital Input



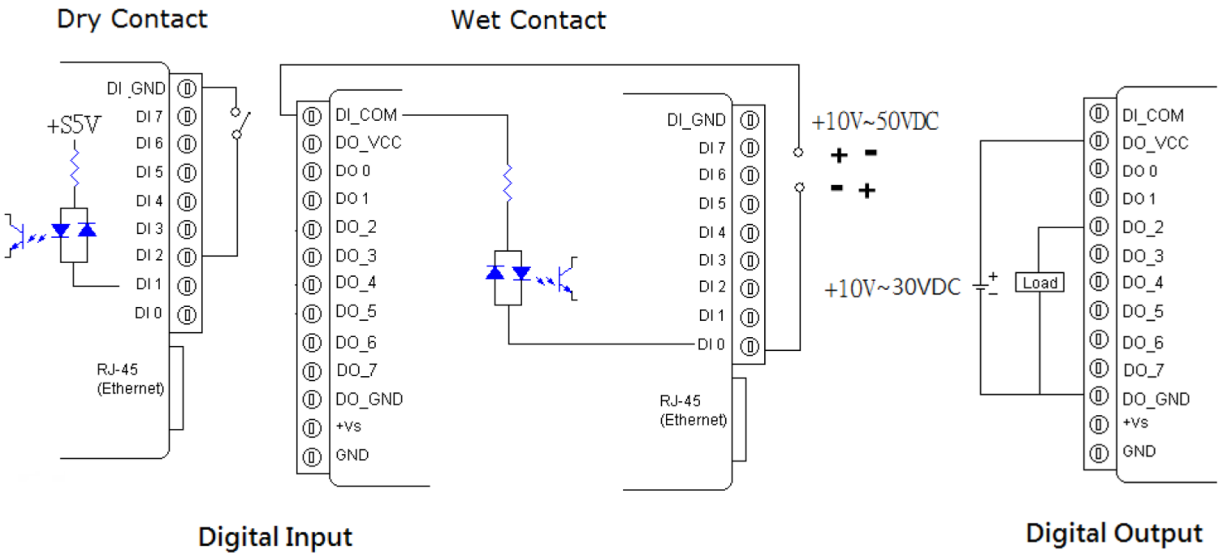
Digital Output

EX-9055AB-MTCP 8 DI and 8 DO channels DIO Module

The EX-9055AB-MTCP is a high-density digital I/O module designed with a 10/100 based-T interface for seamless Ethernet connectivity. It provides *8 digital input channels(Dry/Wet Contact), and 8 digital output channels.* All of the digital input channels support the input latch function for important signal handling. The digital output channels support source type output. Opposite to the intelligent DI functions, the EX-9055AB-MTCP Digital Output channels also support pulse output function, *Auto-Off Time of digital output* and *DIO Synchronization* function.

4.6.1 Specification

- Digital Input : Isolated single ended with common source/ground (Dry/Wet Contact).
  - ✓ Channel : 8 channels (DI0~DI7).
  - ✓ Input level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Dry Contact : @ Logic level 0 (active) : Close to DI.GND
    @ Logic level 1 (inactive): Open
  - ✓ Wet Contact : **To use Wet Contact , the DI.GND pin must be opened.**
    - Logic level 1 (active), +10V to 50VDC max.
    - Logic level 0 (inactive), +2 Vac max.
  - ✓ Input Impedance : 10K ohm(Wet Contact)
  - ✓ Counter mode : Supports 500Hz counter(by software,32-bit + 1-bit overflow)
  - ✓ Optical Isolation Voltage: 3750 Vrms
- Digital Output : Isolated Open drain(P-MOSFET) output channels.
  - ✓ Channel : 8 channels (DO0~DO7) .
  - ✓ Output logical level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Output load voltage : +5V ~ +30Vdc
  - ✓ Max load current : 3 A/ channel (total amount of DO channels max. 8A).
  - ✓ Pulse Output : Each channel supports 500Hz pulse output
  - ✓ Optical Isolation Voltage: 3750 Vrms
- Display : 8 digital inputs & 8 digital outputs status LED
- Power requirements : Unregulated, +10V ~ +30 VDC
- Power consumption : 1.8 W

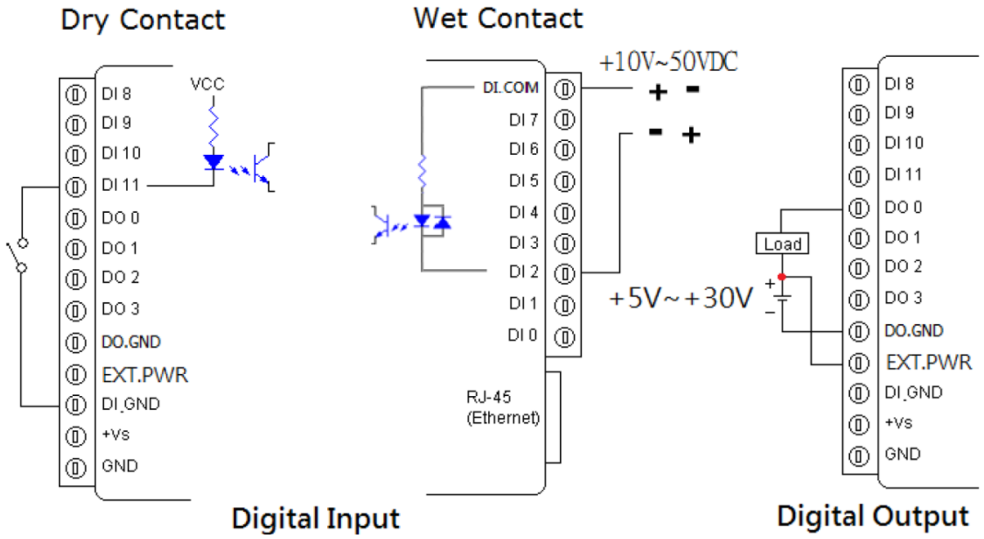


4.7 EX-9053A-MTCP 12 DI and 4 DO channels Digital I/O Module

The EX-9053A-MTCP is a high-density I/O module. It provides ***12 digital input** and **4 digital output channels*** with 3750VRMS Isolating protection. All of the Digital Input channels support input latch function for important signal handling. Meanwhile, these DI channels allow to be used as 500Hz counter. Opposite to the intelligent DI functions, the EX-9053A-MTCP Digital Output channels also support pulse output function, *Auto-Off Time of digital output* and *DIO Synchronization* function.

4.7.1 Specification

- **Digital input** : Isolated single ended with common source/ground (Dry/Wet Contact).
  - ✓ Channel : 12 channels (DI0~DI11).
  - ✓ Input Level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Dry Contact : Single ended with common ground.
    - ➢ Logic level 1(active) : Close to DI.GND
    - ➢ Logic level 0 (inactive): Open
  - ✓ Wet Contact : **To use Wet Contact , the DI.GND pin must be opened.**
    - ➢ Logic level 1 (active), *+10V to +50VDC max.*
    - ➢ Logic level 0 (inactive), +2VDC max.
  - ✓ Input Impedance : 10K ohm(Wet Contact)
  - ✓ Counter mode : Supports 500Hz counter(by software,32-bit + 1-bit overflow)
  - ✓ Optical Isolation Voltage: 3750Vrms
- **Digital Output** : Isolated Open collector (NPN) output channels.
  - ✓ Channel : 4 channels (DO0~DO3) .
  - ✓ Output logical level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Open Collector : +5V ~ 30V / 500 mA max. load
  - ✓ Pulse Output : Each channel supports 500Hz pulse output
  - ✓ Optical Isolation Voltage: 3750Vrms
- Display : 12 digital input & 4 digital output status LED
- Power requirements : Unregulated, +10V ~ +30 VDC
- Power Consumption : 1.8 W (Typical)

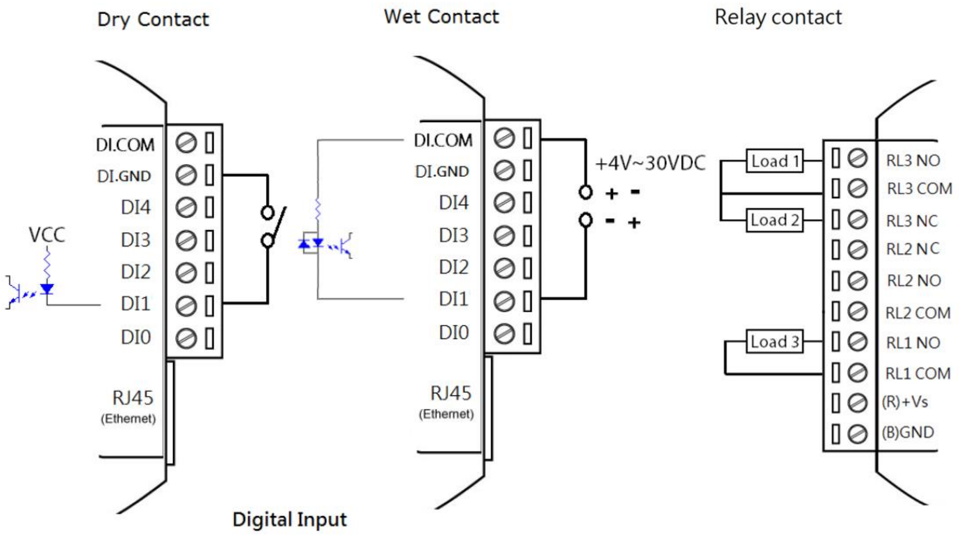


4.8 EX-9060A-MTCP 5-channel Digital Input and 3 RELAY output Module

EX-9060A-MTCP provides 5 isolated digital input channels and 3 relay output channels. All input channels are single ended with common source/ground and support input latch function for important signal handling. Mean while, these DI channels allow to be used as 500Hz counter. All relay output channels are differential with individually common . Opposite to the intelligent DI functions, the EX-9060A-MTCP Digital Output channels also support *Auto-Off Time of digital output* and *DIO Synchronization* function.

4.8.1 Specification

- **Digital input** : Isolated single ended with common source/ground.
  - ✓ Channel : 5 channels (DI0~DI4).
  - ✓ Input Level : Logic level status can be inversed via ASCII/Modbus command.
  - ✓ Dry Contact : Single ended with common ground.
    - ➢ Logic level 1(active), Close to DI.GND
    - ➢ Logic level 0 (inactive), Open
  - ✓ Wet Contact : **To use Wet Contact , the DI.GND pin must be opened.**
    - ➢ Logic level 1 (active), +4V to +30VDC max.
    - ➢ Logic level 0 (inactive), +2VDC max.
  - ✓ Input Impedance : 3K ohm(Wet Contact)
  - ✓ Counter mode : Supports up to 500Hz counter(by software,32-bit + 1-bit overflow)
  - ✓ Optical Isolation Voltage: 3750Vrms
- **Relay Output** : RL1, RL2, RL3
  - ✓ Output channels : 3 relay output channels (RL1: Form A, RL2, RL3 Form C).
  - ✓ Surge strength : 500V
  - ✓ Relay contact rating : 0.6A/125Vac, 2A/30Vdc
  - ✓ Operate Time : 3mS max.
  - ✓ Release Time : 2mS max.
  - ✓ Min Life : $5*10^5$ ops
  - ✓ Pulse Output : Each channel supports 500Hz pulse output
- Display : 5 digital input & 3 Relay output status LED
- Power requirements : Unregulated, +10V ~ +30 VDC
- Power Consumption : 1.8 W (Typical)

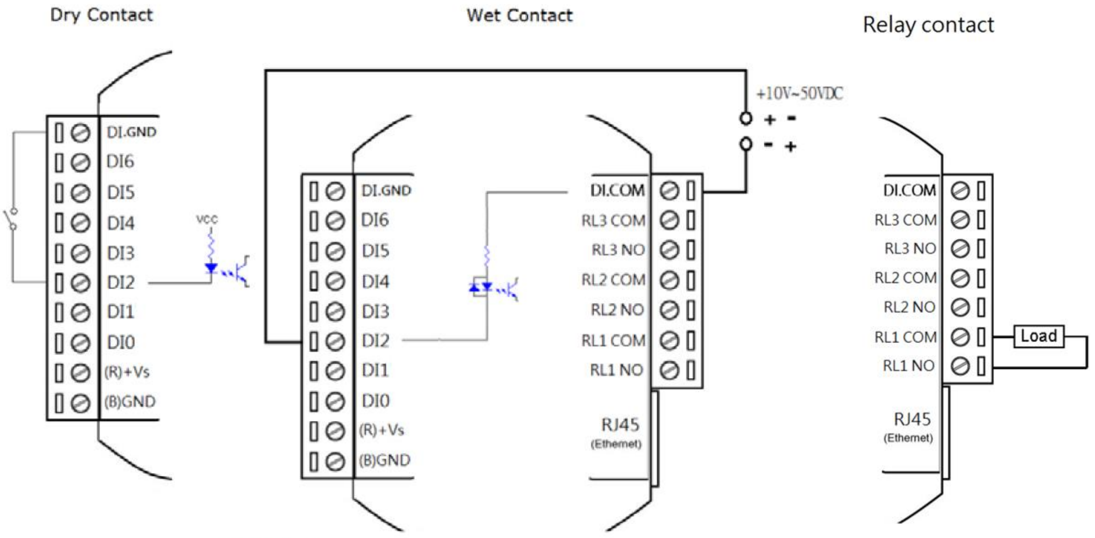


4.9 EX-9063A-MTCP 7-channel Digital Input and 3 RELAY output Module

EX-9063A-MTCP provides 7 isolated digital input channels and 3 relay output channels. All input channels are single ended with common source/ground and support input latch function for important signal handling. Meanwhile, these DI channels allow to be used as 500Hz counter. All relay output channels are differential with individually common . the EX-9063A-MTCP Digital Output channels also support *Auto-Off Time of digital output* and *DIO Synchronization* function.

4.9.1 Specification

◆ Digital input	: Isolated single ended with common source /ground.
✓ Channel	: 7 channels (DI0~DI6).
✓ Input Level	: Logic level status can be inversed via ASCII/Modbus command.
✓ Dry Contact	: Single ended with common ground
	➢ Logic level 1(active) : Close to GND
	➢ Logic level 0 (inactive): Open
✓ Wet Contact	: **To use Wet Contact , the DI.GND pin must be opened.**
	➢ Logic level 1 (active), +10V to +50VDC max
	➢ Logic level 0 (inactive), +2VDC max
✓ Input Impedance	: 10K ohm(Wet Contact)
✓ Counter mode	: Supports up to 500Hz counter(by software,32-bit + 1-bit overflow)
✓ Optical Isolation Voltage	: 3750Vrms
◆ **Relay Output**	**:** RL1, RL2, RL3 (DO0~DO2)
✓ Output channels	: 3 relay output channels (Form A).
✓ Surge strength	: 4000V
✓ Relay contact rating	: 5A/250Vac, 5A/30Vdc
✓ Operate Time	: 6mS max.
✓ Release Time	: 3mS max.
✓ Min Life	: 10**5** ops.
✓ Pulse Output	: Each channel supports 500Hz pulse output
◆ **Display**	: 7 digital input & 3 Relay output status LED
◆ **Power requirements**	: Unregulated, +10V ~ +30 VDC
◆ **Power Consumption**	: 2.4 W (Typical)



Digital Input

4.10 EX-9061A / 9461-MTCP 6-channel Digital Input and 6 RELAY output Module

EX-9061A/9461(**PoE**) provides 6 isolated digital input channels and 6 relay output channels. All input channels are single ended with common source/ground and support input latch function for important signal handling. Mean while, these DI channels allow to be used as 500Hz counter. All relay output channels are differential with individually common . Opposite to the intelligent DI functions, the EX-9061A Digital Output channels also support Auto-Off Time of digital output and *DIO Synchronization* function.

4.10.1 Specification

◆ Digital input : Isolated single ended with common source (Dry Contact)

✓ Channel : 6 channels (DI0~DI6).

✓ Input Level : Logic level status can be inversed via ASCII/Modbus command.

✓ Dry Contact

➢ Logic level 1(active) : Close to GND

➢ Logic level 0 (inactive): Open

✓ Wet Contact

➢ Logic level 1 (active), +10V to +50VDC max

➢ Logic level 0 (inactive), +2VDC max

✓ Input Impedance : 3K ohm(Wet Contact)

✓ Counter mode : Supports up to 500Hz counter(by software,32-bit + 1-bit overflow)

✓ Optical Isolation Voltage : 3750Vrms

◆ **Relay Output** : RL0~RL5

✓ Output channels : 6 relay output channels (Form A).

✓ Surge strength : 500V

✓ Relay contact rating : 0.6A/125Vac, 2A/30Vdc

✓ Operate Time : 3mS max.

✓ Release Time : 2mS max.

✓ Min Life : $5*10^5$ ops.

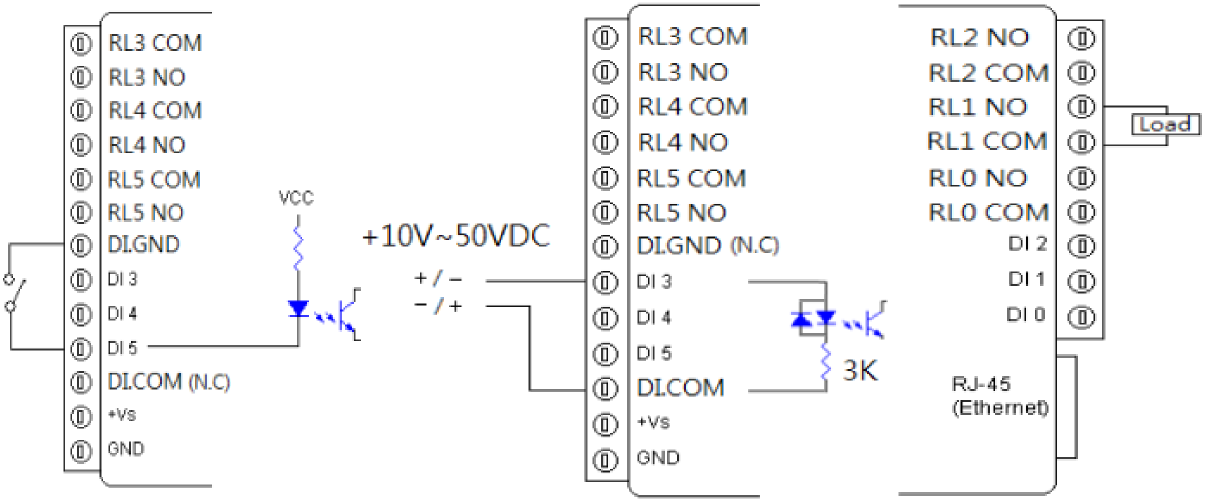
✓ Pulse Output : Each channel supports 500Hz pulse output

◆ **Display** : 6 digital input & 6 Relay output status LED

◆ **Power requirements** : Unregulated, +10V ~ +30 VDC

◆ **Power Consumption** : 2.5 W (Typical)

◆ **Power Over Ethernet (PoE)** : only for 9461



4.11 EX-9066A / 9466-MTCP 6-channel Digital Input and 6 RELAY output Module

EX-9066A/9466(**PoE**) provides 6 isolated digital input channels and 6 relay output channels. All input channels are single ended with common source/ground and support input latch function for important signal handling. Meanwhile, these DI channels allow to be used as 500Hz counter. All relay output channels are differential with individually common . the EX-9066A/9466 Digital Output channels also support Auto-Off Time of digital output and *DIO Synchronization* function

4.11.1 Specification

◆ Digital input : Isolated single ended with common source (Dry Contact)
- ✓ Channel : 6 channels (DI0~DI6).
- ✓ Input Level : Logic level status can be inversed via ASCII/Modbus command.
- ✓ Dry Contact
  - ➢ Logic level 1(active) : Close to GND
  - ➢ Logic level 0 (inactive): Open
- ✓ Wet Contact
  - ➢ Logic level 1 (active), +10V to +50VDC max
  - ➢ Logic level 0 (inactive), +2VDC max
- ✓ Input Impedance : 3K ohm(Wet Contact)
- ✓ Counter mode : Supports up to 500Hz counter(by software,32-bit + 1-bit overflow)
- ✓ Optical Isolation Voltage : 3750Vrms

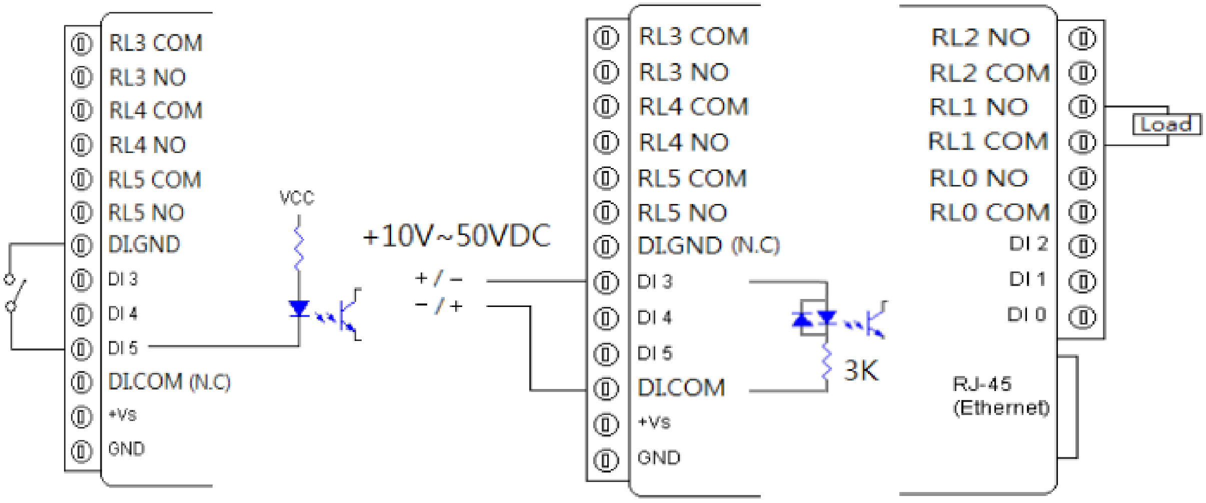
◆ **Relay Output** : RL0~RL5 (DO0~DO5)
- ✓ Output channels : 6 relay output channels (Form A).
- ✓ Surge strength : 4000V
- ✓ Relay contact rating : 5A/250Vac, 5A/30Vdc
- ✓ Operate Time : 6mS max.
- ✓ Release Time : 3mS max.
- ✓ Min Life : 10^5 ops.
- ✓ Pulse Output : Supports up to 500Hz pulse output

◆ **Display** : Power-LED only, No DIO status display LEDs

◆ **Power requirements** : Unregulated, +10V ~ +30 VDC

◆ **Power Consumption** : 2.4 W (Typical)

◆ **Power Over Ethernet (PoE)** : only for 9466



Chapter 5 EX-9000A/AB-MTCP Utility Guide

In order to properly configure ExpertDAQ series. You will need following items to complete your system hardware configuration.

5.1 System Requirement

Host computer

- ♦ IBM PC compatible computer with 486 CPU (Pentium is recommended)
- ♦ Microsoft 95/98/2000/NT 4.0 (SP3 or SP4)/Win 7,8,10 or higher versions
- ♦ At least 32 MB RAM
- ♦ 20 MB of hard disk space available
- ♦ VGA color monitor
- ♦ 2x or higher speed CD-ROM
- ♦ Mouse or other pointing devices
- ♦ 10 or 100 Mbps Ethernet Card
- ♦ 10 or 100 Mbps Ethernet Hub (at least 2 ports)
- ♦ Two Ethernet Cable with RJ-45 connector
- ♦ Power supply for EX-9000A/AM-MTCP (+10 to +30 V unregulated), (for 94xx: option).
- ♦ Make sure to prepare all of the items above, then connect the power and network wiring as Figure 5-1

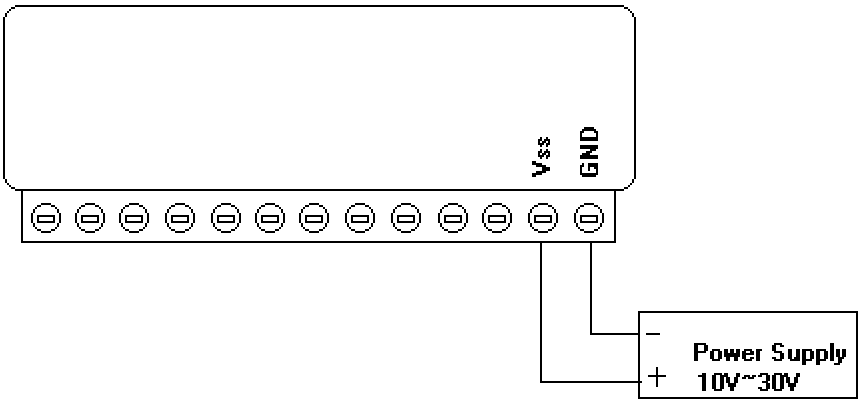


Figure 5-1 Power wiring

5.2 Install Utility Software on Host PC

ExpertDAQ provide free download Manual and Utility software for EX-9000A/AB-MTCP modules' operation and configuration. Link to the web site: www.topsccc.com and click into the "Download Area" to get the latest version EX-9000A/AB-MTCP manual and Ethernet I/O Utility. Once you download and setup the Utility software, there will be a shortcut of the Utility executive program on Windows' desktop after completing the installation.

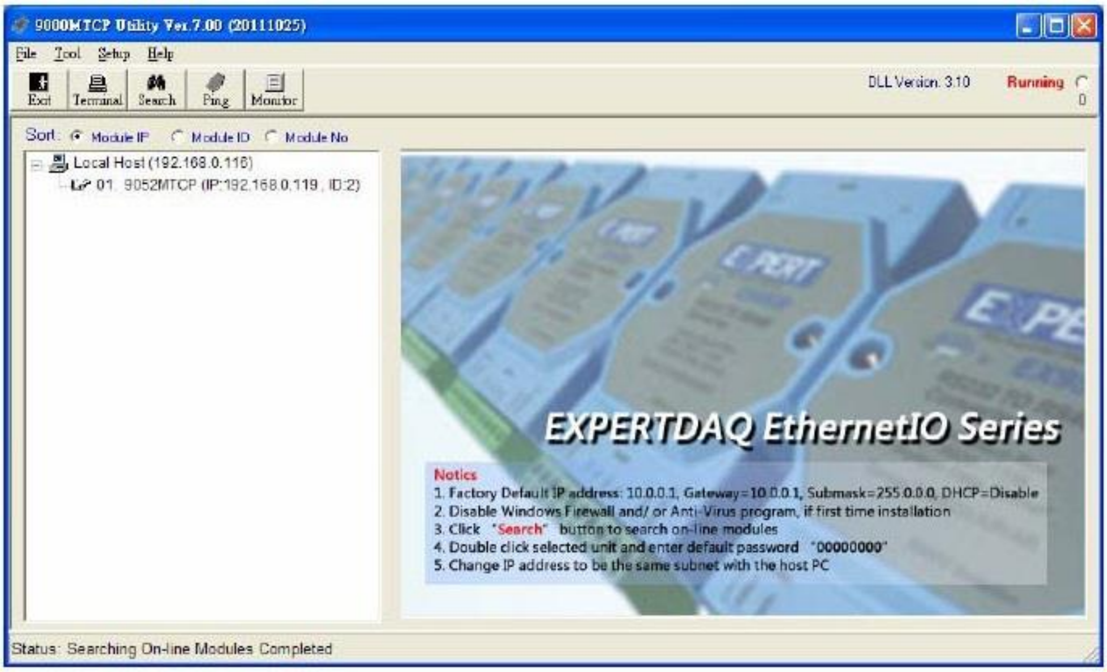
5.3 EX-9000A/AB-MTCP Ethernet I/O Utility Overview

The Utility software offers a graphical interface that helps you configure the EX-9000A/AB-MTCP modules. It is also very convenient to test and monitor your remote DAQ system. The following guidelines will give you some brief instructions on how to use this Utility.

- ♦ Main Menu
- ♦ Network Setting
- ♦ Adding Remote Station
- ♦ Security setting
- ♦ I/O Module Configuration
- ♦ Alarm Setting
- ♦ I/O Module Calibration
- ♦ Security Setting
- ♦ Terminal emulation
- ♦ Data/Event Stream

5.4 Main Menu

Double Click the icon of EX-9000A/AB-MTCP Ethernet I/O Utility shortcut, the Operation screen will pop up as Figure 5-2 main window.


9000MTCP Utility Ver.7.00 (20111025)
File
Tool
Setup
Help
Exit
Terminal
Search
Ping
Monitor
DLL Version: 3.10
Running
0
Sort:
● Module IP
○ Module ID
○ Module No
Local Host (192.168.0.116)
01. 9052MTCP (IP:192.168.0.119 , ID:2)
EXPERTDAQ EthernetIO Series

Notics

1. Factory Default IP address: 10.0.0.1, Gateway=10.0.0.1, Submask=255.0.0.0, DHCP=Disable
2. Disable Windows Firewall and/ or Anti-Virus program, if first time installation
3. Click "Search" button to search on-line modules
4. Double click selected unit and enter default password "00000000"
5. Change IP address to be the same subnet with the host PC

Status: Searching On-line Modules Completed

Figure 5-2 main window

The top of the operation screen consists of a function menu and a tool bar for user's commonly operating functions.

5.4.1 Function Menu

- ♦ File contents "Exit" Function, using to exit this Utility program.
- ♦ Tool contents functions as below:

Search : for Ethernet Device Search all EX-9000A/AB-MTCP units in the specific Ethernet domination. (The same with host PC's Ethernet domination)

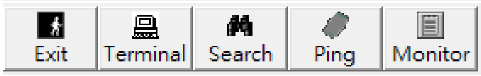
Add Remote Ethernet Device: Create a new EX-9000A/AB-MTCP module located in other Ethernet domination, both available to local LAN and Internet application.

Monitor Stream/Event Data : Comes from the remote I/O module

- Terminal : Call up the operation screen of Terminal emulation to do the request /
  response command execution.
- Setup : Contents Timeout and Scan Rate setting functions. Please be aware of the
  time setting for other Ethernet domination usually longer than local
  network.
- Help : Contents on-line help function as user's operation guide; the item "About" contents information about software version, released date, and support modules.

5.4.2 Tool Bar

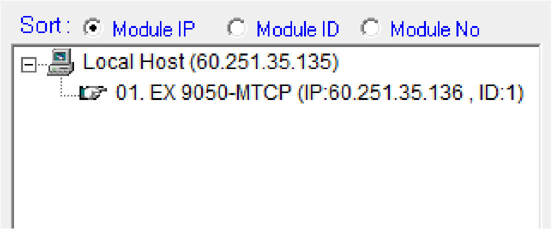
There are five push buttons in the tool bar.



- Exit : Exit utility program
- Terminal : Terminal emulation
- Search : Search ExpertDAQ module
- Ping : Ping remote ExpertDAQ I/O module
- Monitor : Monitor the Stream/Event Data

5.4.3 List Sort

The searched units will be listed in the tree-structure display area in order by "**Sort**" selection



Sort : ● Module IP ○ Module ID ○ Module No

Local Host (60.251.35.135)

01. EX 9050-MTCP (IP:60.251.35.136 , ID:1)

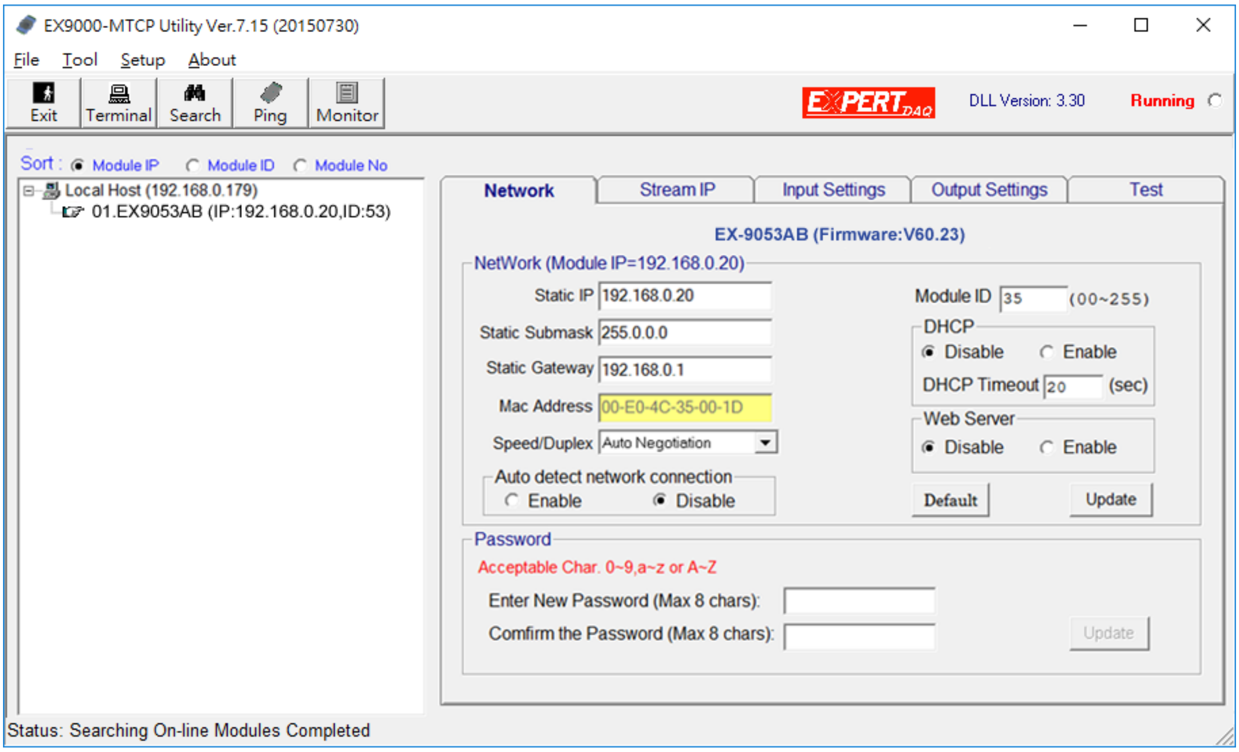
- Module IP : Sort by module IP
- Module ID : Sort by module ID
- Module No : Sort by module name

5.5 Network Setting

As the moment you start up this Windows Utility, it will search all EX-9000A/AB-MTCP I/O modules on the host PC's domination Ethernet network automatically. Then the tree-structure display area will appeal with the searched units and the relative IP address.

Since Utility software detects the EX-9000A/AB-MTCP on the network, user can begin to setup each unit.

Choose any one I/O module listed on the tree-structure display area and entry the correct password. The module basic configuration table is listed as shown in for setting


EX9000-MTCP Utility Ver.7.15 (20150730)
File Tool Setup About
Exit Terminal Search Ping Monitor
EXPERT DAQ
DLL Version: 3.30
Running
Network Stream IP Input Settings Output Settings Test
Default Update
Update

Sort : ● Module IP ○ Module ID ○ Module No

Local Host (192.168.0.179)
01.EX9053AB (IP:192.168.0.20,ID:53)

EX-9053AB (Firmware:V60.23)

NetWork (Module IP=192.168.0.20)

Static IP: 192.168.0.20
Static Submask: 255.0.0.0
Static Gateway: 192.168.0.1
Mac Address: 00-E0-4C-35-00-1D
Speed/Duplex: Auto Negotiation
Auto detect network connection: ○ Enable ● Disable

Module ID: 35 (00~255)
DHCP: ● Disable ○ Enable
DHCP Timeout: 20 (sec)
Web Server: ● Disable ○ Enable

Password
Acceptable Char. 0~9,a~z or A~Z
Enter New Password (Max 8 chars):
Comfirm the Password (Max 8 chars):

Status: Searching On-line Modules Completed

Figure 5-3

5.5.1 Module IP

MAC Address：This is also called Ethernet address and needs no further configuration.

IP Address, Subnet Mask, and Default Gateway: (default 10.0.0.1, 255.0.0.0 and 10.0.0.1)

The IP address identifies your EX-9000A-MTCP devices on the global network. Each EX-9000A-MTCP has same default IP address 10.0.0.1. Therefore, *please do not initial many EX-9000A-MTCP at the same time to avoid the Ethernet collision*. If you want to configure the EX-9000A-MTCP in the host PC's dominating network, only the IP address and Subnet Mask will need to set (The host PC and EX-9000A/AB-MTCP Ethernet I/O must belong to same subnet Mask).

If you want to configure the EX-9000A-MTCP via Internet or other network domination, you have to ask your network administrator to obtain a specific IP and Gateway addresses, and then configure each EX-9000A-MTCP with the individual setting.

DHCP : (default Disabled)

Allow you to get IP address from the DHCP server without setting IP address by manual.

DHCP timeout : (default 20 sec)

Allow you to set timeout to search for the DHCP servo. If there is no DHCP servo exist, the module will reboot and use static IP address assigned by E9KUtility.exe

Web Server : (default Disabled)

Allow you monitor and control I/O status on EX-9000A-MTCP modules remotely through web browser.

Module ID : (default 00)

Each module must has a unique ID number to be identified when the DHCP enabled, because you would not know the module IP address when DHCP enabled, but if with the different ID number. You can call provided function call(TCP_GetIPFromID() in TCPDAQ.DLL) to get correct IP address for each ID number

Password : (default 00000000)

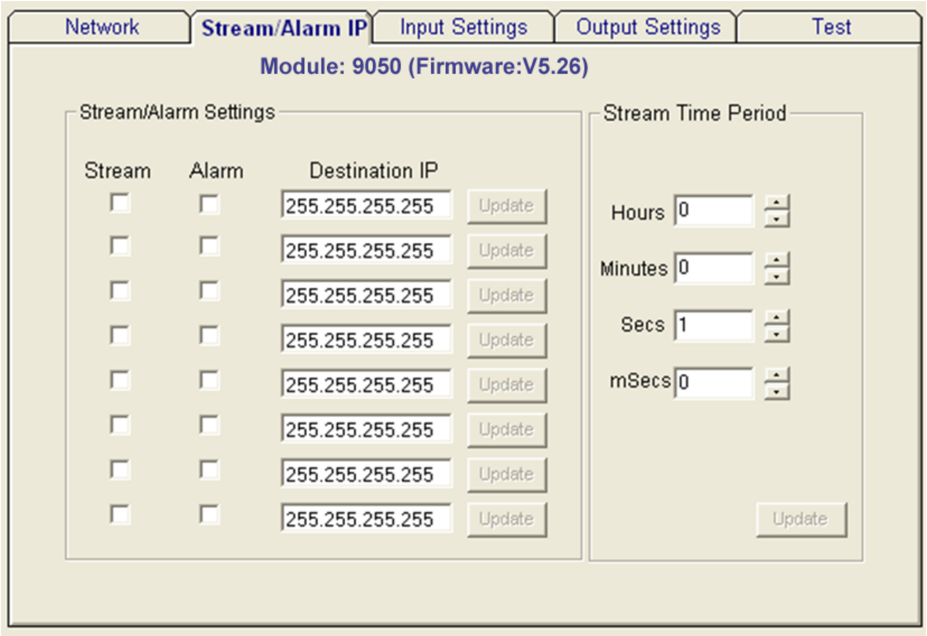
Allow you to change the password of the module

5.5.2 TCP/IP port:

EX-9000A/AB-MTCP series use four ports to communication with Host as shown below table

Protocol	Port (dec)	Description
TCP	502	MODBUS/TCP
UDP	1025	ASCII Command
UDP	5168	Event/Stream trigger
TCP	80	HTTP (web)

5.5.3 Stream/Alarm IP



Module: 9050 (Firmware:V5.26)

Stream/Alarm Settings

Stream	Alarm	Destination IP
□	□	255.255.255.255
□	□	255.255.255.255
□	□	255.255.255.255
□	□	255.255.255.255
□	□	255.255.255.255
□	□	255.255.255.255
□	□	255.255.255.255
□	□	255.255.255.255

Stream Time Period

Hours 0

Minutes 0

Secs 1

mSecs 0

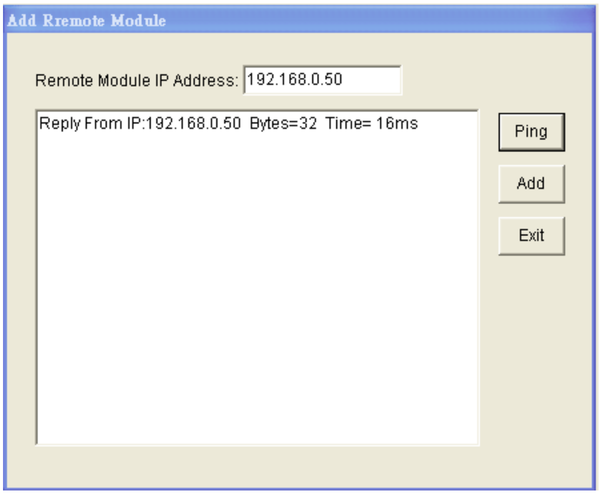
Stream/Alarm event Enable Setting : Set Stream /Event data Destination IP (default all disabled),

Active Stream time period : Set time interval for sending stream data (default 1 sec)

5.6 Add Remote Stations

To meet the remote monitoring and maintenance requirements, The EX-9000A-MTCP system does not only available to operate in local LAN, but also allowed to access from Internet or Intranet. Thus users would able to configure an EX-9000A/AB-MTCP easily no matter how far it is.

Select item **Tool**\Add Remote Ethernet I/O in function menu or click the button, the adding station screen will pop up as Figure1 6 Add remote module. Then key-in the specific IP address and click the **"Ping"** button. If the communication success, click **"Add"** to add EX-9000A/AB-MTCP Ethernet I/O unit into the tree-structure display area.



