User Manual

Version 1.0.0 February 2018

tZT-P4C4

(ZigBee Wireless IO Module)





Written by Bernie Wu

Edited by Kalia Huang

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1. Introduction

1.1 Introduction to ZigBee

ZigBee is a specification for a suite of high-level communication protocols using small, low-power digital radios based on the IEEE 802.15.4 standard for personal area networks. ZigBee devices are often used in mesh network form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones. This allows ZigBee networks to be formed ad-hoc, with no centralized control or high-power transmitter/receiver able to reach all of the devices. Any ZigBee device can be tasked with running the network.

ZigBee is targeted at applications that require a low data rate, long battery life, and secure networking. ZigBee has a defined rate of 250 kbit/s, best suited for periodic or intermittent data transmission or a single signal transmission from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range wireless transfer of data at relatively low rates. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs.

1.2 Introduction to tZT-P4C4

The tZT-P4C4 provides 4 channels for digital input and 4 channels for digital output, each of which features photocouple isolation. The tZT-P4C4 supports sink-type output with short circuit protection, while input is source-type. All input channels can be used a 16-bit counters. There are options for configuring power-on and safe digital output values. 4 kV ESD protection and 3750 VDC intra-module isolation are also provided.

The tZT series products of ICP DAS have the advantage of low cost and low power consumption of ZigBee. Provide wireless communication capability up to 700 meters (LOS) standard transmission distance. Coupled with the dynamic mesh network, users can easily catch DIO data in difficult-to-wire environments.

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1.3 Features

- ISM 2.4 GHz Operating Frequency
- Fully Compliant with 2.4G IEEE 802.15.4 / ZigBee 2007 Pro Specifications
- Wireless Transmission Range up to 300 m
- Adjustable RF Transmission Output Power
- GUI Configuration Software (Windows Version)
- Supports AES-128 Encryption for the Wireless Communication (Passive)
- Supports ZigBee Repeater Function
- 4 Digital Input Channels and 4 Digital Output Channels
- All Digital Input Channels can be used as 16-bit Counters
- Sink-type Digital Output Channels with Overload Protection
- Surge and ESD Protection
- Configurable Power-on Value and Safe Value Settings
- DIN-Rail Mountable

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2. Information to the Hardware

2.1 System Specifications

Module	tZT-P4C4
Communication Interface	
Wireless Standards	ZigBee 2007 Pro
Transmission Power	11dBm (Max. 19dBm)
2.4GHz Antenna	2.4 GHz - PCB Antenna (3dBi, 50Ω)
Transmission Range(LOS)	300m
Protocols	Supports DCON and ModBus
Watchdog	Module(1.6seconds),Communication(Programmable)
LED Indicators	
ZigBee Communication	1LED, Green
Power	1LED, Red
EMS Protection	
ESD (IEC 61000-4-2)	±4 kV Contact for each Terminal
EFT (IEC 61000-4-4)	±1 kV for Power
Power	
Range	+10 V_{DC} ~ +30 V_{DC}
Input Voltage Range	1W Max.
Power Consumption	
Mechanical	52mm x 98mm x 27mm
Dimensions(W x L x H)	DIN-Rail Mounting
Installation	
Environment	-25 ~ +75℃
Operating Temperature	-30 ~ +80℃
Storage Temperature	10 ~ 95% RH(Non-condensing)

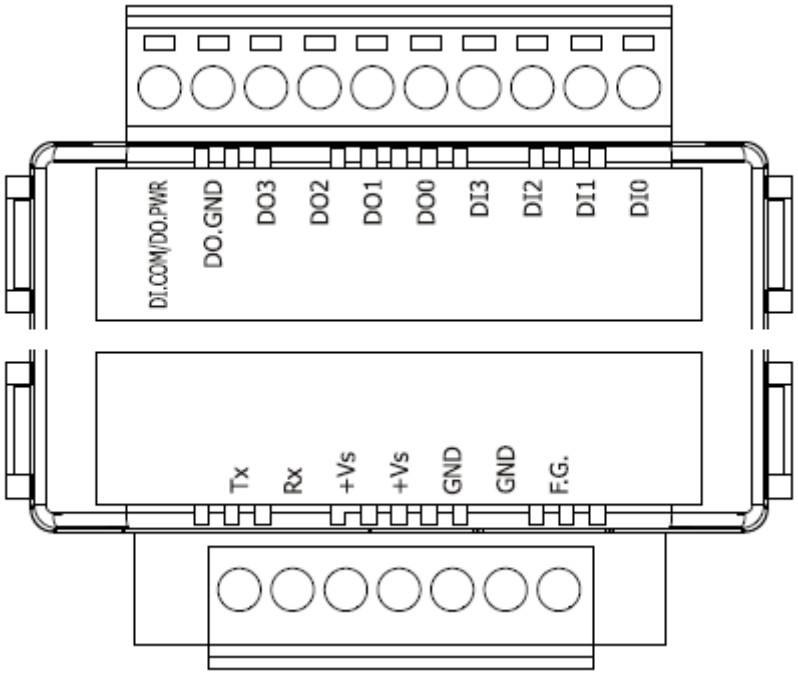
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2.2 I/O System Specifications

