TRP-C28 User's Manual

Introductions

TRP-C28 provides 4 optical isolated digital input channels that allow you to input the logic signal from 0 to 30V DC and 4 power relays output . All channel features screw terminals for the convenience connection of field signals as well as LED to indicate channel status. Each output power relay equips with high surge current suppressors varistor to entirely protect your module and devices without damage when irregularly high power voltage input. TRP-C28 can be configured and conduct self-test by outside dip-switch without complicated setting and connection. Build-in a full set of command, watch-dog, auto reset function the module can be bi-directionally remote controlled by RS485 protocol.
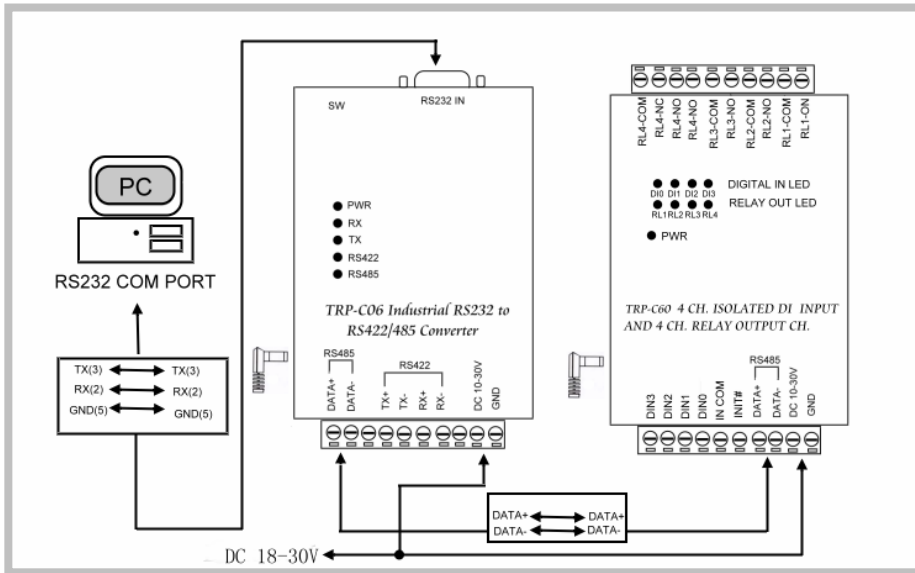
Features

➢All communication's command are perform in ASCII.
➢Programmable in virtually any high-level language.
➢4-CH isolated digital input (with common power) and 4- CH power relay output.
➢Baud Rate can be set from 1200 to 115.2K bps.
➢High surge current suppressors varistor for relay.
➢LED display to indicate input and relay output channels and PWR/watchdog/RS485 status.
➢Dual Watchdog for hardware reset circuit and host operating status .
➢External switch for hardware self-test and module's configuration.
➢Digital Input Isolation with power source (2500 Vrms).
➢Support screw terminal and standard external DC power adaptor.
➢Power input from +18V to +30V DC.

Specification

➢Output Channel: 4 Channel Power Relay.
➢Relay type : 2 Form A (RL1,RL2) , 2 Form C (RL3,RL4).
➢Contact rating : 5A/30V DC , 5A/120V AC , 4A/250V AC.
➢Relay surge strength : 4000V.
➢Relay Operate time : 3mS.
➢Relay Min Life : 2*10(7) ops.
➢Input channel : 4 isolated input channels and counter.
➢Input isolation voltage : 2500Vrms.
➢Digital input level 0 : +1V Max.
➢Digital input level 1 : +4V ~ +30V.
➢Input impedance : 3KΩ.
➢Distance : RS485 up to 4000ft. (1250meters) .
➢Baud-Rate: 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K (bps).
➢Communication protocol : RS485 differential 2 half-duplex wires.
➢Format : Asynchronous data with any combination of bits, parity, stop.
➢RS-485 and input/output connector : Industrial plug-in screw terminal.
➢Power input : DC +18~30V.
➢Power consumption :2.7W.
➢Operating Temperature：-20 to 55℃.
➢Humidity : 10-90% non-condensing.