Remote Module IP Address: 192.168.0.50

Reply From IP:192.168.0.50 Bytes=32 Time= 16ms

Figure5-4 Add remote module

Note:

♦ There is several conditions need to be sure before adding a remote EX-9000A-MTCP system in the Window Utility.

♦ Be sure the specific IP is existed and available.

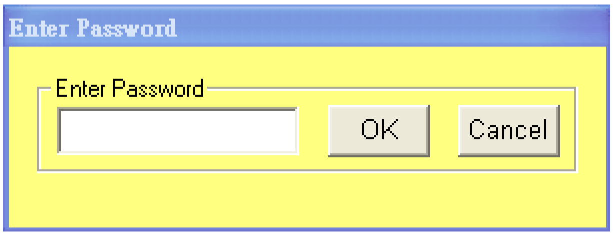
♦ Be sure to complete the network linkage for both sides.

♦ Be sure to adjust the best timing of timeout setting.

♦ Even you are not sure whether the communication is workable or not, there is also a **"Ping"** function for testing the network connection.

5.7 Security Setting

Though the technology of Ethernet discovered with great benefits in speed and integration, there also exist risk about network invading form anywhere. For the reason, the security protection design has built-in EX-9000A-MTCP I/O modules. Once user setting the password into the EX-9000A-MTCP firmware, the important system configurations (Network, Firmware, Password) are only allowed to be changed by password verification.



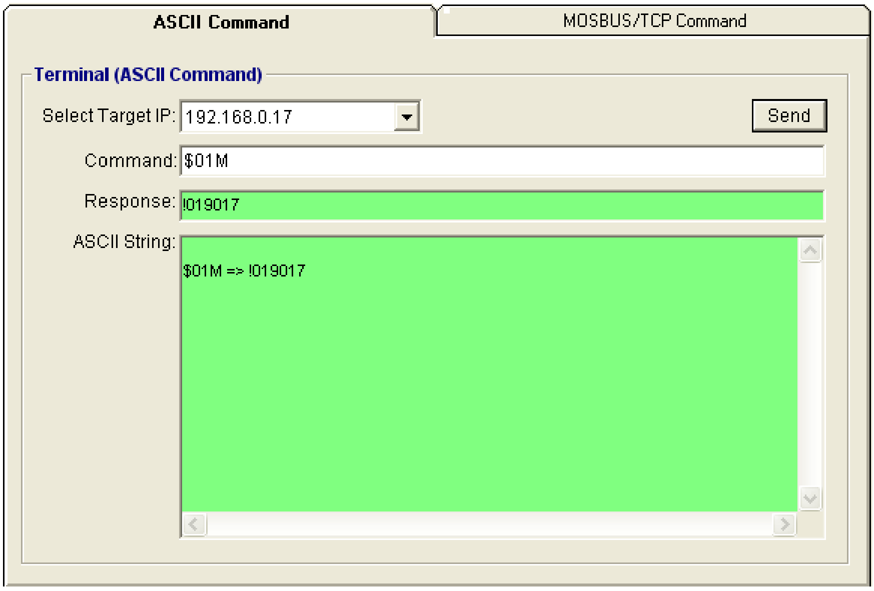
Note:

The default password of EX-9000A/AB-MTCP is "**00000000**". Please make sure to keep the correct password by yourself. If you lose it, please contact to ExpertDAQ's technical support center for help.

5.8 Terminal Emulations

You can issue commands and receive response by clicking the Terminal button on the tool bar. There are two kinds of command format supported by this emulating function. Users can choose ASCII or ModBus Hexadecimal mode as their communication base. If the ASCII mode has been selected, the Windows Utility will translate the request and response string in ASCII format.

ASCII Command mode: Shown as ASCII Command Terminal



Select Target IP: 192.168.0.17

Command: $01M

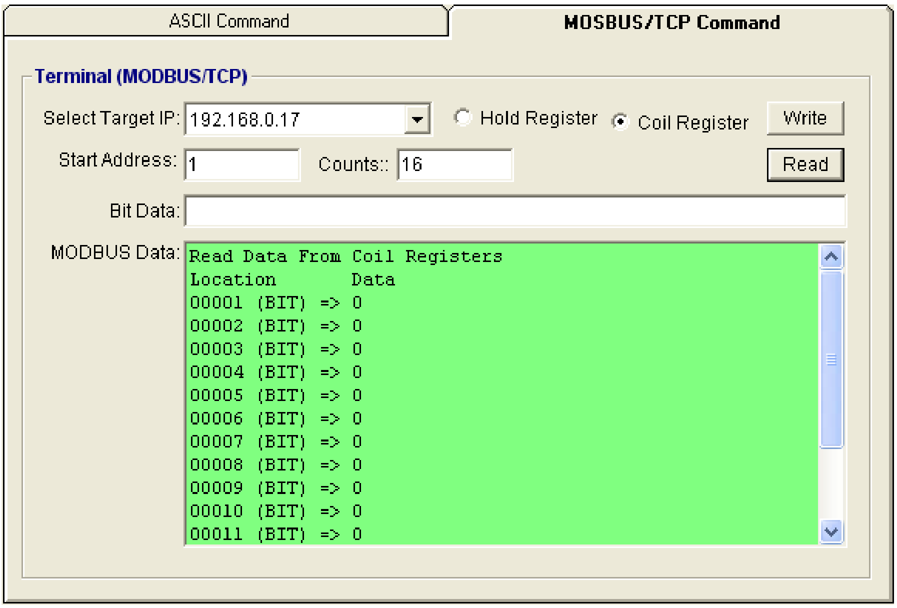
Response: !019017

ASCII String:

```
$01M => !019017
```

Figure 5-5 ASCII Command Terminal

ModBus Hexadecimal mode: shown as Chapter 9



Select Target IP: 192.168.0.17 ○ Hold Register ● Coil Register

Start Address: 1 Counts:: 16

Bit Data:

MODBUS Data:

```
Read Data From Coil Registers
Location        Data
00001 (BIT) => 0
00002 (BIT) => 0
00003 (BIT) => 0
00004 (BIT) => 0
00005 (BIT) => 0
00006 (BIT) => 0
00007 (BIT) => 0
00008 (BIT) => 0
00009 (BIT) => 0
00010 (BIT) => 0
00011 (BIT) => 0
```

Figure 5-6 ModBus Terminal

5.9 Data /Event Stream

Data Stream Configuration:

In addition to TCP/IP communication protocol, EX-9000A-MTCP supports UDP communication protocol to regularly broadcast data to specific host PCs. Click the tab of Data Stream, then configure the broadcasting interval and the specific IP addresses which need to receive data from the specific EX-9000A/AB-MTCP I/O module. This UDP Data Stream function broadcasts up to 8 host PCs simultaneously, and the interval is user-defined from 50ms to 7 Days.

Event Stream Configuration:

In addition to TCP/IP communication protocol, EX-9000A-MTCP supports UDP communication protocol to regularly broadcast data to specific host PCs. Click the tab of Data Stream, then configure the broadcasting interval and the specific IP addresses which need to receive data from the specific EX-9000A/AB-MTCP I/O module. This UDP Data Stream function broadcasts up to 8 host PCs simultaneously, and the interval is user-defined from 50ms to 7 Days.

Data Stream Monitoring:

After finishing the configuration of Data Stream, you can select the tab "Stream Monitor" in the function bar or click icon to call up operation display as Figure 1 7 Stream display.

Select the IP address of the EX-9000A-MTCP you want to read data, then click "**Start** " button. The Utility software will begin to receive the stream data on this operation display.

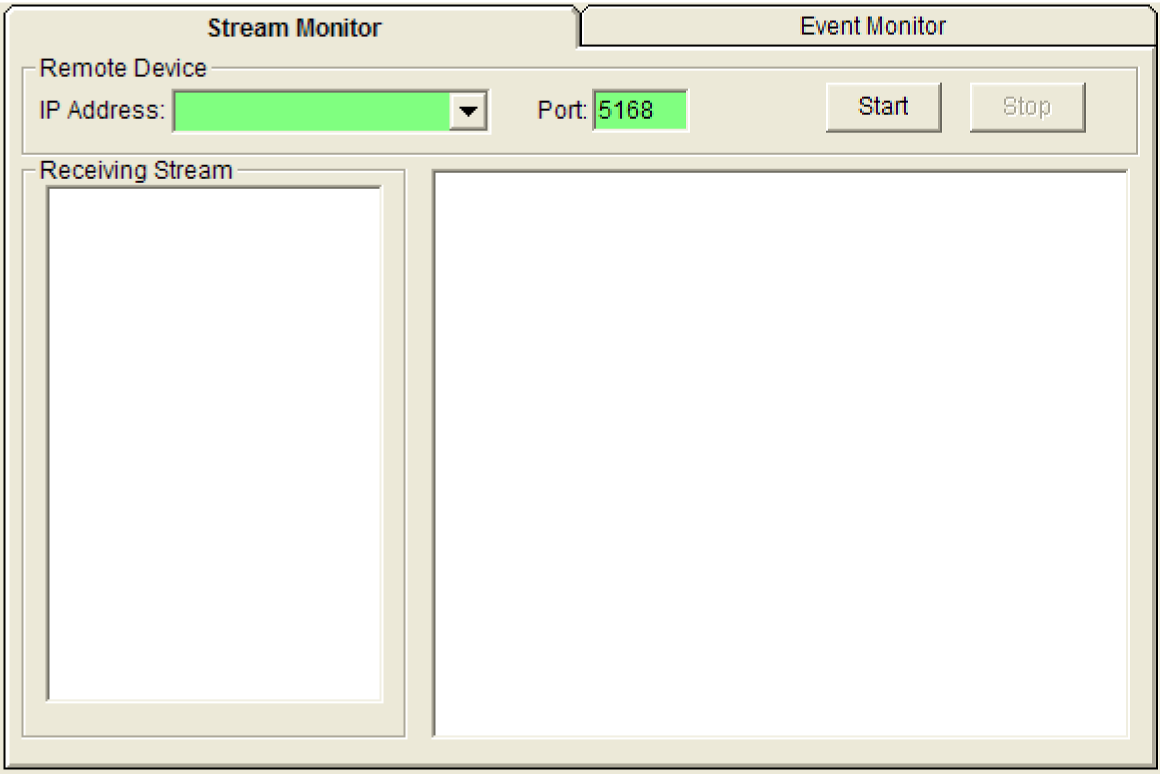
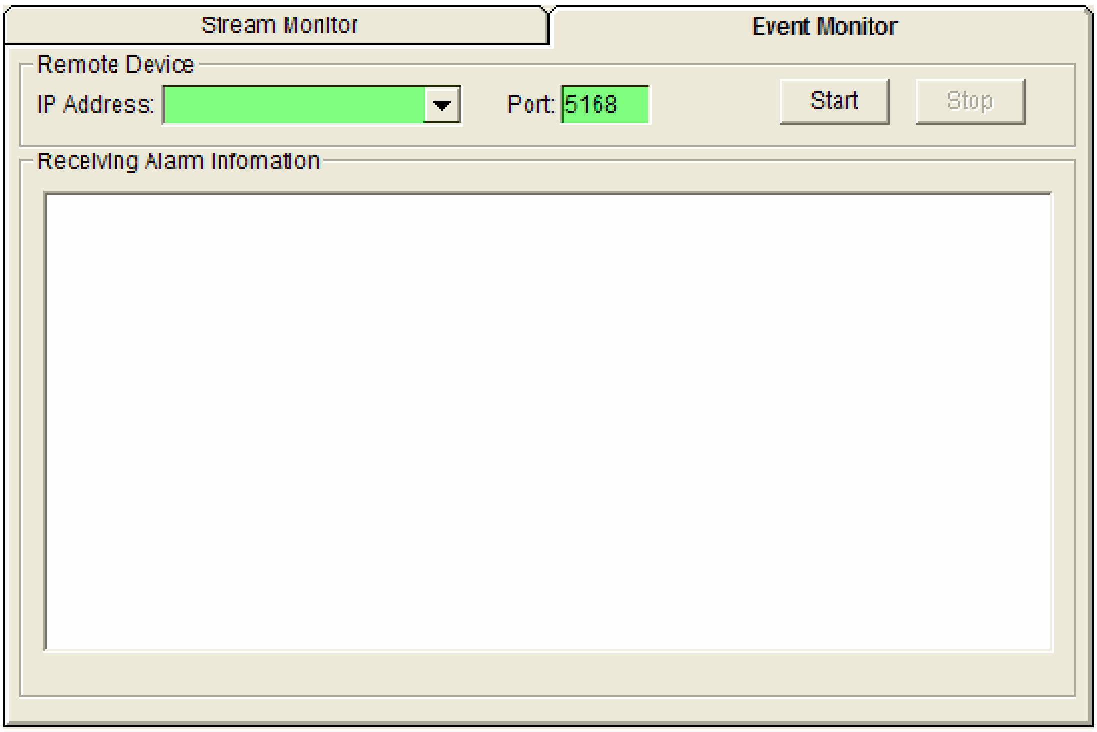


Figure 5-7 Stream display

Data Event Monitoring:

After finishing the configuration of Data Event, you can select the tab “Event Monitor” in the function bar or click icon to call up operation display as Figure 1 8 Event display.

Select the IP address of the EX-9000A-MTCP you want to read data, then click “**Start**” button. The Utility software will begin to receive the stream data on this operation display.



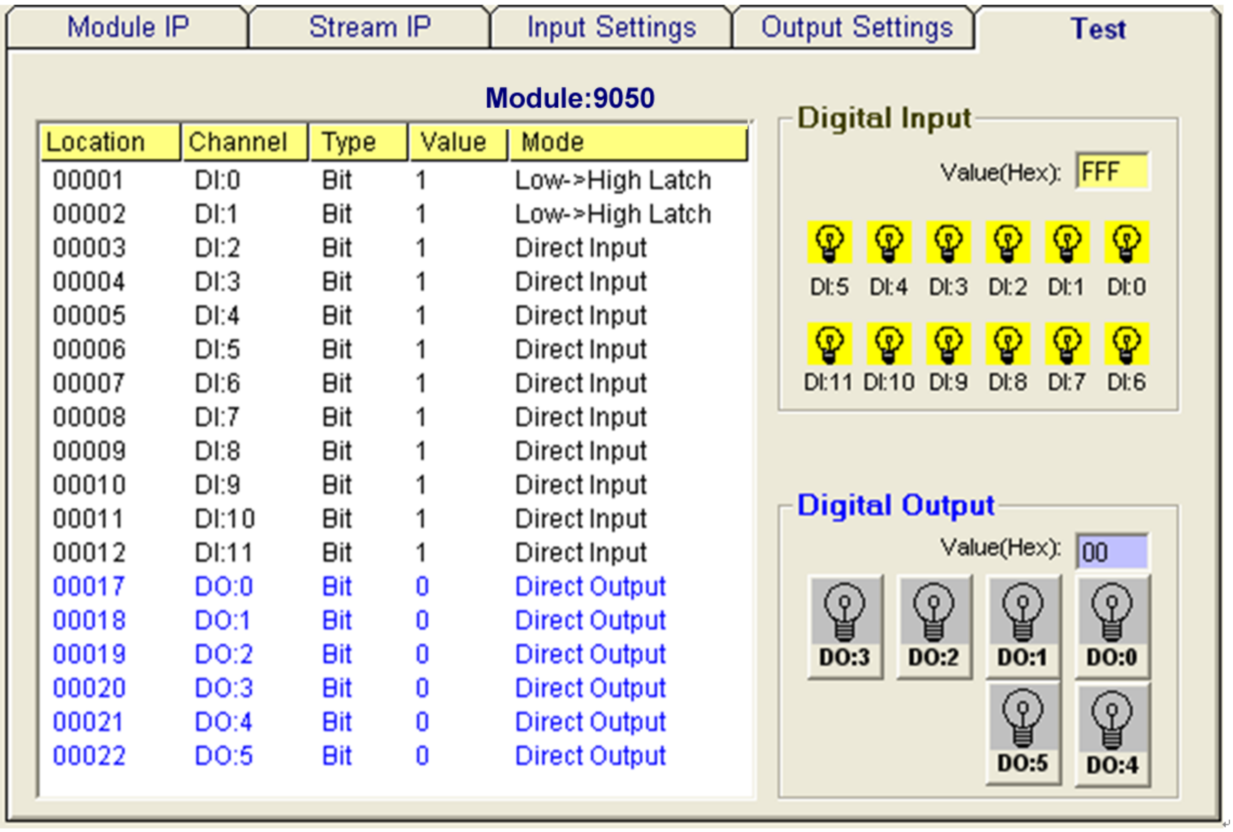
Port: 5168

Figure 5-8 Event display

5.10 Digital I/O Module Settings

Selecting EX-9000A-MTCP Digital Modules and select "**Test**" tab, user can read following information from the Utility.

5.10.1 Digital Test Tab



Module:9050

Location	Channel	Type	Value	Mode
00001	DI:0	Bit	1	Low->High Latch
00002	DI:1	Bit	1	Low->High Latch
00003	DI:2	Bit	1	Direct Input
00004	DI:3	Bit	1	Direct Input
00005	DI:4	Bit	1	Direct Input
00006	DI:5	Bit	1	Direct Input
00007	DI:6	Bit	1	Direct Input
00008	DI:7	Bit	1	Direct Input
00009	DI:8	Bit	1	Direct Input
00010	DI:9	Bit	1	Direct Input
00011	DI:10	Bit	1	Direct Input
00012	DI:11	Bit	1	Direct Input
00017	DO:0	Bit	0	Direct Output
00018	DO:1	Bit	0	Direct Output
00019	DO:2	Bit	0	Direct Output
00020	DO:3	Bit	0	Direct Output
00021	DO:4	Bit	0	Direct Output
00022	DO:5	Bit	0	Direct Output

Digital Input Value(Hex): FFF

Digital Output Value(Hex): 00

Figure 5-9 ModBus location and I/O status

Digital I/O Module Test tab"

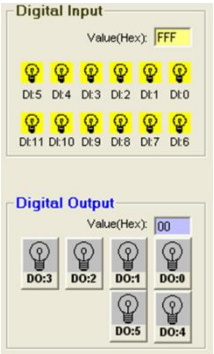
Location : Standard Modbus address. EX-9000A/AB-MTCP Ethernet I/O Utility shows the Modbus mapping address of each I/O channel. And the addresses will be the indexes for applying into the database of HMI or OPC Server.

Channel : Indicate the channel number of digital I/O module.

Type : Data Type of the I/O channel. The data type of Digital I/O modules is always "Bit".

Value : The current status on each channel of I/O Module. The value of digital I/O modules could be "0" (OFF) or "1" (ON).

Mode :Describes the I/O types of the specific module. In addition to monitor the current DI/DO status, the Windows Utility offers a graphical operating interface as Figure1 12 DI/O status display. You can read the Digital input status through the change of the indicator icons. Oppositely, you can write the digital output status through clicking the indicator icons.



Digital Input

Value(Hex): FFF

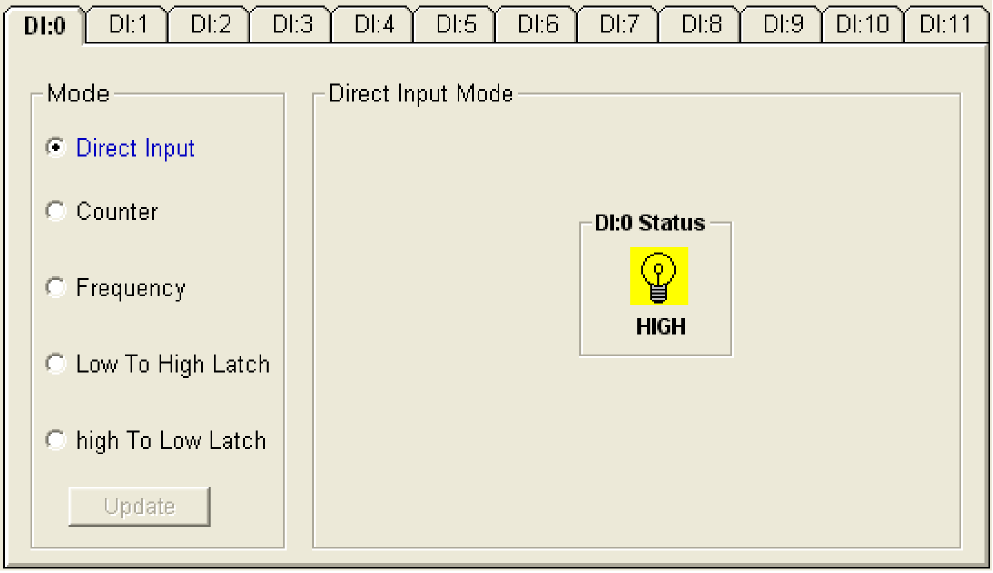
Digital Output

Value(Hex): 00

Figure 5-10 DI/O status display

5.10.2 Digital Input Settings Tab

The digital input channels support counter and signal latch functions. Click the specific channel, there will be five working modes for choosing.



Mode

● Direct Input

○ Counter

○ Frequency

○ Low To High Latch

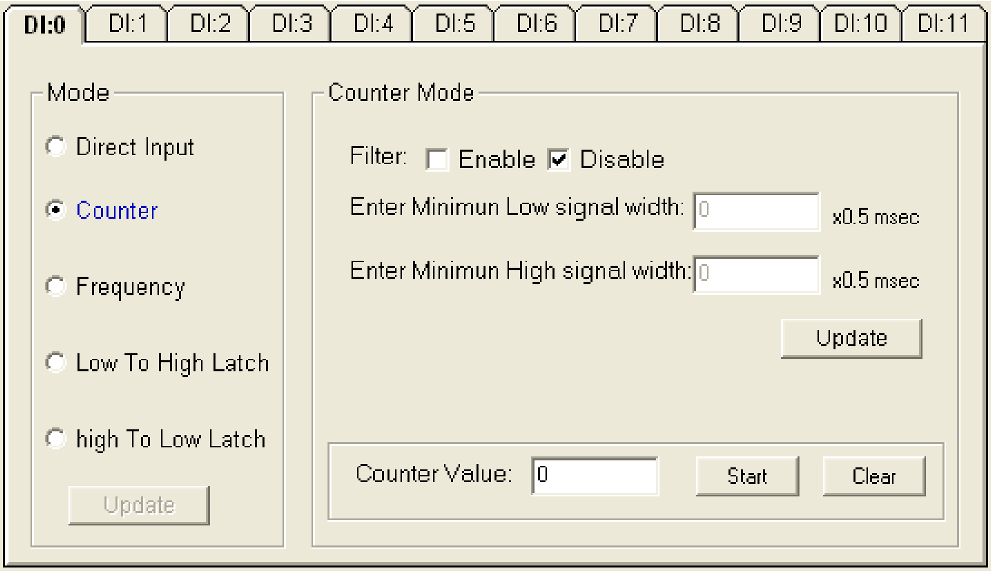
○ high To Low Latch

Direct Input Mode

DI:0 Status

HIGH

Figure 5-11 Direct input mode



Mode

○ Direct Input

● Counter

○ Frequency

○ Low To High Latch

○ high To Low Latch

Counter Mode

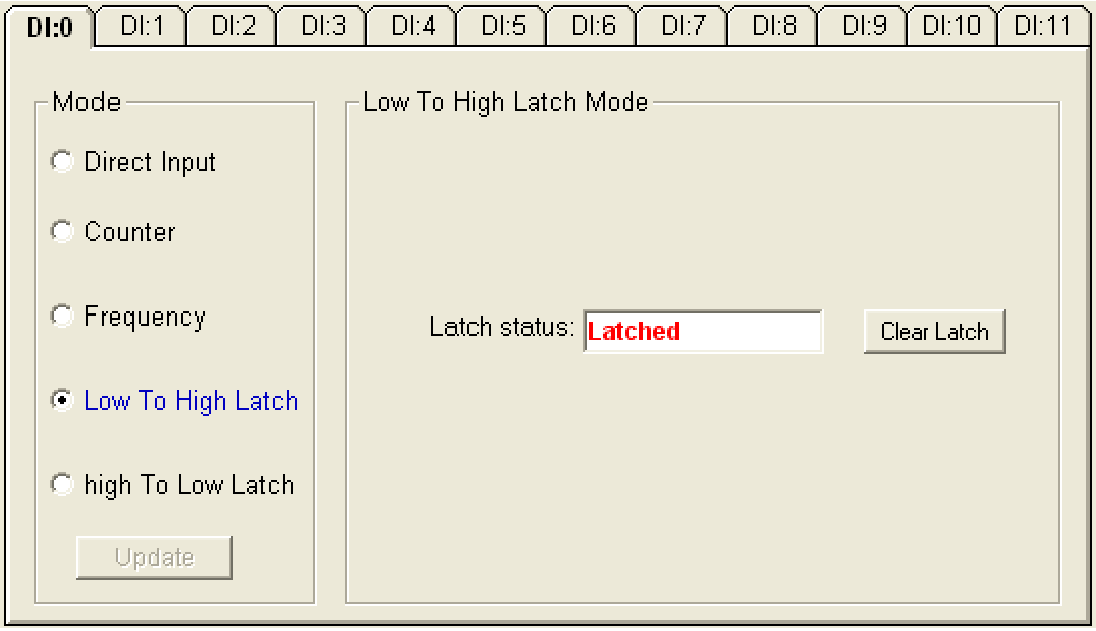
Filter: □ Enable ☑ Disable

Enter Minimun Low signal width: 0 x0.5 msec

Enter Minimun High signal width: 0 x0.5 msec

Counter Value: 0

Figure 5-12 Counter mode



Mode

○ Direct Input

○ Counter

○ Frequency

● Low To High Latch

○ high To Low Latch

Low To High Latch Mode

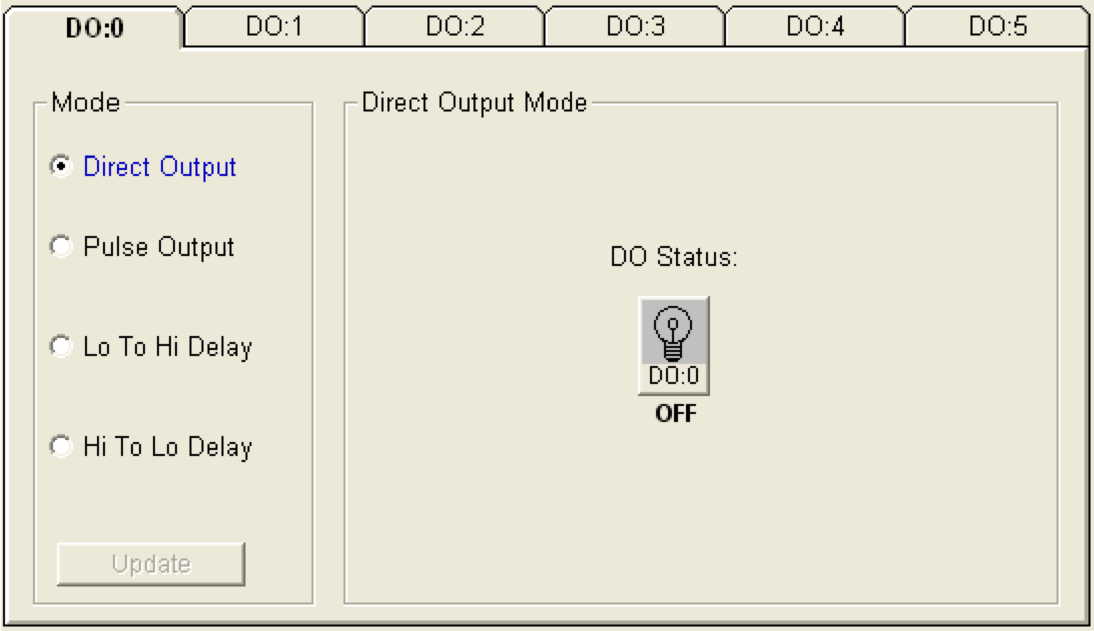
Latch status: Latched

Figure 5-13 Input latch mode

Note:
The new working mode setting will take effective after click the "Update" button.
If necessary, users could invert the original single for flexible operation needs.

5.10.3 Digital Output Settings Tab

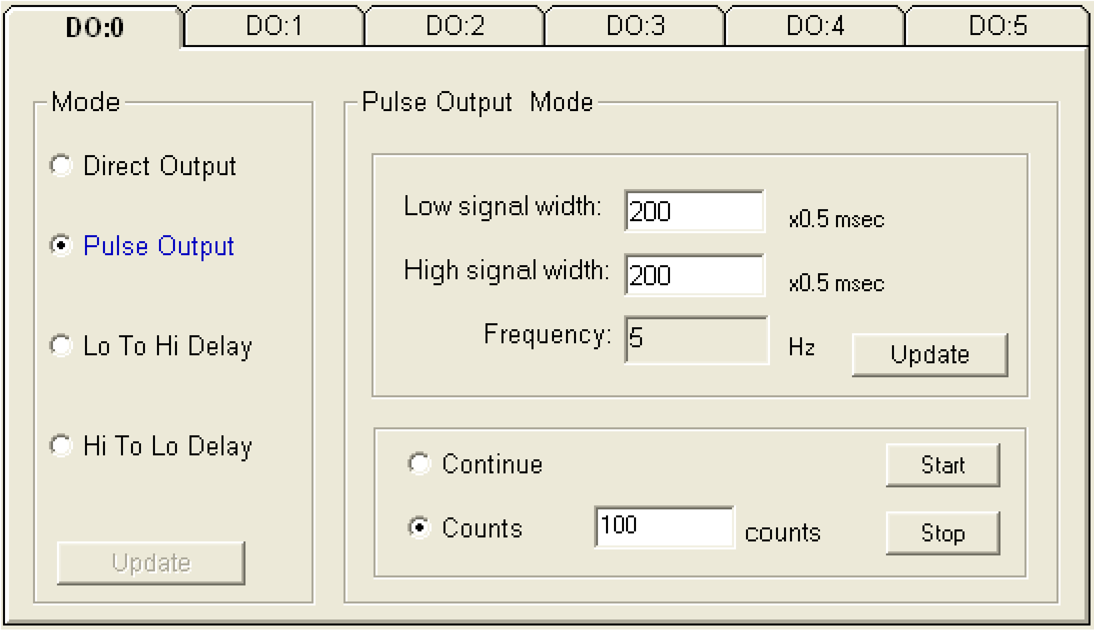
The digital output channels support pulse output and delay output functions. Click the specific channel, there will be four working modes for choosing.



Mode
● Direct Output
○ Pulse Output
○ Lo To Hi Delay
○ Hi To Lo Delay

Direct Output Mode
DO Status:
DO:0
OFF

Figure 5-14 **Direct output mode**

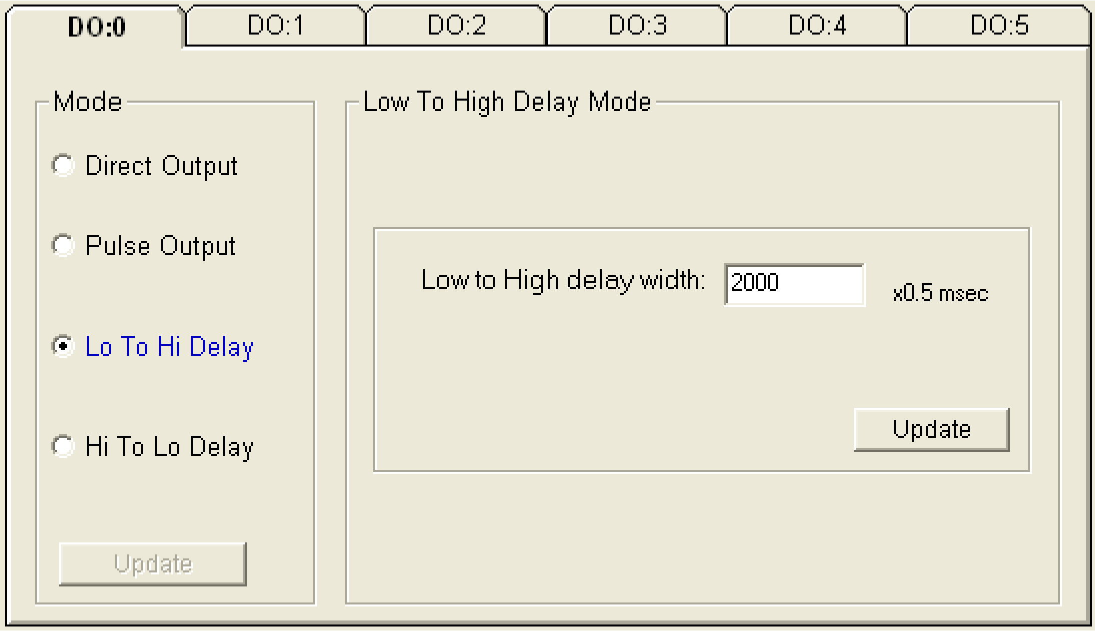


Mode
○ Direct Output
● Pulse Output
○ Lo To Hi Delay
○ Hi To Lo Delay

Pulse Output Mode
Low signal width: 200 x0.5 msec
High signal width: 200 x0.5 msec
Frequency: 5 Hz

○ Continue
● Counts 100 counts

Figure 5-15 **Pulse output mode**



Mode

○ Direct Output

○ Pulse Output

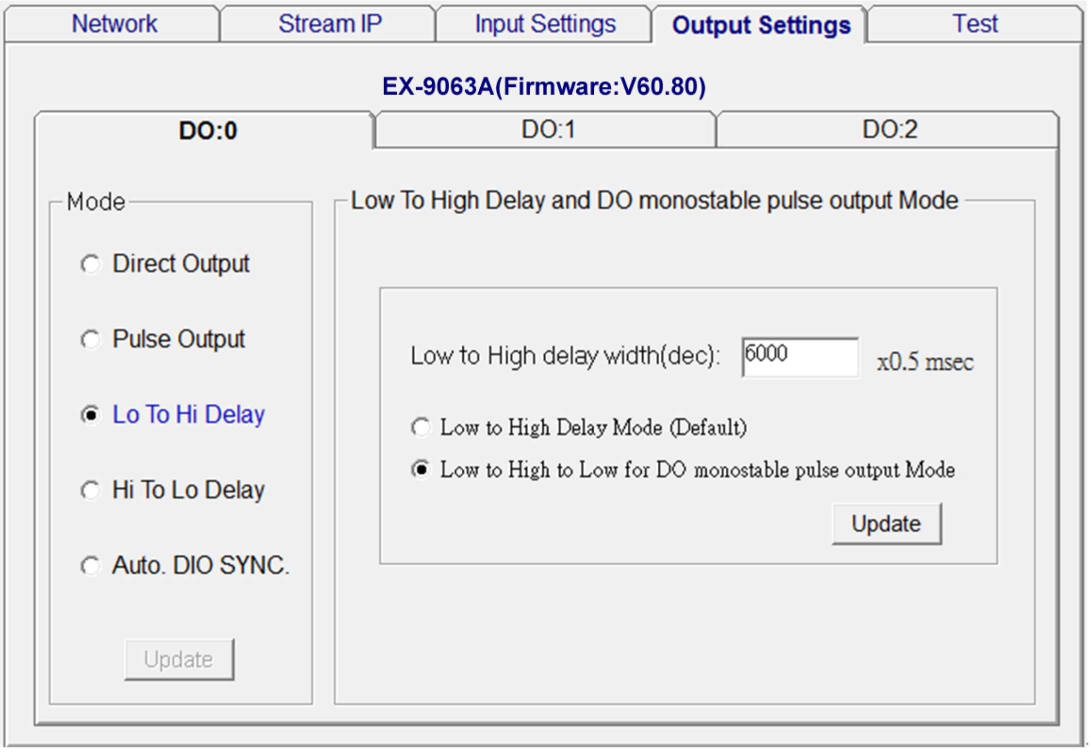
● Lo To Hi Delay

○ Hi To Lo Delay

Low To High Delay Mode

Low to High delay width: 2000 x0.5 msec

Figure 5-16 **Low to High Delay mode**



EX-9063A(Firmware:V60.80)

Mode

○ Direct Output

○ Pulse Output

● Lo To Hi Delay

○ Hi To Lo Delay

○ Auto. DIO SYNC.

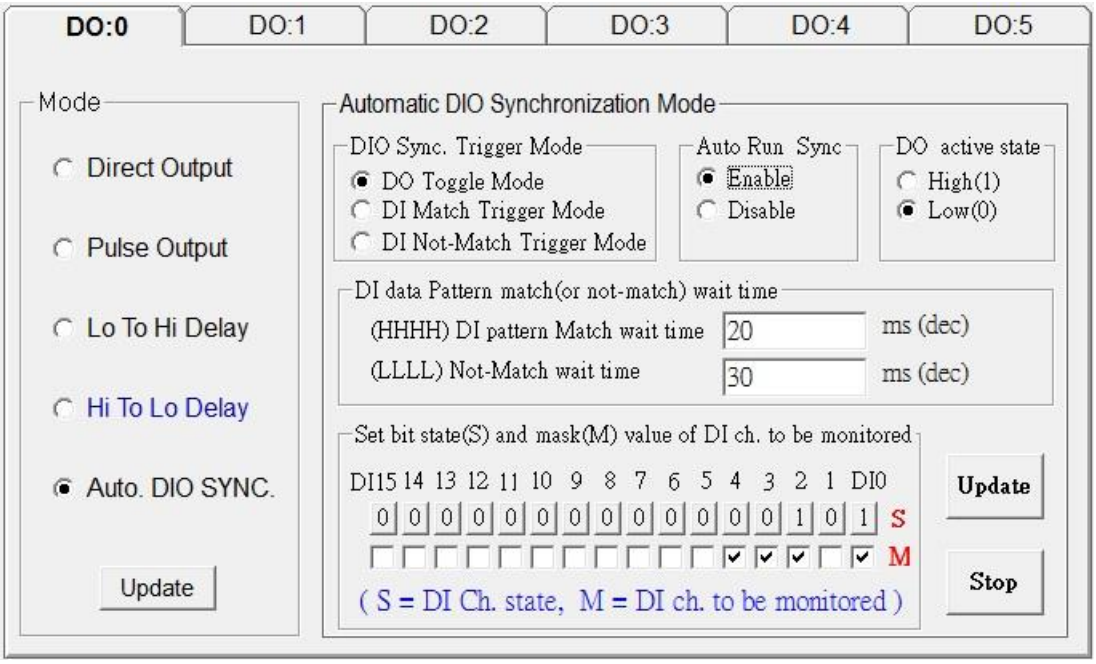
Low To High Delay and DO monostable pulse output Mode

Low to High delay width(dec): 6000 x0.5 msec

○ Low to High Delay Mode (Default)

● Low to High to Low for DO monostable pulse output Mode

Figure 5-17 ***Low to High to Low*** for **DO Auto-Off Time Mode**



Mode

○ Direct Output

○ Pulse Output

○ Lo To Hi Delay

○ Hi To Lo Delay

● Auto. DIO SYNC.

Automatic DIO Synchronization Mode

DIO Sync. Trigger Mode
● DO Toggle Mode
○ DI Match Trigger Mode
○ DI Not-Match Trigger Mode

Auto Run Sync
● Enable
○ Disable

DO active state
○ High(1)
● Low(0)

DI data Pattern match(or not-match) wait time

(HHHH) DI pattern Match wait time 20 ms (dec)

(LLLL) Not-Match wait time 30 ms (dec)

Set bit state(S) and mask(M) value of DI ch. to be monitored

DI15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	DI0	
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	S
□	□	□	□	□	□	□	□	□	□	□	☑	☑	☑	□	☑	M

(S = DI Ch. state, M = DI ch. to be monitored)

Figure 5-18 **DIO SYNC. mode** (BIOS version: 6.070 or later)

Chapter 6 What is TCPDAQ ActiveX Control?

TCPDAQ.OCX is a collection of ActiveX controls for performing I/O operations within any compatible ActiveX control container, such as Visual Basic, Delphi, etc. You can easily perform the I/O operations through properties, events and methods. Specific information about the properties, methods, and events of the TCPDAQ ActiveX controls can be found later in this manual.

With TCPDAQ ActiveX Control, you can perform versatile I/O operations to control your ExpertDAQ EX-9000A/AB-MTCP module series.

The TCPDAQ ActiveX Control setup program installs TCPDAQ.OCX through a process that may take several minutes. Installing the necessary software to use the TCPDAQ.OCX in your application involves two main steps: Installing the TCPDAQ ActiveX Control

Use the ExpertDAQ EX-9000A/AB-MTCP utility to configure the modules that is attached to your computer.

You can use these ActiveX controls in any development tool that supports them, including Microsoft Visual C++, Microsoft Visual Basic, Borland C++ Builder, Borland Delphi

6.1 Installing the TCPDAQ ActiveX Controls

Before using the TCPDAQ ActiveX Control, you must install the TCPDAQ.OCX first

♦ Insert the TCPDAQ installation CD-ROM disc into your computer.