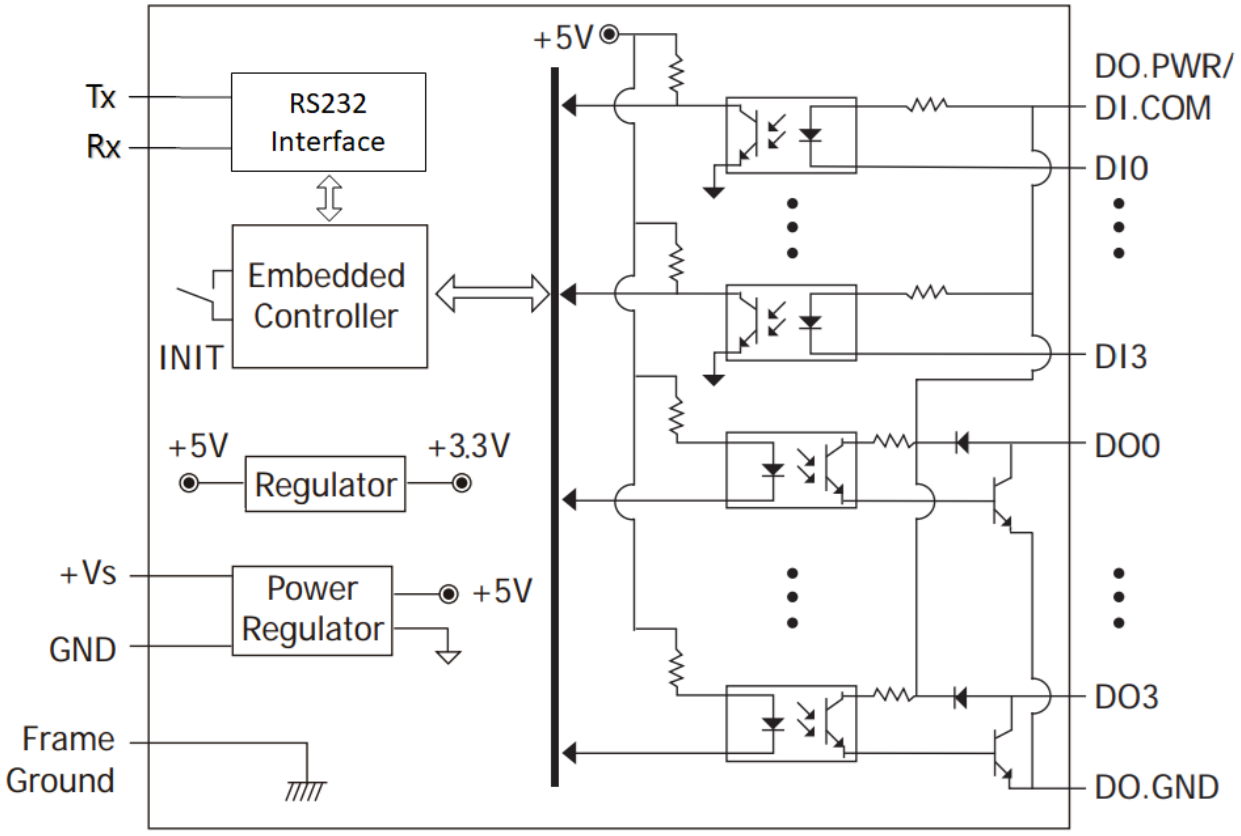
Module		tZT-P4C4
Digital Input / Counter		
Input Channels		4
Type		Wet Contact (Source)
On Voltage Level		+6 VDC ~ +50 VDC
Off Voltage Level		Max. +5 VDC
Counters	Channels	4
	Max. Counts	65535 (16-bit)
	Max. Input Frequency	100Hz
	Min. Pulse Width	5ms
Input Impedance		10 KΩ , 0.66W
Overvoltage Protection		± 70 VDC
Digital Output		
Output channels		4
Type		Isolated Open Collector (Sink)
Load Voltage		+3.5 ~ +50 VDC
Max. Load Current		700mA / channel
Overvoltage Protection		Yes
Overload Protection		Yes
Power On Value		Yes, Programmable
Safe Value		Yes, Programmable