Digital I/O Module By RS485 Communication
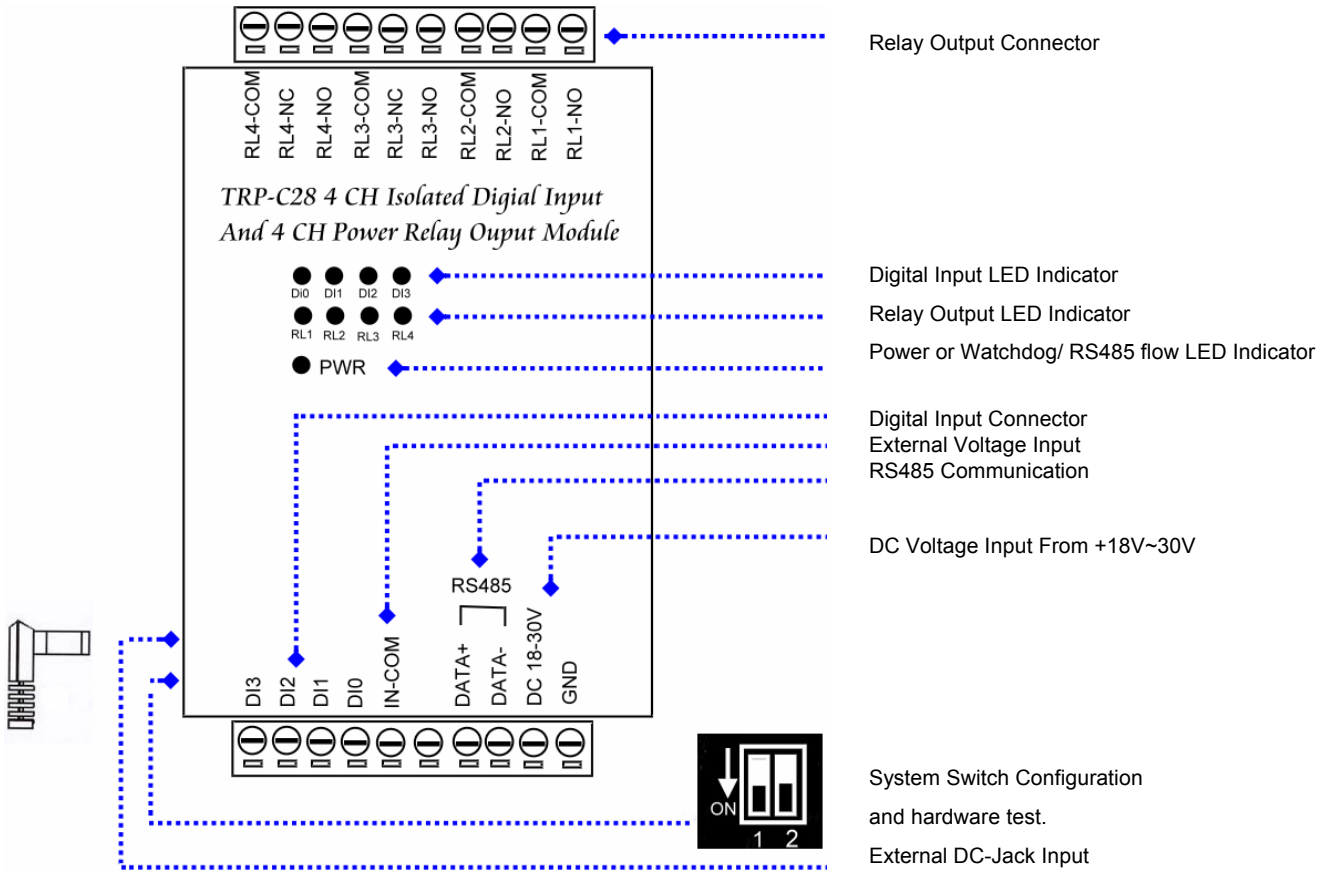
Communication Wiring

Warning: Don't connect external DC-Jack and screw terminal DC input at the same time.

Pin Definitions

DI3	Digital Input CH 3	RL4-COM	Relay 4 –Common
DI2	Digital Input CH 2	RL4-NC	Relay 4-Normal Close
DI1	Digital Input CH 1	RL4-NO	Relay 4-Normal Open
DI0	Digital Input CH 0	RL3-COM	Relay 3 -Common
IN-COM	External Voltage Input For Digital Input	RL3-NC	Relay 3-Normal Close
NC	None	RL3-NO	Relay 3-Normal Open
DATA+	RS485 +	RL2-COM	Relay 2 -Common
DATA-	RS485 -	RL2-NO	Relay 2-Normal Open
DC 18-30V	Input Voltage DC +18-30V	RL1-COM	Relay 1 –Common
GND	Input Voltage Ground	RL1-NO	Relay 1-Normal Open