♦ The installation program should start automatically. If autorun is not enabled on your computer, use your Windows Explorer or the Windows Run command to execute Setup.exe on the TCPDAQ installation CD-ROM disc

(Assume "d" is the letter of your CD-ROM disc drive): **D: \Setup.exe**

6.2 Building TCPDAQ ActiveX Control with Various Tools

This chapter describes how you can use the TCPDAQ ActiveX Control with the following development tools:

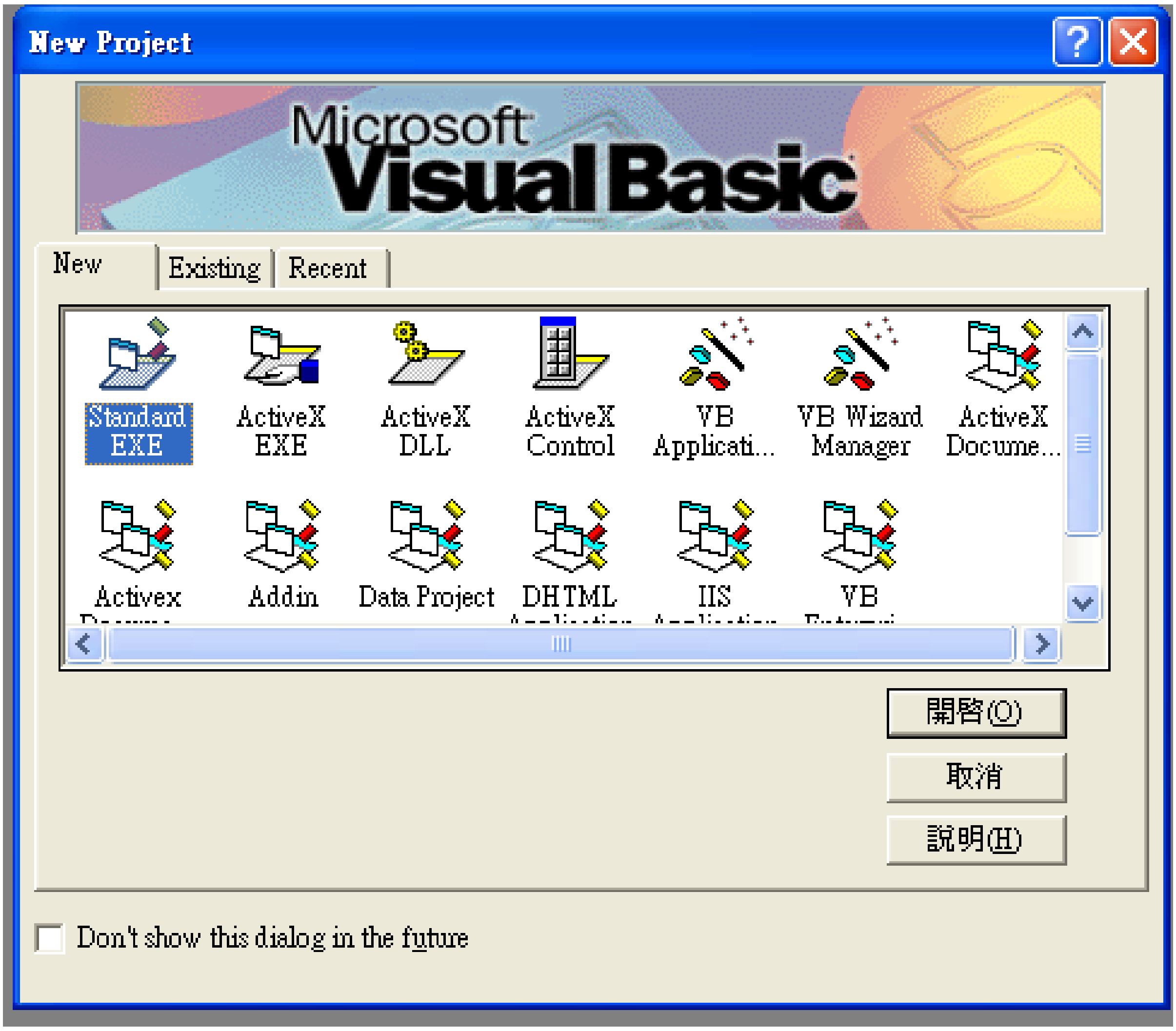
- ♦ Microsoft Visual C++ version 6.0 (SP5)
- ♦ Microsoft Visual Basic version 6.0 (SP5)
- ♦ Borland Delphi version 4.0 (with the Delphi 6 Update Pack fixes for ActiveX installed)
- ♦ Borland C++ Builder version 5.0

This chapter assumes that you are familiar with the basic concepts of using Visual Basic, Delphi, Borland C++ Builder, and Visual C++, including selecting the type of application, designing the form, placing the control on the form, configuring the properties of the control, creating the code (event handler routines) for this control.

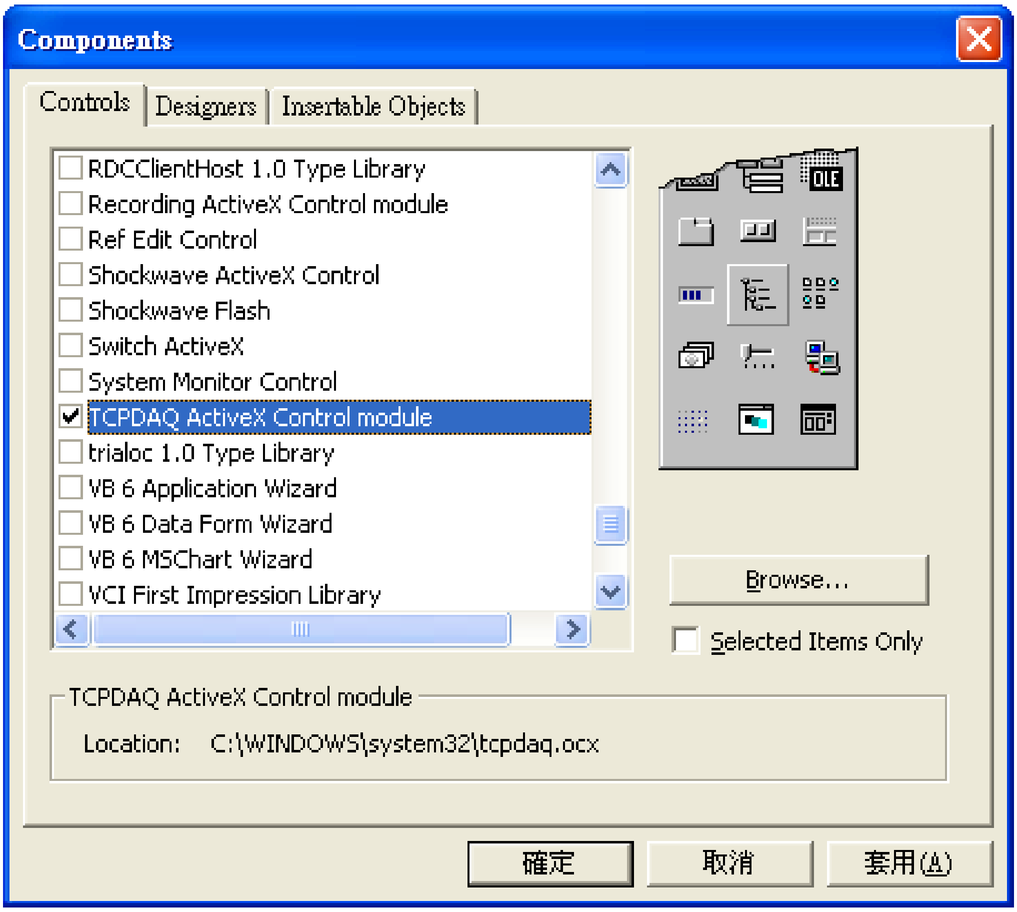
Note: For Borland Delphi 6, the Delphi 6 Update Pack fixes for ActiveX must be installed.

6.3 Building TCPDAQ Applications with Visual Basic

- ♦ Start Visual Basic.



- Select **Standard EXE** icon and press the **Open** button. A new project is created. Click on **Components...** from the **Project** menu. The Components dialog box is loaded as shown below:



Components

Controls | Designers | Insertable Objects

□ RDCClientHost 1.0 Type Library
□ Recording ActiveX Control module
□ Ref Edit Control
□ Shockwave ActiveX Control
□ Shockwave Flash
□ Switch ActiveX
□ System Monitor Control
☑ TCPDAQ ActiveX Control module
□ trialoc 1.0 Type Library
□ VB 6 Application Wizard
□ VB 6 Data Form Wizard
□ VB 6 MSChart Wizard
□ VCI First Impression Library

Browse...

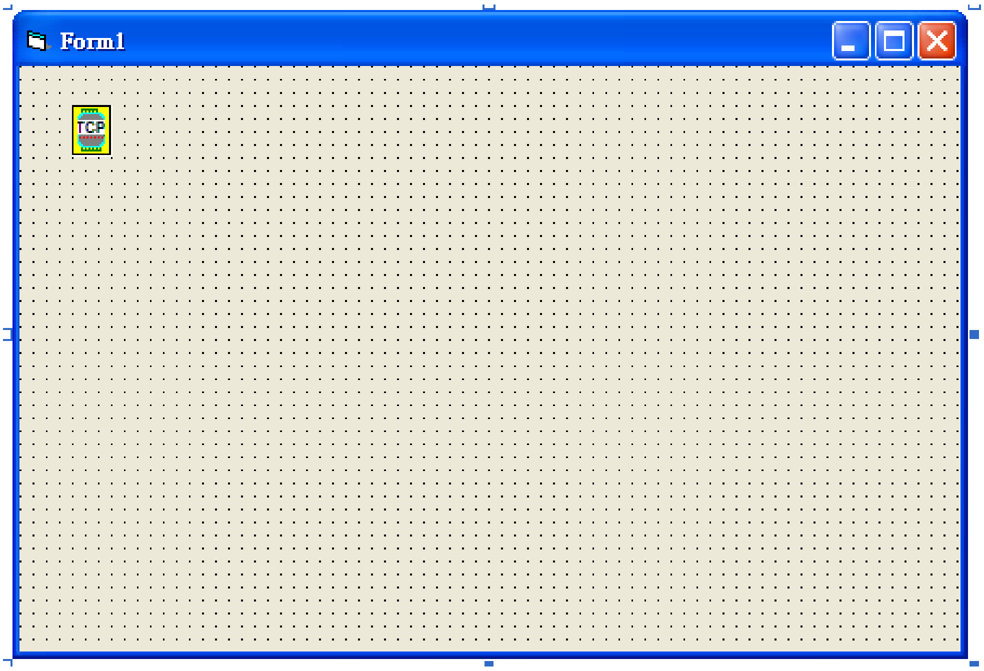
□ Selected Items Only

TCPDAQ ActiveX Control module

Location: C:\WINDOWS\system32\tcpdaq.ocx

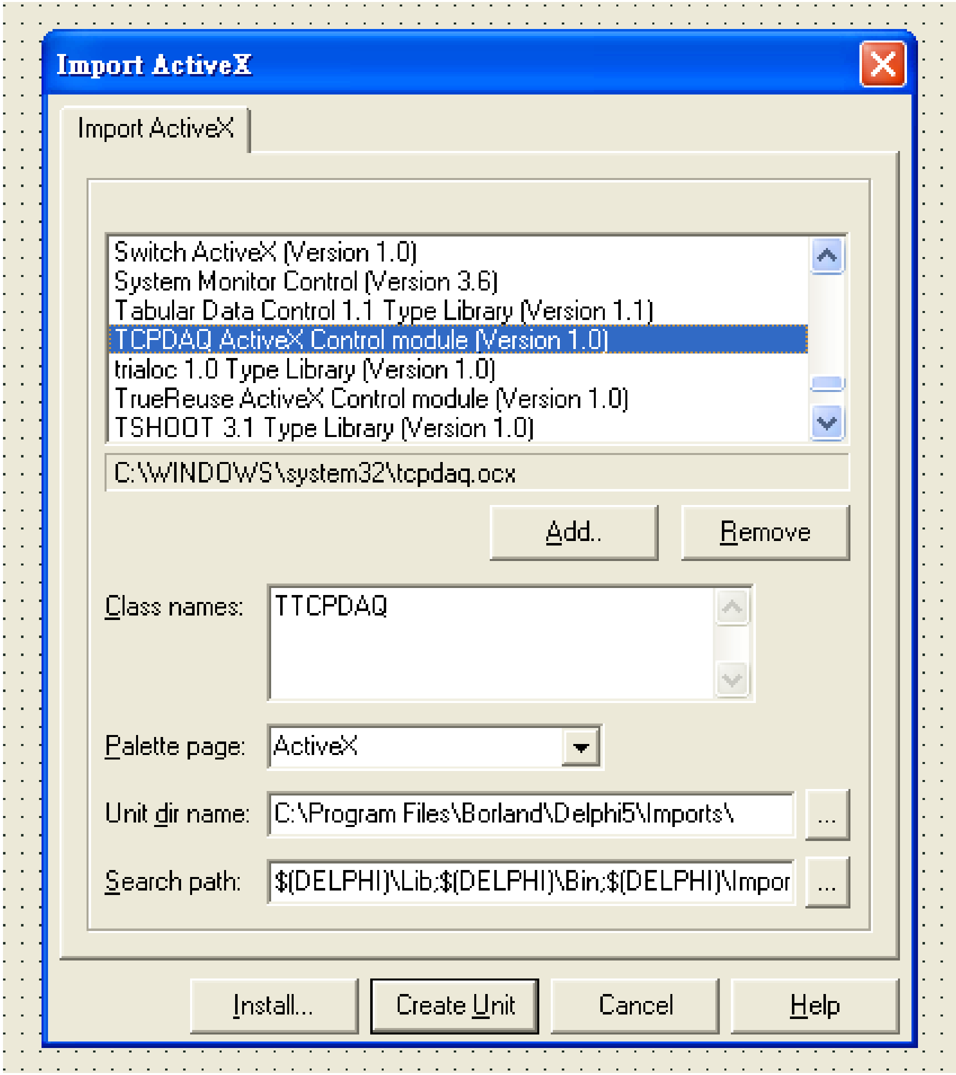
確定 | 取消 | 套用(A)

- Place a TCPDAQ control from the Toolbox on the form. Use the default name.
- Your form should look similar to the one shown below:



6.4 Building TCPDAQ Applications with Delphi

- Start Delphi, Delphi will launch as shown below:
- Select **Import ActiveX Control...** from the **Component** menu. The Import ActiveX dialog box loads:
- Select the TCPDAQ ActiveX Control Module and press the **Install...** button. A dialog box is displayed as follows:



Switch ActiveX (Version 1.0)
System Monitor Control (Version 3.6)
Tabular Data Control 1.1 Type Library (Version 1.1)
TCPDAQ ActiveX Control module (Version 1.0)
trialoc 1.0 Type Library (Version 1.0)
TrueReuse ActiveX Control module (Version 1.0)
TSHOOT 3.1 Type Library (Version 1.0)

C:\WINDOWS\system32\tcpdaq.ocx

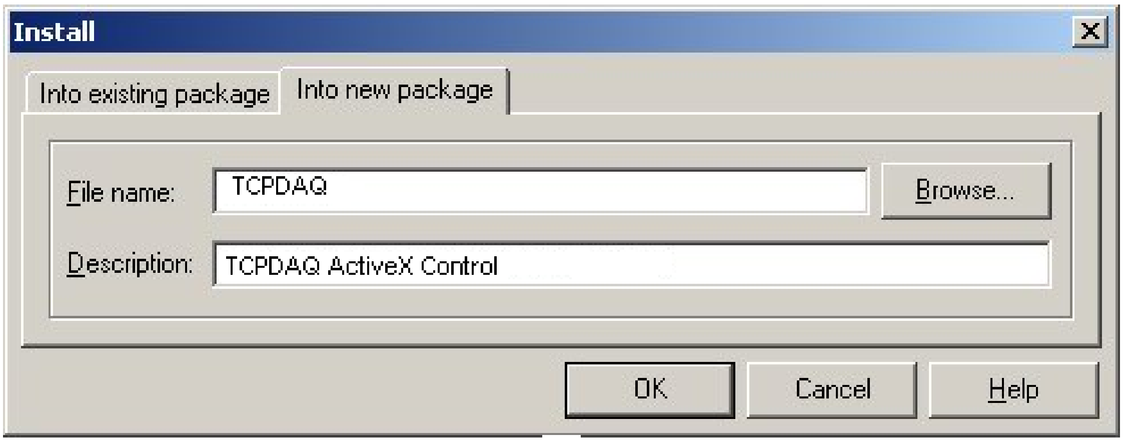
Class names: TTCPDAQ

Palette page: ActiveX

Unit dir name: C:\Program Files\Borland\Delphi5\Imports\

Search path: $(DELPHI)\Lib;$(DELPHI)\Bin;$(DELPHI)\Impor

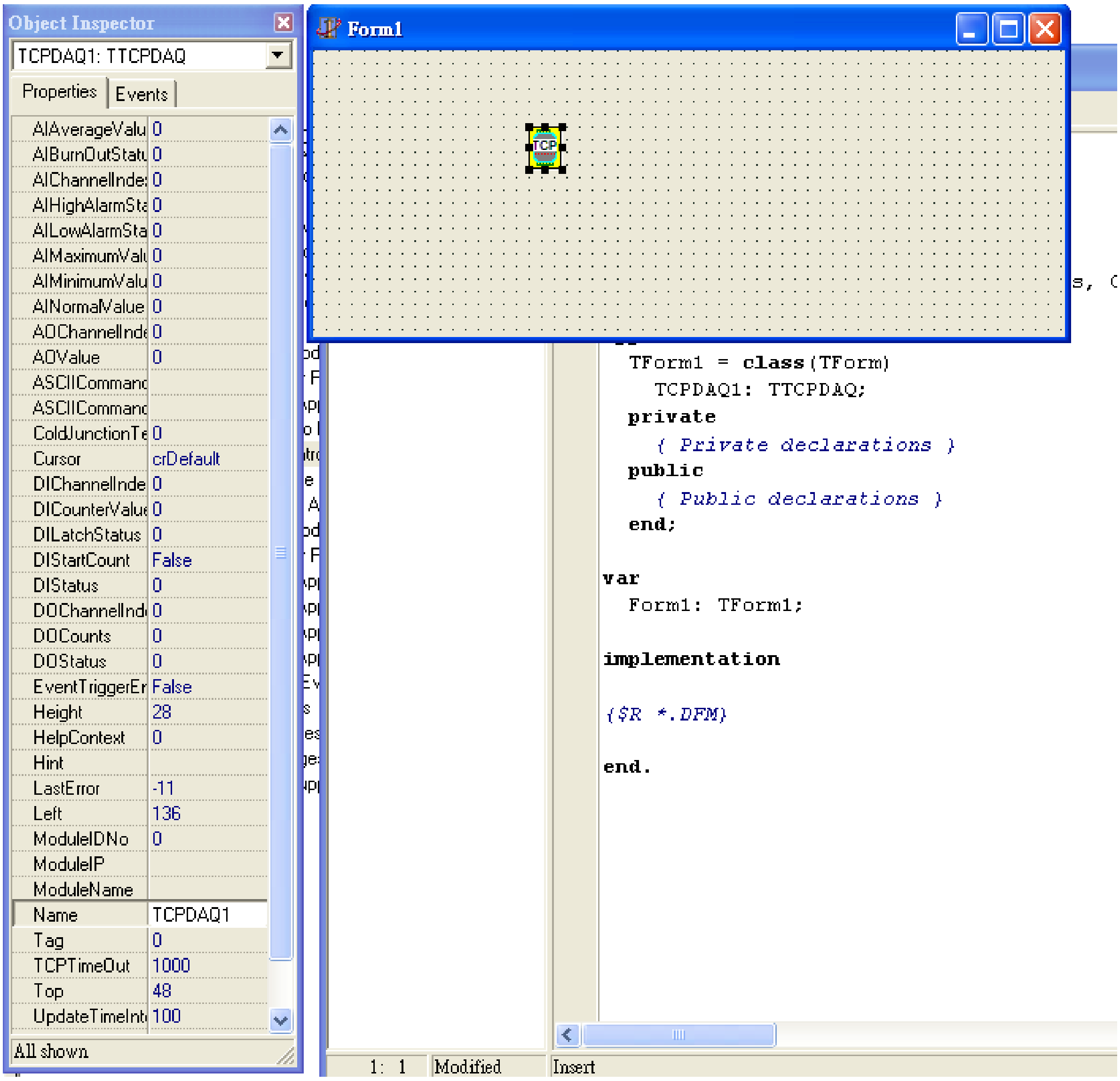
The TCPDAQ control is loaded into the **Component Palette**. You can check it by clicking on **Install Package...** from the **Component** menu. A dialog box is shown as below.



File name: TCPDAQ

Description: TCPDAQ ActiveX Control

- ♦ Switch to the form and select the ActiveX tab from the **Component Palette**.
- ♦ Place a TCPDAQ control from the **Component Palette** on the form. Use the default names TCPDAQ1.
- ♦ Your form should look similar to the one shown below:



TCPDAQ1: TTCPDAQ

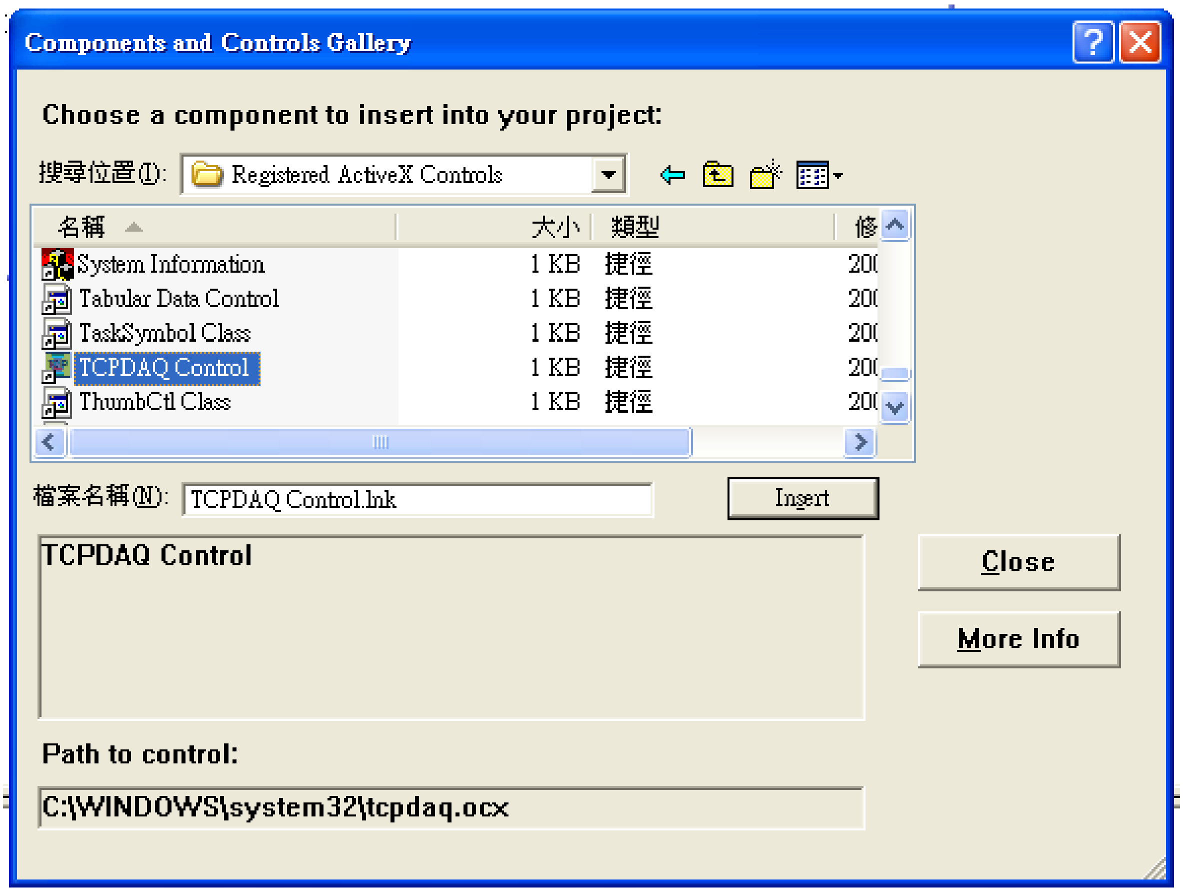
AIAverageValu	0
AIBurnOutStatu	0
AIChannelInde	0
AIHighAlarmSta	0
AILowAlarmSta	0
AIMaximumValu	0
AIMinimumValu	0
AINormalValue	0
AOChannelInde	0
AOValue	0
ASCIICommand	
ASCIICommand	
ColdJunctionTe	0
Cursor	crDefault
DIChannelInde	0
DICounterValue	0
DILatchStatus	0
DIStartCount	False
DIStatus	0
DOChannelInd	0
DOCounts	0
DOStatus	0
EventTriggerEr	False
Height	28
HelpContext	0
Hint	
LastError	-11
Left	136
ModuleIDNo	0
ModuleIP	
ModuleName	
Name	TCPDAQ1
Tag	0
TCPTimeOut	1000
Top	48
UpdateTimeInt	100

```
    TForm1 = class(TForm)
      TCPDAQ1: TTCPDAQ;
    private
      { Private declarations }
    public
      { Public declarations }
    end;

  var
    Form1: TForm1;

  implementation

  {$R *.DFM}

  end.
```

```
1: 1    Modified    Insert
```

6.5 Building TCPDAQ Applications with Visual C++

- ♦ Start Visual C++ program.
- ♦ Select **Add to Project→ Components and Controls** from the **Project** menu, and double-click on **Registered ActiveX Controls**. The result should be as below:



Components and Controls Gallery

Choose a component to insert into your project:

搜尋位置(I): Registered ActiveX Controls

名稱	大小	類型	修
System Information	1 KB	捷徑	20
Tabular Data Control	1 KB	捷徑	20
TaskSymbol Class	1 KB	捷徑	20
TCPDAQ Control	1 KB	捷徑	20
ThumbCtl Class	1 KB	捷徑	20

檔案名稱(N): TCPDAQ Control.lnk

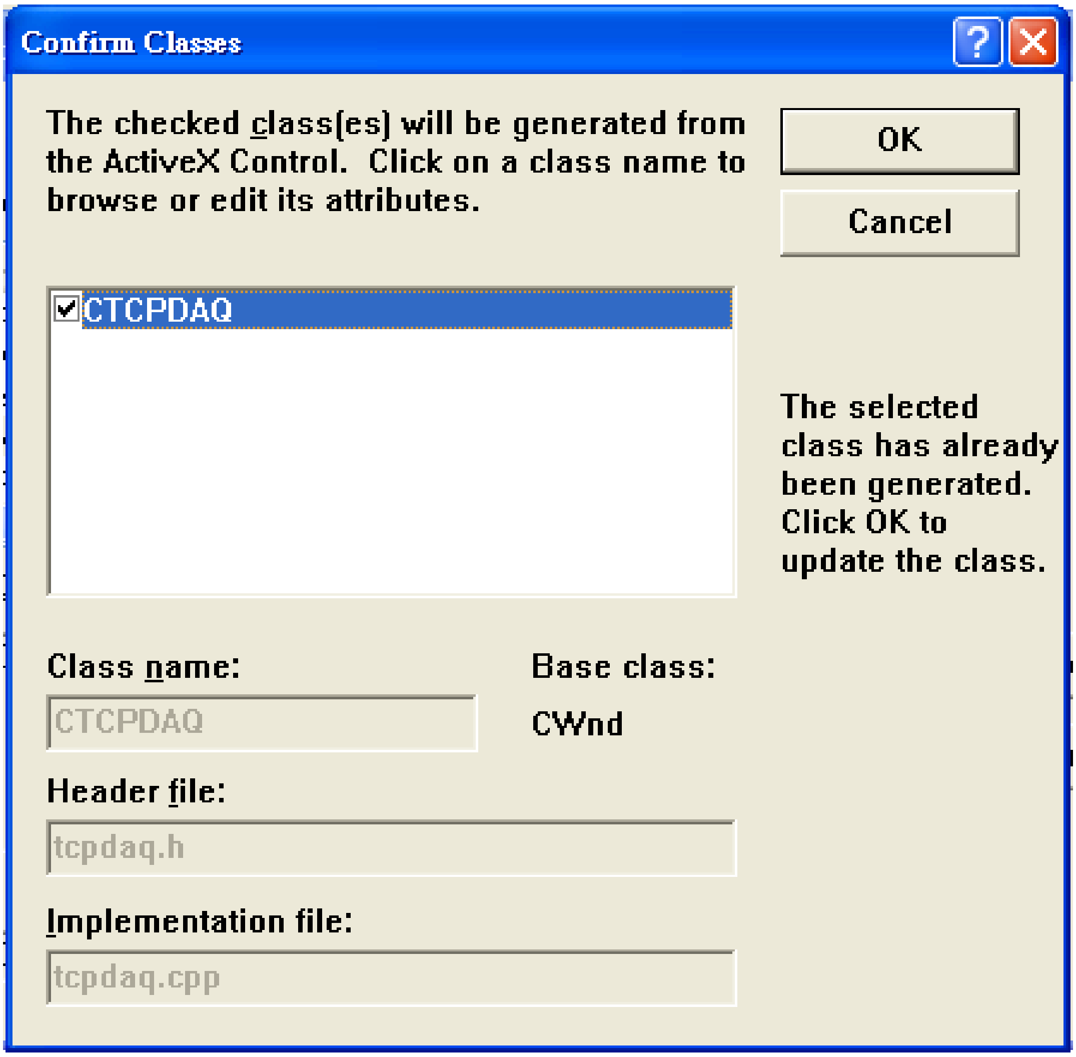
TCPDAQ Control

Path to control:

C:\WINDOWS\system32\tcpdaq.ocx

- ♦ Scroll down to the TCPDAQ Control and press the **Insert** button. A Class Confirm dialog box is displayed, Press **OK**

  button.



Confirm Classes

The checked class(es) will be generated from the ActiveX Control. Click on a class name to browse or edit its attributes.

☑ CTCPDAQ

The selected class has already been generated. Click OK to update the class.

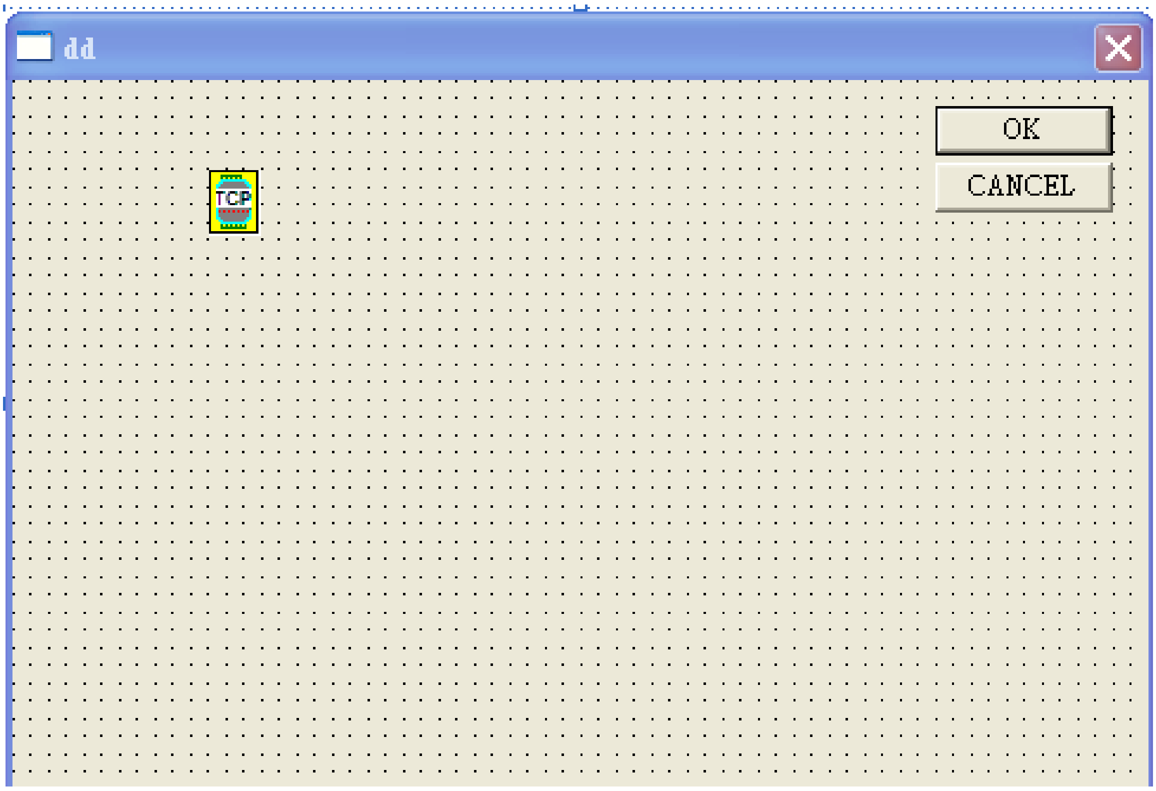
Class name: CTCPDAQ

Base class: CWnd

Header file: tcpdaq.h

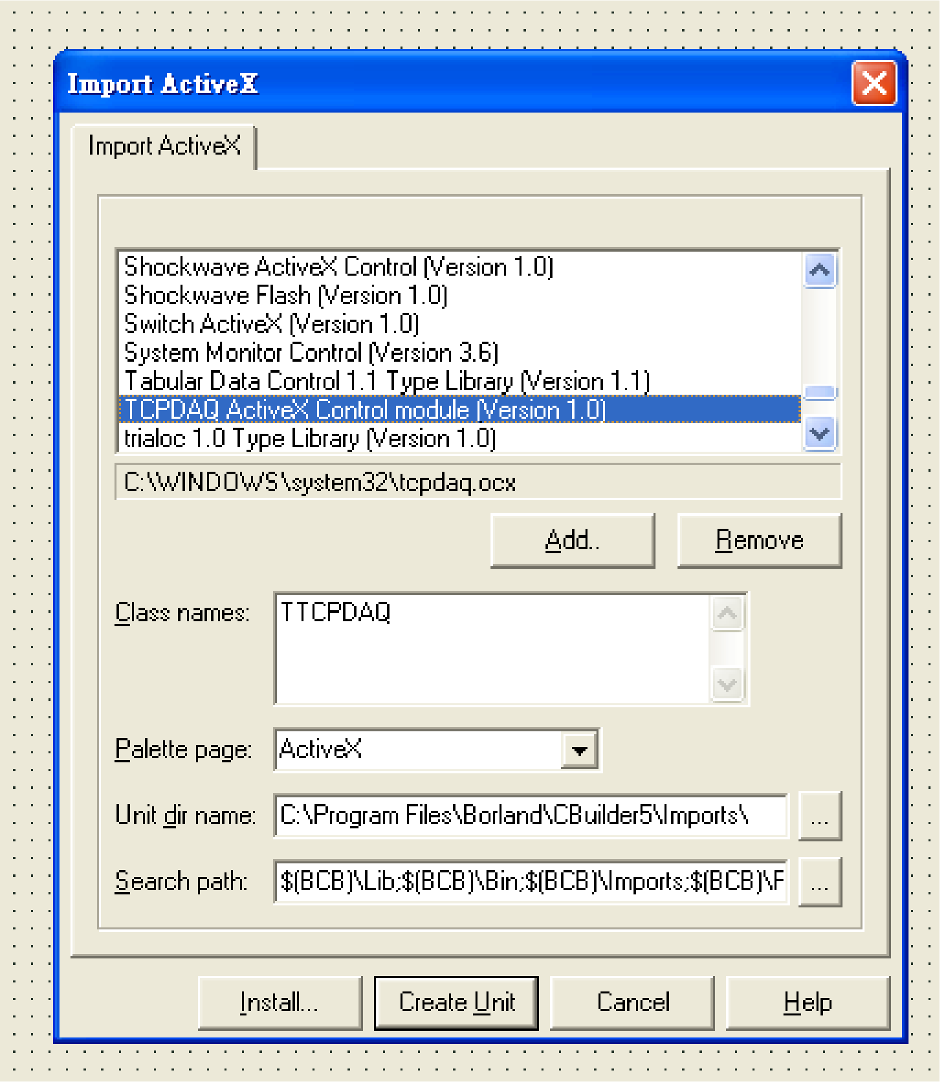
Implementation file: tcpdaq.cpp

- ♦ The TCPDAQ control will be showed in Visual C++ Toolbar.
- ♦ Place a TCPDAQ control from the Controls Toolbar on the dialog-based form.



6.6 Building TCPDAQ Applications with Borland C++ Builder

- ♦ Start Borland C++ Builder (BCB), BCB will launch as shown below:
- ♦ Select **Import ActiveX Control...** from the **Component** menu. The Import ActiveX dialog box loads:
- ♦ Select the TCPDAQ Control and press the **Install...** button. A dialog box is displayed as follows:



Import ActiveX

Shockwave ActiveX Control (Version 1.0)
Shockwave Flash (Version 1.0)
Switch ActiveX (Version 1.0)
System Monitor Control (Version 3.6)
Tabular Data Control 1.1 Type Library (Version 1.1)
TCPDAQ ActiveX Control module (Version 1.0)
trialoc 1.0 Type Library (Version 1.0)

C:\WINDOWS\system32\tcpdaq.ocx

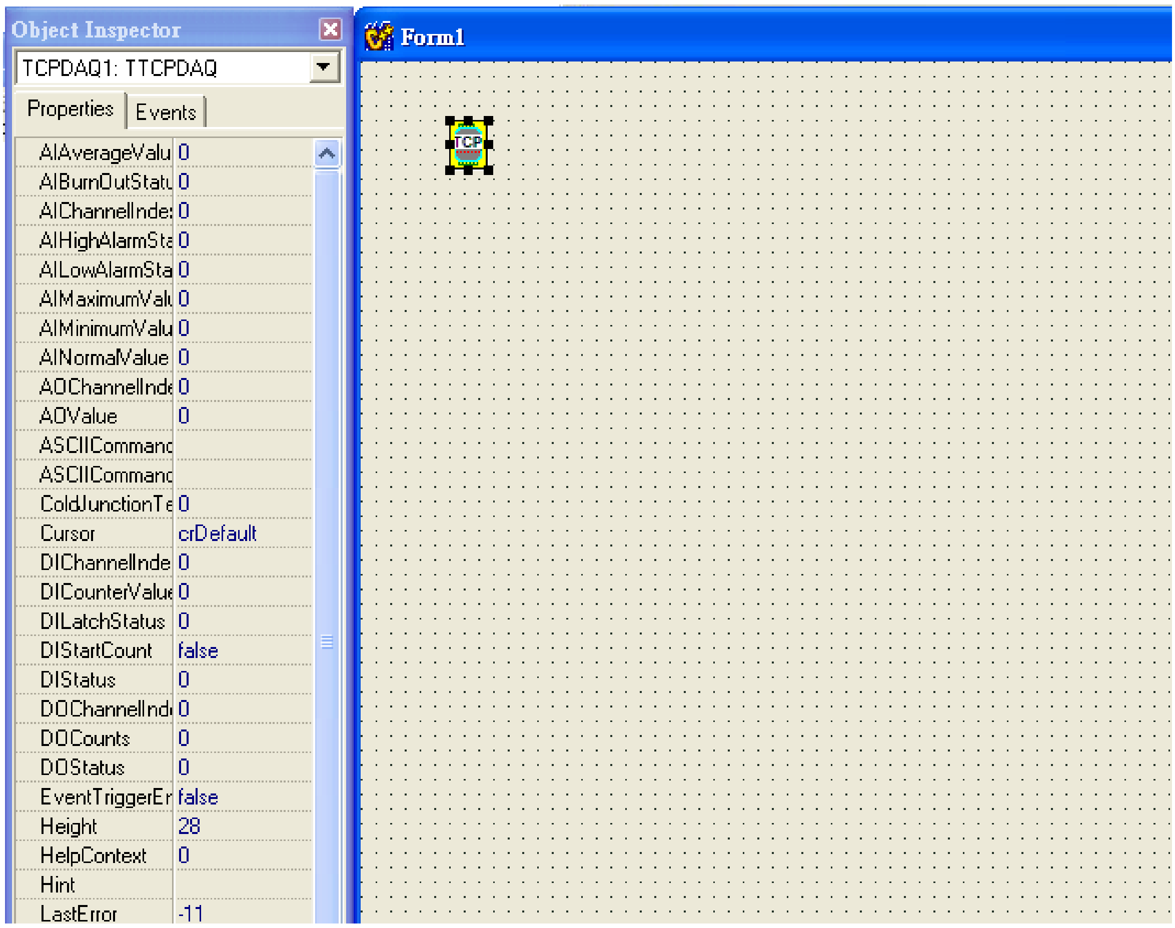
Class names: TTCPDAQ

Palette page: ActiveX

Unit dir name: C:\Program Files\Borland\CBuilder5\Imports\

Search path: $(BCB)\Lib;$(BCB)\Bin;$(BCB)\Imports;$(BCB)\F

- ♦ Enter "TCPDAQ" into the File name field under the **Into new package** tab, and press **OK** button. A Confirm dialog box is displayed. press “**Yes”** button.
- ♦ The TCPDAQ control is loaded into the **Component Palette**. You can check it by clicking on **Install Package...** from the **Component** menu. A dialog box is shown as below.