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2.3 Pin Assignments

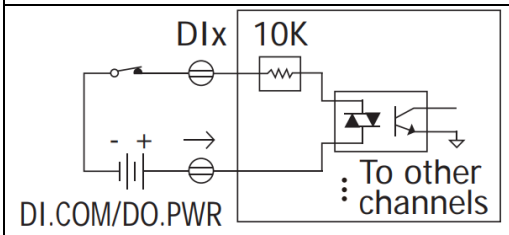
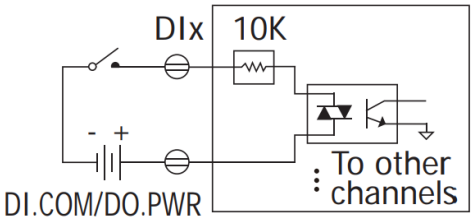


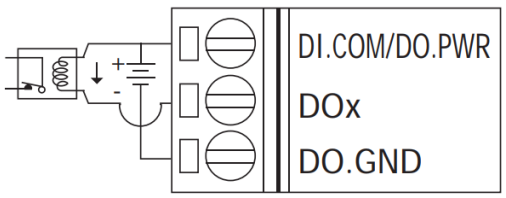
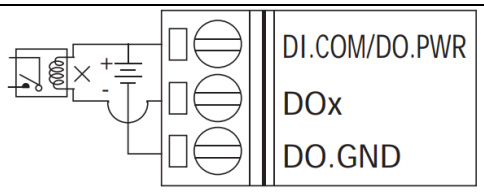
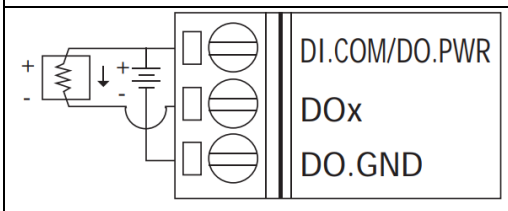
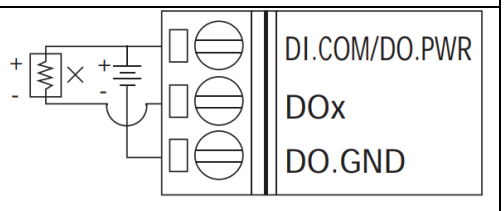
2.4 Block Diagram



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2.5 Wire Connections

Digital Input/ Counter	ON State Readback as 1	OFF State Readback as 0
Source	+6 ~ +50 VDC	OPEN or < 5VDC
		

Output Type	ON State Readback as 1	OFF State Readback as 0
Drive Relay	Relay ON	Relay OFF
		
Resistance Load		
		

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3. Setting up the tZT-P4C4

3.1 Introduction to the Configuration Parameters

i. Pan ID : parameter is the group identity for a ZigBee network, and must the same for all devices in the same ZigBee network.

(tZT-P4C4 module use range : 0x0000~0x3FFF)