Digital I/O Module By RS485 Communication

Function Description

Relay Output Connector

Digital Input LED Indicator

Relay Output LED Indicator

Power or Watchdog/ RS485 flow LED Indicator

Digital Input Connector
External Voltage Input
RS485 Communication

DC Voltage Input From +18V~30V

System Switch Configuration

and hardware test.
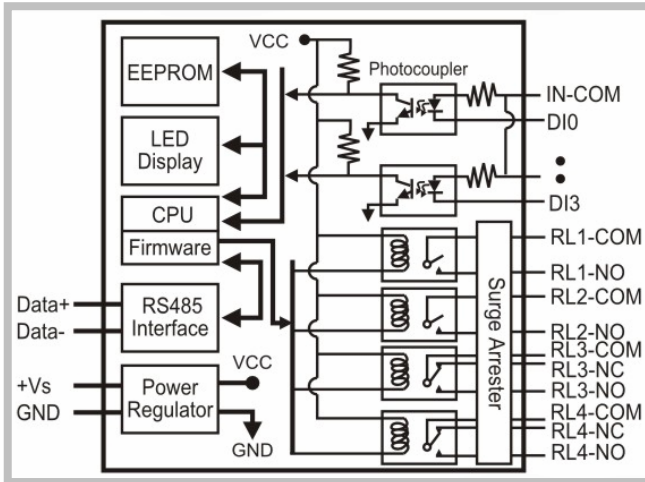
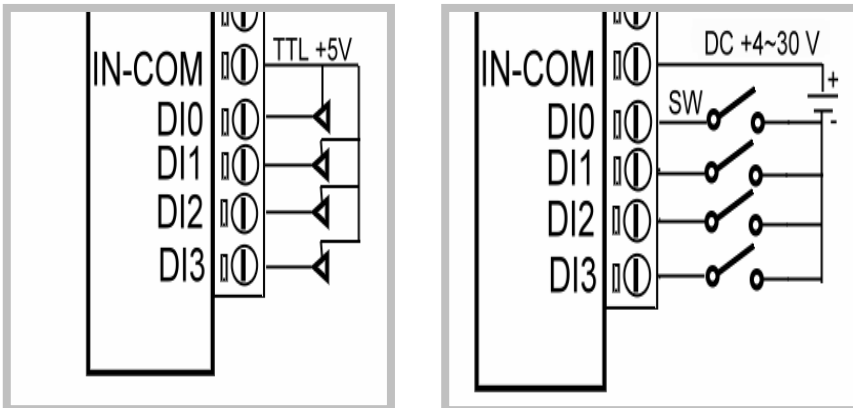External DC-Jack Input

DC-jack connector (0.5*2.1 mm plug).

Use in RS485 interface along with bellowing TRP converter family

TRP-C06   :RS232 to RS422/485 optical isolated converter.
TRP-C07   :RS422/485 optical isolated repeater.
TRP-C06E :RS232 to RS422/485 converter.
TRP-C08   :USB to RS232/422/485 optical isolated converter.
TRP-C36   :TCP/IP to RS232/422/485 optical isolated converter.
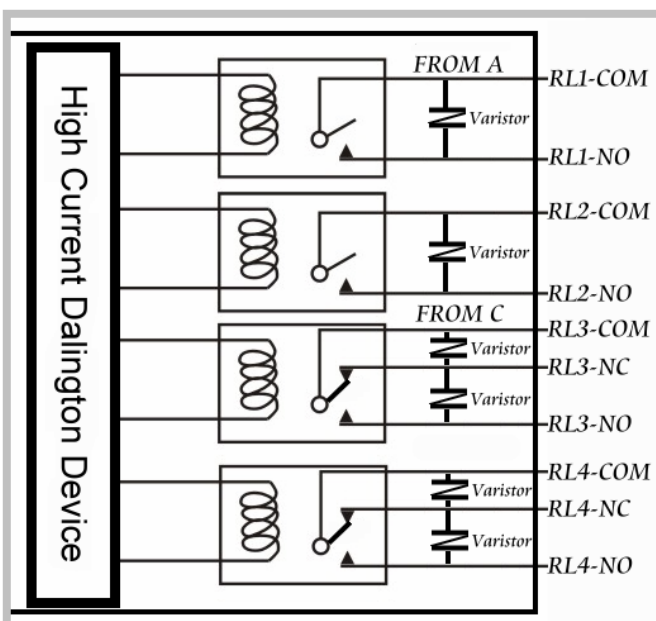TRP-C39   :Multi-mode fiber to RS232/422/485 optical isolated converter.

Digital I/O Module By RS485 Communication
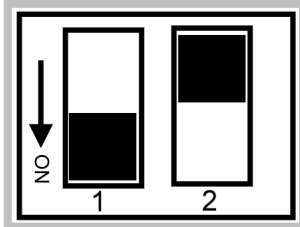
Block Diagram

Wire Connection For Digital Input

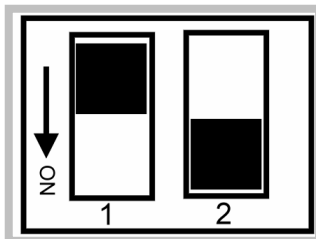Wire Connection For Relay Output

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System Configuration Switch.1

1. Power off the module, then adjust Switch.1 to ON.
2. Power on the module ,The module will be reset to ID=00, baud rate:9600, checksum: Disable!.
3. Send command to configure TRP-C28.
4. Power off the module, then adjust the Switch to OFF.