TCPDAQ1: TTCPDAQ

AIAverageValu	0
AIBurnOutStatu	0
AIChannelInde:	0
AIHighAlarmSta	0
AILowAlarmSta	0
AIMaximumValu	0
AIMinimumValu	0
AINormalValue	0
AOChannelInde	0
AOValue	0
ASCIICommanc	
ASCIICommanc	
ColdJunctionTe	0
Cursor	crDefault
DIChannelInde	0
DICounterValue	0
DILatchStatus	0
DIStartCount	false
DIStatus	0
DOChannelInd	0
DOCounts	0
DOStatus	0
EventTriggerEr	false
Height	28
HelpContext	0
Hint	
LastError	-11

6.7 Properties of TCPDAQ ActiveX Control

Name	Type	Description	Avaliable Model(s)
AOValue	double	Set the analog output voltage	All models
ASCIICommandReceive	string	Return the ASCII response message from module	All models
ASCIICommandSend	string	Send the ASII command message to module	All models
DIChannelIndex	short	Specifies the digital input channel to perform other DI properties read/write operation.	All DIO models
DIounterValue	long	Return the counting value for the specific DI channel which functions in "Count/Frequency mode"	All DIO models
DILatchStatus	short	Return the latch status for the specific DI channel which functions in "Lo-Hi/Hi-Lo latch mode" (1=Latched, 0=No latched)	All DIO models
DIStartCount	boolean	Start/stop counting for the specific DI channel which functions in "Count/Frequency mode" (True=Start, 0=Stop)	All DIO models
DIStatus	short	Return the status for the specific DI channel which functions in "DI mode" (1=Active, 0=Inactive)	All DIO models
DOChannelIndex	short	Specifies the digital output channel to perform other DO properties read/write operation.	All DIO models
DOCount	long	Set the output count value for the specific DO channel which functions in "Pulse output mode"	All DIO models
DOStatus	short	Return/set the status for the specific DO channel which functions in "D/O mode" (1=Active, 0=Inactive)	All DIO models
EventTriggerEnable	boolean	Enable/disable event trigger mode (True=Enable, False=Disable)	All models
LastError	short	Return the Error code of operation	All models
MoudleIDNo	short	Return the module ID number	All models
ModuleIP	string	Set the remote module IP address	All models
ModuelName	string	Return the module name	All models
TCPTimeOut	long	Return/set the TCP/IP Timeout (ms)	All models
UpdateTimeInterval	long	Return/set data update time interval(ms)	All models

6.8 Methods of TCPDAQ ActiveX Control

Name	Arguments	Returned type	Description
Open	None	None	Open TCPDAQ.OCX to start operation (Must be called before accessing properties at run time)
Close	None	None	Close TCPDAQ.OCX(Must be called before terminating the APP)

ModBusReadCoil	short Startaddress short Counts short coildata[]	None	Read coil data from remote module, and stored into coildata[] buffer
ModBusWriteCoil	shot StartAddress short Counts short coildata[]		Write coil data stored in coildata[] buffer to remote module
ModBusReadReg	short Startaddress short Counts short regdata[]	None	Read holding register data from remote module, and stored into regdata[] buffer
ModBusWriteReg	shot StartAddress short Counts short regdata[]		Write register data stored in regdata[] buffer to remote module

6.9 Events of TCPDAQ ActiveX Control

Name	Arguments	Returned type	Description
OnError	short ErrCode(out) string Errmsg(out)	None	be called when error occurred
EventDataArrival	string Datetime(out) short EventChannel(out) short EventType(out) short EventStatus(out) short EventValue(out)	None	be called when received an event data from the remote module **(*)**

(*): Please see *TCPDAQ_Data_Structure.pdf* file to understand the means of parameters

6.10 Building TCPDAQ ActiveX Applications with Various Development Tools

The demo programs of TCPDAQ AvtiveX control module are included in the provided DISC. The Installed folders include the demo programs for various development tools.

Chapter 7 TCPDAQ DLL API

7.1 Common Functions

NO.	Function Name	Description	Sec.
1	TCP_Open	To initiate the TCPDAQ.dll to use.	
2	TCP_Close	To terminates use of the TCPDAQ.dll.	
3	TCP_Connect	To create a Window TCP socket then establishing a connection to a specific EX-9000A-MTCP	
4	TCP_Disconnect	Disconnecting the Window TCP socket from all EX-9000A/AB-MTCP modules	
5	TCP_ModuleDisconnect	Disconnecting the Window TCP socket from a specific EX-9000A/AB-MTCP	
6	TCP_SendData	Send data to a specific EX-9000A-MTCP module	
7	TCP_RecvData	Receive data to a specific EX-9000A-MTCP module	
8	TCP_SendReceiveASCcmd	To accept an ASCII format string as a command, and transform it to meet the Modbus/TCP's specification. Then sending it to 9000A-MTCP and receiving the response from 9000A-MTCP	
9	UDP_Connect	To create a Window UDP socket then establishing a connection to a specific EX-9000A-MTCP	
10	UDP_Disconnect	Disconnecting the Window UDP socket from all EX-9000A-MTCP modules	
11	UDP_ModuleDisconnect	Disconnecting the Window UDP socket from a specific EX-9000A-MTCP	
12	UDP_SendData	Send data to a specific EX-9000A-MTCP module	
13	UDP_RecvData	Receive data to a specific EX-9000A-MTCP module	
14	UDP_SendReceiveASCcmd	Direct send an ASCII format string as a command, and receive the response from EX-9000A-MTCP	
15	TCP_GetModuleIPinfo	Return module IP information of a specific module	
16	TCP_GetModuleID	Return module ID number of a specific module	
17	TCP_GetIPFromID	Return IP address of a specific module ID number	
18	TCP_ScanOnLineModules	Scan all on-line EX-9000A-MTCP modules	
19	TCP_GetDLLVersion	Return the DLL's version, that is the version of TCPDAQ.DLL	
20	TCP_GetModuleNo	Return the module name of a specific IP address	
21	TCP_GetLastError	Return the error code of the latest called function	
22	TCP_PingIP	Ping to Remote IP address	

7.2 Stream/Event Functions

TCP_StartStream	To instruct the PC to start to receive stream data that coming from EX-9000A-MTCP	
TCP_StopStream	To instruct the PC to stop receiving stream data from all modules	

TCP_ReadStreamData	To receive stream data that coming from the specific EX-9000A-MTCP	
TCP_StartEvent	To instruct the PC to start to receive alarm event data that coming from EX-9000A-MTCP	7.5.26
TCP_StopEvent	To instruct the PC to stop receiving alarm event data from all modules	
TCP_ReadEventData	To receive alarm event data that coming from the specific ED EX-9000A-MTCP	

7.3 Digital I/O Functions

TCP_ReadDIOMode	To read the type for every D/I & D/O channels of an EX-9000A-MTCP module	
TCP_ReadDIO	To read DI/DO's status for an EX-9000A-MTCP module	
TCP_ReadDISignalWidth	To read the minimal high/low signal width of each D/I channel for an EX-9000A-MTCP module	
TCP_WriteDISignalWidth	To set the minimal high/low signal width of each D/I channel for an EX-9000A-MTCP module	
TCP_ReadDICounter	To read the counter value when a D/I channel function in 'Counter' mode	
TCP_ClearDICounter	To clear the counter value when a D/I channel function in 'Counter' mode	
TCP_StartDICounter	To start the counting when a D/I channel function in 'Counter' mode	
TCP_StopDICounter	To stop the counting when a D/I channel function in 'Counter' mode	
TCP_ClearDILatch	To clear the latch when a D/I channel function as 'Lo to Hi Latch' or 'Hi to Lo Latch'	
TCP_ReadDILatch	To read the counter value when a D/I channel function in 'Counter' mode	
TCP_WriteDO	To write some value to D/O channels for an EX-9000A-MTCP module	
TCP_WriteDOPulseCount	To write the pulse output count for EX-9000A-MTCP DIO modules during runtime	
TCP_WriteDODelayWidth	To set the pulse and delay signal widths to the specific EX-9000A-MTCP DIO modules	
TCP_ReadDODelayWidth	To read the pulse and delay signal width from the specific EX-9000A-MTCP DIO modules	

7.4 MODBUS/TCP Functions

TCP_MODBUS_ReadCoil	To read the coil values at a specific range described in parameters	
TCP_MODBUS_WriteCoil	To write the coil values at a specific range described in parameters.	
TCP_MODBUS_ReadReg	To read the holding register value at a specific range described in parameters	
TCP_MODBUS_WriteReg	To write values to the holding registers at a specific range described in parameters	

7.5 Function Description

The TCPDAQ.DLL function declarations are all included in following files that are attached with the provided DISC.

♦ TCPDAQ.h	:	Include file for both VC++ and Borland C++ Builder
♦ TCPDAQ.lib	:	Library file for VC++
♦ TCPDAQ_BC.lib	:	Library file for Borland C++ Builder
♦ TCPDAQ.bas	:	Module file for Visual Basic
♦ TCPDAQ.pas	:	Module file for Delphi

You need to add the above file into your AP project before using TCPDAQ.DLL functions

7.5.1 TCP_Open

Description: To initiate the TCPDAQ.dll to use.

Syntax:

♦ **Visual Basic:** (*see TCPDAQ.bas*)

Declare Sub TCP_Open Lib "TCPDAQ.dll" Alias "_TCP_Open@0" ()

♦ **Borland C++ Builder:** (see TCPDAQ.h)

int TCP_Open();

♦ **Delphi:** (*see TCPDAQ.pas*)

function TCP_Open(); StdCal;

♦ **VC++:** *(see TCPDAQ.h*)

int TCP_Open();

Parameters: void

Return Code: refer to the *Error code.*

7.5.2 TCP_Close

Description: To terminates use of the TCPDAQ.dll.

Syntax:

♦ **Visual Basic:** *(see TCPDAQ.bas)*

Declare Sub TCP_Close Lib "TCPDAQ.dll" Alias "_TCP_Close@0" ()

♦ **Borland C++ Builder:** (*see TCPDAQ.h*)

int TCP_ Close();

♦ **Delphi:** *(see TCPDAQ.pas)*

function TCP_ Close(); StdCall;

♦ **VC++:** *(see TCPDAQ.h)*

int TCP_ Close();

Parameters: void

Return Code: refer to the *Error code.*

7.5.3 TCP_Connect

Description: to create a Window TCP socket then establishing a connection to a specific EX-9000A/AB-MTCP

Syntax:

♦ **Visual Basic:** *(see TCPDAQ.bas)*

Declare Function TCP_Connect Lib "TCPDAQ.dll" Alias "_TCP_Connect@20" (ByVal szIP As String, ByVal port As Integer, ByVal ConnectionTimeout As Long, ByVal SendTimeout As Long, ByVal ReceiveTimeout As Long) As Long

♦ **Borland C++ Builder:** (see TCPDAQ.h) int TCP_Connect(char szIP[],u_short port,int ConnectionTimeout, int SendTimeout,int ReceiveTimeout);

- **Delphi:** *(see TCPDAQ.pas)*

  FunctionTCP_Connect (szIP: PChar; port: Integer; ConnectionTimeout: Longint; SendTimeout: Longint;ReceiveTimeout: Longint): Longint; StdCall;

- **VC++:** *(see TCPDAQ.h)*

  int TCP_Connect(char szIP[],u_short port,int ConnectionTimeout, int SendTimeout, int ReceiveTimeout);

Parameters:

szIP[in]	: the IP address for an EX-9000A/AB-MTCP that to be connected
port[in]	: the TCP/IP port used by Modbus/TCP, it is 502
ConnectionTimeout[in]	: Connection timeout value (msec)
SendTimeout[in]	: Send timeout value (msec)
ReceiveTimeout[in]	: Receive timeout value (msec)

Return Code: refer to the *Error code.*

7.5.4 TCP_Disconnect

Description: disconnecting the Window TCP socket from all EX-9000A/AB-MTCP modules

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

  Declare Sub TCP_Disconnect Lib "TCPDAQ.dll" Alias "_TCP_Disconnect@0" ()

- **Borland C++ Builder:** (see TCPDAQ.h)

  void TCP_Disconnect(void);

- **Delphi:** ***(see TCPDAQ.pas)***

  procedure TCP_Disconnect ; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  void TCP_Disconnect(void);

Parameters: void

Return Code: none.

7.5.5 TCP_ModuleDisconnect

Description: disconnecting the Window TCP socket to a specific EX-9000A/AB-MTCP

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

  Declare Function TCP_ModuleDisconnect Lib "TCPDAQ.dll" Alias "_TCP_ModuleDisconnect@4" (ByVal szIP As String) As Long

- **Borland C++ Builder:** (see TCPDAQ.h)

  Int TCP_ModuleDisconnect(char szIP[]);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_ModuleDisconnect (szIP: PChar): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  Int TCP_ModuleDisconnect(char szIP[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

Return Code: refer to the *Error code.*

7.5.6 TCP_SendData

Description: to send data to a specific EX-9000A/AB-MTCP module

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

  Declare Function TCP_SendData Lib "TCPDAQ.dll" Alias "_TCP_SendData@12" (ByVal szIP As String, ByRef pData As Byte, ByVal wDataLen As Integer) As Long
- **Borland C++ Builder:** (see TCPDAQ.h)

  Int TCP_SendData(char szIP[],char *pData,u_short wDataLen);
- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_SendData (szIP: PChar; pData: PByte; wDataLen: Integer): Longint; StdCall;
- **VC++:** ***(see TCPDAQ.h)***

  Int TCP_SendData(char szIP[],char *pData,u_short wDataLen);

Parameters:

szIP[in]	: the IP address for an EX-9000A/AB-MTCP that to be connected
pData[in]	: 8 bit data array
wDataLen[in]	: length of data be sent

Return Code: refer to the *Error code*.

7.5.7 TCP_RecvData

Description: receive data to a specific EX-9000A/AB-MTCP module

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

  Declare Function TCP_RecvData Lib "TCPDAQ.dll" Alias "_TCP_RecvData@12" (ByVal szIP As String, ByRef pData As Byte, ByVal wDataLen As Integer) As Long
- **Borland C++ Builder:** (see TCPDAQ.h)

  Int TCP_RecvData(char szIP[],char *pData,u_short wDataLen);
- **Delphi:** *(see TCPDAQ.pas)*

  Function TCP_RecvData (szIP: PChar; pData: PByte; wDataLen: Integer): Longint; StdCall;
- **VC++:** *(see TCPDAQ.h)*

  Int TCP_RecvData(char szIP[],char *pData,u_short wDataLen);

Parameters:

szIP[in]	: the IP address for an EX-9000A/AB-MTCP that to be connected
pData[out]	: 8 bit data array
wDataLen [in]	: length of data array

Return Code:

If return value >=0, it represents the length of received data

If return value<0, it represents *Error code*.

7.5.8 TCP_SendReceiveASCcmd

Description: to accept an ASCII format string as a command, and transform it to meet the Modbus/TCP's specification. Then sending it to EX-9000A/AB-MTCP and receiving the response from EX-9000A/AB-MTCP

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

  Declare Function TCP_SendReceiveASCcmd Lib "TCPDAQ.dll" Alias "_TCP_SendReceiveASCcmd@12" (ByVal szIP As String, ByVal Sendbuf As String, ByVal Recvbuf As String) As Long
- **Borland C++ Builder:** (see TCPDAQ.h)

  Int TCP_SendReceiveASCcmd(Char szIP[], char Sendbuf [], char Recvbuf []);
- **Delphi:** *(see TCPDAQ.pas)*

  Function TCP_SendReceiveasCcmd (szIP: PChar; Sendbuf: PChar; Recvbuf: PChar): Longint; StdCall;
- **VC++:** *(see TCPDAQ.h)*

  Int TCP_SendReceiveASCcmd(Char szIP[], char Sendbuf[], char Recvbuf[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
Sendbuf [in] : 8 bit data array to be sent
Recvbuf [out] : 8 bit data array that stored the received data

Return Code: refer to the *Error code*.

7.5.9 UDP_Connect

Description: to create a Window UDP socket then establishing a connection to a specific EX-9000A/AB-MTCP

Syntax:

♦ **Visual Basic:** (*see TCPDAQ.bas*)

```
Declare Function UDP_Connect Lib "TCPDAQ.dll" Alias "_UDP_Connect@24" ( ByVal szIP As String, ByVal
        s_port As Integer, ByVal d_port As Integer, ByVal ConnectionTimeout As Long, ByVal SendTimeout
        As Long,
        ByVal ReceiveTimeout As Long) As Long
```

♦ **Borland C++ Builder:** (see TCPDAQ.h)

```
Int    UDP_Connect(char szIP[],u_short s_port,u_short d_port, int ConnectionTimeout,
                   int SendTimeout, int ReceiveTimeout);
```

♦ **Delphi:** *(see TCPDAQ.pas)*

```
Function  UDP_Connect (szIP: PChar; s_port: word; d_port: word; ConnectionTimeout: Longint;
                       SendTimeout: Longint; ReceiveTimeout: Longint): Longint; StdCall;
```

♦ **VC++:** *(see TCPDAQ.h)*

```
Int    UDP_Connect(char szIP[],u_short s_port,u_short d_port,int ConnectionTimeout,
                   int SendTimeout,int ReceiveTimeout);
```

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
s_port : source port number
d_port : destination port number
ConnectionTimeout : timeout value for connection (msec)
SendTimeout : timeout value for sending (msec)
ReceiveTimeout : timeout value for receiving (msec)

Return Code: refer to the *Error code*.

7.5.10 UDP_Disconnect

Description: disconnecting the Window UDP socket from all EX-9000A/AB-MTCP modules

Syntax:

♦ **Visual Basic**: (*see TCPDAQ.bas*)

```
Declare Sub UDP_Disconnect Lib "TCPDAQ.dll" Alias "_UDP_Disconnect@0" ()
```

♦ **Borland C++ Builder:** (see TCPDAQ.h)

```
void     UDP_Disconnect(void);
```

♦ **Delphi:** *(see TCPDAQ.pas)*

```
procedure   UDP_Disconnect ; StdCall;
```

♦ **VC++:** *(see TCPDAQ.h)*

```
void     UDP_Disconnect(void);
```

Parameters: void

Return Code: None

7.5.11 UDP_ModuleDisconnect

Description: disconnecting the Window UDP socket from a specific EX-9000A/AB-MTCP

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

  Declare Function UDP_ModuleDisconnect Lib "TCPDAQ.dll" Alias "_UDP_ModuleDisconnect@4" (ByVal szIP As

  String) As Long

- **Borland C++ Builder:** (see TCPDAQ.h)

  int UDP_ModuleDisconnect(Char szIP[]);

- **Delphi:** *(see TCPDAQ.pas)*

  Function UDP_ModuleDisconnect (szIP: PChar): Longint; StdCall;

- **VC++:** *(see TCPDAQ.h)*

  int UDP_ModuleDisconnect(char szIP[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be disconnected

Return Code: refer to the *Error code.*

7.5.12 UDP_SendData

Description: send data to a specific EX-9000A/AB-MTCP module (Datagram)

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

  Declare Function UDP_SendData Lib "TCPDAQ.dll" Alias "_UDP_SendData@12"
  (ByVal szIP As String, ByRef pData As Byte, ByVal wDataLen As Integer) As Long

- **Borland C++ Builder:** (see TCPDAQ.h)

  int UDP_SendData(char szIP[],char *pData,u_short wDataLen);

- **Delphi:** *(see TCPDAQ.pas)*

  Function UDP_SendData (szIP: PChar; pData: PByte; wDataLen: Integer): Longint; StdCall;

- **VC++:** *(see TCPDAQ.h)*

  int UDP_SendData(char szIP[],char *pData,u_short wDataLen);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
pData[in] : points to data buffer
wDataLen[in] : length of data be sent

Return Code: refer to the *Error code.*

7.5.13 UDP_RecvData

Description: receive data to a specific EX-9000A/AB-MTCP module (Datagram)

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

  Declare Function UDP_RecvData Lib "TCPDAQ.dll" Alias "_UDP_RecvData@12"
  (ByVal szIP As String, ByRef pData As Byte, ByVal wDataLen As Integer) As Long

- **Borland C++ Builder:** (see TCPDAQ.h)

  int UDP_RecvData(char szIP[],char *pData,u_short wDataLen);

- **Delphi:** *(see TCPDAQ.pas)*

  Function UDP_RecvData (szIP: PChar; pData: PByte; wDataLen: Integer): Longint; StdCall;

- **VC++:** *(see TCPDAQ.h)*

  int UDP_RecvData(char szIP[],char *pData,u_short wDataLen);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
pData[out] : 8 bit array that stored the received data
wDataLen [in] : length of received data

Return Code: refer to the *Error code.*

7.5.14 UDP_SendReceiveASCcmd

Description: send an ASCII format string as a command to EX-9000A/AB-MTCP and receiving the response from EX-9000A/AB-MTCP.

Syntax:

♦ **Visual Basic:** *(see TCPDAQ.bas)*

Declare Function UDP_SendReceiveASCcmd Lib "TCPDAQ.dll" Alias "_UDP_SendReceiveASCcmd@12" (ByVal szIP As String, ByVal Txdata As _ String, ByVal Rxdata As String) As Long

♦ **Borland C++ Builder:** (see TCPDAQ.h)

int UDP_SendReceiveASCcmd(char szIP[],char Txdata [],char Rxdata []);

♦ **Delphi:** *(see TCPDAQ.pas)*

Function UDP_SendReceiveAsCcmd (szIP: PChar; Txdata:PChar; Rxdata: PChar): Longint; StdCall;

♦ **VC++:** *(see TCPDAQ.h)*

int UDP_SendReceiveASCcmd(char szIP[],char Txdata [],char Rxdata []);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
Txdata [in] : 8 bit array that stored the data to be sent
Rxdata [out] : 8 bit array that stored the received data

Return Code: refer to the *Error code.*

7.5.15 TCP_GetModuleIPinfo

Description: return module IP information of a specific module

Syntax:

♦ **Visual Basic:** *(see TCPDAQ.bas)*

Declare Function TCP_GetModuleIPinfo Lib "TCPDAQ.dll" Alias "_TCP_GetModuleIPinfo@8" (ByVal szIP As String, ByRef ModuleIP As ModuleInfo) As Long

♦ **Borland C++ Builder:** (see TCPDAQ.h)

Int TCP_GetModuleIPinfo(char szIP[],struct ModuleInfo *ModuleIP);

♦ **Delphi:** *(see TCPDAQ.pas)*

Function TCP_GetModuleIPinfo (szIP: PChar; var ModuleIP: TModuleInfo): Longint; StdCall;

♦ **VC++:** *(see TCPDAQ.h)*

Int TCP_GetModuleIPinfo(char szIP[],struct ModuleInfo *ModuleIP);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
ModuleIP[out] : a structure array that stroes the module IP information

Return Code: refer to the *Error code.*

7.5.16 TCP_GetModuleID

Description: return ID number of a specific module.

Syntax:

♦ **Visual Basic:** *(see TCPDAQ.bas)*

Declare Function TCP_GetModuleID Lib "TCPDAQ.dll" Alias "_TCP_GetModuleID@8" (ByVal szIP As String, ByRef ModuleID As Byte) As Long

♦ **Borland C++ Builder:** (see TCPDAQ.h)

Int TCP_GetModuleID(char szIP[], char * ModuleID);

♦ **Delphi:** *(see TCPDAQ.pas)*

Function TCP_GetModuleID(szIP: PChar; ModuleID: PByte): Longint; StdCall;;

- **VC++:** *(see TCPDAQ.h)*

Int TCP_GetModuleID(char szIP[], char * ModuleID);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

ModuleID [in] : the ID number

Return Code: refer to the *Error code.*

7.5.17 TCP_GetIPFromID

Description: get IP address for a specific module ID number. This function is helpful when the module is DHCP enabled

Syntax:

- **Visual Basic:** *(see TCPDAQ.bas)*

Declare Function TCP_GetIPFromID Lib "TCPDAQ.dll" Alias "_TCP_GetIPFromID@8" (ByVal szID As Byte, ByRef szIP As String) As Long

- **Borland C++ Builder:** (see TCPDAQ.h)

Int TCP_GetIPFromID(u_char szID ,char szIP[]);

- **Delphi:** *(see TCPDAQ.pas)*

Function TCP_GetIPFromID(szID: Byte; szIP: PChar): Longint; StdCall;

- **VC++:** *(see TCPDAQ.h)*

Int TCP_GetIPFromID(u_char szID ,char szIP[]);

Parameters:

szID[in] : module ID number (0~255)

szIP[out] : 8 bit array that stored the IP address string(such as "192.168.0.2")

Return Code: refer to the *Error code.*

7.5.18 TCP_ScanOnLineModules

Description: search on-line EX-9000A/AB-MTCP modules in the same subnet

Syntax:

- **Visual Basic: *(see TCPDAQ.bas)***

Declare Function TCP_ScanOnLineModules Lib "TCPDAQ.dll" Alias "_TCP_ScanOnLineModules@8" (ModuleIP As ModuleInfo, ByVal Sortkey As Byte) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

Int TCP_ScanOnLineModules(struct ModuleInfo ModuleIP[], u_char SortKey);

- **Delphi: *(see TCPDAQ.pas)***

Function Scan_OnLineModules (var ModuleIP: TModuleInfo; Sortkey: Byte): Longint; StdCall;

- **VC++: *(see TCPDAQ.h)***

Int TCP_ScanOnLineModules(struct ModuleInfo ModuleIP[], u_char SortKey);

Parameters:

ModuleIP[out] : points to ModuleInfo structure array

SortKey[in] : sortkey word (by IP address,by ID number, or by Module no)
=SORT_MODULE_IP ,sort by IP address
=SORT_MODULE_ID ,sort by ID number
=SORT_MODULE_NO ,sort by module number

Return Code: refer to the *Error code.*

7.5.19 TCP_GetDLLVersion

Description: return the version number of TCPDAQ.dll

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

  Declare Function TCP_GetDLLVersion Lib "TCPDAQ.dll" Alias "_TCP_GetDLLVersion@0" () As Long
- **Borland C++ Builder: (see TCPDAQ.h)**

  Int TCP_GetDLLVersion(void);
- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_GetDLLVersion: Longint; StdCall;
- **VC++:** ***(see TCPDAQ.h)***

  Int TCP_GetDLLVersion(void);

  Parameters: void

  Return Code: the version number.

7.5.20 TCP_GetModuleNo

Description: return the module name of a specific IP address

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

  Declare Function TCP_GetModuleNo Lib "TCPDAQ.dll" Alias "_TCP_GetModuleNo@8" _
  (ByVal szIP As String, ByRef Mname As Byte) As Long
- **Borland C++ Builder: (see TCPDAQ.h)**

  Int TCP_GetModuleNo(char szIP[], char Mname[]);
- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_GetModuleNo (szIP: PChar; Mname: PByte): Longint; StdCall;
- **VC++:** ***(see TCPDAQ.h)***

  Int TCP_GetModuleNo(char szIP[], char Mname[]);

  Parameters:

  szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

  Mname[out] : 8 bit array that stored the module name string

  Return Code: refer to the *Error code.*

7.5.21 TCP_GetLastError

Description: return the error code of the latest called function

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

  Declare Function TCP_GetLastError Lib "TCPDAQ.dll" Alias "_TCP_GetLastError@0" () As Long
- **Borland C++ Builder: (see TCPDAQ.h)**

  Int TCP_GetLastError(void);
- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_GetLastError: Longint ; StdCall;
- **VC++:** ***(see TCPDAQ.h)***

  Int TCP_GetLastError(void);

  Parameters: void

  Return Code: refer to the *Error code*

7.5.22 TCP_PingIP

Description: ping to remote IP address

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

  Declare Function TCP_PingIP Lib "TCPDAQ.dll" Alias "_TCP_PingIP@8" (ByVal IPadr As String, ByVal PingTimes As Integer) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_PingIP(char szIP[],int PingTimes);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_PingIP(szIP: PChar;PingTimes: Integer): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  int TCP_PingIP(char szIP[],int PingTimes);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

PingTimes [in] :Timeout value

Return Code: = -1, no response from remote IP

>0, response time from remote IP

7.5.23 TCP_StartStream

Description: to instruct the PC to start to receive stream data that coming from EX-9000A/AB-MTCP

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

  Declare Function TCP_StartStream Lib "TCPDAQ.dll" Alias "_TCP_StartStream@8" (ByVal IP As String, ByVal EventFromApp As Long) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_StartStream(char szIP[],HANDLE EventFromApp);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_StartStream (szIP: PChar; EventFromApp: Longint): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  int TCP_StartStream(char szIP[],HANDLE EventFromApp);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

EventFromApp : event handle (be signaled, when stream data arrived)

Return Code: refer to the *Error code*.

7.5.24 TCP_StopStream

Description: to instruct the PC to stop receiving stream data from all modules.

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

  Declare Function TCP_StopStream Lib "TCPDAQ.dll" Alias "_TCP_StopStream@0" () As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_StopStream(void);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_StopStream: Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  int TCP_StopStream(void);

Parameters: void

Return Code: refer to the *Error code.*

7.5.25 TCP_ReadStreamData

Description: to read stream data that coming from the specific EX-9000A/AB-MTCP

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

Declare Function TCP_ReadStreamData Lib "TCPDAQ.dll" Alias "_TCP_ReadStreamData@8" (ByVal szIP As String, ByRef lpData As StreamData) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

int TCP_ReadStreamData (char szIP[], struct _StreamData *lpData);

- **Delphi:** ***(see TCPDAQ.pas)***

Function TCP_ReadStreamData (szIP: PChar; Var lpData: TStreamData): integer; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

int TCP_ReadStreamData (char szIP[], struct _StreamData *lpData);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

lpData[out] : points to stream data structure that stored the stream data

Return Code: refer to the *Error code.*

7.5.26 TCP_StartEvent

Description: to start listening the alarm event trigger

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

Declare Function TCP_StartEvent Lib "TCPDAQ.dll" Alias "_TCP_StartEvent@8" (ByVal IPadr As String, ByVal EventFromApp As Long) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

int TCP_StartEvent(char szIP[],HANDLE EventFromApp);

- **Delphi:** ***(see TCPDAQ.pas)***

Function TCP_StartEvent(szIP: PChar; EventFromApp: Longint): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

int TCP_StartEvent(char szIP[],HANDLE EventFromApp);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

EventFromApp : event handle (be signaled, when alarm event occured)

Return Code: refer to the *Error code.*

7.5.27 TCP_StopEvent

Description: to stop listening the alarm event trigger from all module

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

Declare Function TCP_StopEvent Lib "TCPDAQ.dll" Alias "_TCP_StopEvent@0" () As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

Int TCP_StopEvent(void);

- **Delphi:** ***(see TCPDAQ.pas)***

Function TCP_StopEvent: Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

Int TCP_StopEvent(void);

Parameters: void

Return Code: refer to the *Error code.*

7.5.28 TCP_ReadEventData

Description: to read triggered alarm event message

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

  Declare Function TCP_ReadEventData Lib "TCPDAQ.dll" Alias "_TCP_ReadEventData@8" (ByVal szIP As String, ByRef lpData As AlarmData) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_ReadEventData (char szIP[], struct _AlarmInfo *lpData);

- **Delphi: *(see TCPDAQ.pas)***

  Function TCP_ReadEventData (SzIP: PChar; Var lpData: TEventInfo): integer; StdCall;

- **VC++: *(see TCPDAQ.h)***

  int TCP_ReadEventData (char szIP[], struct _AlarmInfo *lpData);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

lpData[out] : points to alarm event data structure that stored event message (ref. to TCPDAQ.H)

Return Code: refer to the *Error code.*

7.5.29 TCP_ReadDIOMode

Description: to read the mode of D/I & D/O channels of an EX-9000A/AB-MTCP module.

Syntax:

- **Visual Basic: *(see TCPDAQ.bas)***

  Declare Function TCP_ReadDIOMode Lib "TCPDAQ.dll" Alias "_TCP_ReadDIOMode@12" _
  (ByVal szIP As String, ByRef DImode As Byte, ByRef DOmode As Byte) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  Int TCP_ReadDIOMode(char szIP[],u_char DImode[],u_char DOmode[]);

- **Delphi: *(see TCPDAQ.pas)***

  Function TCP_ReadDIOMode (szIP: PChar; DImode: PByte; DOmode: PByte): Longint; StdCall;

- **VC++: *(see TCPDAQ.h)***

  int TCP_ReadDIOMode(char szIP[],u_char DImode[],u_char DOmode[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

DImode[out] : an 8 bit array that stored the DI channel mode

DOmode[out] : an 8 bit array that stored the DO channel mode

Return Code: refer to the *Error code.*

7.5.30 TCP_ReadDIO

Description: to read DI/DO's status for an EX-9000A/AB-MTCP module

Syntax:

- **Visual Basic: *(see TCPDAQ.bas)***

  Declare Function TCP_ReadDIO Lib "TCPDAQ.dll" Alias "_TCP_ReadDIO@12" _
  (ByVal szIP As String, ByRef ByDi As Byte, ByRef ByDo As Byte) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  Int TCP_ReadDIO(char szIP[],u_char byDI[],u_char byDO[]);

- **Delphi: *(see TCPDAQ.pas)***

  Function TCP_ReadDIO (szIP: PChar; ByDi: PByte; ByDo: PByte): Longint; StdCall;

- **VC++: *(see TCPDAQ.h)***

  Int TCP_ReadDIO(char szIP[],u_char u_byDI[],u_char byDO[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

byDI[out] : an 8 bit array that stored the DI channel status (ex: byDI[0]= 0 → DI channel 0 = 0) byDO[out] : an 8 bit array that stored the DO channel status (ex: byDO[3] = 1 → channel 3 = 1)

Return Code: refer to the *Error code.*

7.5.31 TCP_ReadDISignalWidth

Description: to read the minimal high/low signal width of all D/I channels

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

Declare Function TCP_ReadDISignalWidth Lib "TCPDAQ.dll" Alias "_TCP_ReadDISignalWidth@12" (ByVal szIP As String, ByRef ulLoWidth As Long, ByRef ulHiWidth As Long) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

Int TCP_ReadDISignalWidth(char szIP[],u_long ulLoWidth[],u_long ulHiWidth[]);

- **Delphi: *(see TCPDAQ.pas)***

Function TCP_ReadDISignalWidth (szIP: PChar; var ulLoWidth:array of Longword; var ulHiWidth:array of Longword): Longint; StdCall;

- **VC++: *(see TCPDAQ.h)***

Int TCP_ReadDISignalWidth(char szIP[],u_long ulLoWidth[],u_long ulHiWidth[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

ulLoWidth[out] : an 32 bit array that stored channel low width value

ulHiWidth[out] : an 32 bit array that stored channel high width value

Return Code: refer to the *Error code*.

7.5.32 TCP_WriteDISignalWidth

Description: to set the minimal high/low signal width of all D/I channels

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

Declare Function TCP_WriteDISignalWidth Lib "TCPDAQ.dll" Alias "_TCP_WriteDISignalWidth@12" (ByVal szIP As String, ByRef ulLoWidth As Long, ByRef ulHiWidth As Long) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

Int TCP_WriteDISignalWidth(char szIP[],u_long ulLoWidth[],u_long ulHiWidth[]);

- **Delphi: *(see TCPDAQ.pas)***

Function TCP_WriteDISignalWidth(szIP: PChar; var ulLoWidth:array of Longword; var ulHiWidth:array of Longword): Longint; StdCall;

- **VC++: *(see TCPDAQ.h)***

Int TCP_WriteDISignalWidth(char szIP[],u_long ulLoWidth[],u_long ulHiWidth[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

ulLoWidth[in] : an unsigned 32 bits array that stored the minimal low signal width for each D/I channel. The unit is 0.5 mSec

ulHiWidth[in] : an unsigned 32 bits array that stored the minimal high signal width for each D/I channel. The unit is 0.5 mSec

Return Code: refer to the *Error code*.

7.5.33 TCP_ReadDICounter

Description: to read the counter value of all D/I channels (the counter value is available only for channel that functions in 'Counter' mode

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

  Declare Function TCP_ReadDICounter Lib "TCPDAQ.dll" Alias "_TCP_ReadDICounter@8"
  (ByVal szIP As String, ByRef ulCounterValue As Long) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  Int TCP_ReadDICounter(Char szIP[],u_long ulCounterValue[]);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_ReadDICounter (szIP: PChar; var ulCounterValue:array of Longword): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  Int TCP_ReadDICounter(Char szIP[],u_long ulCounterValue[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

ulCounterValue[out] :an unsigned 32 bits array that stored the counter value for each D/I channel

Return Code: refer to the *Error code.*

7.5.34 TCP_ClearDICounter

Description: to clear the counter value when a D/I channel function in 'Counter' mode

Syntax:

- **Visual Basic: (*****see TCPDAQ.bas*****)**

  Declare Function TCP_ClearDICounter Lib "TCPDAQ.dll" Alias "_TCP_ClearDICounter@8"
  (ByVal szIP As String, ByVal wChno As Integer) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_ClearDICounter(char szIP[],u_short wChNo);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_ClearDICounter (szIP: PChar; wChno: Integer): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  int TCP_ClearDICounter(char szIP[],u_short wChNo);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

wChNo[in] : the D/I channel to be cleared.

Return Code: refer to the *Error code.*

7.5.35 TCP_StartDICounter

Description: to start the counting when a D/I channel function as 'Counter' mode

Syntax:

- **Visual Basic: (*****see TCPDAQ.bas*****)**

  Declare Function TCP_StartDICounter Lib "TCPDAQ.dll" Alias "_TCP_StartDICounter@8" (ByVal szIP As String,
  ByVal wChno As Integer) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_StartDICounter(Char szIP[],u_short wChNo);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_StartDICounter (szIP: PChar; wChno: Integer): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  int TCP_StartDICounter(Char szIP[],u_short wChNo);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

wChNo[in] : the channel number that is enabled to count

Return Code: refer to the *Error code.*

7.5.36 TCP_StopDICounter

Description: to stop the counting when a D/I channel function as 'Counter' mode

Syntax:

- **Visual Basic:** ***(see TCPDAQ.bas)***

  Declare Function TCP_StopDICounter Lib "TCPDAQ.dll" Alias "_TCP_StopDICounter@8"
  (ByVal szIP As String, ByVal wChno As Integer) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_StopDICounter(char szIP[],u_short wChNo);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_StopDICounter (szIP: PChar; wChno: Integer): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  int TCP_StopDICounter(char szIP[],u_short wChNo);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
wChNo[in] : the channel number that is disabled to count

Return Code: refer to the *Error code.*

7.5.37 TCP_ClearDILatch

Description: to clear the latch when a D/I channel function as 'Lo to Hi Latch' or 'Hi to Lo Latch'

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

  Declare Function TCP_ClearDILatch Lib "TCPDAQ.dll" Alias "_TCP_ClearDILatch@8" (ByVal szIP As String, ByVal wChno As Integer) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_ClearDILatch(char szIP[],u_short wChNo);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_ClearDILatch(szIP: PChar; wChno: Integer): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h*)**

  int TCP_ClearDILatch(char szIP[],u_short wChNo);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
wChNo[in] : the channel number that latch status is cleared

Return Code: refer to the *Error code.*

7.5.38 TCP_ReadDILatch

Description: to read the DI latch status when a D/I channel function in 'Lo to Hi Latch' or 'Hi to Lo Latch'

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

  Declare Function TCP_ReadDILatch Lib "TCPDAQ.dll" Alias "_TCP_ReadDILatch@8" (ByVal szIP As String, ByRef wLatch As Byte) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  int TCP_ReadDILatch(char szIP[],u_char wLatch[]);

- **Delphi:** ***(see TCPDAQ.pas)***

  Function TCP_ReadDILatch (szIP: PChar; wLatch: PByte): Longint; StdCall;

- **VC++:** ***(see TCPDAQ.h)***

  int TCP_ReadDILatch(char szIP[],u_char wLatch[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
wLatch[out] : an unsigned 8 bits array that stored the latch stsatus for each D/I channel

Return Code: refer to the *Error code*.

7.5.39 TCP_WriteDO

Description: to write some value to D/O channels for an EX-9000A/AB-MTCP module

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

```
Declare Function TCP_WriteDO Lib "TCPDAQ.dll" Alias "_TCP_WriteDO@16" _
                  ByVal szIP As String, ByVal wStartDO As Integer, ByVal wCount As Integer,
                  ByRef ByDo As Byte) As Long
```

- **Borland C++ Builder: (see TCPDAQ.h)**

```
int      TCP_WriteDO(Char szIP[], u_short wStartDO, u_short wCount,u_char byDO[]);
```

- **Delphi: *(see TCPDAQ.pas)***

```
Function  TCP_WriteDO(szIP: PChar; wStartDO: Integer; wCount: Integer;ByDo: PByte): Longint; StdCall;
```

- **VC++: *(see TCPDAQ.h)***

```
int      TCP_WriteDO(Char szIP[], u_short wStartDO, u_short wCount,u_char byDO[]);
```

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
wStartDO[in] : the starting channel that to be written.
wCount[in] : how many channels to be written.
byDO[in] : an 8 bit array that stored the values that written to the connected EX-9000A/AB-MTCP

Return Code: refer to the *Error code*.

7.5.40 TCP_WriteDOPulseCount

Description: to write the pulse output count for EX-9000A/AB-MTCP DIO modules during runtime

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

```
Declare Function TCP_WriteDOPulseCount Lib "TCPDAQ.dll" Alias _ "_TCP_WriteDOPulseCount@12" (ByVal
         szIP As String, ByVal wDoChannel As Integer, ByVal ulPulseCount As Long) As Long
```

- **Borland C++ Builder: (see TCPDAQ.h)**

```
int      TCP_WriteDOPulseCount(char szIP[],u_short wDoChannel,u_long ulPulseCount);
```

- **Delphi: *(see TCPDAQ.pas)***

```
Function    TCP_WriteDOPulseCount(szIP: PChar; wDoChannel: Integer; ulPulseCount: Longint): Longint;
               StdCall;
```

- **VC++: *(see TCPDAQ.h)***

```
int      TCP_WriteDOPulseCount(char szIP[],u_short wDoChannel,u_long ulPulseCount);
```

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
wDoChannel[in] : the channel index for writing
ulPulseCount[in] : the pulse output count.

Return Code: refer to the *Error code*.