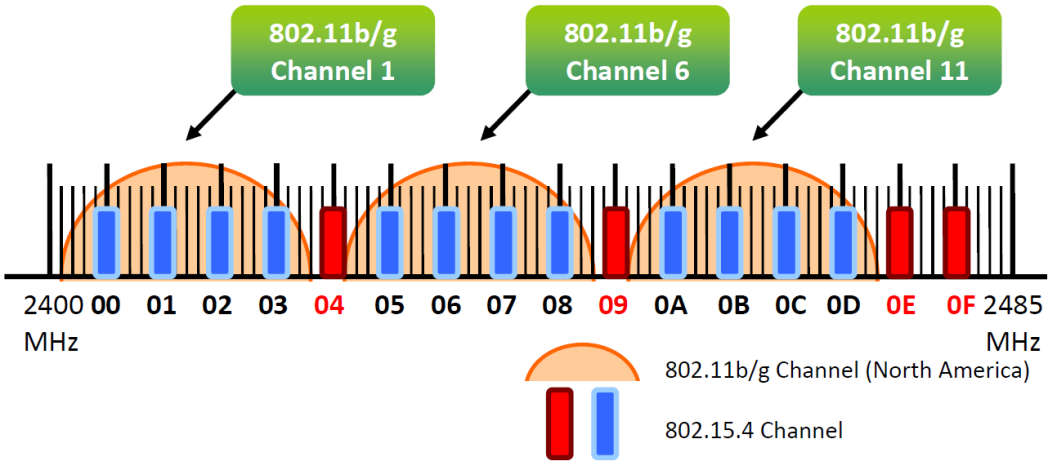
ii. Address / Node ID : parameter is the undivided identity of a specific the ZigBee module, and must be unique for each device connected the same ZigBee network.

(tZT-P4C4 module use range : 0x01~0xFF)

iii. RF Channel : parameter indicates the radio frequency channel, and must be set to the same value as other modules on the same ZigBee network.

Channel	0x00	0x01	……	0x0F
Frequency (MHz)	2405	2410	……	2480

※ RF channels 0x04, 0x09, 0x0E or 0x0F are recommended because they do not overlap with the Wi-Fi frequencies based.



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3.2 Starting the tZT-P4C4

As the ZigBee network is controlled by the ZigBee coordinator, the ZT-2550/ZT-2570 (ZigBee coordinator) must be configured first. Please refer to documents shown below for full details of how to configure these devices.

Once configuration of the ZigBee coordinator has been completed. Set the ”Pan ID” and the “RF Channel” values for the tZT-P4C4 to the same values as the network, and then reboot the device. The module will automatically start to function on the ZigBee network using the default protocol.

Documents

http://ftp.icpdas.com.tw/pub/cd/usbcd/napdos/zigbee/zt_series/document/zt-255x/

http://ftp.icpdas.com.tw/pub/cd/usbcd/napdos/zigbee/zt_series/document/zt-257x/

Configuration Utility (Used to configure ZT-25xx device Coordinator)

http://ftp.icpdas.com.tw/pub/cd/usbcd/napdos/zigbee/zt_series/utility/

3.3 Default parameter

The tZT-P4C4 has a default wireless parameter values in Init mode. Just set the switch to Init and reboot the module, you can connect the module through the following parameter.

(If you don’t want to change existing ZigBee Coordinator settings, you can connect via RS-232)

Protocol	DCON
CheckSum	Disable
PAN ID	0x1234
Node ID	0x01
RF Channel	0x0E
RF Power	0x07

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3.4 Communications Testing

Once the tZT-P4C4 has joined the ZigBee network, the signal quality can be confirmed by monitoring the status of the ZigBee Net LED indicators. If the LED indicator shows a steady light, communication with the tZT-P4C4 has been successfully established for data acquisition and control.

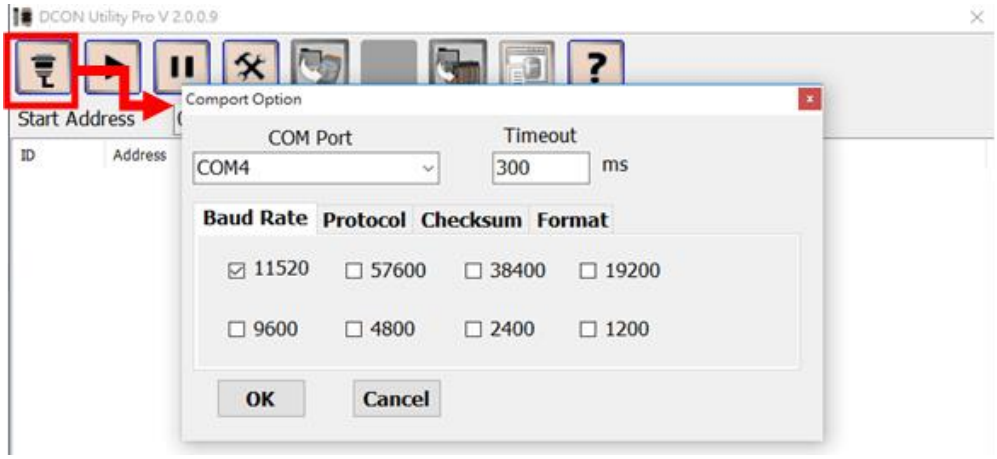
ICP DAS also provides the “DCON Utility”, which can be used to simulate DCON/Modbus communication. This software can also be used to verify the device settings and ZigBee I/O functions.