Self- test Switch.2

1. Power off the module , then adjust switch.2 to ON.
2. Power on the module , The module start self-testing, PWR and digital input LED start lighting one by one, power relay activating.
3. Power off the module to stop self-testing.

Command Description

Default setting:ID Address :01 Baud Rate:9600 DIO Mode Type :40 Checksum:Disable

Command Format :"Leading Code"+"ID Address"+"Command"+"CHK"+(cr) .

Response Format :"Leading Code"+"ID Address"+"Data"+"CHK"+(cr) .

How To Calculate The Checksum

1. Calculate all characters of the command string to get the ASCII sum, except the character return.
2. Mask the sum of string with 0FFH.

Example :

Send the command is "$06M".

Sum of string is "$"+"0"+"6"+"M"="24H"+"30H"+" 4D"="A1H"……The checksum and [CHK]="A1".

Response string with checksum is :" A1 ".

Digital I/O Module By RS485 Communication

Command List

Command List	Function Description	Page Index
%IDNNPPBBDD(CHK)(cr)	Set the module's configuration	See 7.1~7.3
#IDPPDD (CHK)(cr)	Digital Output Data	See 8.1
#IDN (CHK)(cr)	Read digital input N channel counter value	See 9.1
#IDCN (CHK)(cr)	Clear digital input N channel counter's value	See 9.2
#IDCW(CHK)(cr)	Clear all digital input counter's value	See 10.1
#IDCS(CHK(cr)	Save all digital input counter's value to EEPROM	See 10.2
$IDLS(CHK)(cr)	Read digital input latched value	See 11.1
$IDC(CHK)(cr)	Clear digital input latched data	See 11.2
$ID6 (CHK)(cr)	Read digital input/output status	See 12.1
$ID2 (CHK)(cr)	Read the module's configuration	See 12.2
$IDRS (CHK)(cr)	Reset the module	See 13.1
$IDM (CHK)(cr)	Read the module's name	See 13.2
$IDF (CHK)(cr)	Read the module's firmware version	See 14.1
$ID5 (CHK)(cr)	Read reset status	See 14.2
~IDONN (CHK)(cr)	Change the module's name	See 15.1
~IDLEDA(CHK)(cr)	Set the module's LED operating mode	See 15.2
~IDWENN (CHK)(cr)	Enable watchdog and set the timeout value	See 16.1
~IDWD (CHK)(cr)	Disable watchdog	See 16.2
~IDWR (CHK)(cr)	Read watchdog timeout value	See 17.1
~**(CHK)(cr)	System stand by (Host ok!)	See 17.2
~ID4V (CHK)(cr)	Read power on/safe value	See 18.1
~ID5V (CHK)(cr)	Save existing digital output status to power on mode or safe mode	See 18.2
#**	Save existing digital input status	See 19.1
$ID4	Read synchronized data	See 19.2

Safe mode: Digital output when Watchdog enable.
Power on mode: Digital output when power on.
Watchdog: The watchdog is designed to monitor the module's output status to prevent the module from communication problem or system halt due to unexpected situation
*User can save the module output value by using the command "ID5V" if the power is fails.

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7.1 Set the module's configuration *Must adjust the system configuration Switch.1 to ON (See Page 5)

Command	%IDNNPPBBDD(CHK)(cr)	
Syntax Description	%	First leading code
	ID	Address of setting module 00-FF(HEX)
	NN	New address of setting from 00-FF(HEX)
	PP	The Digital I/O module type define to 40
	BB	Set new baud rate (See 7.2)
	DD	Data format (See 7.3)
	CHK	Checksum
	(cr)	Carriage return
Response	!ID(CHK) (cr)	Command valid
	?ID (CHK)(cr)	Command Invalid

7.2 Baud rate (BB) setting

Code number	03	04	05	06	07	08	09	0A
Baud rate	1200	2400	4800	9600	19200	38400	57600	115200

7.3 Data (DD) format setting

Bit	7	6	5	4	3	2	1	0
Function	Input counter 0:Rising 1:Falling	Checksum 0:Disable 1:Enable	0	0	0	0	0	0

EX: Send command:"%0001400600".....If you turn on the system setting switch , the ID will be reset to "00",

New ID is "01",D I/O type is "40" ,Bard-Rate:9600 ,Checksum setting disable is "00", Response:"**!01**".

EX: Send command:%0003400540....New ID="03",Bard-Rate="4800",Checksum="Enable",Response:"**!03**".

*We offer the utility to guide you to configure the module ,the utility is with on-line RS485 modules scanning and searching function. You can find the utility in the CD which bundled in TRP-C24 standard package. (See the page 20).