7.5.41 TCP_WriteDODelayWidth

Description: to set the pulse and delay signal widths to specific EX-9000A/AB-MTCP DIO modules

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

Declare Function TCP_WriteDODelayWidth Lib "TCPDAQ.dll" Alias "_TCP_WriteDODelayWidth@24" (ByVal szIP As String, ByVal wChno As Integer, ByVal ulLoPulseWidth As Long, ByVal ulHiPulseWidth As Long,
ByVal ulLoDelayWidth As Long, ByVal ulHiDelayWidth As Long) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

Int TCP_WriteDODelayWidth(Char szIP[], u_short wChno,u_long ulLoPulseWidth,u_long ulHiPulseWidth,
u_long ulLoDelayWidth,u_long ulHiDelayWidth);

- **Delphi: *(see TCPDAQ.pas)***

Function TCP_WriteDODelayWidth (szIP: PChar; wChno: Integer; ulLoPulseWidth: Longint; ulHiPulseWidth: Longint;ulLoDelayWidth: Longint; ulHiDelayWidth: Longint): Longint; StdCall;

- **VC++: *(see TCPDAQ.h)***

```
int     TCP_WriteDODelayWidth(char szIP[], u_short wChno,
        u_long ulLoPulseWidth, u_long ulHiPulseWidth,
        u_long ulLoDelayWidth, u_long ulHiDelayWidth);
```

Parameters:

szIP[in]	: the IP address for an EX-9000A/AB-MTCP that to be connected
wChno[in]	: the channel index for writing
ulLoPulseWidth[in]	: the output pulse signal width at low level.
ulHiPulseWidth[in]	: the output pulse signal width at high level.
ulLoDelayWidth[in]	: the output signal delay width when set DO from high to low level.
ulHiDelayWidth[in]	: the output signal delay width when set DO from low to high level.

Return Code: refer to the *Error code*.

7.5.42 TCP_ReadDODelayWidth

Description: to read the pulse and delay signal widths from specific EX-9000A/AB-MTCP DIO modules

Syntax:

- **Visual Basic:** (*see TCPDAQ.bas*)

Declare Function TCP_ReadDODelayWidth Lib "TCPDAQ.dll" Alias "_TCP_ReadDODelayWidth@24" (ByVal szIP As String, ByVal wChno As Integer, ByRef ulLoPulseWidth As Long, ByRef ulHiPulseWidth As Long, ByRef ulLoDelayWidth As Long, ByRef ulHiDelayWidth As Long) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

```
int     TCP_ReadDODelayWidth(char szIP[],u_short wChno,
         u_long *ulLoPulseWidth,u_long *ulHiPulseWidth,
         u_long *ulLoDelayWidth,u_long *ulHiDelayWidth);
```

- **Delphi: (see TCPDAQ.pas)**

Function TCP_ReadDODelayWidth (szIP: PChar; wChno: Integer; ulLoPulseWidth: Longint; ulHiPulseWidth: Longint;ulLoDelayWidth: Longint; ulHiDelayWidth: Longint): Longint; StdCall;

- **VC++: (see TCPDAQ.h)**

int TCP_ReadDODelayWidth(char szIP[],u_short wChno, u_long *ulLoPulseWidth,lu_long *ulHiPulseWidth,
u_long *ulLoDelayWidth,u_long *ulHiDelayWidth);

Parameters:

szIP[in]	: the IP address for an EX-9000A/AB-MTCP that to be connected
wChno[in]	: the channel index for reading
ulLoPulseWidth[out]	: the pulse output signal width at low level
ulHiPulseWidth[out]	: the pulse output signal width at high level
ulLoDelayWidth[out]	: the delay output signal width at low level
ulHiDelayWidth) [out]	: the delay output signal width at high level

Return Code: refer to the *Error code*.

7.5.43 TCP_MODBUS_ReadCoil

Description: to read the coil values at a specific range described in parameters

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

```
Declare Function TCP_MODBUS_ReadCoil Lib "TCPDAQ.dll" Alias "_TCP_MODBUS_ReadCoil@16"
                 (ByVal szIP As String, ByVal wStartAddress As Integer, ByVal wCount As Integer,
                  ByRef DATA As Byte) As Long
```

- **Borland C++ Builder: (see TCPDAQ.h)**

```
Int   TCP_MODBUS_ReadCoil(char szIP[],u_short wStartaddress,u_short wCount,u_char byData[]);
```

- **Delphi: *(see TCPDAQ.pas)***

```
Function  TCP_MODBUS_ReadCoil (szIP: PChar; wStartAddress: Integer; wCount: Integer; Data: PByte):
          Longint; StdCall;
```

- **VC++: *(see TCPDAQ.h)***

```
Int   TCP_MODBUS_ReadCoil(char szIP[],u_short wStartAddress,u_short wCount,u_char byData[]);
```

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
wStartAddress[in] : start address of coil registers (1 ~ 255)
wCount[in] : the count that coil data be read
byData[in] : the 8 bit array that stored the coil data (0=set, 1=reset)

Return Code: refer to the *Error code*.

7.5.44 TCP_MODBUS_WriteCoil

Description: to write the coil values at a specific range described in parameters.

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

```
Declare Function TCP_MODBUS_WriteCoil Lib "TCPDAQ.dll" Alias "_TCP_MODBUS_WriteCoil@16"
                (ByVal szIP As String, ByVal wStartAddress As Integer, ByVal wCount As Integer,
                ByRef DATA As Byte) As Long
```

- **Borland C++ Builder: (see TCPDAQ.h)**

```
int       TCP_MODBUS_WriteCoil(char szIP[],u_short wStartAddress,u_short wCount,u_char byData[]);
```

- **Delphi: *(see TCPDAQ.pas)***

```
Function  TCP_MODBUS_WriteCoil(szIP: PChar; wStartAddress: Integer; wCount: Integer; Data: PByte):
          Longint; StdCall;
```

- **VC++: *(see TCPDAQ.h)***

```
int       TCP_MODBUS_WriteCoil(char szIP[],u_short wStartAddress,u_short wCount,u_char byData[]);
```

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected
wStartAddress[in] : start address of coil registers (1 ~ 255)
wCount[in] : the count that coil data be written
byData[in] : the 8 bit array that stored the coil data (0=set, 1=reset)

Return Code: refer to the *Error code*.

7.5.45 TCP_MODBUS_ReadReg

Description: to read the holding register value at a specific range described in parameters

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

  Declare Function TCP_MODBUS_ReadReg Lib "TCPDAQ.dll" Alias "_TCP_MODBUS_ReadReg@16"
  (ByVal szIP As String, ByVal wStartAddress As Integer, ByVal wCount As Integer,
  ByRef DATA As Integer) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  Int TCP_MODBUS_ReadReg(char szIP[],u_short wStartAddress,u_short wCount,u_short wData[]);

- **Delphi: *(see TCPDAQ.pas)***

  Function TCP_MODBUS_ReadReg (szIP: PChar; wStartAddress: Integer; wCount: Integer; Data: PWord): Longint; StdCall;

- **VC++: *(see TCPDAQ.h)***

  Int TCP_MODBUS_ReadReg(char szIP[],u_short wStartAddress,u_short wCount,u_short wData[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

wStartAddress[in] : start address of holding registers (1 ~ 255)

wCount[in] : the count that holding data be read

byData[in] : the 16 bit array that stored the holding data

Return Code: refer to the *Error code*.

7.5.46 TCP_MODBUS_WriteReg

Description: to write values to the holding registers at a specific range described in parameters

Syntax:

- **Visual Basic: (*see TCPDAQ.bas*)**

  Declare Function TCP_MODBUS_WriteReg Lib "TCPDAQ.dll" Alias "_TCP_MODBUS_WriteReg@16"
  (ByVal szIP As String, ByVal wStartAddress As Integer, ByVal wCount As Integer,
  ByRef DATA As Integer) As Long

- **Borland C++ Builder: (see TCPDAQ.h)**

  Int TCP_MODBUS_WriteReg(char szIP[],u_short wStartAddress,u_short wCount,u_short wData[]);

- **Delphi: *(see TCPDAQ.pas)***

  Function TCP_MODBUS_WriteReg(szIP: PChar; wStartAddress: Integer; wCount: Integer; Data: PWord): Longint; StdCall;

- **VC++: *(see TCPDAQ.h)***

  Int TCP_MODBUS_WriteReg(char szIP[],u_short wStartAddress,u_short wCount,u_short wData[]);

Parameters:

szIP[in] : the IP address for an EX-9000A/AB-MTCP that to be connected

wStartAddress[in] : start address of holding registers (1 ~ 255)

wCount[in] : the count that holding data be read

byData[in] : the 16 bit array that stored the holding data

Return Code: refer to the *Error code*.

Chapter 8 ASCII Commands for EX-9000A/AB-MTCP Modules

8.1 About ASCII Commands

For users do not familiar to Modbus protocol, ExpertDAQ offers a function library as a protocol translator, integrating ASCII command into Modbus/TCP structure. Therefore, users familiar to ASCII command can access EX-9000A/AB-MTCP easily. Before explaining the structure of ASCII command packed with Modbus/TCP format. Let's see how to use an ASCII command and how many are available for your program.

EX-9000A/AB-MTCP *series also integrate ASCII command into* ***UDP protocol with port 1025****. User can simply send the Command of ASCII format through UDP protocol (such as UPD_send (Dest_IP, "$01M")).*

8.2 Syntax of ASCII

Command Syntax: [delimiter character][address][channel][command][data][checksum][carriage return] Every command begins with a delimiter character.

There are two valid characters: $ and # .The delimiter character is followed by a two-character address (hex-decimal) that specifies the target system. The two characters following the address specific the module and channel.

Depending on the command, an optional data segment may follow the command string. An optional two-character checksum may also be appended to the command string. Every command is terminated with a carriage return(cr).

The command set is divided into the following five categories:

- ♦ System Command Set
- ♦ Analog Input Command Set
- ♦ Analog Input Alarm Command Set
- ♦ Universal I/O Command Set
- ♦ Digital I/O Command Set

Every command set category starts with a command summary of the particular type of module, followed by datasheets that give detailed information about individual commands. Although commands in different subsections sometime share the same format, the effect they have on a certain module can be completely different than that of another. Therefore, the full command sets for each type of modules are listed along with a description of the effect the command has on the given module.

Note: All commands should be issued in UPPERCASE characters only!

8.3 ASCII Command Set

8.3.1 General commands

Command	Function	Description	Modules	Pg.
$AAM	Read Module Name	Returns the module name from a specific module	All	92
$AAF	Read Firmware Version	Returns the firmware version from a specific module.	All	93
$AAID	Read module ID	Returns the ID number from a specific module. (for tcpdaq.dll driver)	All	94
$AAIDFF	Set Module ID number	Set module ID number, (for tcpdaq.dll device driver).	All	95
$AAMD(data)	Write module description	Write module description(max 30 characters)	All	96
$AAMD	Read module description	Read module description	All	97
$AAS1	Reloads the module factory default	Reloads the module factory default	All	98
~AAI	Soft INIT* command (Enable)	Soft INIT* command (Enable)	All	99
~AATNN	Sets the soft INIT* timeout value	Sets the soft INIT* timeout value	All	100
$AARS	Reboot the module	Reboot the module to the power-on state	All	101
$AA5	Reads the Reset Status of a module	Reads the Reset Status of a module	All	102
~AADNNNNN	Set timout to search DHCP	Set timout to search DHCP	All	103
~AAD	Read timout to search DHCP	Read timout to search DHCP	All	104
^AAMAC	Read MAC address	Read MAC address	All	105

8.3.2 Digital I/O commands

Command	Function	Description	Modules	Pg.
$AACONNDD	Set a single DO mode for channel N	Set a single DO mode for channel N	All	106
$AACONN	Read a single DO mode for channel N	Read a single DO mode for channel N	All	107
$AACINNDD	Set a single DI mode for channel N	Set a single DI mode for channel N	All	108
$AACINN	Read a single DI mode for channel N	Read a single DI mode for channel N	All	109
~AADSMN	Set DI/O active state	Set digital input/output active state	All	110
~AADS	Read DI/O active state	Read digital input/output active state	All	111
$AA6	Read DI/O Channel Status	Read the status of DI(0~11) and DO (0~7) channels	All	112
		Read the status of all DI(0~15) and DO(0~15) channels. (ref. "@AA6" for read 16bits DIO)	All Except 9050A, 9051A , 9052A.	112
@AA	Read DI/O Status	Read the status of all DI(0~11) and DO(0~7) channels. (ref. "@AA6" for read 16bits DIO)	All	113
		Read the status of all DI(0~15) and DO(0~15) channels. (ref. "@AA6" for read 16bits DIO)	All Except 9050A,	113

			9051A, 9052A.	
#AA00DD	Write DO channels(0~7)	Write a value to digital output channels(0~7)	All	114
#AA1NDD	Set a single DO channel	Set a single digital output channel	All	115
@AA6DDDD	Write DO channels	Write a value to digital output channels(0~15)	All	116
@AA6ONSS	Set a single DO channel	Set a single digital output channel(0~15)	All	117
@AA6ON	Read single digital output for channel N	Read a single digital output for channel (0~15)	All	118
@AA6	Read the status of all DIO channels	Read the status of all DIO(0~15) channels.	All	119
@AA6IN	Read a single digital input for channel N	Read a single digital input for channel (0~15)	All	120
$AA7	Read DI latch status	Read DI latch status	All	121
$AACLSNN	Clear DI latch status	Clear DI latch status for channel N	All	122

8.3.3 DIO Synchronization Mode(Mirror Local DI to DO) Commands

Command	Function	Description	Modules	Pg.
$AAYM1CPSH HHHLLLL(data)	Set DI *match DO toggler mode* of DIO Sync.	Set *DI match DO toggler mode* of DIO Sync. (for Mirror Local DI to DO)	All	123
$AAYM2CPSTT TT (data)	Set *DI match DO latch mode of DIO Sync.*	Set *DI match DO latch mode* of DIO Sync. (for firmware version 6.070 or later)	All	124
$AAYM3CPSTT TT (data)	Set DI mismatch DO latch mode of DIO Sync.	Set *DI mismatch DO latch mode* ofr DIO Sync. (for firmware version 6.070 or later)	All	125
$AAYMRCS	Start(Run)/Stop DIO synchronize	Start(Run)/Stop DIO sync. operation (for firmware version 6.070 or later)	All	126
$AAYMC	Read DIO Sync. mode	Read DIO Sync. mode (for firmware version 6.070 or later)	All	127
$AAYMS	Read DIO Sync. DO active status	Read DIO Sync. DO active status (for firmware version 6.070 or later)	All	128

8.3.4 DO Pulse Output mode & Digital output Auto-Off Time mode commands

Command	Function	Description	Modules	Pg.
#AA2NPPPPPPPP	Write DO pulse counts	Write DO pulse counts to the specific DO channel (For *High/Low delay mode*)	All	129
$AA9PNNLLLL HHHH	Set DO pulse low/high width for channel N	Set DO pulse low/high width for channel N. (For High/Low delay mode)	All	130
$AA9NN	Read DO pulse low/high width for channel N	Read DO pulse low/high width and DO Low/high delay output width for ch. N, (For *High/Low delay mode* and *Digital output Auto-Off Time Mode*)	All	131
$AA9DNNHHHH LLLL	Set DO low/high delay width for channel N	Set DO Low/high delay output width for channel N (00~15), unit: 0.5ms. (For *High/Low delay mode* and *Digital output Auto-Off Time Mode*)	All	132

8.3.5 Digital Input Counter commands

Command	Function	Description	Modules	Pg.

$AA0MCC	Read DI counter filter (debounce time)	Read DI counter pre-debounce and post-debounce of channel N (unit = 0.5ms)	All Except 9051A	134
$AA0MCC (data1)(data2)	Set DI counter filter (debounce time)	Set DI counter pre-debounce and post-debounce of channel N (unit = 0.5ms)	Except 9051A	135
$AAECN	Start/Stop DI counter	Start/Stop counter of the specific DI channel.	All	136
$AACN	Clear DI counter	Clear DI counter of the specific DI channel.	All	137
#AAN	Read DI counter	Read counter value of the specific DI channel.	All	138
#AARN	Read DI counter with overflow	Read a single DI channel counter with overflow.	All	139

8.3.6 WatchDog commands

Command	Function	Description	Modules	Pg.
~**	Host ok	host ok. Refresh WDT counter of all modules via broadcast, (No reply from modbus response	All	140
~AA**	Host ok	host ok. Refresh WDT counter of the specific module (Response : !01)	All	141
~AA0	Read host watchdog timeout status	Read host watchdog timeout status. bit(7) - watchdog Enable/Disable, bit(2) - watchdog timeout(1) status)	All	142
~AA1	Reset host watchdog timeout status	Reset host watchdog timeout status	All	143
~AA2	Read host communication Timeout value.	Read host communication Timeout value. (0.1sec)	All	144
~AA3EVVV	Set Host watchdog timeout interval.	Enable Host watchdog and set timeout interval (unit=0.1sec)	All	145
~AA4V	Read the power-on DO value or the safe DO value of a module	Read the power-on DO value or the safe DO value of a module	All	147
~AA5V	Sets the current value as the power-on DO value or the safe DO value	Sets the current value as the power-on DO value or the safe DO value	All	148
~AA3PPP	Set module Power-on delay time.	Set module Power-on delay time (unit=0.1sec) to start host communication timeout watchdog	All	149
~AA3P	read module Power-on delay time	Read module Power-on delay time (unit=0.1sec) to start host communication timeout watchdog	All	150

8.4 ASCII Command Description

8.4.1 $AAM Read Module Name

Description:	Read the module name	
Command:	$AAM[CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF)
	M	Command for Read Module Name
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA(data)[CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	(data)	A string showing the name of the module (max. 8 chars.)
	CHK	Check sum
	(cr)	Carriage return

Example:

The command requests the system at address 01h to send its module name. The system at address 01h responds with module name EX-9050A-MTCP indicating that there is an EX-9050A-MTCP at address 01h.

Command: $01M(cr)

Response: !019050A(cr)

8.4.2 $AAF Read Firmware Version

Description:	Returns the firmware version from a specific module.	
Command:	$AAF[CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF)
	F	is the Firmware Version command
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA(data)[CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	(data)	A string showing the firmware version of the module (max. 6 chars.)
	CHK	Check sum
	(cr)	Carriage return

Example:

The command requests the system at address 01h to send its firmware version. The system responds with firmware version 6.080

Command: $01F(cr)

Response: !01 6.080 (cr)

8.4.3 $AAID Read module ID number

Description:	Returns the ID number from a specific module. (for tcpdaq.dll device driver)	
Command:	$AAID[CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	ID	is the ID command.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AANN[CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	NN	represents the ID number of the module.
	CHK	Check sum
	(cr)	Carriage return

Example:

The command requests the system at address 01h to send its ID number. The system responds with ID number 10(0AH).

Command: $01ID (cr)

Response: !010A (cr)

Related command: $AAIDFF

8.4.4 $AAIDFF Set module ID number

Description:	Set module ID number (for tcpdaq.dll device driver)	
Command:	$AAIDFF[CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	ID	is the ID command.
	FF	Module ID (range 01-FF)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA[CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example:

The command Sets the ID of the module 01 to be “1A " and returns a valid response.

Command: $01ID1A (cr)

Response: !01 (cr)

Related command: $AAID

8.4.5 $AAMD(data) Set module description

Description:	Set module description	
Command:	$AAMD(data)[CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	MD	Set module description command.
	(data)	module description (max 30 characters)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA[CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example:

Set the desc. of the module 01 to be “12DI8DO " and returns a valid response.

Command: $01MD12DI8DO(cr)

Response: !01 (cr)

Related command: $AAMD

8.4.6 $AAMD Read module description

Description:	Read module description	
Command:	$AAMD [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	MD	Set module description command.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA(data)[CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	(data)	module description (max 30 characters)
	CHK	Check sum
	(cr)	Carriage return

Example:

Set the desc. of the module 01 to be "12DI8DO " and returns a valid response.

Command: $01MD12DI8DO(cr)

Response: !01 (cr)

Related command: $AAMD(data)

8.4.7 $AAS1 Reloads the module factory default

Description:	Reloads the module factory default	
Command:	$AAS1 [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	S1	command to reload the factory default.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Note: Before the command is issued, The Soft INIT* switch should be set to enable via "set the soft INIT* " command. (ref. ~AAI, ~AATnn)

Example :

(1) Sets the soft INIT* timeout value of module 01 to 32 seconds and returns a valid response.

Command: ~01T32(cr)
Response: !01(cr)

(2) Sets the soft INIT* enable and returns a valid response.

Command: ~01I(cr)
Response: !01(cr)

(3) Reloads the module factory default

Command: $01S1(cr)
Response: !01(cr)

Related command: ~AATnn, ~AAI

8.4.8 ~AAI Set the Soft INIT*

Description:	The Soft INIT* command is used to enable modification of the IP, Gateway and communication protocol settings using software only.	
Command:	~AAI [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	I	command to set the Soft INIT* enable
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example :

1. Sets the soft INIT* timeout value of module 01 to 16 seconds and returns a valid response.

   Command: ~01T10(cr)
   Response: !01(cr)

2. Sets the soft INIT* enable and returns a valid response.

   Command: ~01I(cr)
   Response: !01(cr)

3. Reloads the module factory default

   Command: $01S1(cr)
   Response: !01(cr)

Related command: ~AATnn, $AAS1

8.4.9 ~AATNN Sets the soft INIT* timeout value

Description:	The Soft INIT* command is used to enable modification of the IP, Gateway and communication protocol settings using software only.	
Command:	~AATNN [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	T	command to Sets the soft INIT* timeout value
	NN	Two hexadecimal digits representing the timeout value in seconds. The maximum timeout value is 60 seconds. When changing the IP or Gateway settings without altering the INIT* slide switch, the ~AAI and (or $AAS1) commands should be sent consecutively and the time interval between the two commands should be less than the soft INIT* timeout. If the soft INIT* timeout is 0, then the IP and Gateway settings cannot be changed using software only. The power-on reset value of the soft INIT timeout is 0.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example :

1. Sets the soft INIT* timeout value of module 01 to 16 seconds and returns a valid response.

   Command: ~01T10(cr)
   Response: !01(cr)

2. Sets the soft INIT* enable and returns a valid response.

   Command: ~01I(cr)
   Response: !01(cr)

3. Reloads the module factory default

   Command: $01S1(cr)
   Response: !01(cr)

Related command: ~AAI, $AAS1

8.4.10 $AARS Reboot the module to the power-on state

Description:	Reboot the module to the power-on state	
Command:	$AARS [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	RS	command to reboot the module to the power-on state
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example:

command: $01RS(cr)

response: !01(cr) ; Reboot the module to the power-on state.

Related command: $AA5

8.4.11 $AA5 Reads the Reset Status of a module

Description:	Reads the Reset Status of a module	
Command:	$AA5 [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	5	Command for read reset status
	CHK	Check sum
	(cr)	Carriage return
Response:	!AAS [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	S	the Reset Status of a module. = 0 - the module is not been reseted. = 1 - the module is been reseted.
	CHK	Check sum
	(cr)	Carriage return

Example 1:

command: $015(cr)

response: !011(cr) ; the module is been reseted

Example 2:

command: $015(cr)

response: !010(cr) ; the module is not been reseted

Related command: $AARS

8.4.12 ~AADNNNNN Set timout to search DHCP

Description:	Set timout to search DHCP	
Command:	~AADNNNNN [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	D	is set DHCP search timeout command.
	NNNNN	DHCP timeout value (10~1800 sec, dec)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example:

The command set timeout value to search DHCP servo. If there is no DHCP exist and timeout reached, the module will reboot and use static (Fixed) IP assigned by E9KUtiliy.exe

```
command:    ~01D01200(cr)
response:   !01(cr)
```

Related command: ~AAD

8.4.13 ~AAD Read timout to search DHCP

Description:	Set timout to search DHCP	
Command:	~AAD [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	D	is read DHCP search timeout command.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AANNNNN,D [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	NNNNN	DHCP timeout value (10~1800 sec, dec)
	,	Delimiter for DHCP IP OK
	D	DHCP IP OK, = 1 - DHCP IP OK, otherwise = 0 - none
	CHK	Check sum
	(cr)	Carriage return

Example:

The command read timeout is 1200 seconds and None DHCP IP.

command: **~01D(cr)**

response: **!0101200,0(cr)**

Related command: ~AADNNNNN

8.4.14 ^AAMAC Read MAC address

Description:	Read MAC address	
Command:	^AAMAC [CHK](cr)	
Syntax:	^	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	MAC	ccommand for read MAC address
	CHK	Check sum
	(cr)	Carriage return
Response:	!AAMMMMMM MMMMMM [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	MMMMMMMMMMMM	MAC address(hex)
	CHK	Check sum
	(cr)	Carriage return

Example:

command: ^01MAC(cr)

response: !0100E04C360629(cr) ; MAC Address: 00E04C360629

8.4.15 $AACONNDD Set a single DO channel mode

Description:	Set a single DO channel mode.	
Command:	$AACONNDD [CHK](cr)	
Syntax:	^	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	CO	command for set a single DO mode for channel N
	NN	Channel number (00~1F)
	DD	DO mode setting (2 characters), = 00 - Direct DO output(default) = 01 - Pluse output mode = 02 - Low to high delay = 03 - High to low delay = 04 - Automatic DIO Synchronization Mode = 05 - reserved = 06 - DO Auto-Off Time Mode for DO L*ow to High to Low*. = 07 - DO Auto-Off Time Mode for DO *High to Low to High*.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example:

Set DO channel(0) to *Low to high delay mode*.

Command: $01CO0002(cr)

Response: !01(cr)

Related command: $AACONN, $AACIINNDD, $AACINN

8.4.16 $AACONN Read a single DO channel mode

Description:	Read a single DO channel mode	
Command:	$AACONN [CHK](cr)	
Syntax:	^	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	CO	command for read a single DO mode for channel N
	NN	Channel number (00~1F)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AADD [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	DD	DO mode setting (2 characters), = 00 - Direct DO output(default) = 01 - Pluse output mode = 02 - Low to high delay = 03 - High to low delay = 04 - Automatic DIO Synchronization Mode = 06 - DO Auto-Off Time Mode for DO L*ow to High to Low*. = 07 - DO Auto-Off Time Mode for DO *High to Low to High*.
	CHK	Check sum
	(cr)	Carriage return

Example:

read DO channel(0) *Low to high delay mode*

Command: $01CO00(cr)

Response: !0102(cr)

Related command: $AACONNDD, $AACIINNDD, $AACINN

8.4.17 $AACINNDD Set a single DI channel mode

Description:	Set a single DI channel mode	
Command:	$AACINNDD [CHK](cr)	
Syntax:	^	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	CI	command for set a single DI mode for channel N
	NN	Channel number (00~1F)
	DD	DI mode setting (2 characters), bit(2,1,0) - DI mode setting(default). = 0x000 - Direct DI input = 0x001 - Counter Mode = 0x010 - Low to high latch = 0x011 - High to low latch = 0x100 - Input frequency mode bit(5,4,3) - always 0, bit(6) - DI counter H/L width filter (Default H/L width =5ms) = 0 - disable (off), (default) = 1 - enable (on) bit(7) - always 0,
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example:

Set DI channel(0) to *Counter Mode*, *DI counter H/L width filter* enable,

```
Command:   $01CI00C1(cr)          // bit(2,1,0) = 0x001, bit(6)=1
Response:   !01(cr)
```

Related command: $AACINN, $AACONNDD, $AACONN

8.4.18 $AACINN Read a single DI channel mode

Description:	Read a single DI channel mode	
Command:	$AACINN [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	CI	command for read a single DI mode for channel N
	NN	Channel number (00~1F)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AADD [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	DD	DI mode setting (2 characters), bit(2,1,0) - DI mode setting. = 0x000 - Direct DI input = 0x001 - Counter Mode = 0x010 - Low to high latch = 0x011 - High to low latch = 0x100 - Input frequency mode bit(5,4,3) - always 0, bit(6) - DI counter H/L width filter (Default H/L width =5ms) = 0 - disable (off). = 1 - enable (on). bit(7) - always 0,
	CHK	Check sum
	(cr)	Carriage return

Related command: $AACINNDD, $AACONNDD, $AACONN

8.4.19 ~AADSMN Set DI/O active state

Description:	Set digital input/output active state.	
Command:	~AADSMN [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	DS	Command for setting DIO active status
	M	Digital input channel active values, = 0 - represent input value=0 is activate (ON), input value=1 is deactivate (OFF or OPEN). = 1 - represent input value=1 is activate (ON), input value=0 is deactivate (OFF or OPEN).
	N	Digital output channel active values, = 0 – represent output low is activate (ON), output output high/open is deactivate = 1 - represent output high/open is activate (ON), output output low is deactivate
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: For EX-9050A-MTCP (10-DI/6-DO channels)

- ◆ Reads the value of the DI/DO channels

  Command: @016(cr)

  Response: >000003FF (cr) ; DO=0000 & DI=03FF

- ◆ Read DI active state is 0 and DO active state is 0.

  Command: ~01DS(cr)

  Response: !0100(cr)

- ◆ Set input active state= 1, when input value=1 and set output active state =1, when output value=high/open,

  Command: ~01DS11(cr)

  Response: !01(cr)

- ◆ Reads the value of the DI/DO channels

  Command: @016(cr)

  Response: >003F0000 (cr) ; DO=003F & DI=0000

Related command: ~AADS

8.4.20 ~AADS Read DI/O active state

Description:	Read digital input/output active state.	
Command:	~AADS [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	DS	Command for read DIO active status
	CHK	Check sum
	(cr)	Carriage return
Response:	!AAMN [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	M	Digital input channel active values, = 0 - represent input value=0 is activate (ON), input value=1 is deactivate (OFF or OPEN). = 1 - represent input value=1 is activate (ON), input value=0 is deactivate (OFF or OPEN).
	N	Digital output channel active values, = 0 – represent output low is activate (ON), output output high/open is deactivate = 1 - represent output high/open is activate (ON), output output low is deactivate
	CHK	Check sum
	(cr)	Carriage return

Example: Ref. command ~AADSMN

Related command: ~AADSMN

8.4.21 $AA6 Read DI /DO Channel Status

Description:	This command requests that the specific EX-9000A-MTCP module return the status of its digital input and digital output channels. ➢ Read the status of DI(0~11) and DO (0~7) channels for EX-9050A-MTCP, 9051A-MTCP ,9055A-MTCP ➢ Read the status of DIO(0~15) channels for all modules except EX-9050A-MTCP, 9051A-MTCP ,9055A-MTCP (ref. "@AA6" for read 16-bits DIO)	
Command:	$AA6 [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	6	Command for read DIO channel status
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA**0**(data1)(data2) [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	0	The value is always 0
	(data1)	◆ For EX-9050A-MTCP,EX-9051A-MTCP,EX-9055A-MTCP: Represents the **2**-character hexadecimal DO status (00~FF). ◆ Else: Represents the **4**-character hexadecimal DO status (0000~FFFF).
	(data2)	◆ For EX-9050A-MTCP,9051A-MTCP,9055A-MTCP: Represents the **3**-character hexadecimal DI status (000~FFF). ◆ Else: Represents the **4**-character hexadecimal DI status (0000~FFFF).
	CHK	Check sum
	(cr)	Carriage return

Note: (data1) is always 00 or 0000 for none DO modules and (data2) is always 000 or 0000 for none DI modules.

Example 1: Read EX-9050A-MTCP DIO status

```
command:   $016(cr)              ; read EX-9050A-MTCP DIO status
response : !01003004(cr)          ; represents DO0, DO1 are ON and DI2 is ON
```

Example 2: Read EX-9053A-MTCP DIO status

```
command:   $016(cr)              ; read EX-9053A-MTCP DIO status
response : !0100030004(cr)        ; represents DO0, DO1 are ON and DI2 is ON
```

Related command: @AA, @AA6

8.4.22 @AA Read DIO status

Description:	This command requests that the specific EX-9000A-MTCP module return the status of its digital input and digital output channels. ➢ Read the status of DI(0~11) and DO (0~7) channels for EX-9050A-MTCP, 9051A ,9052A ➢ Read the status of DIO(0~15) channels for all modules except 9050A, 9051A ,9052A. (ref. "@AA6" for read 16-bits DIO)	
Command:	@AA [CHK](cr)	
Syntax:	@	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	CHK	Check sum
	(cr)	Carriage return
Response:	>AA(data1)(data2) [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	>	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	(data1)	◆ For EX-9050A-MTCP,9051A,9052A: Represents the 2-character hexadecimal DO status (00~FF). ◆ Else: Represents the 4-character hexadecimal DO status (0000~FFFF).
	(data2)	◆ For EX-9050A-MTCP,9051A,9052A: Represents the 3-character hexadecimal DI status (000~FFF). ◆ Else: Represents the 4-character hexadecimal DI status (0000~FFFF).
	CHK	Check sum
	(cr)	Carriage return

Note: (data1) is always 00 or 0000 for none DO modules and (data2) is always 000 or 0000 for none DI modules.

Example 1: Read EX-9050A-MTCP DIO status

```
command:    @016(cr)              ; read EX-9050A-MTCP DIO status
response :  >0103004(cr)          ; represents DO0, DO1 are ON and DI2 is ON
```

Example 2: Read EX-9053A-MTCP DIO status

```
command:    @016(cr)              ; read EX-9053A-MTCP DIO status
response :  >0100030004(cr)       ; represents DO0, DO1 are ON and DI2 is ON
```

Related command: @AA, $AA6

8.4.23 #AA00DD Write DO channels

Description:	Write a value to digital output channels).	
Command:	#AA00DD [CHK](cr)	
Syntax:	#	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	00	Represents Writing to all channels (write a byte) command
	DD	Represents the data be written to digital output(00~FF)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: An output byte with value 33h (00110011) is sent to the digital output module at address 01h. The Output channel 0,1,4,5 = ON, Output channel 2,3,6,7 = OFF

command: #010033(cr)

response: !01(cr)

Related command: @AA, $AA6, @AA6, @AA6DDD

8.4.24 #AA1NDD Set a single Digital Output Channel

Description:	Write a single digital output channel	
Command:	#AA1NDD [CHK](cr)	
Syntax:	#	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	1	represents writing to a single DO channel command
	N	Channel number (0-F).
	DD	represents the status you want to set to the specific channel. = 00 – output Deactivate. = 01 – output Activate.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example 1: The command set digital channel 2 Activate (ON) status for the specific module at address 01h.

command: #011201(cr)

response: !01

Example 2: The command set digital channel 2 Deactivate (OFF) status for the specific module at address 01h.

command: #011200(cr)

response: !01

Related command: @AA, $AA6, @AA6, @AA6DDD , #AA00DD

8.4.25 @AA6DDDD Write DO channels (0~15)

Description:	Write value to digital output channels (0~15)	
Command:	@AA6DDDD [CHK](cr)	
Syntax:	@	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	6	represents write value to digital output channels command
	DDDD	Represents the data be written to digital output(0000~FFFF)
	CHK	Check sum
	(cr)	Carriage return
Response:	> [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	>	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: For E-9050A, write DO(0,2) to Activate (ON)

command: @0160005(cr)

response: >(cr)

Related command: @AA, $AA6, @AA6, @AA6DDD , #AA00DD, #AA1NDD

8.4.26 @AA6ONSS Set a single digital output channel

Description:	Write a single digital output channel	
Command:	@AA6ONSS [CHK](cr)	
Syntax:	@	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	6O	represents writing to a single DO channel command
	N	Channel number (0-F).
	SS	represents the status you want to set to the specific channel. = 00 – output Deactivate. = 01 – output Activate.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: Set DO(1) to active state

```
command:   @016O1(cr)        ; Read channel(1) DO status
response:  >00(cr)           ; 00 represents DO channel(1) is deactivated

command:   @016O101(cr)      ; set DO(1) to activate state
response:  !01(cr)

command:   @016O1(cr)        ; Read DO channel(1) value
response:  >01(cr)           ; 01 represents DO channel(1) is activated
```

Related command: @AA, $AA6, @AA6, @AA6DDD , #AA00DD, #AA1NDD, @AA6DDDD

8.4.27 @AA6ON Read a single digital output channel

Description:	Read status of a single digital output channel	
Command:	@AA6ON [CHK](cr)	
Syntax:	@	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	6O	command to read status of a single digital output channel.
	N	Channel number (0-F).
	CHK	Check sum
	(cr)	Carriage return
Response:	>DD [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	>	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	DD	Represents the status you want to set to the specific channel. = 00 – output Deactivate. = 01 – output Activate.
	CHK	Check sum
	(cr)	Carriage return

Example: Read DO(1) status

command: @016O1(cr)

response: >01(cr) ; 01 represents DO channel(1) is activated

Related command: @AA, $AA6, @AA6, @AA6DDD , #AA00DD, #AA1NDD, @AA6DDDD, @AA6ONSS

8.4.28 @AA6 Read the status of all DIO channels

Description:	Read the status of all 16 DO and 16 DI channels	
Command:	@AA6 [CHK](cr)	
Syntax:	@	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	6	command for read DIO status
	CHK	Check sum
	(cr)	Carriage return
Response:	>TTTTNNNN [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	>	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	TTTT	Represents the 4-character hexadecimal DO status (0000~FFFF)
	NNNN	Represents the 4-character hexadecimal DI status (0000~FFFF)
	CHK	Check sum
	(cr)	Carriage return

Example: For E-9050A,

command: @016(cr)

response: >00030004(cr) ; 0003 represents DO0, DO1 are ON and DO2~DO15 are OFF

; 0004 represents DI2 is ON and DI0, DI1, and DI3~DI15 are OFF

Related command: @AA, $AA6, @AA6, @AA6DDD , #AA00DD, #AA1NDD, @AA6DDDD, @AA6ONSS

8.4.29 @AA6IN Read a single digital input channel

Description:	Read status of a single digital input channel	
Command:	@AA6IN [CHK](cr)	
Syntax:	@	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	6I	command to read status of a single digital input channel
	N	Channel number (0-F).
	CHK	Check sum
	(cr)	Carriage return
Response:	>DD [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	>	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	DD	Input value = 00 – Inactive(OFF). = 01 – Active(ON).
	CHK	Check sum
	(cr)	Carriage return

Example: Read the status of DI channel(1)

command: @016I1(cr)

response: >01(cr) ; 01 represents DI channel(1) is active

Related command: @AA, $AA6, @AA6, @AA6DDD, #AA00DD, #AA1NDD, @AA6DDDD, @AA6ONSS, @AA6ON

8.4.30 $AA7 Read DI latch status

Description:	Read DI latch status	
Command:	$AA7 [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	7	Represents read DI latch status command
	CHK	Check sum
	(cr)	Carriage return
Response:	!AADDDD [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	DDDD	Represent DI latch status, The discrete DI latch status in the response message are packed as one input per bit of the data field. Status is indicated as 1= latched; 0= no latched.
	CHK	Check sum
	(cr)	Carriage return

Example: The command read DI latch status= 0003, DI #0 latched, DI #1 latched, and DI #2 ~ DI #15 no latched

command: $017(cr)

response: !010003(cr)

Related command: $AACLSNN

8.4.31 $AACLSNN Clear DI latch status for channel N

Description:	Read DI latch status	
Command:	$AACLSNN [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	CLS	Represents clear DI latch status command
	NN	Represents DI channel to be cleared, = 0x00 ~ 0x0F - channel number. = 0xFF - Clear all DI channels
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: This command clears DI(1) latch status

command: $01CLS01(cr)

response: !01(cr)

Example: This command clears all DI latch status

command: $01CLSFF(cr)

response: !01(cr)

Related command: $AA7

8.4.32 $AAYM1CPSHHHHLLLL(data) Set *DI match DO toggler mode* of DIO Sync.

Description:	Set DI match/mismatch DO Toggle Mode parameters of DIO Synchronization (Ref. to 12.7). A single digital output channel is activated(1 or 0) dependent on the DI input value, When the DI input value match/mismatch DI mask pattern,the specific DO channel will be set to active(1 or 0). (available for version 6.070 or later).	
Command:	$AAYM1CPSHHHHLLLL(data) [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	YM1	represents DO Toggle Mode of Automatic DIO Synchronization.
	C	DO channel number (0~F) been mirrored.
	P	Enable/Disable Auto Run(Start) DIO Synchronization operation when power-on. = 0 - Disiable = 1 - Enable
	S	Set digital output to active state(0/1) when DI value match DI mask pattern set digital output to inactive state(0/1) when DI value mismatch DI mask pattern
	HHHH	DI channel pre-debounce time (hex 0000~FFFF ms)
	LLLL	DI channel post-debounce time (hex 0000~FFFF ms)
	(data)	Represents monitored DI channels and DI mask pattern(16 char) , bits(15..0) - represents DI channel(15..0) state been monitored or ignored, = '1' -represent DI channel n is monitored and match state is '1' = '0' - represent DI channel n is monitored and match state is '0' = 'X' - don't care (DI channel isn't monitored) (Ref. to 12.7).
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Note: *Before running DIO Synchronization function, you must set DO Mode to " DIO Sync. Mode " via command $AACONNDD.*

Example: Assume DI channel 0,2,5 are monitored and the ASCII form of DI mask pattern is XXXXXXXXXX1XX0X1. When DI input ch(0,5)=1 and ch(2)=0, the corresponding DO(0) will be set to ON(1). DI pre-debounce time is 300msec and post-debounce time=150msec

command: $01YM1011012C0096 XXXXXXXXXX1XX0X1(cr) ; (Ref. to 12.7)

where P = 1 Enable Auto Run(Start) DIO Synchronization operation when power-on.

S = 1 Digital output active state(=1) when DI value meet data match pattern.