※ The DCON Utility can be download from:

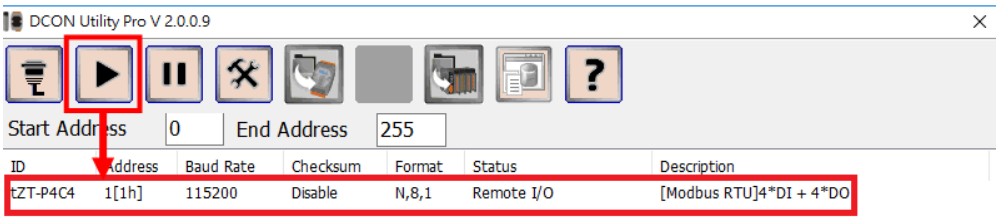
http://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/dcon_utility/

※ Simulating I/O channel operation via the DCON Utility

i. Launch the DCON Utility and select the appropriate COM Port settings to connect to the ZigBee Coordinator (ZT-2550/ZT-2570).

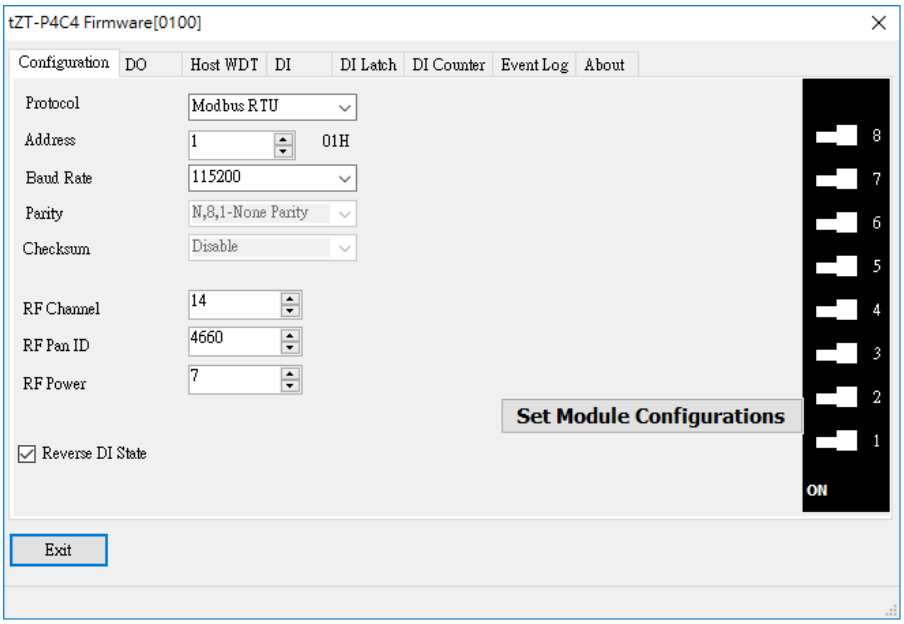


ii. Click the “Search” to start searching for tZT-P4C4 and connected to the ZigBee network.



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iii. If any tZT-P4C4 are found, they will be displayed in the device list window. Double-click the list of the module name to start the platform to operate the I/O channels.



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4. DCON/Modbus RTU Command Set

4.1 How to communication with tZT-P4C4

ICP DAS tZT-P4C4 can operate using both the DCON and the Modbus RTU protocol, and the I/O channel can be easily controlled and monitored via wireless transmission. The document available at the following link gives details of the DCON and Modbus RTU protocol command sets.

http://ftp.icpdas.com/pub/cd/8000cd/napdos/7000/manual/modbusdio.pdf

4.2 DCON Protocol Command Set

tZT-P4C4 are controlled via wireless broadcast commands, so each device must have a unique address that is saved in the EEPROM of the device to denote the difference.