8.1 Digital output data

Command	#IDPPFD(CHK)(cr)	
Syntax description	#	First leading code
	ID	Address of setting module 00-FF(HEX)
	PP	Output(relay) command parameter :00,0A Multi-Channel :1L:Single-Channel (L=0-3)
	FD	F=0, D:Sent the data from 0-F output for relay channel
	CHK	Checksum
	(cr)	Carriage return
Response	>(CHK)(cr)	Command valid
	!ID(CHK) (cr)	Parameter invalid (*Command data error !)
	?ID (CHK)(cr)	Command Invalid

*Multi-Channel mode (Output control for one BYTE)

EX: Send command :"#010A0F".....Data="0F":DO0-DO3="1111", (RL1/RL2/RL3/RL4= ON).

Response:">"……. Command valid.

EX: Send command:"#010008".....Data="08":DO0-DO3="0001",(RL1/RL2/RL3:OFF/RL4:ON).
Response:">"……. Command valid.

EX: Send command:"#01000G"…Data="0G"…….Data error!.

Response:"!01"…….Parameter error!.

*Single-Channel mode(Output control for one BIT)

EX: Send command:"#011001"….. Data="01":DO0="1".
Response:">"……. Command valid.

Send command:"#011201"….. Data="01":DO2="1".
Response:">"……. Command valid.

Send command:#011300……Data="00":DO3="0".
Response:">"……..Command valid.

9.1 Read digital input N channel counter value

Command	#IDN(CHK)(cr)	
Syntax description	#	First leading code
	ID	Address of setting module 00-FF(HEX)
	N	Digital input channel from channel 0-3
	CHK	Checksum
	(cr)	Carriage return
Response	!IDCCCCC(CHK)(cr)	Command valid CCCCC from 0 – 65535 (DEC)
	?ID(CHK) (cr)	Command Invalid

EX: Send command:"#012"…..Read the TRP-C28 channel 2 counter value.

Response:"!0100023"…..The digital input have been trigger 23 times.

*Unless you save value to EEPROM by using the command "#IDCS". The counter's value will reset to 0 if power fail or send command "$IDRS".

9.2 Clear digital input N channel counter value

Command	#IDCN(CHK)(cr)	
Syntax description	#	First leading code
	ID	Address of setting module 00-FF(HEX)
	C	Clear N channel counter value to 0
	N	N=0-3 *Channel DI0-DI3 digital input
	CHK	Checksum
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID (CHK)(cr)	Command Invalid

EX: Send command:"#01C2"…..Clear DI2 counter value to 0.

Response:"!01".

*If counter's value already been reset to 0 you must use command "#IDCS" to save the new value in EEPROM again , or the module will load old value if power fail or reset.

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Digital I/O Module By RS485 Communication

10.1 Clear all digital input counters value

Command	#IDCW(CHK)(cr)	
Syntax description	#	First leading code
	ID	Address of setting module 00-FF(HEX)
	CW	Clear all digital input counters value
	CHK	Checksum
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID (CHK)(cr)	Command Invalid

EX: Send command:"#01CW"…..Clear DI0-DI3 counter value to 0.

Response:"!01".

* After the command "#IDCW" you must save new value in EEPROM again, or the module will load old value if power fail or reset.

10.2 Save all digital input counters value to EEPROM

Command	#IDCS(CHK)(cr)	
Syntax description	#	First leading code
	ID	Address of setting module 00-FF(HEX)
	CS	Save all channels counter to E2PROM
	CHK	Checksum
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID (CHK)(cr)	Command Invalid

EX: Send command:"#01CS"…..Save DI0-DI3 counters value to EEPROM.

Response:"!01".

Then after power fail or reset

Send command:"#010"……..Read DI0 counter value.

Response:"!0100187"………..Last time save value is "187".

11.1 Read digital input latched

Command	$IDLS(CHK)(cr)	
Syntax description	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	L	Read digital input latch
	S	S=0 Latch logic 0 S=1 No use
	CHK	Checksum
	(cr)	Carriage return
Response	!IDABCD(CHK)(cr)	ACD:NO USE B:DI0-DI3 latch status
	?ID (CHK)(cr)	Command Invalid

EX: Send command:"$01L0".......Read digital input logic 0.
 Response:"!010200 "......... DI1 have been latched.

*Digital input latch: User key in a digital signal to the module and want to read the response of key stoke. However the user will lost the stoke information because the key input is pulse digital input. If user read by the command "$ID6" in time A and time B , the response is that no key stoke. Use command $IDLS can solve this problem , user may read the key stoke in time position A and B.