HHHH = 0x012C (300ms)

LLLL = 0x0096 (150ms)

response: !01(cr) ; valid

Related command: $AACONNDD, @AA6ONSS, $AAY6MRCS, $AAY6MC, $AAY6MS, $AAYM2CPSTTTT (data), $AAYM3CPSTTTT(data)

8.4.33 $AAYM2CPSTTTT (data) Set *DI match DO latch Mode* of DIO Sync.

Description:	Set DO to DI match DO latch Mode of DIO Synchronization. A single digital output channel is activated (1 or 0) and latched, when DI input value match DI mask pattern (Ref. to 12.7). (available for version 6.070 or later).	
Command:	$AAYM2CPSTTTT (data) [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	YM2	ommand to set DI match/ DO latch mode of Auto DIO Sync.
	C	Mirrored DO channel number (hex 0~F).
	P	Enable/Disable Auto Run(Start) DIO Synchronization operation when power-on. = 0 - Disiable = 1 - Enable
	S	digital output active state(0/1) when DI input value match DI mask pattern
	TTTT	DI channel pre-bounce time (hex 0000~FFFF ms)
	(data)	represent DI mask pattern is used to indicate the monitored input channels(0~15) and mask state (16char), bits(15..0) - indicate DI channel(15..0) to be monitored and mask state, = '1' - indicate DI channel n is monitored and mask state is '1'. = '0' - indicate DI channel n is monitored and mask state is '0'. = 'X' - don't care (not be monitored) (Ref. to 12.7).
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Note: *Before running DIO Synchronization function, you must set DO Mode to " DIO Sync. Mode " via command $AACONNDD.*

Example: Assume DI channel 0,2,5 are monitored and the ASCII form of DI mask pattern is XXXXXXXXXX1XX0X1. When DI input ch(0,5)=1 and ch(2)=0, the corresponding DO(0) will be set to ON(1) and latched.
DI pre-debounce time is 300 msec. (Ref. to 12.7)

command: $01YM2011012C XXXXXXXXXX1XX0X1(cr)
where P = 1 - Enable Auto Run(Start) DIO Synchronization operation when power-on.
S = 1 - digital output active state(=1) when DI value match DI mask pattern
TTTT = 0x012C (300ms)
response: !01(cr) ; valid

Related command: $AACONNDD, @AA6ONSS, $AAY6MRCS, $AAY6MC, $AAY6MS, $AAYM1CPSHHHHLLLL (data), $AAYM3CPSTTTT(data)

8.4.34 $AAYM3CPSTTTT (data) Set *DI mismatch DO latch Mode* of DIO Sync.

Description:	Set DO to DI mismatch DO latch Mode for Automatic DIO Synchronization. A single digital output channel is activated (1 or 0) and latched, when DI input value mismatch DI mask pattern. (Ref. to 12.7). (available for version 6.070 or later).	
Command:	$AAYM3CPSTTTT (data) [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	YM3	command to set DI mismatch/DO latch mode of Auto DIO Sync.
	C	Mirrored DO channel number (hex 0~F).
	P	Enable/Disable Auto Run(Start) DIO Synchronization operation when power-on. = 0 - Disiable = 1 - Enable
	S	digital output active state(0/1) when DI input value mismatch DI mask pattern
	TTTT	DI channel pre-debounce time (hex 0000~FFFF ms)
	(data)	represent DI mask pattern is used to indicate the monitored input channels(0~15) and mask state, (16 char), bits(15..0) - indicate DI channel(15..0) to be monitored and mask state, = '1' - indicate DI channel n is monitored and mask state is '1'. = '0' - indicate DI channel n is monitored and mask state is '0'. = 'X' - don't care (not be monitored) (Ref. to 12.7).
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Note: *Before starting Automatic DIO Synchronization function, you must set DO Mode to " DIO Sync. Mode " (Ref. $AACONNDD).*

Example: Assume DI channel 0,2,5 are monitored and the ASCII form of DI mask pattern is XXXXXXXXXX1XX0X1. When DI input ch(0)≠1 or ch(5)≠1 or ch(2)≠0(mismatch DI mask pattern), the corresponding DO(0) will be set to ON(1) and latched. DI pre-debounce time is 300 msec. (Ref. to 12.7)

command: $01YM3011012CXXXXXXXXXX1XX0X1(cr)

where P = 1 - enable Auto Run(Start) DIO Synchronization operation when power-on.

S = 1 - digital output active state(=1) when DI value mismatch DI mask pattern

TTTT = 0x012C (300ms)

response: !01(cr) ; valid

Related command: $AACONNDD, @AA6ONSS, $AAY6MRCS, $AAY6MC, $AAY6MS, $AAYM1CPSHHHHLLLL (data), $AAYM2CPSTTTT(data)

8.4.35 $AAYMRCS Start(Run)/Stop *DIO Synchronization* operation

Description:	This command is used to start (run)/stop the DIO Synchronization operation. (Ref. to 12.7). (available for version 6.070 or later).	
Command:	$AAYMRCS [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	YMR	represent this command is used to start/stop DIO Synchronization operation.
	C	mirrored DO channel number (0~F).
	S	Start/Stop DIO Synchronization operation. = 0 - Stop DIO Synchronization operation (default) = 1 - Start(Run) DIO Synchronization operation.
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA [CHK](cr)	Valid command
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Note: *Before starting Automatic DIO Synchronization function, you must set DO Mode to " DIO Sync. Mode " (Ref. $AACONNDD).*

Example: Assume DI channel 0,2,5 are monitored and the ASCII form of DI mask pattern is XXXXXXXXXX1XX0X1. When DI input ch(0,5)=1 and ch(2)=0, the corresponding DO(0) will be set to ON(1) (*DO toggle mode*), otherwise DO(0) will be set to OFF(0). DI pre-debounce time is 300 msec and post-debounce time=150msec.

Step 1: set DO mode(DD=**04**) to " DIO Sync. Mode " for DO channel **0** (Ref. $AACONNDD)

command: $01CO0004(cr)

response: !01(cr) ; valid

Step 2: set DI channels(ch(0,5)=1,ch(2)=**0**) DI mask pattern for DO Toggle Mode.

command: $01YM1011012C0096XXXXXXXXXX1XX0X1(cr)

response: !01(cr) ; valid

Step 3: set the digital output channel to OFF. (ref. @AA6ONSS)

command: @016O000(cr)

response: !01(cr) ; valid

Step 4: Start(Run) DO(0) DIO Sync. operarion

command: $01YMR01(cr)

response: !01(cr) ; valid

Related command: $AACONNDD, @AA6ONSS, $AAY6MC, $AAY6MS, $AAYM1CPSHHHHLLLL (data), $AAYM2CPSTTTT(data)

8.4.36 $AAYMC Read DIO Synchronization Mode parameters

Description:	This command is used to read parameters of DIO Synchronization Mode (Ref. to 12.7). (available for version 6.070 or later).	
Command:	$AAYMC [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	YM	command to read parameters of DIO Synchronization Mode.
	C	mirrored DO channel number (0~F).
	CHK	Check sum
	(cr)	Carriage return
Response:	!AADPSHHHHLLLL(data)(cr)	For " *DI match DO toggle Mode* " Valid command.
	!AADPSTTTT(data)(cr)	For " *DI match/mismatch DO latch Mode* " Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	D	Specific DO channel mode. = 0 - specific DO channel isn’t mirrored to DI hannel(s). = 1 - DIO Synchronization- DI match DO toggle Mode. = 2 - DIO Synchronization- DI match DO latch Mode. = 3 - DIO Synchronization- DI mismatch DO latch Mode.
	P	Enable/Disable Auto Run(Start) DIO Synchronization operation when power-on. = 0 - Disiable = 1 - Enable
	S	Digital output active state (0/1), when DI input value match/mismatch DI mask pattern.
	For “*DI match DO toggle Mode* "	HHHH - DI channel pre-debounce time (0000~FFFF/ms) LLLL - DI channel post-debounce time(0000~FFFF/ms)
	For " *DI match/mismatch DO latch Mode* "	TTTT - DI channels pre-debounce time(0000~FFFF/ms).
	(data)	This parameter is used to indicate the monitored input channels(15~0) (16 char). bits(15..0) - indicate DI channel(15..0) state to be monitored, bit n = '1' or '0' - indicate DI channel n(0~15) is monitored and mask state is 1 or 0 = 'X' - indicate the DI channel n(0~15) isn’t monitored, Example: DI channel(0,1,2,4,5,7) are monitored, (data) = "XXXXXXXX0X10X011"
	CHK	Check sum
	(cr)	Carriage return

Example: Read parametersof DO(0) DIO sync Mode (Ref. to 12.7).

command: $01YM0(cr) ; Read DIO sync Mode parameters of DO(0).

response: !01301012CXXXXXXXXXXXXXX01(cr) ; valid

Related command: $AACONNDD, @AA6ONSS, $AAY6MRCS, $AAY6MS, $AAYM1CPSHHHHLLLL (data), $AAYM2CPSTTTT(data)

8.4.37 $AAYMS Read current DO activated status during DIO Sync. operation

Description:	The DO activity status bit is sets when th channel of output has occurred (for *DIO Sync. mode*). (Ref. to 12.7), (available for version 6.070 or later).	
Command:	$AAYMS [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	YMS	command to read DO current state during DIO Sync. operation
	CHK	Check sum
	(cr)	Carriage return
Response:	!AADDDD (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	DDDD	DO channels (15..0) status(1=active, 0=inactive)
	CHK	Check sum
	(cr)	Carriage return

Example: Read DO current status of DIO Synchronization(Ref. to 12.7).

command: $01YMS(cr)

response: !010005(cr) ; valid and DO(0,2) have been activated

Related command: $AACONNDD, @AA6ONSS, $AAY6MRCS, $AAY6MC, $AAYM1CPSHHHHLLLL (data), $AAYM2CPSTTTT(data)

8.4.38 #AA2NPPPPPPPP Write DO pulse counts

Description:	Write DO pulse counts to the specific DO channel (For *DO Pulse Output mode*)	
Command:	#AA2NPPPPPPPP [CHK](cr)	
Syntax:	#	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	2	Represent generates DO pulse output command.
	N	Channel number(0~F)

	PPPPPPPP	Represents pulse counts (8 digits, decimal 0~5242879)
		if pppppppp = 00000000, continue DO pulse
		if pppppppp = 00000001, stop DO pulse

	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example:

- ($AACONNDD) Set DO channel(3) to Pluse output mode.
  command: $01CO0301(cr)
  response: !01(cr)

- ($AA9PNNLLLLHHHH) Set DO pulse Low/high output width of channel 3.
  command: $019P0301230456(cr)
  response: !01(cr)

- (#AA2NPPPPPPPP) The command force the DO channel 3 to output 9 pulses.
  command: #012300000009 (cr)
  response: !01(cr)

Related command: $AA9PNNLLLLHHHH, $AA9NN , $AA9DNNHHHHLLLL

8.4.39 $AA9PNNLLLLHHHH Set DO pluse Low/High width of channel N

Description:	Set DO Pluse Low /High output width of channel N (unit: 0.5ms) (For *DO Pulse Output mode*)	
Command:	$AA9PNNLLLLHHHH [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	9P	command to set DO pluse high/low width of channel N.
	NN	DO channel number. = 00~0F (hex) - DO channel number. = FF (hex) - Copy the setting to all DO channels
	LLLL	4 char, DO pulse low signal width (hex 0001~ 3332, uint: 0.5ms)
	HHHH	4 char, DO pulse high signal width (hex 0001~ 3332, uint: 0.5ms)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: Ref. command "#AA2NPPPPPPPP"

Related command: #AA2NPPPPPPPP, $AA9NN , $AA9DNNHHHHLLLL

8.4.40 $AA9NN Read DO pulse and DO High/Low delay width for channel N

Description:	Read DO pulse low/high width and DO High/Low delay output width of channel N (unit: 0.5ms). (For *DO Pulse Output mode* , *High/Low delay mode* and *DO Auto-Off Time Mode*)	
Command:	$AA9NN [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	9	command for Read a single digital input..
	NN	Channel number(00~0F)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AALLLLHHHH UUUUDDDD (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	LLLL	4 char, DO pulse low signal width (hex, uint: 0.5ms) (For *DO Pulse Output mode*)
	HHHH	4 char, DO pulse high signal width (hex, uint: 0.5ms) (For *DO Pulse Output mode*)
	UUUU	4 char, DO low to high delay width (hex, uint 0.5ms) (For *High/Low delay mode* and *DO Auto-Off Time Mode*)
	DDDD	4 char, DO high to low delay width (hex, uint: 0.5ms) (For *High/Low delay mode* and *DO Auto-Off Time Mode*)
	CHK	Check sum
	(cr)	Carriage return

Example: Read DO pulse and Low/high delay output width of DO channel 3

```
command:   $01903(cr)
response:  !0101230456000A000A (cr)      ; LLLL=hex 0123,    HHHH=hex 0456,
                                         ; UUUU=hex 000A,    DDDD=hex 000A
```

Related command: #AA2NPPPPPPPP, $AA9DNNHHHHLLLL, $AA9DNNHHHHLLLL

8.4.41 $AA9DNNHHHHLLLL Set DO low/high delay time

Description:	Set DO Low/high delay output width for channel N (unit: 0.5ms). (For *High/Low delay mode* and *DO Auto-Off Time Mode*)	
Command:	$AA9DNNHHHHLLLL [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	9D	Command to set DO low/high delay time of DO channel N
	NN	DO channel number. = 00~0F (hex) - DO channel number. = FF (hex) - Copy the setting to all DO channels
	HHHH	4 char, DO low to high delay width (hex 0001~hex 3332, uint: 0.5ms) (For "High->Low->High Auto-Off Time mode" HHHH always "0001")
	LLLL	4 char, DO high to low delay width (hex 0001~hex 3332, uint: 0.5ms) (For "Low->High->Low Auto-Off Time mode" LLLL always "0001")
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example(1): For DO *Low to High delay mode*

- ($AACONNDD) Set DO channel(1) to *Low to High delay mode*.
  command: $01CO0102(cr)
  response: !01(cr)

- ($AA9DNNHHHHLLLL) Set DO Low to high delay time(2000ms) for channel 1.
  command: $019D010FA00001(cr) ; HHHH=0FA0, LLLL=0001
  response: !01(cr)

- (#AA1NDD) Set DO(1) to High(1).
  command: #011101 (cr) ; after 2000ms the DO(1) to high(1)
  response: !01(cr)

Example(2): For DO *High to Low delay mode*

- ($AACONNDD) Set DO channel(1) to *High to Low delay mode*.
  command: $01CO0203(cr)
  response: !01(cr)

- ($AA9DNNHHHHLLLL) Set DO Low to high delay time(2000ms) for channel 2.
  command: $019D0200010FA0 (cr) ; HHHH=0001, LLLL=0FA0
  response: !01(cr)

- (#AA1NDD) Set DO(2) to High(1).
  command: #011200 (cr) ; after 2000ms the DO(2) to high(0)
  response: !01(cr)

Example(3): For DO *Low to High to Low of DO Auto-Off Time Mode*

- ($AACONNDD) Set DO channel(0) to DO *Low to High to Low of DO Auto-Off Time Mode*.

```
command:   $01CO0006(cr)
response:  !01(cr)
```

- ($AA9DNNHHHHLLLL) Set DO High time(2000ms) for channel 0.

```
command:    $019D000FA00001 (cr)       ; HHHH=0FA0,   LLLL=0001
response:   !01(cr)
```

- (#AA1NDD) Set DO(0) to High(1).

```
command:    #011001 (cr)               ; after 2000ms the DO(0) to Low(0)
response:   !01(cr)
```

Example(4): For DO *High to Low to High of DO Auto-Off Time Mode*

- ($AACONNDD) Set DO channel(0) to *DO High to Low to High of DO Auto-Off Time Mode.*

```
command:   $01CO0007(cr)
response:  !01(cr)
```

- ($AA9DNNHHHHLLLL) Set DO Low time(2000ms) for channel 0.

```
command:    $019D0000010FA0 (cr)       ; HHHH=001,   LLLL=00FA0
response:   !01(cr)
```

- (#AA1NDD) Set DO(0) to Low(0).

```
command:    #011000 (cr)               ; after 2000ms the DO(0) to high(1)
response:   !01(cr)
```

Related command: $AA9NN

8.4.42 $AA0MCC Read DI counter filter (debounce time)

Description:	Read DI counter pre-debounce and post-debounce of channel N (unit = 0.5ms)	
Command:	$AA0MCC [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	0M	command for read DI counter filter of channel N
	CC	Represents DI channel number (00~0F)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA(data1)(data2) (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	(data1)	DI counter pre-debounce (Min. Low width) time, 8-chars, (unit=0.5ms)
	(data2)	DI counter post-debounce(Min. High width) time, 8-chars, (unit=0.5ms)
	CHK	Check sum
	(cr)	Carriage return

Example: Read DI counter filter (debounce time) for channel 0,

command: $010M00(cr)

response: !010000000200000003(cr) ; (data1) = 00000002 - represents channel(0) Low signal width.

; (data2) = 00000003 - represents channel(0) High signal width.

Ref. command: $AA0MCC(data1)(data2), $AAECN

8.4.43 $AA0MCC(data1)(data2) Set DI counter debounce time

Description:	Set DI counter pre-debounce and post-debounce of channel N (unit = 0.5ms)	
Command:	$AA0MCC(data1)(data2) [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	0M	command for read DI counter filter of channel N
	CC	Represents DI channel number (00~0F)
	(data1)	DI counter pre-debounce (Min. Low width) time, 8-chars, (unit=0.5ms)
	(data2)	DI counter post-debounce(Min. High width) time, 8-chars, (unit=0.5ms)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: Set DI counter channel(0) pre-debounce time to 00000002(=1 ms) and post-debounce time to 00000003(=1.5 ms)

command: $010M000000000200000003(cr)
response: !01(cr)

Ref. command: $AA0MCC, $AAECN

8.4.44 $AAECN Start/Stop single DI counter

Description:	Start/Stop single digital input counter (Falling Edge Trigger)	
Command:	$AAECN [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	E	Represents enable/disable DI counter command
	C	Represents DI counter channel number (0~F)
	N	Represents Start/Stop option (=0 –Stop, =1 -Start)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example 1: Start DI(2) counter

command: $01E21(cr)

response: !01(cr)

Example 2: Stop DI(2) counter

command: $01E20(cr)

response: !01(cr)

Ref. command: $AA0MCC, $AAECN, $AA0MCC(data1)(data2)

8.4.45 $AACN Clear single DI counter value and overflow flag

Description:	Clear single digital input counter value with overflow flag	
Command:	$AACN [CHK](cr)	
Syntax:	$	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	C	Represents clear DI counter command
	N	Represents DI counter channel number (0~F)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: Clear DI counter channel 2

command: $01C2(cr)

response: !01(cr)

Related command: $AA0MCC, $AAECN, $AA0MCC(data1)(data2), $AAECN

8.4.46 #AAN Read single DI counter value

Description:	Read single digital input counter value	
Command:	#AAN [CHK](cr)	
Syntax:	#	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	N	Represents DI channel number (0~F)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA(data) (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	(data)	10-characters(decimal) represents counter value
	CHK	Check sum
	(cr)	Carriage return

Example: Read single digital input channel(2) counter value

command: #012(cr)

response: !010000000123(cr) ; 0000000123 represents counter value is 123

Related command: $AA0MCC, $AAECN, $AA0MCC(data1)(data2), $AAECN, $AACN

8.4.47 #AARN Read single DI counter value and overflow flag

Description:	Read single digital input counter value with overflow	
Command:	#AARN [CHK](cr)	
Syntax:	#	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	R	represent read single DI counter value with overflow command
	N	represents DI channel number (0~F)
	CHK	Check sum
	(cr)	Carriage return
Response:	!AAR(data) (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	R	DI Counter Overflow. = 0 - No counter overflow has occurred. = 1 - A counter overflow has occurred.
	(data)	10-characters(decimal) represents counter value
	CHK	Check sum
	(cr)	Carriage return

Example 1: Read single digital input channel(5) counter value with overflow

command: #01R5(cr)

response: !0110000000123(cr) ; Represents counter value is 0000000123 and counter overflow(1) has occurred.

Example 2: Read single digital input channel(5) counter value with overflow

command: #01R5(cr)

response: !0100000000123(cr) ; Represents counter value is 0000000123 and No counter overflow(0) has occurred.

Related command: $AA0MCC, $AAECN, $AA0MCC(data1)(data2), $AAECN, $AACN, #AAN

8.4.48 ~** Send “Host OK” to all modules via broadcast

Description:	Host send this command via broadcast IP to tell all modules that host and network are alive (No reply from modules) When host watchdog timer is enable, host computer must send this command to all module before timeout otherwise “Host watchdog timer enabled” module will go to safety state.	
Command:	~** [CHK](cr)	
Syntax:	~	Command leading code
	**	command for Host OK
	CHK	Check sum
	(cr)	Carriage return
Response:	No response.	

Related command: ~AA**, ~AA0, ~AA1, ~AA2, ~AA4V, ~AA5V, ~AA3EVVV, ~AA3PPP , ~AA3P

8.4.49 ~AA** Send Host OK to the specific module

Description:	Host send this command via broadcast IP to tell all modules that host and network are alive (No reply from modules) When host watchdog timer is enable, host computer must send this command to all module before timeout otherwise "Host watchdog timer enabled" module will go to safety state.	
Command:	~AA** [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	**	command for Host OK
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Ref. command: ~**, ~AA0, ~AA1, ~AA2, ~AA4V, ~AA5V, ~AA3EVVV, ~AA3PPP , ~AA3P

8.4.50 ~AA0 Read watchdog timeout status

Description:	Read watchdog timeout status	
Command:	~AA0 [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	0	command for reading watchdog timeout status
	CHK	Check sum
	(cr)	Carriage return
Response:	!AASS (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	SS	Two hexadecimal digits that represent the host watchdog status. bit(7) - Host watchdog enable/disable , = 0 - Disable. = 1 - Enable. bit(2) - Host watchdog timeout status, = 0 - indicates that no host watchdog timeout has occurred. = 1 - indicates that a host watchdog timeout has occurred. bit(6,5,4,3,1,0) - reserved(always 0)
	CHK	Check sum
	(cr)	Carriage return

Note: *The host watchdog status is stored in EEPROM and can only be reset by using the ~AA1 command*.

Example 1: Reads the host watchdog status of module 01 and returns 00, meaning that the host watchdog is disabled or no host watchdog timeout has occurred.

Command: ~010(cr)

Response: !0100(cr)

Example 2: Reads the host watchdog status of module 01 and returns 04, meaning that a host watchdog timeout has occurred.

Command: ~010(cr)

Response: !0104(cr)

Ref. command: ~**, ~AA1, ~AA2, ~AA4V, ~AA5V, ~AA3EVVV, ~AA3PPP , ~AA3P

8.4.51 ~AA1 Reset host watchdog timeout status

Description:	Reset host watchdog timeout status	
Command:	~AA1[CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	1	command for resetting watchdog timeout status
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example 1: Reads the host watchdog status of module 01 and shows that a host watchdog timeout has occurred.

```
command:  ~010(cr)
response:  !0104(cr)
```

Example 2: Resets the host watchdog timeout status of module 01 and returns a valid response.

```
command:  ~011(cr)
Response:  !01(cr)
```

Example 3: Reads the host watchdog status of module 01 and shows that no host watchdog timeout has occurred.

```
command:  ~010(cr)
response:  !0100(cr)
```

Ref. command: ~**, ~AA*, ~AA0, ~AA2, ~AA4V, ~AA5V, ~AA3EVVV, ~AA3PPP , ~AA3P

8.4.52 ~AA2 Read host communication Timeout value

Description:	Read host communication Timeout value	
Command:	~AA2 [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	2	command for reading watchdog timeout value
	CHK	Check sum
	(cr)	Carriage return
Response:	!AAEVVV (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	E	Host watchdog enabled status = 1 – Enable. = 0 – Disable.
	VVV	Timeout value in hex format from hex 001 to 28F .(unit 0.1 sec), FF denotes 25.5 seconds
	CHK	Check sum
	(cr)	Carriage return

Example: Reads the host watchdog timeout value of module 01 and returns FF, which denotes that the host watchdog is enabled and the host watchdog timeout value is 25.5 seconds.

```
command:    ~012(cr)
response:   !011FF(cr)
```

Ref. command: ~**, ~AA1, ~AA0, ~AA4V, ~AA5V, ~AA3EVVV, ~AA3PPP , ~AA3P

8.4.53 ~AA3EVVV Set Host watchdog timeout interval

Description:	Enable/disable Host watchdog and set timeout interval (unit = 0.1sec)	
Command:	~AA3EVVV [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	3	command for setting host wdt Enable/ disable and host wdt timeout value.
	E	Host watchdog enabled status = 1 – Enable. = 0 – Disable.
	VVV	Timeout value in hex format from hex 001 to 28F .(unit 0.1 sec), FF denotes 25.5 seconds
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Note:

*If host watchdog timer is enabled, the host should send Host OK (see “~**” or ~AA**) command periodically within Timeout value to refresh the timer, otherwise the module will be forced to safet state (see “~AA5V”) and The Power-LED on the module will go to flash. After timeout the all of D/O commands are disabled.*

Example:

- (~AA3EVVV) Set module (ID=01) to have watchdog timeout value 20.0 seconds and enable host watchdog.

  command: ~01310C8(cr) ; enable host watchdog

  response: !01(cr)

- (~AA2) Read watchdog timeout value form module (ID=01). The module returns 10C8, which denotes that the host watchdog is enabled and the host watchdog timeout value is 20.0 seconds.

  command: ~012(cr)

  response: !0110C8(cr)

- (~** or ~AA**) Host send this command to all modules that host and network are alive

  command: ~**(cr) ; Host OK (to all modules)

  or

  command: ~01**(cr) ; Host OK (to the Specific module)

- Stop sending any command string to modules for at least 20.0 seconds. The Power- LED on the module will go to flash. The flash LED indicates the host watchdog is timeout and timeout status flag is set.

- (~AA0) Read watchdog timeout status, the module returns 01, which denotes that a host watchdog timeout has occurred.

  command: ~010(cr)

  response: !0184(cr) ; bit(7)=1 - Host watchdog enabled
  ; bit(2)=1 - indicates that a host watchdog timeout has occurred.

- (~AA1) Reset watchdog timeout status. Watchdog timeout is cleared and LED stops flashing, and host watchdog is disabled

```
command:   ~011(cr)
response:  !01(cr)
```

- Reads the host watchdog status of module 01 and returns 00, meaning that the host watchdog is disabled and no host watchdog timeout has occurred.

```
command:    ~010(cr)
response:   !0180(cr)        ;   bit(7)=1   - Host watchdog enabled and Timeout status is cleared
```

- (~AA3EVVV) Set module (ID=01) to have watchdog timeout value 20.0 seconds and disable host watchdog.

```
command:    ~01300C8(cr)      ; disable host watchdog
response:   !01(cr)
```

- Reads the host watchdog status of module 01 and returns 00, meaning that the host watchdog is disabled and no host watchdog timeout has occurred.

```
command:    ~010(cr)
response:   !0180(cr)        ;   bit(7)=1   - Host watchdog enabled and Timeout status is cleared
```

Ref. command: ~**, ~AA1, ~AA0, ~AA4V, ~AA5V, ~AA2, ~AA3PPP , ~AA3P

8.4.54 ~AA4V Read Power-on or Safe DO value of module

Description:	Read power-on or safe DO value of module	
Command:	~AA4V [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	4	command for read the power-on DO value or the safe DO value of a module
	V	Read power-on value or safe value = P - read power-on value, = S - read safe value.
	VVV	Timeout value in hex format from hex 001 to 28F .(unit 0.1 sec), FF denotes 25.5 seconds
	CHK	Check sum
	(cr)	Carriage return
Response:	!AADDDD (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	DDDD	powe-on or safe value.(0000~FFFF)
	CHK	Check sum
	(cr)	Carriage return

Example 1: Read Power on value and return power-on value 5A5A.

command: ~014P(cr)

response: !045A5A(cr)

Example 2: Read Power on value and return safe value AA00.

command: ~014S(cr)

response: !04AA00(cr)

Ref. command: ~**, ~AA1, ~AA0, ~AA4V, ~AA5V, ~AA2, ~AA3PPP , ~AA3P, ~AA3EVVV

8.4.55 ~AA5V Sets the current DO value as power-on or safe value

Description:	Set the current DO value as power-on or safe value	
Command:	~AA5V [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	5	command for sets the current value as the power-on DO value or the safe DO value.
	V	Set power-on value or safe value = P - set power-on value, = S - set safe value.
	VVV	Timeout value in hex format from hex 001 to 28F .(unit 0.1 sec), FF denotes 25.5 seconds
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example 1: Set Safe value.

- Set module DO to output value 2A.
  Command: @012A(cr)
  Response: >(cr)

- Set current output value 2A as safe value.
  Command: ~015S(cr)
  Response: !01(cr)

- Read safe value and return safe value 2A.
  Command: ~014S(cr)
  Response: !01002A(cr)

Example 2: Set Power on value

- Set module to output value 15.
  Command: @0115(cr)
  Response: >(cr)

- Set current output value 15 as power-on value.
  Command: ~015P(cr)
  Response: !01(cr)

- Read Power on value and return power-on value 0015.
  Command: ~014P(cr)
  Response: !010015(cr)

Ref. command: ~**, ~AA1, ~AA0, ~AA4V, ~AA2, ~AA3PPP , ~AA3P, ~AA3EVVV

8.4.56 ~AA3PPP Set module Power-on delay time

Description:	Set module Power-on delay time	
Command:	~AA3PPP [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	3	command for set module Power-on delay time
	PPP	Power-on delay time(unit:0.1sec) to start communication timeout. (range 001~28F) (default 5 sec).
	CHK	Check sum
	(cr)	Carriage return
Response:	!AA (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	CHK	Check sum
	(cr)	Carriage return

Example: Set power-on delay time to 096 (15 sec)

Command: ~013096(cr)

Response: !01(cr)

Ref. command: ~AA3PPP , ~AA3P, ~AA5V, ~AA4V

8.4.57 ~AA3P Read module Power-on delay time

Description:	Set module Power-on delay time	
Command:	~AA3P [CHK](cr)	
Syntax:	~	Command leading code
	AA	Module address ID (00 to FF) , (Always 01)
	3P	command for read module Power-on delay time
	CHK	Check sum
	(cr)	Carriage return
Response:	!AAPPP (cr)	Valid command.
	?AA[CHK](cr)	Invalid command
	!	Delimiter for valid command
	?	Delimiter for invalid command
	AA	Module address ID
	PPP	Power-on delay time(unit:0.1sec) to start communication timeout. (range 001~28F) (default 5 sec).
	CHK	Check sum
	(cr)	Carriage return

Example 1: Set power-on delay time to 096 (15 sec)

command: ~013096(cr)

response: !01(cr)

Example 2: Read power-on delay time and return 096 (15 sec)

command: ~013P(cr)

response: !01096(cr)

Ref. command: ~AA3PPP

Chapter 9 MODBUS/TCP Command structure

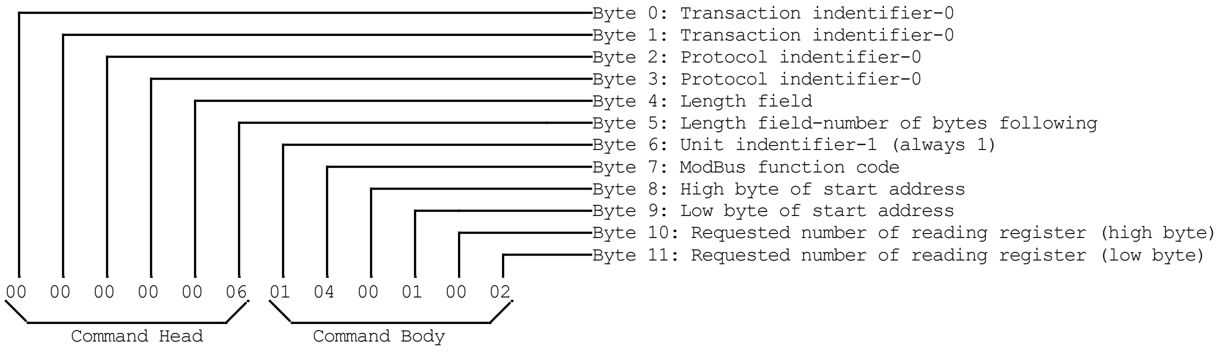
EX-9000A/AB-MTCP system accepts a command/response form with the host computer. When systems are not MODBUS/TCP Command structure. EX-9000A/AB-MTCP system accepts a command/response form with the host computer. When systems are not transmitting they are in listen mode. The host issues a command to a system with a specific address and waits a certain amount of time for the system to respond. If no response arrives, a time-out aborts the sequence and returns control to the host. This chapter explains the structure of the commands with Modbus/TCP protocol, and guides to use these command sets to implement user's programs.

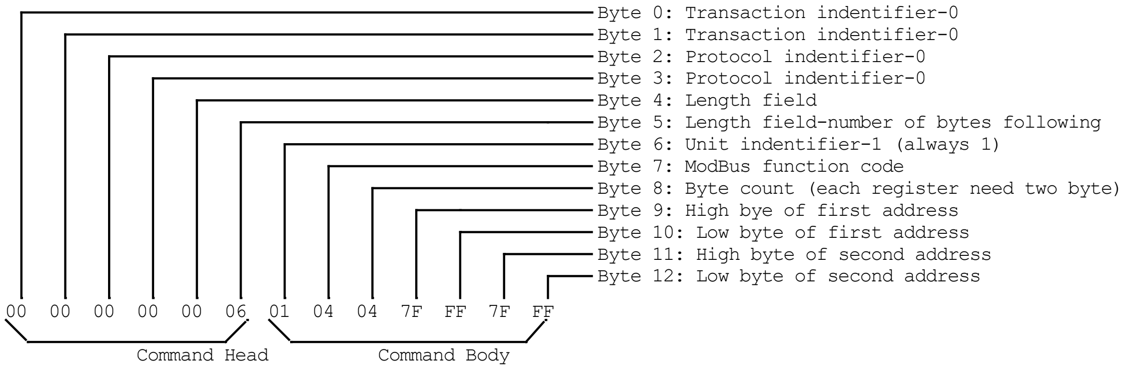
9.1 Command Structure

It is important to understand the encapsulation of a Modbus request or response carried on the Modbus/TCP network. A complete command is consisted of command head and command body. The command head is prefixed by six bytes and responded to pack Modbus format; the command body defines target device and requested action. Following example will help you to realize this structure quickly.

Example:

If you want to read digital input channels(0~11) of EX-9050A-MTCP (address: 00001~00012),
the Request command should be: 00 00 00 00 00 06 01 01 00 00 00 0C
and the Response should be: 00 00 00 00 00 05 01 01 02 00 00


Byte 0: Transaction indentifier-0
Byte 1: Transaction indentifier-0
Byte 2: Protocol indentifier-0
Byte 3: Protocol indentifier-0
Byte 4: Length field
Byte 5: Length field-number of bytes following
Byte 6: Unit indentifier-1 (always 1)
Byte 7: ModBus function code
Byte 8: High byte of start address
Byte 9: Low byte of start address
Byte 10: Requested number of reading register (high byte)
Byte 11: Requested number of reading register (low byte)
00 00 00 00 00 06 01 04 00 01 00 02
Command Head
Command Body


Byte 0: Transaction indentifier-0
Byte 1: Transaction indentifier-0
Byte 2: Protocol indentifier-0
Byte 3: Protocol indentifier-0
Byte 4: Length field
Byte 5: Length field-number of bytes following
Byte 6: Unit indentifier-1 (always 1)
Byte 7: ModBus function code
Byte 8: Byte count (each register need two byte)
Byte 9: High bye of first address
Byte 10: Low byte of first address
Byte 11: High byte of second address
Byte 12: Low byte of second address
00 00 00 00 00 06 01 04 04 7F FF 7F FF
Command Head
Command Body

Note: (Byte 6) Unit Indentifier Always 1

9.2 All Digital Input/Output Modules

All EX-9000A/AB-MTCP DIO modules use the same MODBUS address mapping

9.3 MODBUS/TCP address Mapping & Function Number

0xxxx	- Coils access,	(For 1, 5, 15 function code)
1xxxx	- Read discrete inputs,	(For 2 function code)
3xxxx	- Read input register,	(For 4 function code)
4xxxx	- Holding register access,	(For 3, 6, 16 function code)

xxxx - Element address of a data block, In the MODBUS data model each element within a data block is numbered from 1 to n.

Example:

00005	- Means Coils access and Starting address	= 0004 (0005-1)
10002	- Means Discrete inputs and Starting address	= 0001 (0002-1)
30257	- Means Input register and Starting address	= 0256 (0257-1)
40001	- Means Access holding register and Starting address	= 0000 (0001-1)

◆ MODBUS function code definition:

Function Code	Description
01 (0x01)	Read coils
02 (0x02)	Read Discrete Inputs
03 (0x03)	Read multiple Holding registers
04 (0x04)	Read multiple input registers
05 (0x05)	Write single coil
06 (0x06)	Write single register
15 (0x0F)	write Multiple coils
16 (0x10)	Write Multiple register
70 (0x46)	Read / write module settings

◆ Error Response:

If the function specified in the message is not supported, then the module Response as follows:

Offset	Function	Length	Description
00	Address	1 Byte	1 to 247
01	Function code	1 Byte	Function code | 0x80
02	Exception code	1 Byte	= 0x01 - invalid function code. = 0x02 - invalid data address. = 0x03 - invalid data value. = 0x04 - host WDT timeout = 0x05 – The Emergency input channel was activated.