Consequently, all command and response formats contain the destination address of the module. When an I/O device receives a command, it will determine whether or not to respond based on the address contained in the command. However, there are two exceptions, the #** and ~** commands.

DCON Request Command Format：

Leading Character	Module Address	Command	[CheckSum]	CR

DCON Response Command Format：

Leading Character	Module Address	Data	[CheckSum]	CR

Note：’CR’ (Carriage Return) is the character used to end a frame.

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4.2.1 Checksum

※ Calculate the Checksum:

Sum the ASCII code of all the characters contained in the command in addition to the ‘CR’ terminator. The Checksum is the sum value expressed in Hexadecimal format.

※ Example: Request Command ”$012(CR)”

Sum = ‘$’ + ‘0’ + ‘1’ + ‘2’ = 24h + 30h + 31h + 32h = B7h

Checksum = “B7”

DCON Request Command with Checksum = “$012B7(CR)”

※ Example: Response Command ”!01200600(CR)”

Sum = ‘!’ + ‘0’ + ‘1’ + ‘2’ + ‘0’ + ‘0’ + ‘6’ + ‘0’ + ‘0’

= 21h+30h+31h+32h+30h+30h+36h+30h+30h

= 1AAh

Checksum = “AA”

DCON Response Command with Checksum = “!01200600AA(CR)”

※ Note: Checksum is the sum value expressed in capital letters.

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4.2.2 Overview the DCON Command Sets

DI/O Command Sets			
Command	Access	Response	Description
@AA	R	>(Data)	Read the status of DI/O.
			AA：address of the module
			(Data)：four-digital hexadecimal value representing the status of the DI/O [1-2]：DO value [3-4]：DI value
@AA(Data)	W	>	Set the value of DO0~DO3 channels
			AA：address of the module
			(Data)：set value
#AA00(Data) #AA0A(Data)	W	>	Set the value of digital output specified channels.
			AA：address of the module
			00、0A：DO0~DO7
			(Data)：set value
#AA1c(Data) #AAAc(Data)	W	>	Set a single digital output channel of the specified channels.
			AA：address of the module
			1、A：DO0~DO7
			c：digital output channel to be set (0-7)
			(Data) 00：Sets the digital output channel to OFF 01：Sets the digital output channel to ON
#AAN	R	!AA(Data)	Read the digital input counter .
			AA：address of the module
			N：specified channel to be read
			(Data)：counter value

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Command	Access	Response	Description
$AA6	R	!(Data)	Read the DI/O status.
			AA : address of the module
			6 : read status command
			(Data) : a six-digit hexadecimal value indicating the status of the digital input/output channels [1-2] : DO value [3-4] : DI value [5-6] : 00 (reserved)
$AAC	W	!AA	Clear the status of the latched digital input and output channels.
			AA : address of the module
			C : clear command
$AACN	W	!AA	Clear the digital input counter for specified channel.
			AA : address of the module
			C : clear command
			N : specified channel
$AALS	R	!(Data)	Read the latched DI status
			AA : address of the module
			L : read latched status command
			S : status 1 : read high latched status 0 : read low latched status
			(Data) : latched status [1-2] : DO latched [3-4] : DI latched [5-6] : 00 (reserved)

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<table>
<tr><th>Command</th><th>Access</th><th>Response</th><th>Description</th></tr>
<tr><td>~AAD</td><td>R</td><td>!AAVV</td><td>Read the DI/O active status.
AA : address of the module
D : read active status
VV : wo-digit hexadecimal value indicating the active status of the DI/O
Bit1 (OAS)& DO value status table
<table>
<tr><th>DO / OAS</th><th>0</th><th>1</th></tr>
<tr><td>0</td><td>Relay Inactive</td><td>Relay Active</td></tr>
<tr><td>1</td><td>Relay Active</td><td>Relay Inactive</td></tr>
</table>
Bit0 (IAS) & DI value status table
<table>
<tr><th>DI / IAS</th><th>0</th><th>1</th></tr>
<tr><td>0</td><td>High voltage</td><td>No signal or low voltage</td></tr>
<tr><td>1</td><td>No signal or low voltage</td><td>High voltage</td></tr>
</table></td></tr>
<tr><td>~AADVV</td><td>W</td><td>!AA</td><td>Set the DI/O active status.
AA : address of the module
D : read active status command
VV : two-digit hexadecimal value indicating the active status of the DI/O
Bit1 (OAS)& DO value status table
<table>
<tr><th>DO / OAS</th><th>0</th><th>1</th></tr>
<tr><td>0</td><td>Relay Inactive</td><td>Relay Active</td></tr>
<tr><td>1</td><td>Relay Active</td><td>Relay Inactive</td></tr>
</table>
Bit0 (IAS) & DI value status table
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<tr><th>DI / IAS</th><th>0</th><th>1</th></tr>
<tr><td>0</td><td>High voltage</td><td>No signal or low voltage</td></tr>
<tr><td>1</td><td>No signal or low voltage</td><td>High voltage</td></tr>
</table></td></tr>
</table>