11.2 Clear digital input latched

Command	$IDC(CHK)(cr)	
Syntax description	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	C	Clear digital input latch
	CHK	Checksum
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID (CHK)(cr)	Command Invalid

EX: Send command:"$01C".......Clear digital input latch .
 Response:"!01 "...............   ...Latch have been clear.

12.1 Read digital input/output status

Command	$ID6(CHK)(cr)	
Syntax description	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	6	Read digital input/output status
	CHK	Checksum
	(cr)	Carriage return
Response	!IDABCD(CHK)(cr)	A=0, B=RL1-RL4 status, C=0,D=DI0-DI3 status
	?ID(CHK) (cr)	Command Invalid

EX: Send command:$016…….Read digital I/O status .

Response:"!01060C"……."6": Relay (RL1,RL4:OFF,RL2,RL3:ON).

"C": Input DI0 ,DI1 for logic "0".

12.2 Read the TRP-C28 configuration

Command	$ID2(CHK)(cr)	
Syntax description	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	2	Read configuration
	CHK	Checksum
	(cr)	Carriage return

Response	!IDPPBBDD(CHK)(cr)	Command valid PP: Digital I/O type=40
		BB: Baud rate
		DD=Data format (See data format table)
		Module model BIT0-2="000" TRP-C28
		        "001" TRP-C24
		        "010" TRP-C26

	?ID(CHK)(cr)	Command Invalid

Data format table

Bit	7	6	5	4	3	2	1	0
Function	Input counter 0:rising 1:falling	Checksum 0:Disable 1:Enable	0	0	0	0	0	0

EX: Send command:$012…Read configuration .

Response:"!01400640"……. DIO type=40,Baud-Rate=9600 (See 7.2) ,Data format=40
Input counter :rising ,Checksum= Enable, Model=0….TRP-C28 (See Data format table),

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Digital I/O Module By RS485 Communication

13.1 Reset the module status

Command	$IDRS(CHK)(cr)	
Syntax description	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	RS	Reset the TRP-C28 module
	CHK	Checksum
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID(CHK) (cr)	Command Invalid

EX: Send command:"$01RS"…….Reset TRP-C28.
 Response:"!01 "……… …………..Have been reset.

*Reset will clear all digital output status.

13.2 Read the module's name

Command	$IDM(CHK)(cr)	
Syntax description	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	M	Reading TRP-C28's name
	CHK	Checksum
	(cr)	Carriage return
Response	!IDNNNNNN(CHK)(cr)	NNNNNN :The chars from 1 –6 chars
	?ID(CHK)(cr)	Command Invalid

EX: Send command:$01M…Read the TRP-C28's name.

Response:"!01TRPC28"……. The module's name is "TRPC28".

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14.1 Read the module's firmware version

Command	$IDF(CHK)(cr)	
Syntax description	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	F	Command for reading module's version
	CHK	Checksum
	(cr)	Carriage return
Response	!IDMODMMYY(CHK)(cr)	MOD :The module type MM:Release Month YY : Release Year
	?ID(CHK)(cr)	Command Invalid

EX: Send command:$01F…Read the TRP-C28's version.

Response:"!01C280605"……. The TRP-C28's version date is "06/2005".

14.2 Read the module reset status

Command	$ID5(CHK)(cr)	
Syntax description	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	5	Command for reading reset status
	CHK	Checksum
	(cr)	Carriage return
Response	!IDS(CHK)(cr)	S =1 has been reset S=0 not been reset
	?ID(CHK)(cr)	Command Invalid

EX: Send command:$015…Read the TRP-C28's reset state .

Response:"!011"……. The TRP-C28 has been reset.

*If the module is system halt or detect abnormal voltage , the module will restart and reset the flag to "1" .

Command	~IDONN(CHK)(cr)	
Syntax description	~	First leading code
	ID	Address of setting module 00-FF(HEX)
	O	Command for rename TRP-C28's name
	NN	NN:TRP-C28's name, Max.6 characters
	CHK	Checksum
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID(CHK)(cr)	Command Invalid

EX: Send command:"~01OTRYCOM"….. Change the TRP-C28's name become to "TRYCOM".

Response:"!01"……. . Command valid.

Then send the command "$01M"…read the TRP-C28's name.

Response:"!01TRYCOM"……. .The TRP-C28's name is "TRYCOM".

15.2 Set the module's LED operating mode

Command	~IDLEDA(CHK)(cr)	
Syntax description	~	First leading code
	ID	Address of setting module 00-FF(HEX)
	LED	Set the module's LED operating mode
	A	A=0 Turn off all LEDS, when logic "1" ON A=1 Turn on all LEDS, when logic "1" OFF
	CHK	Checksum
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID(CHK)(cr)	Command Invalid

EX: Send command:"~01LED0"….. Turn off all LED, when logic "1" ON.

Response:"!01"……. . Command valid.