9.3.1 Register Address (Unit: 16bits) (Firmware Ver: 6.000 or later)

9.3.2 Bit Address (Unit:1Bit)

Where X = 40000 for function 03 function 06, function 16

X = 30000 for function 04

X+1453~X+1484	DO mode setting: = 0000 - Direct DO output, (default) = 0001 - Pulse output mode, = 0002 - low to high delay, = 0003 - high to low delay	16-Bits/channel.	R/W
X+1485~X+1516	DI mode setting: = 0000 - Direct DI input, (default) = 0001 - Counter Mode, = 0002 - low to high latch = 0003 - high to low latch = 0004 - Input frequency mode(0.3 ~1000 Hz max)	16-Bits/channel.	R/W
X+1321~X+1322	DI(0~31) input value,	32 Channels, 1-bit/channel. (X+1321) for DI(15~0) (X+1322) for DI(31~16)	R
X+1323~X+1324	DO(0~31) output value	32 Channels, 1-bit/channel. (X+1323) for DO(15~0) (X+1324) for DO(31~16)	R/W
X+1001~ X+1064	DI Counter Count value, (DI counter mode only).	32 Channels, 32-bit/channel (X+1001) for DI(0), bit 15~0 (X+1002) for DI(0), bit 31~16 ……. (X+1063) for DI(15), bit 15~0 (X+1064) for DI(15), bit 31~16	R
X+1065~X+1128	DO pulse output L level time Unit: 0.5ms,(1 ~13170) (DO pulse output mode only)	32 channels, 32-bit/channel (X+1065) for DO(0) , bit 15~0 X+1066) for DO(0) , bit 31~16 ……. (X+1127) for DO(31) , bit 15~0 (X+1128) for DO(31) , bit 31~16	R/W
X+1129~X+1192	For pulse output H level time Unit: 0.5ms,(1 ~13170) (DO pulse output mode only)	32 channels, 32-bit/channel (X+1129) for DO(0) , bit 15~0 (X+1130) for DO(0) , bit 31~16 ……. (X+1191) for DO(31) , bit 15~0 (X+1192) for DO(31) , bit 31~16	R/W
X+1193~X+1256	Start/stop DO Pulse output (0000= continue, 0001= stop, 0002= start)	32 channels, 32-bit/channel (X+1193) for DO(0) , bit 15~0 (X+1194) for DO(0) , bit 31~16 ….. (X+1255) for DO(31) , bit 15~0 (X+1256) for DO(31) , bit 31~16	R/W
X+1257~X+1320	DO pulse output count value (00000000~FFFFFFFF)	32 Channels, 32-bits/channel (X+1257) for DO(0) , bit 15~0 (X+1258) for DO(0) , bit 31~16 ……. (X+1319) for DO(31) , bit 15~0 (X+1320) for DO(31) , bit 31~16	R/W
X+1517~X+1548 (ver: 6.070 or later)	Start / Stop the DIO Synchronization operation. =0000 - Stop DIO Sync. =0001 - Start DIO Sync.	32 channels, 16 bits/channel. (x+1517) for DO(0) , bit 15~0 ……. (x+1548) for DO(31) , bit 15~0	R/W

X+1549~X+1550 (ver: 6.070 or later)	Read DO status in DIO Synchronization operation. the bit is set when output is activated = 0 - output is inactivated = 1 - output is activated	32 channel,1-bit/channel. (x+1549).bit(0) for DO(0) (X+1549).bit(15) for DO(15) (X+1550).bit(0) for DO(16) (X+1550).bit(15) for DO(31)	R
X+1551~X+1582 (ver: 6.070 or later)	Set/read monitored DI channels (0~15) in *DIO Sync operation.* X+1551~X+1566- indicate monitored state of DI(n) =0001 when DI(n) is activated =0000 when DI(n) is inactivated X+1567~X+1582 - DI mask pattern =0001 - Enable DI(n) to be monitored =0000 -Don't care.	16 DI channels, 16-bit/channel (X+1551) monitor state of DI(0) (X+1552) monitor state of DI(1) ..... (X+1566) monitor state of DI(15) (X+1567) Enable/disable DI(0) to be monitored (X+1569) Enable/disable DI(1) to be monitored … (X+1582) Enable/disable DI(15) to be monitored **(Ref. 14.7)**	R/W
X+1615~X+1646 (ver: 6.070 or later)	Set DIO SYNC mode, DO active output state and Enable/disable auto run when power-on for DO channel N. bit(1.0): DIO Sync. operation mode =01 - DI match DO toggler mode . =02 - DI match DO latch mode =03 - DI mismatch DO latch mode. bit(2) : enable/disable DIO Synchronization operation when power-on. = 0 - Disable. = 1 - Enable. bit(3) : digital output state when DI input value match DI mask pattern =0 - Inactive state =1 - Active state bit(15~4): Don't care	32 DO channels,16 Bits/channel (X+1615) for Do(0) (X+1616) for Do(0) …… (X+1646) for Do(31)	R/W
X+1647~X+1710 (ver: 6.070 or later)	Set DIO SYNC DI debounce time for DO channel N **For DI match/mismatch DO toggle mode:** The first word contains the high order bits bit(31~16) :DI pre-debounce time when DI value match DI mask pattern. =0000~FFFF ms The second word contains the low order bits bit(15~0):DI post-debounce time when DI =0000~FFFF ms **For DI match/mismatch DO latch mode:** The first word contains the high order bits bit(31~16): = 0000 . The second word contains the low order bits bit(15~0) :DI pre-debounce time when DI value match or mismatch DI mask pattern. =0000~FFFF ms	32 Bits/DO channel for DO(0) X+1647=0000~FFFF X+1648=0000~FFFF or 0000 for DO(1) X+1649=0000~FFFF X+1650=0000~FFFF or 0000 .... for DO(31) X+1709=0000~FFFF X+1710=0000~FFFF or 0000	R/W

X+1711~X+1774 (ver: 6.070 or later)	Set DO channel High/Low delay output time (unit:**0.5ms**). The first word: bit(31~16) :DO(n) High to Low to (HHHH) output delay time The second word: bit(15~0) :DO(n) Low to High(LLLL) output delay time.	32 DO channel, 32-bits/channel X+1711~X+1714 for DO(0) X+1715~X+1718 for DO(1) X+1719~X+1722 for DO(2) ..... X+1771~X+1774 for DO(3)	R/W
X+1775~X+1806 (ver: 6.070 or later)	Set a single digital output channel for Auto-Off Time of DO = 1 - Set(active) a single digital output channel for Auto-Off	32 channels, 16-bit/channel. X+1775 for DO(0) X+1776 for DO(1) X+1777 for DO(2) ….. X+1806 for DO(31) **Example:** for DO(0) active Request 01 06 A3 2E 00 01 Resp: 01 06 A3 2E 00 01	R/W
x+5678	Informs all modules that the host is OK. (ref. ~AA**, or ~**)	(No reply to modbus response)	R
x+5601	host communication timeout value (unit: 0.1sec)	ref. (x+5604) Host watchdog timeout status	R/W

9.3.3 Bit Address (Unit:1Bit)

Where X = 00000 for function 01, function 05, function 15
X = 10000 for function 02

Address	Channel	Item	Type
X+0001~X+0016	Read digital Input status	16 Channels, 1-bit/channel	R
X+0017~X+0032	Read/write digital output	16 Channels, 1-bit /channel	R/W
X+0033	Start/stop DI(0) counter	0xFF00=Start ,0x0000= Stop	R/W
X+0034	Clear DI(0) counter	0xFF00= Clear DI(0) counter	W
X+0035	Read/clear DI(0) counter overflow status	1= DI(0) overflow occurred or clear 0= DI(0) no overflow occurred	R/W
X+0036	Read/clear DI(0) latch status	1=DI(0) latched/clear latch 0=DI(0) no latched **Example:** # read ch0 Latch Status request: 01 02 27 33 00 01 response: 01 02 01 01 ;ch0 is latched # clear ch0 Latch Status request: 01 0F 00 23 00 01 FF FE response: 01 0F 00 23 00 01 # clear ch0 Latch Status request: 01 05 00 23 00 00 response: 01 05 00 23 00 00 # read ch0 Latch Status request: 01 02 27 33 00 01 response: 01 02 01 00 ;ch0 not latched	R/W
X+0037	Start/stop DI(1) counter	0xFF00=Start ,0x0000= Stop	R/W
X+0038	Clear DI(1) counter	0xFF00= Clear DI(1) counter	W
X+0039	Read/clear DI(1) counter overflow status	1= DI(1) overflow occurred or clear 0= DI(1) no overflow occurred	R/W
X+0040	Read/clear DI(1) latch status	1=DI(1) latched/clear latch 0=DI(1) no latched	R/W
....	X+0041~x+0152 For DI(2~29)	....	R/W
X+0153	Start/stop DI(30) counter	0xFF00=Start ,0x0000= Stop	R/W
X+0154	Clear DI(30) counter	0xFF00= Clear DI(30) counter	W
X+0155	Read/clear DI(30) counter overflow status	1= DI(30) overflow occurred or clear 0= DI(30) no overflow occurred	R/W
X+0156	Read/clear DI(30) latch status	1=DI(30) latched/clear latch 0=DI(30) no latched	R/W
X+0157	Start/stop DI(31) counter	0xFF00=Start ,0x0000= Stop	R/W
X+0158	Clear DI(31) counter	0xFF00= Clear DI(2) counter	W
X+0159	Read/clear DI(31) counter overflow status	1= DI(31) overflow occurred or clear 0= DI(31) no overflow occurred	R/W
X+0160	Read/clear DI(31) latch status	1=DI(31) latched/clear latch 0=DI(31) no latched	R/W
X+0161~x+0192	Read DI(0~31) value	32 Channels, 1-bit/channel.	R
X+0193~x+0224	Read/write DO(0~31) value	32 Channels, 1-bit /channel.	R/W

9.4 Table of command sets

General command sets			
Address	Item	Func.	Attrib.
00272	Reload the module factory default = 0xFF00(or 1) - enable.	5,15	W
00273	Read module reset status = 1 - first read after powered on. = 0 - not the first read after powered on.	1	R
02210	Reset the module to initial power-on status = 0xFF00(1) - enable.	5,15	W
40481	Read Firmware version (version-1,version-2)	3	R
40483~40484	Read module name(name-1, name-2)	3	R

Digital Output command sets			
Address	Item	Func..	Attrib.
41453~41468	DO mode setting: (16 Channels) = 0000 - Direct DO output, (default) = 0001 - Pulse output mode, = 0002 - Low to high delay mode, = 0003 - High to low delay mode = 0004 - DIO Synchronization Mode = 0006 - DO "*Low to High to Low*" for "Auto-Off Time" Mode. = 0007 - DO "*High to Low to High* " for "Auto-Off Time" Mode.	3,6,16	R/W
00017~00032	Digital output (16 Channels, 1-bit /channel)	1,5,15	R/W
45609	Power-on Digital output value for DO0~DO15, (16 Channels)	3,6,16	R/W

DO Pulse Output command sets			
Address	Item	Func.	Attrib.
41065~41080	DO pulse output L level time (1 ~13107 , Unit: 0.5ms), (16 channels, 16-bit/ch)	3,6,16	R/W
41081~41096	DO pulse output H level time (1 ~13107, Unit: 0.5ms), (16 channels, 16-bit/ch)	3,6,16	R/W
41097~41138	DO pulse output count value (00000000~4FFFFFFF), (16 Channels, 32-bits/ch.) Example: ➢ (41097) for DO0(bit 15~0) & (41098) for DO0(bit 31~16), ➢ (41099) for DO1(bit 15~0) & (41100) for DO1(bit 31~16),	3,16	R/W
41139~41154	Start/stop DO Pulse output (16 channels, 16-bit/channel). = 0 - continue, = 1 - stop, = 2 - start	3,6,16	R/W

DIO Synchronization mode command sets			
Address	Item	Func.	Attrib.
41517~41532	Start(run) / Stop the_DIO Synchronization operation. (16 DO channels, 16 bits/ch.) = 0 - Stop DIO Sync. = 1 - Start DIO Sync.	*3,6,16*	*R/W*
41547	Read DO(0~15) status in DIO Synchronization operation. The bit is set when output is activated. (bit/channel.) = 0 - output is inactivated. = 1 - output is activated.	3	R

41548~41563	Monitored state of DI(0~15) in *DO(x) Sync operation* , *(16 DO channels, 16 bits/channel.)* = 0 - when DI(n) is inactivated = 1 - when DI(n) is activated Example: ➢ (41548) for Monitored state of DI(0~15) in DO(0) Sync operation , ➢ (41549) for Monitored state of DI(0~15) in DO(1) Sync operation ,	3,6,16	R/W
41564~41579	DI mask pattern in *DIO Sync operation , (16 DO channels, 16 bits/channel)* = 1 - Enable DI(n) to be monitored = 0 - Don't care. Example: ➢ (41564) for DI(0~15) mask pattern in DO(0) Sync operation. ➢ (41565) for DI(0~15) mask pattern in DO(1) Sync operation.	3,6,16	R/W
41580~41595	DIO SYNC mode, DO(x) active output state and Enable/disable auto run when power-on for DO channel N. (16 DO channels, 16 bits/channel.) bit(1.0): DIO Sync. operation mode =01 - DI match DO toggler mode . =02 - DI match DO latch mode =03 - DI mismatch DO latch mode. bit(2) : Enable/disable DIO Synchronization operation when power-on. = 0 - Disable. = 1 - Enable. bit(3) : digital output state when DI input value match DI mask pattern =0 - Inactive state =1 - Active state bit(15~4): Don't care	3,6,16	R/W
41596~41611	DI *Pre-debounce time* of DIO SYNC . DI match /mismatch DO toggle mode. (16 hannels, 16 bits/channel.) ✓ DI Pre-debounce time when DI value match DI mask pattern: =0x 0000 ~ 0xFFFF ms.	3,6,16	R/W
41612~41627	DI Post-debounce time of DIO SYNC . DI match /mismatch DO toggle mode. (16 hannels, 16 bits/channel.) ✓ DI Post-debounce time when DI value match DI mask pattern: =0x 0000 ~ 0xFFFF ms.	3,6,16	R/W
41628~41643	DI Pre-debounce time of DIO SYNC . DI match /mismatch DO lacth mode. (16 hannels, 16 bits/channel.) ✓ DI pre-debounce time when DI value match/mismatch DI mask pattern. =0x 0000 ~ 0xFFFF ms.	3,6,16	R/W

Digital output channel delay output mode command sets

Address	Item	Func.	Attrib.
41644~41659	Set DO channel Low to High delay output time (0x0001~0x3332, unit: **0.5ms)**. (16 DO channels, 16 Bits/channel).	3,6,16	R/W
41660~41675	Set DO channel High to Low delay output time (0x0001~0x3332, unit: **0.5ms)**. (16 DO channels, 16 Bits/channel).	3,6,16	R/W

Digital output *Auto-Off Time Mode* command sets

Address	Item	Func.	Attrib.
41676~41691	DO "*Low to High to Low mode*" High output delay time (0x1~0x3332 , unit: 0.5ms). (16 DO channels, 16 Bits/channel).	3,6,16	R/W

41692~41707	DO "*High to Low to High Mode*" Low output delay time (0x1~0x3332 , unit: 0.5ms). (16 DO channels, 16 Bits/channel).	3,6,16	R/W

Digital Input command sets

Address	Item	Func.	Attrib.
41485~41500	DI mode setting: (16 Channels) = 0000 - Direct DI input, (default) = 0001 - Counter Mode, = 0002 - Low to high latch = 0003 - High to low latch = 0004 - Input frequency mode(0.3 ~1000 Hz max)	3,6,16	R/W
00001~00016	Read digital Input status (16 Channels, 1-bit/channel)	1	R
00101~00116	Read / Clear DI latch statu. Example: ➢ Clear ch0 Latch Status by func. 15 request: 01 0F 00 23 00 01 FF FE response: 01 0F 00 23 00 01 ➢ Clear ch0 Latch Status by func. 5 request: 01 05 00 23 00 00 response: 01 05 00 23 00 00 ➢ Read ch0 Latch Status request: 01 02 27 33 00 01 response: 01 02 01 00 ; ch0 not latched	1,5,15	R/W

Digital Input Counter command sets

Address	Item	Func.	Attrib.
00117~00132	Start/Stop DI Counter (0xFF00 = Start , 0x0000 = Stop)	1,5,15	R/W
00133~00148	Clear DI Counter (0xFF00= Clear), (16 Channels, 1-bit/channel)	5,15	W
00225~00240	Read counter overflow status (16 Channels, 1-bit/channel), = 1 - Overflow has occurred, = 0 - No overflow has occurred.	1	R
41001~41032	Read DI counter value (16 Channels, 32-bit/channel). Example: (41001) for DI0 (bit 15~0), (41002) for DI0 (bit 31~16). (41003) for DI1 (bit 15~0), (41004) for DI1 (bit 31~16).	3	R

WatchDog command sets

Address	Item	Func.	Attrib.
45678	Informs all modules that the host is OK. (No reply to modbus response)	3	R
45601	Host communication timeout value (unit: 0.1sec). (ref. (45604) Host watchdog timeout status)	3,6,16	R/W
45602	Host wdt timeout Safe DO(0~15) value. Note: After timeout the all of digital output commands are disabled.	3,6,16	R/W
45604	Host watchdog timeout status: ➢ 0xFF00 = host wdt timeout bit is set, ➢ Write (0xFF00) to clear host watchdog timeout.	3,6,16	R/W
45605	host wdt Enable(=0xFF00) and Disable(=0x0000), (Clear host wdt timeout status(45604) before disable host wdt) (ref. Ascii command: "~AA3EVVV")	3,6,16	R/W

9.5 Example of Modbus/TCP commands

- (00272) Reload the module factory default.

  request: 01 05 01 0F FF 00

  response: 01 05 01 0F FF 00 ; response: successful

- (02210) Reset the module to initial power-on status and return successful
  - (00273) Read reset status:

    request: 01 01 01 10 00 01

    response: 01 01 01 01 ; the module is been reseted,
  - (00273) read reset status:

    resquest: 01 01 01 10 00 01

    response: 01 01 01 00 ; the module is not been reseted,
  - (02210) Reset(reboot) the module to initial power-on state

    request : 01 05 08 A1 FF 00

    response: no respomse
  - (00273) Read reset status:

    request: 01 01 01 10 00 01

    response: 01 01 01 01 ; the module is been reseted,

- (40481) Read Firmware version.

  request: 01 03 01 E0 00 01

  response: 01 03 02 06 08 ; response: 06 08 (version: 06.08)

- (40483~40484) Read module name(name-1, name-2).

  request: 01 03 01 E2 00 02

  response: 01 03 04 00 42 50 00 ; response: module name(4250)

- (41453~41468) DO mode setting:
  - (41453) set DO(0) to *Automatic DIO Synchronization Mode*:

    request: 01 06 05 AC 00 04

    response: 01 06 05 AC 00 04 ; response: successful,
  - (41454) set DO(1) to Direct DO output mode:

    request: 01 06 05 AD 00 00

    response: 01 06 05 AD 00 00 ; response: successful,
  - (41458) set DO(5) to DO Auto-Off Time Mode for DO "Low to High to Low":

    request: 01 06 05 B1 00 06

    response: 01 06 05 B1 00 06 ; response: successful,

- (41453) read mode setting for channel 0~5:

  resquest: 01 03 05 AC 00 06

  response: 01 03 0C 00 04 00 00 00 04 00 03 00 02 00 06 ;DO0~5(04,00,04,03,03,06)

◆ (00017~00032) Digital output (16 Channels, 1-bit /channel):

- (41453) set DO(0~7) to *Direct DO output mode*
- (00017) write digital output DO(0,2,5) to ON and DO(1,3,4,6,7) to OFF:

  request: 01 0F 00 10 00 08 01 25

  response: 01 0F 00 10 00 08 ; response: successful,
- (00017) Read digital output channels from DO0~DO7:

  request: 01 01 00 10 00 08

  response: 01 01 01 25 ; DO value 0x25.
- (00017) write DO(1) to ON:

  request: 01 05 00 11 FF 00

  response: 01 05 00 11 FF 00 ; response: successful,
- (00017) Readback Digital output for DO1:

  request: 01 01 00 11 00 01

  response: 01 01 01 01 ; DO1 ON,
- (00017) write DO(0) to OFF and return successful.:

  request: 01 05 00 10 00 00

  response: 01 05 00 10 00 00 ; response: successful,
- (00017) Readback Digital output for DO0:

  request: 01 01 00 10 00 01

  response: 01 01 01 00 ; DO0 OFF,

◆ (45609) set power-on digital output value (16 Channels, 1-bit /channel):

- (45609) set power-on DO(0,2,1) value to ON

  request: 01 06 15 E8 00 25

  response: 01 06 15 E8 00 25 ; response: successful,
- (45609) read power-on DO(0~15) value

  request: 01 03 15 E8 00 01

  response: 01 03 02 00 25 ; power-on value DO(0,2,1) ON,

◆ Pulse Output command sets:

- (41453) set DO(0) to *Pulse output mode*

  request: 01 06 05 AC 00 01

  response: 01 06 05 AC 00 01 ; response: successful,

- (41065) write DO(0) pulse output L level value to 500ms

  request: 01 06 04 28 03 E8 ; unit=0.5ms

  response: 01 06 04 28 03 E8

- (41081) write DO(0) pulse output H level value to 500ms

  request: 01 06 04 38 03 E8 ; unit=0.5ms

  response: 01 06 04 38 03 E8 ; response: successful,

- (41097~41098) set DO(0) pulse output count value to 0x13121110 (32-bits/channel)

  request: 01 10 04 48 00 02 04 11 10 13 12

  response: 01 10 04 48 00 20 ; response: successful,

- (41097~41098) read DO(0) pulse output count value

  request: 01 03 04 48 00 02

  response: 01 03 04 11 10 13 12 ; response: successful,

- (41139) Start DO(0) Pulse output

  request: 01 06 04 72 00 02

  response: 01 06 04 72 00 02 ; response: successful,

  Wait seconds..............

- (41097~41098) read DO(0) pulse output count value

  request: 01 03 04 48 00 02

  response: 01 03 04 11 10 13 12 ; response: successful,

- (41139) Stop DO(0) Pulse output

  request: 01 06 04 72 00 01

  response: 01 06 04 72 00 01 ; response: successful,

- For *DIO Synchronization mode*:
  - Ref. Appendix 12.7 " DIO Synchronization (Mirror Local DI to DO)"

- For Digital output channel delay output mode:
  - (41453) set DO(0) to *High to Low delay mode* and DO(1) to *Low to High delay mode*

    request: 01 10 05 AC 00 02 04 00 03 00 02

    response: 01 10 05 AC 00 02 ; response: successful,

  - (41644) Set DO(0) *high to low* delay output time (=4000ms).

    request: 01 06 06 6B 1F 40 (unit: 0.5ms)

    response: 01 06 06 6B 1F 40

  - (41644) read DO(0) channel *high to low* delay output time (unit: 0.5ms).

    request: 01 03 06 6B 00 01

    response: 01 03 04 1F 40

  - (41645) Set DO(1) *Low to High* delay output time (=3000ms).

    request: 01 06 06 6C 17 70 (unit: 0.5ms)

    response: 01 06 06 6C 17 70

- (41645) read DO(1) channel *Low to High* delay output time (unit: 0.5ms)

  request: 01 03 06 6C 00 01

  response: 01 03 02 17 70

- (00017) write digital output DO(0) to active(ON) and DO(1) to inactive(OFF).

  request: 01 0F 00 10 00 02 01 01

  response: 01 0F 00 10 00 02

  wait 4 sec........, the DO(0) will be activated(ON) and the DO(1) to inactivated(OFF)

- (00017) write digital output DO(0) to inactive(OFF) and DO(1) to active(ON).

  request: 01 0F 00 10 00 02 01 02

  response: 01 0F 00 10 00 02

◆ DO channel "*Low to High to Low*" output for "*Auto-Off Time Mode*":

- (41455~41456) Set DO(2,3)to DO "Low to High to Low" for "Auto-Off Time" Mode.

  request: 01 10 05 AE 00 02 04 00 06 00 06

  response: 01 10 05 AE 00 02 ; response: successful,

- (41678) Set DO(2) output high delay timefor L->H->L (unit=0.5ms)

  request: 01 06 06 8D 0F A1 ; DO(2)=0x0FA1(2000.5)ms

  response: 01 06 06 8D 0F A1

- (41679) Set DO(3) output high delay timefor L->H->L (unit=0.5ms).

  request: 01 06 06 8E 07 D1

  response: 01 06 06 8E 07 D1

- (41678~41679) read DO(2,3) output high delay time for L->H->L (unit=0.5ms)

  request: 01 03 06 8D 00 02

  response: 01 03 04 0F A1 07 D1

- (00017) Write digital output DO(2,3) to active(ON).

  request: 01 0F 00 12 00 02 01 03

  response: 01 0F 00 12 00 02

wait 2 sec........, the DO(2,3) will be inactivated(OFF)

◆ DO channel " *High to Low to Hig*" output for "*Auto-Off Time Mode*":

- (41453~41454) set DO(0,1)to DO "High to Low to High" for "Auto-Off Time" Mode.

  request: 01 10 05 AC 00 02 04 00 07 00 07

  response: 01 10 05 AC 00 02 ; response: successful,

- (41691~41692) set DO(0,1) output low delay timefor H->L->H (unit=0.5ms) ,

  request: 01 10 06 9B 00 02 04 0F A0 07 D0 ; DO(0)=0x0FA0(2000)ms, DO(1)=0x07D0(1000)ms

  response: 01 10 06 9B 00 02

- (41691~41692) read DO(0,1) output low delay timefor H->L->H (unit=0.5ms) ,

  request: 01 03 06 9B 00 02

  response: 01 03 04 0F A0 07 D0

- ➢ (00017) write digital output DO(0,1) to inactive(OFF)

  request: 01 0F 00 10 00 02 01 00

  response: 01 0F 00 10 00 02

wait 2 sec........, the DO(0,1) will be activated(ON)

- ◆ For DI Counter Mode:
  - ➢ (41485) Set DI(0) to Counter Mode.

    request: 01 06 05 CC 00 01

    response: 01 06 05 CC 00 01 ; response: successful,
  - ➢ (00133) Clear DI(0) Counter Register.

    request: 01 05 00 84 FF 00

    response: 01 05 00 84 FF 00
  - ➢ (00117) Star DI(0) Counter.

    request: 01 05 00 74 FF 00

    response: 01 05 00 74 FF 00

wait for DI(0) input pulse........

- ➢ (41001~41002) Read DI(0) counter value (32-bit/channel)..

  request: 01 03 03 E8 00 02

  response: 01 03 04 00 0A 00 00 ; response: DI(0) counter value = 0x0000000A,
- ➢ (00225~00240) Read DI(0) counter overflow status(1-bit/channel).

  request: 01 01 00 E0 00 08

  response: 01 01 01 00 ; response: No overflow has occurred.

- ◆ Host watchdog timer:
  - ➢ (45601) Set host communication timeout value to 30sec.

    request: 01 06 15 E0 01 2C ; set timeout value = 30sec (unit=0.1s)

    response: 01 06 15 E0 01 2C ; response: successful,
  - ➢ (45602) Set host wdt timeout Safe DO(0~15) value.

    request: 01 06 15 E1 00 13 ; set Safe DO(0,1,4) to active(1)

    response: 01 06 15 E1 00 13
  - ➢ (45604) Clear host watchdog timeout status.

    request: 01 06 15 E3 FF 00 ; Write (0xFF00) to clear host watchdog timeout.

    response: 01 06 15 E3 FF 00
  - ➢ (45605) Enable host wdt.

    request: 01 06 15 E4 FF 00 ; set host wdt Enable(x0FF00)

    response: 01 06 15 E4 FF 00

wait 8 sec.......

- (45678) Informs all modules that the host is OK.

request: 01 06 16 2D 00 64 ; Informs all modules that the host is OK

response: ; no response

wait 10 sec for host wdt timeout.................

- (45604) Read Host watchdog timeout status (0xFF00 = host wdt timeout bit is set).

request: 01 03 15 E3 00 01

response: 01 03 02 FF 00 ; response: 0xFF00(the host wdt timeout bit is set),

- (45604) Write (0xFF00) to clear host watchdog timeout..

request: 01 06 15 E3 FF 00

response: 01 06 15 E3 FF 00 ; response: No overflow has occurred.

- (45605) Disable host wdt (clear host wdt timeout status before disable host wdt) .

request: 01 06 15 E4 00 00 ; set host wdt disable(x00000)

response: 01 06 15 E4 00 00

9.6 ModBus Function code introductions

Code (Hex)	Name	Usage
01	Read Coil Status	Read Discrete Output Bit
02	Read Input Status	Read Discrete Input Bit
03	Read Holding Registers	Read 16-bit register. Used to read integer or floating point process data.
04	Read Input Registers	
05	Force Single Coil	Write data to force coil ON/OFF
06	Preset Single Register	Write data in 16-bit integer format
0F	Force Multiple Coils	Write multiple data to force coil ON/OFF
10	Preset Multiple Registers	Write multiple data in 16-bit integer format

9.7 For DIO Modules:Register Address (Unit: 16bits)

Where X = 40000 for function 03, function 06, function 16
X = 30000 for function 04

9.8 EX-9050: 12 Digital Input/6 Digital Output Module

9.8.1 Holding Register Address (Unit: 16bits)

Where X=00000 for function 01, function 05
X=10000 for function 02

Address	Channel	Item	type
X+0001~X+0024	Read DI Counter Count value, (For DI Counter Mode).	12 Channels, 32 Bits/channel.	R
X+0025~X+0036	For Pulse Output L level, time Unit:0.1ms	6 Channels, 32 Bits/channel.	R/W
X+0037~X+0048	For Pulse Output H level, time Unit:0.1ms	6 Channels, 32 Bits/channel.	R/W
X+0049~X+0060	Set DO pulse count value. (Set to 0= Continue mode & 1= stop)	6 Channels, 32 Bits/channel.	R/W

9.8.2 Bit Address (Unit: 1Bit)

Where X=00000 for function 01, function 05
X=10000 for function 02

Address	Channel	Item
X+0001~X+0012	For DI	12 Channels, 1 Bit
X+0017~X+0022	For DO	6 Channels, 1 Bit
X+0032	Ch0 (For Counter Mode)	Start(1)/Stop(0)
X+0033	Ch0 (For Counter Mode)	Clear Counter(1)
X+0034	Ch0 (For Counter Mode)	Clear Overflow
X+0035	Ch0 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0036	Ch1 (For Counter Mode)	Start(1)/Stop(0)
X+0037	Ch1 (For Counter Mode)	Clear Counter(1)
X+0038	Ch1 (For Counter Mode)	Clear Overflow
X+0040	Ch1 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0041	Ch2 (For Counter Mode)	Start(1)/Stop(0)
X+0042	Ch2 (For Counter Mode)	Clear Counter(1)
X+0043	Ch2 (For Counter Mode)	Clear Overflow
X+0044 X+0045	Ch2 (For Counter Mode) Ch3 (For Counter Mode)	Latch Status(read)/Clear Status(Write) Start(1)/Stop(0)
X+0046	Ch3 (For Counter Mode)	Clear Counter(1)
X+0047	Ch3 (For Counter Mode)	Clear Overflow
X+0048	Ch3 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0049	Ch4 (For Counter Mode)	Start(1)/Stop(0)
X+0050	Ch4 (For Counter Mode)	Clear Counter(1)
X+0051	Ch4 (For Counter Mode)	Clear Overflow
X+0052	Ch4 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0053	Ch5 (For Counter Mode)	Start(1)/Stop(0)
X+0054	Ch5 (For Counter Mode)	Clear Counter(1)
X+0055	Ch5 (For Counter Mode)	Clear Overflow
X+0056	Ch5 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0057	Ch6 (For Counter Mode)	Start(1)/Stop(0)
X+0058	Ch6 (For Counter Mode)	Clear Counter(1)
X+0059	Ch6 (For Counter Mode)	Clear Overflow
X+0060	Ch6 (For Counter Mode)	Latch Status(read)/Clear Status(Write)

X+0061	Ch7 (For Counter Mode)	Start(1)/Stop(0)
X+0062	Ch7 (For Counter Mode)	Clear Counter(1)
X+0063	Ch7 (For Counter Mode)	Clear Overflow
X+0064	Ch7 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0065	Ch8 (For Counter Mode)	Start(1)/Stop(0)
X+0066	Ch8 (For Counter Mode)	Clear Counter(1)
X+0067	Ch8 (For Counter Mode)	Clear Overflow
X+0068	Ch8 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0069	Ch9 (For Counter Mode)	Start(1)/Stop(0)
X+0070	Ch9 (For Counter Mode)	Clear Counter(1)
X+0071	Ch9 (For Counter Mode)	Clear Overflow
X+0072	Ch9 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0073	Ch10 (For Counter Mode)	Start(1)/Stop(0)
X+0074	Ch10 (For Counter Mode)	Clear Counter(1)
X+0075	Ch10 (For Counter Mode)	Clear Overflow
X+0076	Ch10 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0077	Ch11 (For Counter Mode)	Start(1)/Stop(0)
X+0078	Ch11 (For Counter Mode)	Clear Counter(1)
X+0079	Ch11 (For Counter Mode)	Clear Overflow
X+0080	Ch11 (For Counter Mode)	Latch Status(read)/Clear Status(Write)

9.9 EX-9051: 12 Digital Input/2 Counter/2 Output Module

9.9.1 Holding Register Address (Unit: 16bits)

Address	Channel	Item	Type
X+0001~X+0028	Read DI Counter Count value, (For DI Counter Mode).	14 Channels, 32 Bits per channel	R
X+0029~X+0032	For Pulse Output L level, time Unit:0.5ms	2 Channels, 32 Bits/channel	R/W
X+0033~X+0036	For Pulse Output H level, time Unit:0.5ms	2 Channels, 32 Bits/channel	R/W
X+0037~X+0040	Set DO pulse count value. (Set to 0= Continue mode & 1= stop)	2 Channels, 32 Bits/channel	R/W

9.9.2 Bit Address (Unit: 1Bit)

Where X=00000 for function 01, function 05
X=10000 for function 02

Address	Channel	Item
X+0001~X+0012	For DI	12 Channels, 1 Bit
X+0017~X+0022	For DO	6 Channels, 1 Bit
X+0032	Ch0 (For Counter Mode)	Start(1)/Stop(0)
X+0033	Ch0 (For Counter Mode)	Clear Counter(1)
X+0034	Ch0 (For Counter Mode)	Clear Overflow
X+0035	Ch0 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0036	Ch1 (For Counter Mode)	Start(1)/Stop(0)
X+0037	Ch1 (For Counter Mode)	Clear Counter(1)
X+0038	Ch1 (For Counter Mode)	Clear Overflow
X+0040	Ch1 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0041	Ch2 (For Counter Mode)	Start(1)/Stop(0)
X+0042	Ch2 (For Counter Mode)	Clear Counter(1)
X+0043	Ch2 (For Counter Mode)	Clear Overflow

X+0044	Ch2 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0045	Ch3 (For Counter Mode)	Start(1)/Stop(0)
X+0046	Ch3 (For Counter Mode)	Clear Counter(1)
X+0047	Ch3 (For Counter Mode)	Clear Overflow
X+0048	Ch3 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0049	Ch4 (For Counter Mode)	Start(1)/Stop(0)
X+0050	Ch4 (For Counter Mode)	Clear Counter(1)
X+0051	Ch4 (For Counter Mode)	Clear Overflow
X+0052	Ch4 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0053	Ch5 (For Counter Mode)	Start(1)/Stop(0)
X+0054	Ch5 (For Counter Mode)	Clear Counter(1)
X+0055	Ch5 (For Counter Mode)	Clear Overflow
X+0056	Ch5 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0057	Ch6 (For Counter Mode)	Start(1)/Stop(0)
X+0058	Ch6 (For Counter Mode)	Clear Counter(1)
X+0059	Ch6 (For Counter Mode)	Clear Overflow
X+0060	Ch6 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0061	Ch7 (For Counter Mode)	Start(1)/Stop(0)
X+0062	Ch7 (For Counter Mode)	Clear Counter(1)
X+0063	Ch7 (For Counter Mode)	Clear Overflow
X+0064	Ch7 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0065	Ch8 (For Counter Mode)	Start(1)/Stop(0)
X+0066	Ch8 (For Counter Mode)	Clear Counter(1)
X+0067	Ch8 (For Counter Mode)	Clear Overflow
X+0068	Ch8 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0069	Ch9 (For Counter Mode)	Start(1)/Stop(0)
X+0070	Ch9 (For Counter Mode)	Clear Counter(1)
X+0071	Ch9 (For Counter Mode)	Clear Overflow
X+0072	Ch9 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0073	Ch10 (For Counter Mode)	Start(1)/Stop(0)
X+0074	Ch10 (For Counter Mode)	Clear Counter(1)
X+0075	Ch10 (For Counter Mode)	Clear Overflow
X+0076	Ch10 (For Counter Mode)	Latch Status(read)/Clear Status(Write)
X+0077	Ch11 (For Counter Mode)	Start(1)/Stop(0)
X+0078	Ch11 (For Counter Mode)	Clear Counter(1)
X+0079	Ch11 (For Counter Mode)	Clear Overflow
X+0080	Ch11 (For Counter Mode)	Latch Status(read)/Clear Status(Write)

9.10 EX-9055: 8 channel digital Input /digital out Module

9.10.1 Register Address (Unit: 16bits)

Where X=40000 for function 03, function 06, function 16
X=30000 for function 04

Address	Channel	Item	Type
X+0001~X+0016	Read DI Counter Count value, (For DI Counter Mode).	8 Channels, 32 Bits/channel	R
X+0017~X+0032	For Pulse Output L level, time Unit:0.5ms	8 Channels, 32 Bits/channel	R/W
X+0033~X+0048	For Pulse Output H level, time Unit:0.5ms	8 Channels, 32 Bits/channel	R/W
X+0049~X+0064	Set DO pulse count value. (Set to 0= continue and 1= stop)	8 Channels, 16 Bits/channel (0,1 or 2~65535)	R/W
X+0065	Digital input status	8 channel,16 Bits	R
X+0066	Digital output status	8 channel,16 Bits	R/W

9.10.2 Bit Address (Unit: 1Bit)

Where X=00000 for function 01, function 05
X=10000 for function 02

Address	Channel	Item	Type
X+0001~X+0008	For DI 8 Channels, 1 Bit/channel		R
X+0017~X+0024	For DO 8 Channels, 1 Bit/channel		R/W
X+0033	Ch0 (For Counter Mode)	Start(1)/Stop(0)	R/W
X+0034	Ch0 (For Counter Mode)	Clear Counter(1)	R/W
X+0035	Ch0 (For Counter Mode)	Clear Overflow	R/W
X+0036	Ch0 (For Counter Mode)	Latch Status(read)/Clear Status(Write)	R/W
X+0037	Ch1 (For Counter Mode)	Start(1)/Stop(0)	R/W
X+0038	Ch1 (For Counter Mode)	Clear Counter(1)	R/W
X+0039	Ch1 (For Counter Mode)	Clear Overflow	R/W
X+0040	Ch1 (For Counter Mode)	Latch Status(read)/Clear Status(Write)	R/W
X+0041	Ch2 (For Counter Mode)	Start(1)/Stop(0)	R/W
X+0042	Ch2 (For Counter Mode)	Clear Counter(1)	R/W
X+0043	Ch2 (For Counter Mode)	Clear Overflow	R/W
X+0044	Ch2 (For Counter Mode)	Latch Status(read)/Clear Status(Write)	R/W
X+0045	Ch3 (For Counter Mode)	Start(1)/Stop(0)	R/W
X+0046	Ch3 (For Counter Mode)	Clear Counter(1)	R/W
X+0047	Ch3 (For Counter Mode)	Clear Overflow	R/W
X+0048	Ch3 (For Counter Mode)	Latch Status(read)/Clear Status(Write)	R/W
X+0049	Ch4 (For Counter Mode)	Start(1)/Stop(0)	R/W
X+0050	Ch4 (For Counter Mode)	Clear Counter(1)	R/W
X+0051 X+0052	Ch4 (For Counter Mode) Ch4 (For Counter Mode)	Clear Overflow Latch Status(read)/Clear Status(Write)	R/W R/W
X+0053	Ch5 (For Counter Mode)	Start(1)/Stop(0)	R/W
X+0054	Ch5 (For Counter Mode)	Clear Counter(1)	R/W
X+0055	Ch5 (For Counter Mode)	Clear Overflow	R/W
X+0056	Ch5 (For Counter Mode)	Latch Status(read)/Clear Status(Write)	R/W
X+0057	Ch6 (For Counter Mode)	Start(1)/Stop(0)	R/W

X+0058	Ch6 (For Counter Mode)	Clear Counter(1)	R/W
X+0059	Ch6 (For Counter Mode)	Clear Overflow	R/W
X+0060	Ch6 (For Counter Mode)	Latch Status(read)/Clear Status(Write)	R/W
X+0061	Ch7 (For Counter Mode)	Start(1)/Stop(0)	R/W
X+0062	Ch7 (For Counter Mode)	Clear Counter(1)	R/W
X+0063	Ch7 (For Counter Mode)	Clear Overflow	R/W
X+0064	Ch7 (For Counter Mode)	Latch Status(read)/Clear Status(Write)	R/W

Chapter 10 TCPDAQ Data Structure

10.1 Typedef struct _AlarmInfo

```
typedef    struct _AlarmInfo             //Alarm Event data structure
{
    u_cha         szIP[4];               //The IP address which cause the alarm change
    u_short       szDateTime[6];         //E.x[ 2001]/[09/][23][10]:[12]:[34]

  //      (Year/Month/Day Hour:Minute:Second)
    u_short       byChannel;             //The Channel of which cause the alarm change
    u_short       byAlarmType;           //0x00:AIO Low Alarm
                                         //0x01:AIO High Alarm
                                         //0x20:DIO Alarm
                                         //0xF0:Connection Alarm
    u_short       byAlarmStatus;         //0:Alarm ON to OFF, 1:Alarm OFF to ON
    u_short       wValue;                //Alarm value.For DIO, this value could be "0" or "1" means that
"ON" or                                               //"OFF"
                                         //For high or low alarm, this is the AIO value.
                                         //For connection lost, this value is '0'.
} _AlarmInfo;
```

10.2 Typedef struct _StreamData

```
Typedef    struct _StreamData            //Stream Event data structure
{
    u_char        szIP[4];               //The IP address which send the stream datae
    u_short       szDateTime[6];         //E.x [2001]/[09]/[23] [10]:[12]:[34]
                                         //      (Year/Month/Day Hour:Minute:Second)
    u_short       DIN;                   //Digital input data (DI#0~DI#15)
    u_short       DOUT;                  //Digital output data (DO#0~DO#15)
    u_short       wData[32];             //Digital input Counter (Each channel occupies 4 Byte)
} _StreamData;
```

10.3 Typedef struct ModuleInfo

```
typedef    struct ModuleInfo             // Used For Scan_Online_Modules(..)
{     u_char      szIP[4];               //IP address
    u_char        szGate[4];             //Gateway
    u_char        szMask[4];             //Submask
    u_char        szDHCP;                //DHCP status 01=enable, 00=disable
    u_char        szID;                  //Module ID number
    u_char        szMacAddr[6];          //MAC address of module
    u_short       szModuleNo;            //Module name
    u_char        szBuffer[12];          //Buffer reserved for TCPDAQ.DLL
} ModuleInfo;
```

10.4 Typedef struct ModuleData

```
typedef    struct ModuleData             //Used for function TCP_ReadAllDataFromModule (..)
```

```
{   u_char     Din[16];                  //Digital input data (DI#0~DI#15),avaliable for
EX9050A/51A/55AMTCP
    u_char           Dout[16];           //Digital output data (DO#0~DO#15),avaliable for
                                                             //EX9050A/51A/55A/17/19-MTCP
    u_char     DiLatch[16];          //Digital input latch status (DI#0~DI#15),avaliable for EX9050/51/55-
MTCP
    long        DiCounter[16];       //Digital input counter value (DI#0~DI#15),avaliable for EX9050/51/55-
MTCP
    double      AiNormalValue[16];   //Analog Input value(AI#0~AI#15),avaliable for EX9015/17/19-MTCP
    double      AiMaxValue[16];      //Analog maximum value(AI#0~AI#15),avaliable for EX9015/17/19-MTCP
    double      AiMinValue[16];      //Analog minimum value(AI#0~AI#15),avaliable for EX9015/17/19-MTCP
    u_char      AiHighAlarm[16];         //Analog high alarm status(AI#0~AI#15),avaliable for EX9015/17/19-
MTCP
    u_char      AiLowAlarm[16];      //Analog low alarm status(AI#0~AI#15),avaliable for EX9015/17/19-MTCP
    u_char      AiChannelType[16];       //Analog channel Type, avaliable for EX9015/17/19-MTCP
    u_char      AiBurnOut[16] ;          //Analog channel burn out status,avaliable for EX9019/15-MTCP only
    double      CJCTemperature ;     //Cold junction temperature,avaliable for EX9019-MTCP only
} ModuleData;
```

Chapter 11 EX-9000A/AB-MTCP Web Server

11.1 What is TCPDAQ Web Server?

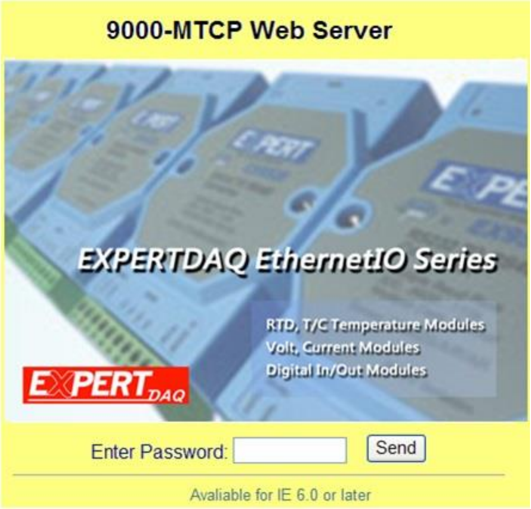
EX-9000A/AB-MTCP I/O modules all features built-in web server. Remote computer or devices can monitor and control I/O status on EX-9000A/AB-MTCP modules remotely through web browser. There is default built-in web page on EX-9000A/AB-MTCP modules.