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Host Watchdog Command Sets			
Command	Access	Response	Description
~**	W	--	Informs all modules that the host is OK. ** : host OK command
~AA0	R	!AASS	Read the status of the host watchdog. AA : address of the module SS : Two hexadecimal digits that represent the status of the host watchdog Bit2 high : WDT Enable Bit2 low : WDT disable Bit7 high : WDT occurred Bit7 low : WDT not occurred
~AA1	W	!AA	Reset the status of the WDT. AA : address of the module 1 : reset status command
~AA2	R	!AAVV	Read the WDT value. AA : address of the module 2 : read WDT value command VV : two hexadecimal digits to represent the timeout value in tenths of a second Ex : 01 denotes 0.1 seconds
~AA3EVV	W	!AA	Set the WDT enable and value. AA : address of the module 3 : set WDT enable and value command E : status 1 : enable the host watchdog 0 : disable the host watchdog VV : two hexadecimal digits to represent the timeout value in tenths of a second Ex: 0A denotes 1.0 seconds

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Command	Access	Response	Description
~AA4V	R	!AA(Data)	Read the power-on or safe DO value
			AA : address of the module
			4 : read power-on or safe DO value command
			V : P : Power-on Value S : Safe Value
~AA5V	W	!AA	Set current DO status for power-on or safe DO value.
			AA : address of the module
			5 : set current DO status for power-on or safe DO value command
			V : P : Power-on Value S : Safe Value

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General Command Sets			
Command	Access	Response	Description
%AANNTTCCFF	W	!AA	Set the module configuration.
			AA：address of the module
			NN：new address of the module
			TT：new type code, DI/O device always 0x40
			CC：new baud rate, ZigBee I/O devices always 0x0A
			FF：two hexadecimal digits to represent the direction of the DI counter and checksum Bit 6 high/low：checksum enable/disable Bit 7 high/low：rising/falling edge
$AA2	R	!AATTCCFF	Read the module configuration.
			AA：address of the module
			2：read the module configuration command
			TT：type Code of the module should be 0x40
			CC：Baud Rate of the module should be 0x0A
			FF：two hexadecimal digits to represent the direction of the DI counter and checksum Bit 6 high/low：checksum enable/disable Bit 7 high/low：rising/falling edge
$AA5	R	!AAS	Read the reset status.
			AA：address of the module
			5：read the reset status command
			S： 1：first read after powered on 0：not first read after powered on
$AAF	R	!AA(Data)	Read the firmware version
			AA：address of the module
			F：read the firmware version command
			(Data)：firmware version of the module

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Command	Access	Response	Description
$AAM	R	!AA(Data)	Read the module name
			AA：address of the module
			M：read the module name command
			(Data)：name of the module tZT-P4C4：tZT-P4C4
$AAP	R	!AASC	Read the communication protocol
			AA：address of the module
			P：protocol command
			S：support protocol 0：DCON 1：DCON and Modbus RTU
			C：protocol is current used 0：DCON 1：Modbus RTU
$AAPN	W	!AA	Set the communication protocol
			AA：address of the module
			P：protocol command
			N：Set protocol 0：DCON 1：DCON and Modbus RTU
~AARP	R	!AAN	Read the RF Power
			AA：address of the module
			RP：RF Power command
			N：Set Value (0x07 ~ 0x0F)