16.1 Enable watchdog and set the timeout value

Command	~IDWENN(CHK)(cr)	
Syntax description	~	First leading code
	ID	Address of setting module 00-FF(HEX)
	WE	Watchdog Enable
	NN	Set the watchdog time(NN:00-FF) One Unit=0.1 Sec FF: MAX. 25.5 Sec
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID(CHK)(cr)	Command Invalid

EX: Send Command:"~01WEFF"….. Set the watchdog time for 25.5 Sec.

Response:"!01"……. . Command valid, When module count to 25.5 Sec the watchdog will into safe mode ,then PWR LED will flash, before timeout if host send "~**", the watchdog will re-counted!.

*When the module is in safe mode , any digital output command are invalid , you will get the response "!IDWE" , which means the system is in safe mode, you can't change output status.

*Reset and power fail will not affect watchdog mode.

16.2 Disable watchdog

Command	~IDWD(CHK)(cr)	
Syntax description	~	First leading code
	ID	Address of setting module 00-FF(HEX)
	WD	Disable watchdog
	(cr)	Carriage return
Response	!ID(CHK)(cr)	Command valid
	?ID(CHK)(cr)	Command Invalid

EX: Send Command:"~01WD"….. Watchdog disable!.
Response:"!01"……. . Command valid, System LED will stop flashing!.

Digital I/O Module By RS485 Communication

17.1 Read watchdog timeout value

Command	~IDWR(CHK)(cr)	
Syntax description	~	First leading code
	ID	Address of setting module 00-FF(HEX)
	WR	Read watchdog timeout value
	CHK	Checksum
	(cr)	Carriage return
Response	!IDWANN (CHK)(cr) !ID (CHK)(cr)	W: watchdog A=E: watchdog enable D: watchdog disable or safe mode NN: watchdog timeout value
	?ID(CHK)(cr)	Command Invalid

EX: Send Command:"~01WR"…. Read watchdog timeout value.

Response:" !01WD0F"……. . Command valid, set the watchdog timeout is "0F"..1.6 Sec.

17.2 System stand by (Host OK!)

Command	~**(CHK)(cr)	
Syntax description	~	First leading code
	**	Host ok!
	CHK	Checksum
	(cr)	Carriage return
Response		No Response

Before watchdog timeout,Send the Host ok !   NN:Watchdog timeout value

*If watchdog is in enable , send the "Host Ok!" before watchdog timeout (B) the watchdog will re-count, PWR LED will flashing after watchdog timeout.

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Digital I/O Module By RS485 Communication

18.1 Read power on/safe value

Command	~ID4V(CHK)(cr)	
Syntax description	~	First leading code
	ID	Address of setting module 00-FF(HEX)
	4	Read power on/safe digital IO value
	V	V=P: Power On V=S: Safe value
	CHK	Checksum
	(cr)	Carriage return
Response	!IDABCD (CHK)(cr)	A=0 B:DO0~DO3 C=0 D:DI0~ DI3
	?ID(CHK)(cr)	Command Invalid

EX: Send Command:~014S……….Read safe mode digital output status.

Response:" !01080F"……. . Command valid, safe mode digital IO status is "080F".

18.2 Save current digital output status to power on or safe mode

Command	~ID5V(CHK)(cr)	
Syntax description	~	First leading code
	ID	Address of setting module 00-FF(HEX)
	5	Save the current digital output is safe or power on mode
	V	V=P Power On V=S Safe value
	(cr)	Carriage return
Response	!ID (CHK)(cr)	Command valid
	?ID(CHK)(cr)	Command Invalid

EX: Send Command:"#010A0F"…Relay output RL1~RL4= ON/ON/ON/ON

Response:" !01"……. . Command valid!

Then Send Command :" ~015P"….Set the relay output for power on ,.After power fail or reset , The module will load current DO status.

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Command	#**(CHK)(cr)	
Syntax description	#	First leading code
	**	Save current digital IO status(All modules on line).
	CHK	Checksum
	(cr)	Carriage return
Response		No Response

EX: Send Command:"#**"………. Save current digital IO status of all modules on line.