To use your computer to browse the web page on EX-9000A/AB-MTCP module, you can simply type the IP address to connect to your EX-9000A/AB-MTCP module in web browser. There will be one dialog window asking you to enter the password. After you have typed the correct password, you can start to monitor or control I/O on EX-9000A/AB-MTCP modules.

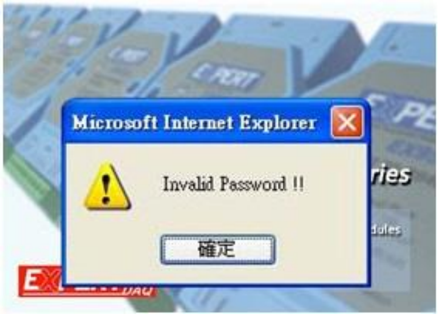
Notice: Please use Windows Internet Explorer 5.5 (IE 5.5 or later version)

11.2 Home Page

- ♦ Type the **IP address** in the web browser (example: http:\\192.168.0.51)
- ♦ The home page will pop-up in the browser window to ask you to enter the password



- ♦ Enter the correct password and click send button to verify the password. If the password is not correct, a warming message box will show up to remain you to reenter the password

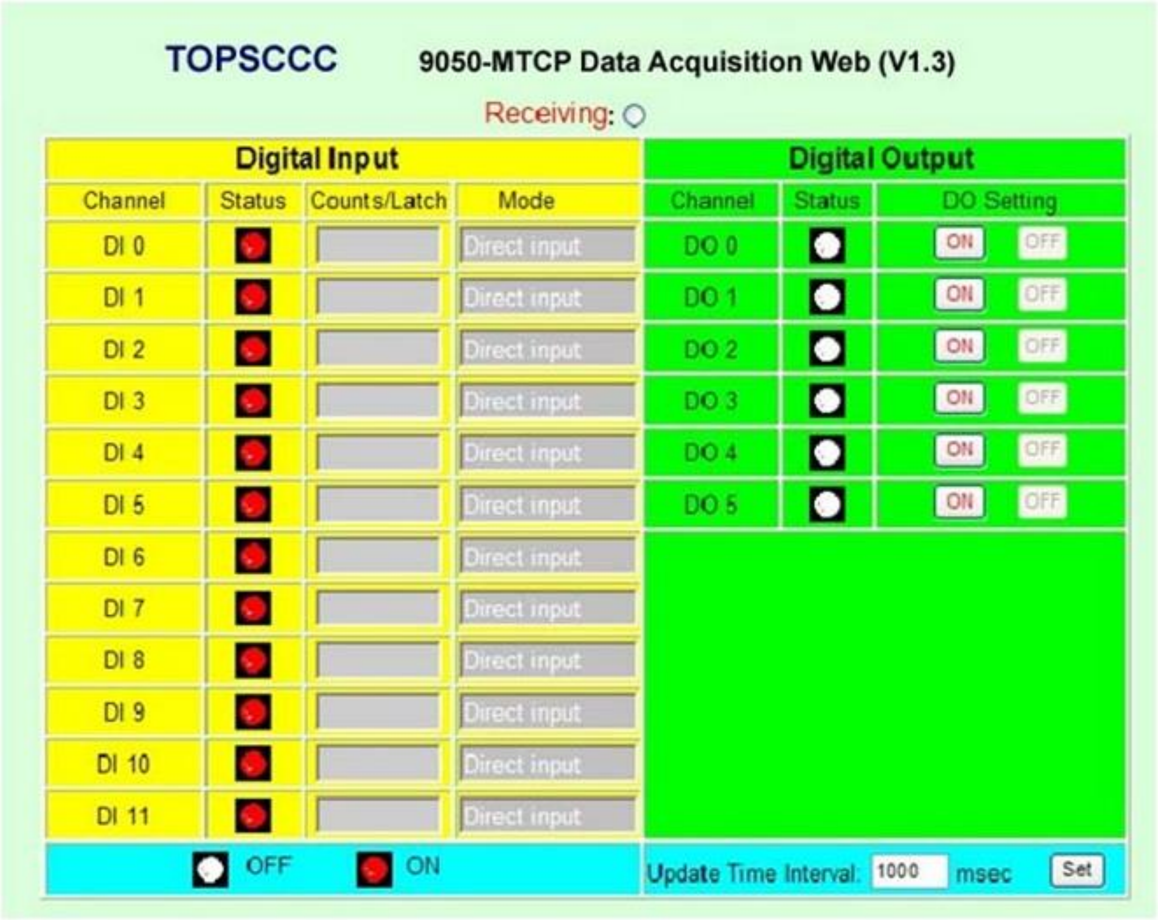


Invalid Password !!

- ♦ If the password is correct, the module monitoring page will pop up in the web browser.

11.3 Module monitoring page

11.3.1 EX-9050A-MTCP monitoring page



TOPSCCC 9050-MTCP Data Acquisition Web (V1.3)

Receiving: ○

Digital Input				Digital Output		
Channel	Status	Counts/Latch	Mode	Channel	Status	DO Setting
DI 0	●		Direct input	DO 0	○	ON OFF
DI 1	●		Direct input	DO 1	○	ON OFF
DI 2	●		Direct input	DO 2	○	ON OFF
DI 3	●		Direct input	DO 3	○	ON OFF
DI 4	●		Direct input	DO 4	○	ON OFF
DI 5	●		Direct input	DO 5	○	ON OFF
DI 6	●		Direct input			
DI 7	●		Direct input			
DI 8	●		Direct input			
DI 9	●		Direct input			
DI 10	●		Direct input			
DI 11	●		Direct input			

○ OFF ● ON

Update Time Interval: 1000 msec Set

Channel : Channel number of digital input or output

Status : Current input or output status

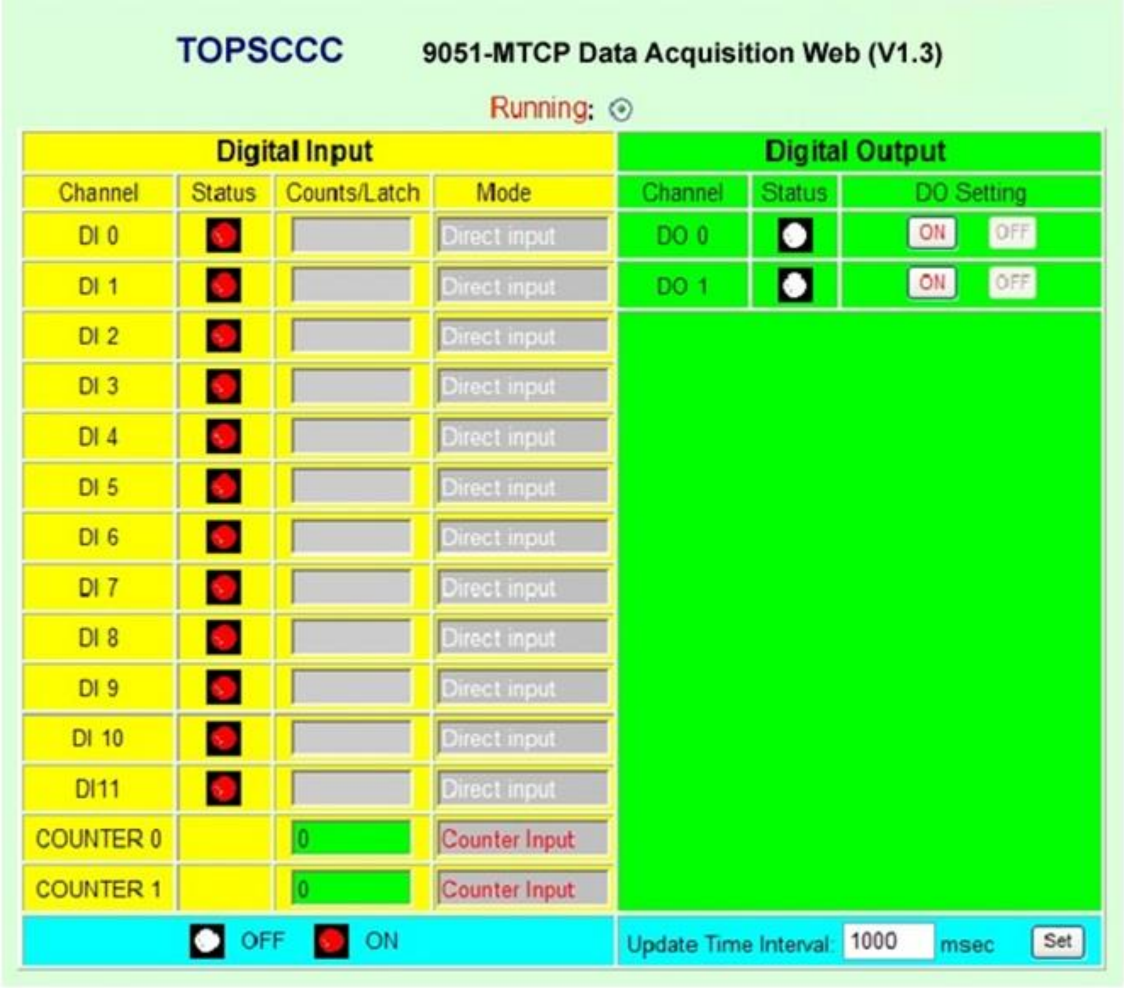
Count/Latch mode : Counter value or latch status of digital input which functions at "Counter" or "Latch"

Mode : Channel operating mode

DO Setting : Set digital output on or off

Time interval : I/O status update time interval

11.3.2 EX-9051A-MTCP monitoring page



TOPSCCC 9051-MTCP Data Acquisition Web (V1.3)

Running: ⊙

Digital Input			
Channel	Status	Counts/Latch	Mode
DI 0	●		Direct input
DI 1	●		Direct input
DI 2	●		Direct input
DI 3	●		Direct input
DI 4	●		Direct input
DI 5	●		Direct input
DI 6	●		Direct input
DI 7	●		Direct input
DI 8	●		Direct input
DI 9	●		Direct input
DI 10	●		Direct input
DI11	●		Direct input
COUNTER 0		0	Counter Input
COUNTER 1		0	Counter Input

○ OFF ● ON

Digital Output		
Channel	Status	DO Setting
DO 0	○	ON OFF
DO 1	○	ON OFF

Update Time Interval: 1000 msec Set

Channel : Channel number of digital input or output

Status : Current input or output status

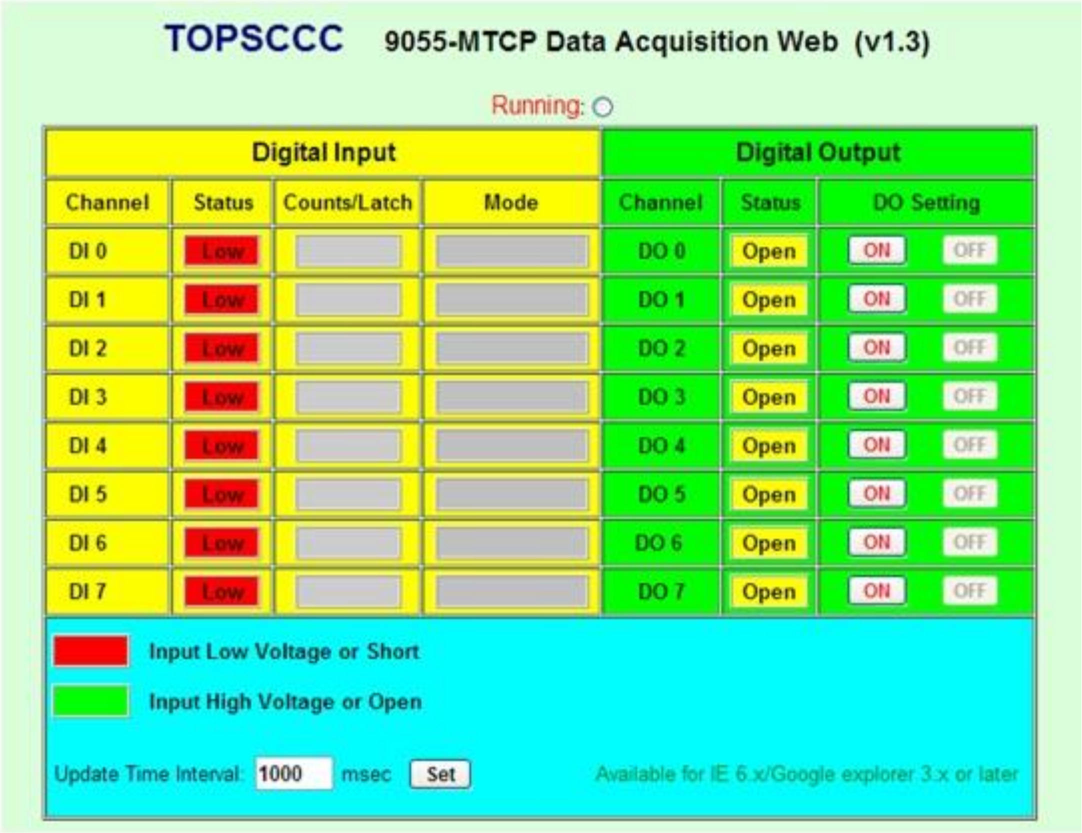
Count/Latch : Counter value or latch status of digital input which functions at “Counter” mode or “Latch” mode

Mode : Channel operating mode

DO Setting : Set digital output on or off

Time interval : I/O status update time interval

11.3.3 EX-9055A-MTCP monitoring page



TOPSCCC 9055-MTCP Data Acquisition Web (v1.3)

Running: ○

Digital Input				Digital Output		
Channel	Status	Counts/Latch	Mode	Channel	Status	DO Setting
DI 0	Low			DO 0	Open	ON OFF
DI 1	Low			DO 1	Open	ON OFF
DI 2	Low			DO 2	Open	ON OFF
DI 3	Low			DO 3	Open	ON OFF
DI 4	Low			DO 4	Open	ON OFF
DI 5	Low			DO 5	Open	ON OFF
DI 6	Low			DO 6	Open	ON OFF
DI 7	Low			DO 7	Open	ON OFF

🟥 Input Low Voltage or Short

🟩 Input High Voltage or Open

Update Time Interval: 1000 msec Set

Available for IE 6.x/Google explorer 3.x or later

Channel : Channel number of digital input or output

Status : Current input or output status

Count/Latch mode : Counter value or latch status of digital input which functions at "Counter" mode or "Latch"

Mode : Channel operating mode

DO Setting : Set digital output on or off

Time interval : I/O status update time interval

Chapter 12 Appendix

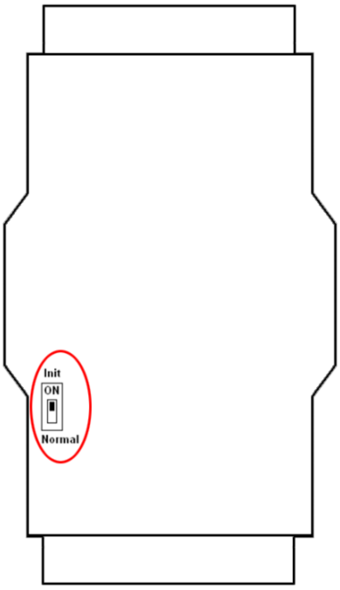
12.1 INIT* switch operation

The EX-9000A/AB-MTCP “INIT*mode” has two purposes, one for reading module current configuration, and another for configuring the module **IP Address, Subnet Mask, and Gateway**.

♦ Reading module current configuration

Each ExpertDAQ module has a built-in EEPROM which is used to store the configuration information such as address ID, type, DIO mode etc.. If the user unfurtunally forget the configuration of the module. User may use a special mode called “INIT* mode” to resolve the problem When the module is set to “INIT* mode”, the default settings are IP Address, Subnet Mask, and Default Gateway (10.0.0.1, 255.0.0.0 and 10.0.0.1)

♦ Originally, the INIT mode is accessed by connecting the INIT* terminal to the GND terminal. New EX-9000A-MTCP modules have the INIT switch located on the rear side of the module to allow easier access to the INIT mode. For these modules, INIT mode is accessed by sliding the INIT switch to the Init position as shown below.



♦ The following steps show you how to enable INIT* mode and read the current configuration:

1. Power off the module.
2. Sliding the INIT switch to the “Init” position.
3. Power on the module.
4. Start up the Windows Utility, it will search all EX-9000A/AB-MTCP I/O modules on the host PC’ to read the current configuration stored in the EEPROM and set new **IP Address, Subnet Mask, and Default Gateway**,
5. Power off the module again
6. Sliding the INIT switch to the “Normal” position.

♦ Factory default settings:

1.	IP Address	: 10.0.0.1
2.	Subnet Mask	: 255.0.0.0
3.	Gateway	: 10.0.0.1
4.	DHCP	: Disabled
5.	Web Server	: Disabled
6.	Module ID	: 00
7.	Password	: 00000000

12.2 Module Status

Power-On Reset will let all output go to Power-On Value. The module may accept the host's command to change the output value. Host Watchdog Timeout will let all digital output go to Safe Value if the host watchdog timeout flag is set, and the output command will be ignored. The module's LED will go to flash and user must reset the module status via command to restore normal operation.

12.3 Dual Watchdog Operation

Dual Watchdog = Module Watchdog + Host Watchdog

The Module Watchdog is a hardware reset circuit to monitor the module's operating status. While working in harsh or noisy environment, the module may be down by the external signal. The circuit may let the module to work continues and never halt. The Host Watchdog is a software function to monitor the host's operating status. Its purpose is to prevent the network/communication from problem or host halt. While the timeout occurred, the module will turn the all output into safe state to prevent from unexpected problem of controlled target. The EX-9000A-MTCP module with Dual Watchdog may let the control system more reliable and stable.

12.4 Reset Status

The reset status of a module is set when the module is powered-on or when the module is reset by the module watchdog. It is cleared after the responding of the first $AA5 command. This can be used to check whether the module had been reset. When the $AA5 command responds that the reset status is cleared, that means the module has not been reset since the last $AA5 command was sent. When the $AA5 command responds that the reset status is set and it is not the first time $AA5 command is sent, it means the module has been reset and the digital output value had been changed to the power-on value.

12.5 Input counter and Input latch

Input counter:

Each input channel has internal counter used to software count the state change (*falling edge*) of input signal (max. 500Hz). The counting value can be read and cleared by sending "*Read digital input counter command*" or " *Clear digital input counter command*".

Input latch:

Each input channel has internal latch which is used to latch the pulse signal from the input. This latched state can be read by sending "*Read latched digital input* " command and cleared by sending "*Clear latched digital input*" command. For example, if the digital input is connected to a key switch. The key switch is a pulse signal. The user may lose the strike information by sending command $AA6. The digital input latch can latch the pulse and ready be read by sending "*Read latched digital input* " command. If the latched state=1 means that there is a key strike occurred.

12.6 Power-on & Safe value

Power-on value:

Power-on value is used to set the module default output value when the module is turned-on or watch dog timeout reset. This function is especially importance in some application where the specific initial output states are required User can set power on value by sending *Set power-on/safe value* command

Safe value:

Safe value are used to set the module outputs into the specific values when Host watchdog timeout If The host watchdog timer is enabled by sending *Set host watchdog timeout value*, the host should send *Host OK* command periodically within Timeout value to refresh the timer, otherwise the module will be forced to safety state.

12.7 DIO Synchronization (Mirror Local DI to DO)

EX-9000A/AB-MTCP series modules also provide a *DIO Synchronization* function. A single digital output channel can be activated (1 or 0) dependent on the digital input channels value. When the specific DI channels value changed from "match" to "mismatch" (or "mismatch" to "match")DI mask pattern, the corresponding DO will be set to active state(1 or 0) dependent on the DO setting. (only for version 6.070 or later)

12.7.1 The *DIO Synchronization* is divided into three modes:

1. DI match/mismatch DO Toggle Mode.
2. DI macth DO latch Mode.
3. DI mismatch DO latch Mode.

✓ Using ASCII command:

✓ Configure DI match/mismatch DO Toggle Mode

Step 1:

Set a single DO channel to *DIO Synchronization Mode*
$AACONNDD

Step 2:

Set *DI match/mismatch DO Toggle Mode* parameters of DIO Sync..
$AAYM1CPSHHHHLLLL(data)

Step3:

Set the digital output channel to activate (ON) or inactivated (OFF).
@AA6ONSS

Step4:

Start(run) DIO Synchronization operation.
$AAYMRCS

✓ Configure DI match/mismatch DO latch Mode

Step 1:

Set a single DO channel to DIO Synchronization Mode
$AACONNDD

Step 2:

Set DI match DO toggler mode of DIO Sync.
$AAYM2CPSTTTT(data) ; for DI *match DO latch* mode
or
$AAYM3CPSTTTT(data) **;** for DI *mismatch* DO latch mode

Step 3:

Set digital output channel to ON or OFF.
@AA6ONSS

Step 4:

Start(run) DIO Sync.
$AAYMRCS

Note: Before enable DIO Synchronization function, you must set DO to “***DIO SYNC. Mode***” first (Ref. $AACONNDD).

Ref. Command: $AACONNDD , **@AA6ONSS**, $AAYMC, $AAYMRCS, $AAYMS, $AAYM1CPSHHHHLLLL(data), $AAYM2CPSTTTT(data), $AAYM3CPSTTTT(data))

✓ Using Modbus-TCP commands:

Step 1:

(X+1453~X+1484) :Set a single DO channel to DIO SYNC. mode.

Step 2:

(X+1615~X+1646) :Set *DO active state* (0/1) when DI match/mismatch and power-on *auto run mode*

Step 3:

(X+1551~X+1582) :Set DI channels to be monitored and DI mask pattern.

Step 4:

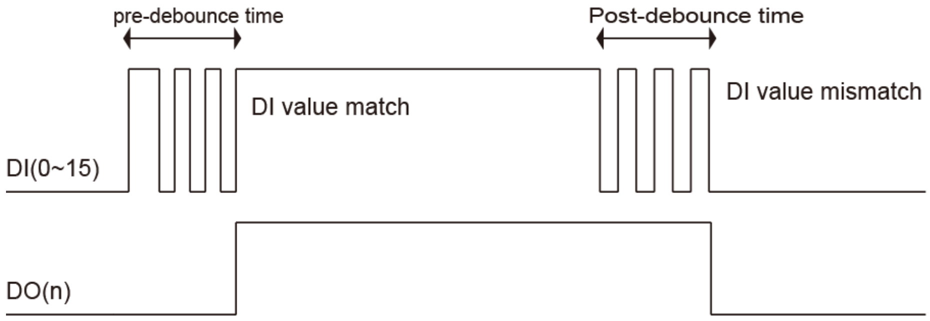
(X+1647~X+1710) :Set DI pre-debounce and post-debounce time.

Step 5:

(X+1517~X+1548) :Run(Start)/Stop DIO Synchronization operation.

12.7.2 DIO Synchronization –DI match/mismatch DO Toggle Mode

A single digital output channel is activated or inactivated (1 or 0) dependent on the specific DI channels value, When the specific DI input value *match/mismatch* DI mask pattern, the corresponding DO will be set to *active/inactive*(1 or 0) state.



♦ **Example** (*using ASCII command*) : (DI match/mismatch DO Toggle Mode)

Assume DI channel 0,2,5 are monitored and the ASCII form of DI mask pattern is XXXXXXXXXX1XX0X1. When DI input ch(0,5)=1 and ch(2)=0, the corresponding DO(0) will be set to activate(ON). DI pre-debounce time is 300 msec and post-debounce time is 150 msec, otherwise(DI value mismatch DI mask pattern) DO(0) will be toggled to inactivate (OFF)

1. Set DO 0 to " DIO SYNC. Mode " (Ref. $AACONNDD)

   command: $01CO0000(cr)

   response: !01(cr) ; valid

2. Set DI mask pattern (DI(0,5)=1 and DI(2)=**0**) and DO(0) to "DI match/mismatch *DO toggle mode*". DI pre-debounce time=300(0x 0012C) msec and post-debounce time=150(0x0096)msec

   P = 1 - enable Auto Run(Start) DIO Synchronization operation when power-on.

   S = 1 - digital output active state(=1),when DI input value match DI mask pattern *(Ref. $AAYM1CPSHHHHLLLL(data))*

   command: $01YM1011012C0096XXXXXXXXXX1XX0X1(cr)

   response: !01(cr) ; valid

3. Set the digital output channel to OFF. *(ref. @AA6ONSS)*
   command: @016O000(cr)
   response: !01(cr) ; valid

4. Start/Run(S=1) DIO Sync. Operation *(Ref. $AAYMRCS)*
   command: $01YMR01(cr)
   response: !01(cr) ; valid

Ref. $AACONNDD, @AA6ONSS, $AAY6MRCS, $AAY6MC, $AAY6MS, $AAYM1CPSTTTT (data), $AAYM2CPSTTTT(data)

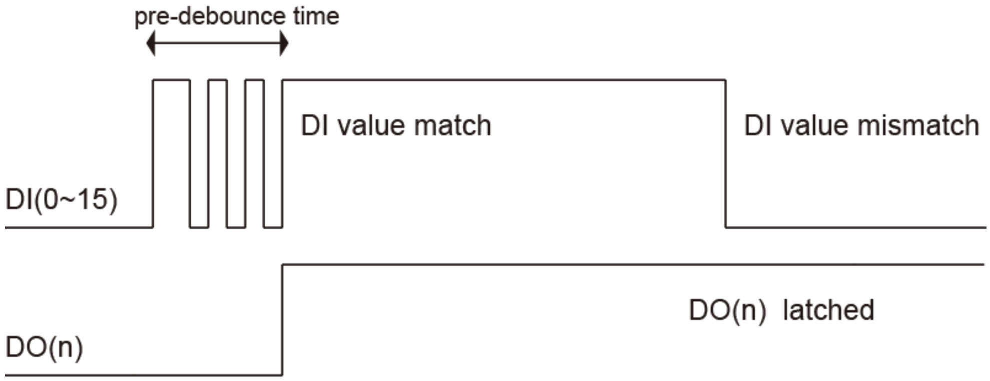
♦ **Example** (*using Modbus command*) : (DI match/mismatch DO Toggle Mode)

Assume DI channel 0,2,5 are monitored and the ASCII form of DI mask pattern is XXXXXXXXXX1XX0X1. When DI input ch(0,5)=1 and ch(2)=0, the corresponding DO(0) will be set to ON(1), otherwise (DI mismatch) DO(0) will be toggled to OFF(0). DI pre-debounce time is 400 msec and post-debounce time is 800 msec

1. (41453) Set DO(0) mode to " DIO SYNC. Mode "
   Request: 01 06 A1 EC 00 00 ; Modbus address=0xA1EC=41453-1=41452
   Response: 01 06 A1 EC 00 00 ; valid
2. (41615) Set DO(0) to "DI match/mismatch DO Toggle Mode" , DO active =1,and enable=1 auto run when power-on
   Request: 01 06 A2 8E 00 0D ; Modbus address=0xA28E=41615-1=41464
   Response: 01 06 A2 8E 00 0D ; valid
3. (41551) Set DI mask pattern (DI(2,3)=1 and DI(0)=0) for DIO Sync. operation.
   Request: 01 06 A2 4E 00 0C ; DI bits(15..0) = (0000 0000 0000 1100). Modbus ; address=0xA24E=41551-1=41550
   Response: 01 06 A2 4E 00 0C ; valid
4. (41552) Set DI channels (3,2,0) to be monitored for DIO Sync. operation.
   Request: 01 06 A2 4F 00 0D ; bits(15..0) = (0000 0000 0000 1101), Modbus ; address=0xA24F=41552-1=41551-
   Response: 01 06 A2 4F 00 0D ; valid
5. (41647) Set debounce time (pre-debounce time=0x0190(400)ms, post-debounce time=0x0320(800)ms
   Request: 01 10 A2 AE 00 02 04 01 90 03 20 ; Modbus address=0xA2AE=41647-1=41646
   Response: 01 10 A2 AE 00 02 ; valid
6. (41517) Run(start) DO(0) DIO Sync.
   Request: 01 06 A2 2C 00 01 ; Modbus address=0xA22C=41517-1=41516
   Response: 01 06 A2 2C 00 01 ; valid

12.7.3 DIO Synchronization –DI match DO latch mode

When DI input value "match" DI mask pattern, the specific single digital output channel will be activated (1 or 0) and latched.



♦ **Example** *(using ASCII command)***:** (DI match DO latch mode)

When the specific DI channels (DI(0)=1, DI(2)=0) , the corresponding DO(0) will be set to ON(1). Assume DI pre-debounce time=0x0096(150)ms

1. Set DO(0) to " DIO SYNC. Mode " (Ref. $AACONNDD)
   command: $01CO0000(cr)
   response: !01(cr) ; valid

2. Assume DI(0)=1 and DI(2)=0 are monitored and DI(1,3,4,5,6..)=X (don't care).
   P = 1 - enable Auto Run(Start) DIO Synchronization operation when power-on.
   S = 1 - set digital output to active state (=1) when DI input data match DI mask pattern
   (Ref. $AAYM2CPSTTTT(data))
   command: $01YM2011012CXXXXXXXXXXXXX0X1(cr)
   response: !01(cr) ; valid

3. Set the DO(0) to inactive state (OFF). *(Ref. @AA6ONSS)*
   command: @016O000(cr)
   response: !01(cr) ; valid

4. Start/Run (S=1) DIO Sync. Operation on (Ref. $AAYMRCS)
   command: $01YMR01(cr)
   response: !01(cr) ; valid

Ref. $AACONNDD, @AA6ONSS, $AAY6MRCS, $AAY6MC, $AAY6MS, $AAYM1CPSHHHHLLLL(data), $AAYM3CPSTTTT(data)

♦ **Example (using Modbus command) :** (DI match DO latch mode)

When the specific DI(2,4)=1 ,DI(0)=0, the corresponding DO(0) will be set to active state(ON). Assume DI pre-debounce time=400ms

1. (41453) Set DO(0) mode to " DIO SYNC. Mode "
   Request: 01 06 A1 EC 00 00 ;Modbus address=0xA1 EC =41453-1=41452
   Response: 01 06 A1 EC 00 00 ; valid
2. (41615) Set DO(0) to "DI Match DO latch mode" , DO latch output =1 and disable auto run when power-on
   Request: 01 06 A2 8E 00 0A ; Modbus address=0xA28E =41615-1=4164
   Response: 01 06 A2 8E 00 0A ; valid
3. (41551) Set DI channels DI(2,4,0) to be monitored and DI mask pattern
   high order word : = 0x0014 = (0000 0000 0001 0100) ; DI mask pattern

low order word : = 0x0015 = (0000 0000 0001 0101) ; DI channels to be monitored

;(1=monitored DI chn,0=not monitored DI chn.)

Request: 01 10 A2 4E 00 02 04 00 14 00 15 ;Modbus address=0xA24E=41551-1=41550

Response: 01 10 A2 4E 00 02 ; valid

4. (41647) Set DI pre-debounce time to=400(0x0190)ms

   Request: 01 10 A2 AE 00 02 04 01 90 00 00 ; Modbus address=0xA2AE=41647-1=41646

   Response: 01 10 A2 AE 00 02 ; valid

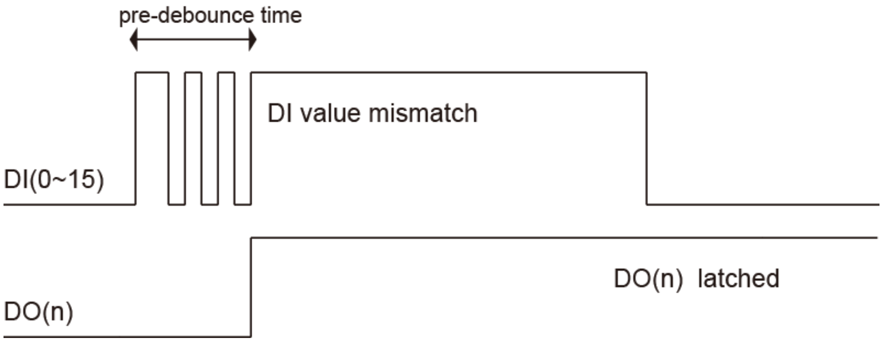
5. (41517) Run(start) DO(0) DIO Sync.

   Request: 01 06 A2 2C 00 01 ; Modbus address=0xA22C=41517-1=41516

   Response: 01 06 A2 2C 00 01 ; valid

12.7.4 DIO Synchronization –DI mismatch DO latch mode

A single digital output channel is activated(1 or 0) dependent on the specific DI value, When the specific DI channels status mismatch DI mask pattern, the corresponding DO will be set to active state(1 or 0)



Example (using ASCII command) : (DI mismatch DO latch mode)

Assume DI mask pattern is 10000001 When DI(2)=1 ,DI(0)=1,, because DI(2)=0 mismatch the value of bit(2) of DI mask pattern, the corresponding DO(0) will be set to ON(1). DI pre-debounce time=300(0x012C) ms

1. Set DO(0) to " *DIO SYNC. Mode* " *(Ref. $AACONNDD)*
   command: $01CO0000(cr)
   response: !01(cr) ; valid
2. Set DI mask pattern and disable auto-run when power-on. DO active state=1
   P = 0 - disable Auto Run(Start) DIO Synchronization operation when power-on.
   S = 1 - digital output active state(=1) when DI value mismatch DI mask pattern
   (Ref. $AAYM3CPSTTTT(data))
   command: $01YM3001012CXXXXXXXXXXXXX0X1(cr)
   response: !01(cr) ; valid
3. Set the DO channel 0 to inactive(OFF). *(Ref. @AA6ONSS)*
   command: @016O000(cr)
   response: !01(cr) ; valid
4. *Start/Run* (S=1) DIO Sync. Operation *(Ref. $AAYMRCS)*
   command: $01YMR01(cr)
   response: !01(cr) ; valid

Ref. $AACONNDD, @AA6ONSS, $AAY6MRCS, $AAY6MC, $AAY6MS, $AAYM1CPSHHHHLLLL(data), $AAYM2CPSTTTT(data)

Example(using Modbus command) **:** (DI mismatch DO latch mode)

When the specific DI(2,4)=1 ,DI(0)=0, the corresponding DO(0) will be set to active state ON(1). Assume DI pre-debounce time=400ms

1. (41453) Set DO(0) to " DIO SYNC. Mode "
   Request: 01 06 A1 EC 00 00 ; Modbus address=0xA1EC =41453-1=41452
   Response: 01 06 A1 EC 00 00 ; valid
2. (41615) Set DIO SYNC. To "*DI misatch DO latch mode*" , DO(0) active output Low(=0) and disable(=0) auto run when power-on.
   Request: 01 06 A2 8E 00 08 ; Modbus address=0xA28E =41615-1=41614
   Response: 01 06 A2 8E 00 08 ; valid
3. (41551) Set DI monitored channels DI(4,2,1) (0000 0000 0001 0101=0x0015) ,DI mask pattern= 0000 0000 0001 0100=0x0014, and DO(0) is mirrored
   Request: 01 10 A2 4E 00 02 04 00 14 00 15 ; Modbus address=0xA24E =41551-1=41550
   Response: 01 10 A2 4E 00 02 ; valid

4. (41647) Set DI pre-debounce time=400(0x0190)ms.

Request:	01 10 A2 AE 00 02 04 01 90 00 00	; Modbus address=0xA2AE =41647-1=41646
Response:	01 10 A2 AE 00 02	; valid

5. (41517) Run(start) DO(0) DIO Sync. opreation

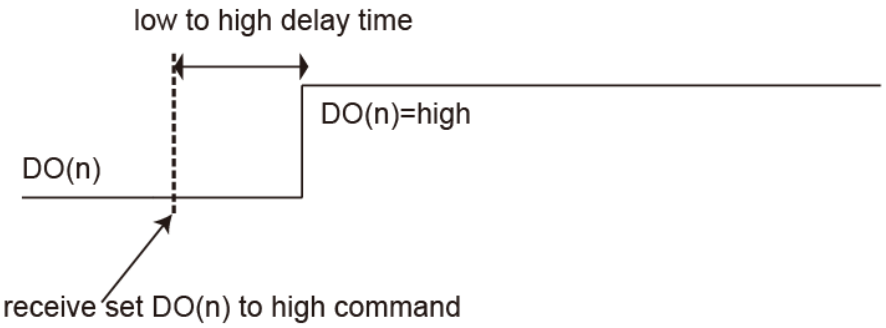
Request:	01 06 A2 2C 00 01	; Modbus address=0xA22C =41517-1=41516
Response:	01 06 A2 2C 00 01	; valid

12.8 High/Low delay output mode

EX-9000A/AB-MTCP series modules supports **high-to-low and low-to-high delay** output function (available for version 6.070 or later)

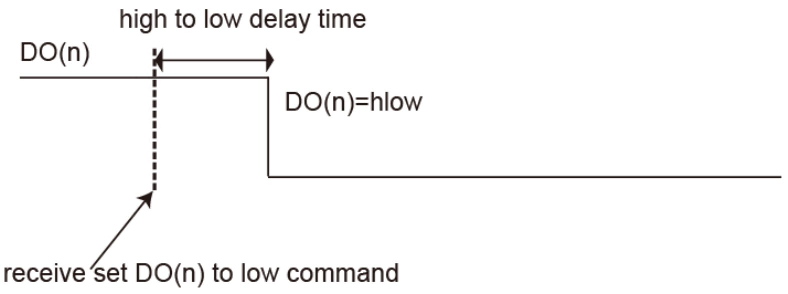
12.8.1 Low to High Delay output

When you choose *Low to High* delay mode, it is almost the same as choosing the DO direct output mode. The only difference is that there will be certain time delay when the output value changes from logic low to logic high. You can define the delay time by entering its value into the delay time text box in the setting area. After you complete the setting, click the" Apply" button. Then you can control the digital output value by the DO button and see its current value by the DO status LED display at the top of the module Display area.



12.8.2 High to Low Delay output

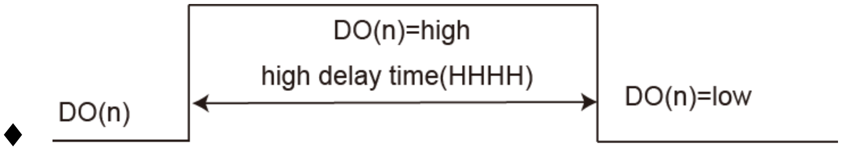
When you choose *High to Low* delay mode, it is almost the same as choosing the DO direct output mode. The only difference is that there will be certain time delay when the output value changes from logic high to logic low. You can define the delay time by entering its value into the Delay time text box in the Setting area. After you complete the setting, click the Apply button. Then you can control the digital output value by the DO button and see its current value by the DO status LED display at the top of the module Display area.



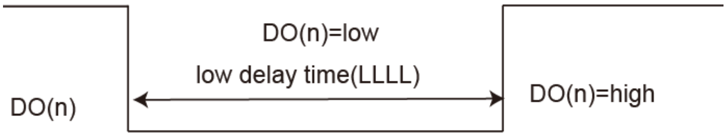
12.9 DO Auto-Off Time Mode

This function is used to force the specific DO channel to work as a monostable operation. After a certain period of time, the DO returns to the stable state until another triggering command is applied.

♦ **Low to High DO(n) pulse output**



♦ **High to Low DO(n) pulse output**



♦ **ASCII command:**

1. $AACONNDD ;Set DO(n) to DO Auto-Off Time Mode
2. $AA9DNNHHHHLLLL ;Set high /low delay width of DO(n)
3. #AA1NDD ; Write DO channel to active

Example: Set the channel-0 of DO to active and the channel-0 of D/O will be auto-off(inactive) after 3 sec.

1. $01CO0006 - Se to DO(0) Auto-Off Time Mode for DO "Low->High->Low.
   (output low is active (ON), outputt high/open is inactive)
2. $019D0017700001 - Set DO High delay time(HHHH=3000ms) and Low delay time(LLLL= 0.5ms).
   (For " Low->High->Low Auto-Off Time mode" LLLL always "0001")
3. #011001 - Write DO channel(0) to active
   wait DO auto-off time (3sec)..........,
   ...
4. the DO channel(0) auto-off from active to inactive.

Example: Set the channel-1 of DO to inactive and the channel-1 of D/O will be auto-off(active) after 3 sec.

1. $01CO0107 - Se to DO(1) Auto-Off Time Mode for DO "High->Low->High.
   (output low is active (ON), outputt high/open is inactive)
2. $019D0100011770 - Set DO High delay time(HHHH=0.5ms) and Low delay time(LLLL= 3000ms).
   (For " High->Low->High Auto-Off Time mode" HHHH always "0001")
3. #011100 - Write DO channel(1) to inactive
   wait DO auto-off time (3sec)..........,
   ...
4. the DO channel(1) auto-off from inactive to active.

♦ **Modbus rtu command:**

1. X+1453 ~ X+1484 ;Set DO(0~31) to low to high delay mode(=2) or high to low delay mode(=3)
2. X+1711 ~ X+1774 ;Set high/low delay time of the specific DO(n)
3. X+1775 ~ X+1806 ;Start *auto-off time Mode* operation