Command	$ID4(CHK)(cr)	
Syntax descrption	$	First leading code
	ID	Address of setting module 00-FF(HEX)
	4	Read synchronized data
	CHK	Checksum
	(cr)	Carriage return
Response	!ABCDE00(CHK)(cr)	Command valid A=1:Have been send"#**" A=0:Have been read BC: Digital output status DE: Digital input status
	?ID	Before send this command do not send the command "#**"

EX: Send Command:"#**"……….Save current digital IO status(All modules on line).
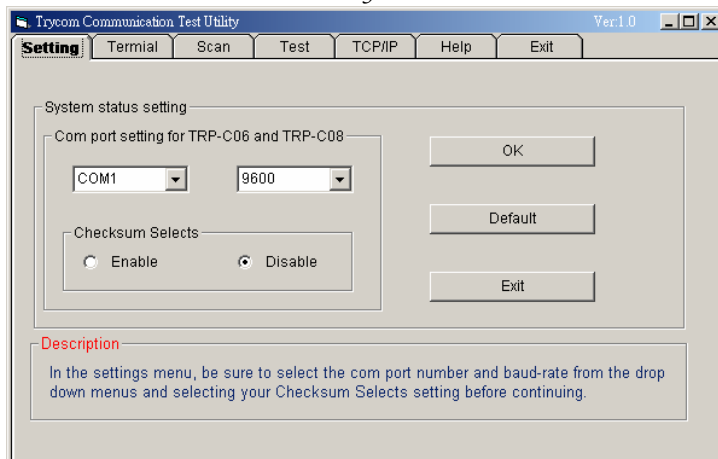
   Then send command:"$014"…. Read synchronized data

   Response:"!1010E00"…."1":Have been send the "#**,the DIO status valid is "010E" *After Read *synchronized data ,A value is"1", Read again become to "0".

Digital I/O Module By RS485 Communication

How to use the utility for windows

The TRPCOM utility can help you to test the module's data transmit and receive ,digital input and output communication status .

Figure 1

1.The "Setting" function will initiate the software to set the Com Port from 1 to 8 and set the baud-rate from 1200 to 19200bps ,and checksum enable or disable. …See Figure 1

*The Module Factory Setting is "9600" and "ID"

Is 01 ,Checksum is Disable.

Figure 2

2.The "Terminal" function enable you to input the module's command to control the module digital input/output status or get module response status …*See Figure 2*
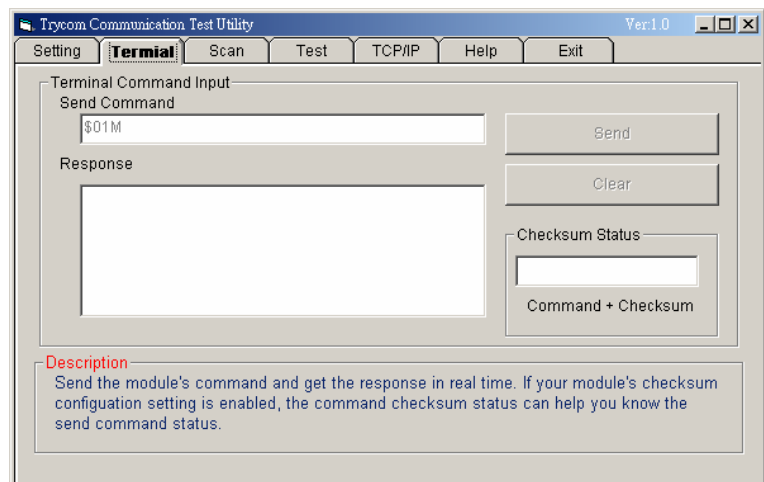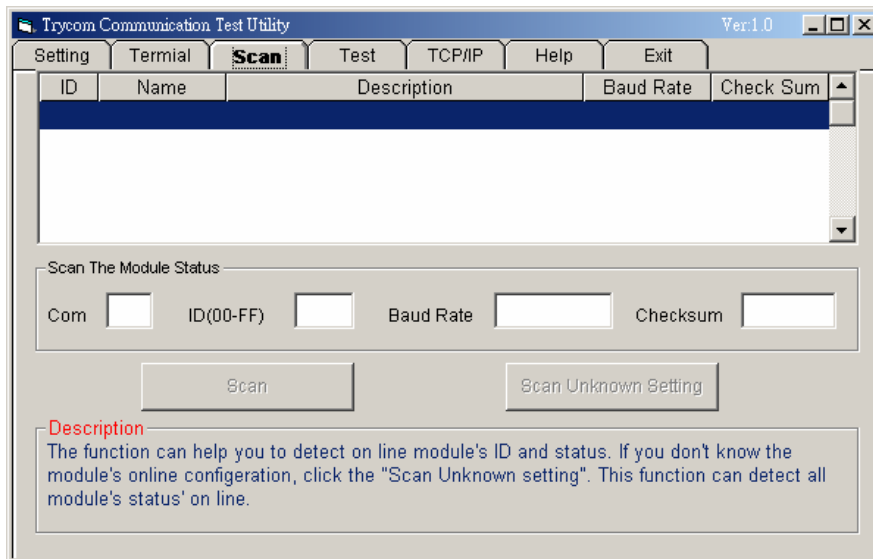
Figure 3

If you don't know the Baud-rate, ID or,Checksum you may select "Scan" to find the module's setting.