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Command	Access	Response	Description
~AARPN	W	!AA	Set the RF Power
			AA：address of the module
			RP：RF Power command
			N：Set Value (0x07 ~ 0x0F)
~AARNC	R	!AAPPPPY	Read the PAN ID & RF Channel
			AA：address of the module
			RNC：PAN ID & RF Channel command
			PPPP：PAN ID value Y：RF Channel (0~F)
~AARNCPPPPY	W	!AA	Set the PAN ID & RF Channel
			AA：address of the module
			RNC：PAN ID & RF Channel command
			PPPP：PAN ID value Y：RF Channel (0~F)
Synchronized Command Sets			
Command	Access	Response	Description
#**	W	No Response	Synchronized sampling
			**：Synchronized sampling command
$AA4	R	!S(Data)	Reads the synchronized data
			AA：address of the module
			4：read the synchronized data command
			S：status 1：first read after sampling 0：not first read after sampling
			(Data)：synchronized sampling data [1-2]：synchronized sampling DO value [3-4]：synchronized sampling DI value [5-6]：00 (reserved)

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4.3 The Modbus RTU Protocol Command Set

➢ Modbus RTU Command Format

Field 1	Field 2	Field 3	Field 4~n	Field n+1~n+2
Module Address	Function Code	Sub function	Configuration field	CRC16

Function Code	Description
0x01	Read coils
0x02	Read discrete inputs
0x03	Read multiple registers
0x04	Read multiple input registers
0x05	Write single coils
0x0F	Write multiple coils

※ Examples:

i. To modify the power-on value for module 01, the following command should be sent：

01 46 27 0F BB F9

ii. To read the current DI value of channels 0 to 5, the following command should be sent：

01 02 00 00 00 05 B8 09

iii. To write the DO value 0x0F from channels 0 to 4, the following command should be sent：

01 0F 00 00 00 04 01 FF 7E D6

iv. To only set the DO value of channel 2 to 1, the following command should be sent：

01 05 00 02 FF 00 2D FA

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4.3.1 PLC Address Mapping

Function Code	Description
0x01	Read coils
0x02	Read discrete inputs
0x03	Read multiple registers
0x04	Read multiple input registers
0x05	Write single coils
0x06	Write multiple registers
0x0F	Write multiple coils
0x46	Read/Write module settings

If the function specified in the message is not supported, then the module will respond as below. Note that the Address mapping of the Protocol is base 0.

Error Response

Number	Description	Length	Value
00	Address	1	0x01 to 0xF7
01	Function Code	1	Function code + 0x80
02	Exception Code	1	01

Note：If a CRC mismatch occurs, the module will not respond.

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4.3.2 Overview the ModBus Command Sets

Address (base1)	Address (base0) (Dec/Hex)	Function Code(s)	Access	Data Type	Name	Comments
00001 ~ 00004	0~3 (0x00~0x03)	01, 02	R	Byte	Digital output value of channel 0 ~ 3	Read the status of the DO.
		05	W	Word		Write word to set one DO value. 0xFF00 : set ON 0x0000 : set OFF
		0F	W	Byte		Write byte to set all DO value.
00033 ~ 00036	32~35 (0x20~0x23)	01, 02	R	Byte	Digital input value of channel 0 ~ 3	Read the status of the DI.
00065 ~ 00068	64~67 (0x40~0x43)	01, 02	R	Byte	High latched values of digital input	Read the status of DI high latched.
00069 ~ 00072	72~75 (0x48~0x4B)	01, 02	R	Byte	High latched values of digital output	Read the status of DO high latched.
00097 ~ 00100	96~99 (0x60~0x63)	01, 02	R	Byte	Low latched values of digital input	Read the status of DI low latched.
00101 ~ 00104	104~107 (0x68~0x6B)	01, 02	R	Byte	Low latched values of digital output	Read the status of DO low latched.
00129 ~ 00132	128~131 (0x80~0x83)	01, 02	R	Byte	Safe value of digital output channel 0 ~ 3	Read the status of DO safe value.
		05	W	Word		Write word to set one DO safe value. 0xFF00 : set ON 0x0000 : set OFF
		0F	W	Byte		Write byte to set all DO safe value.

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Address (base1)	Address (base0) (Dec/Hex)	Function Code(s)	Access	Data Type	Name	Comments
00161 ~ 00164	160~163 (0xA0~0xA3)	01, 02	R	Byte	Power on value of digital output channel 0 ~ 3	Read the status of DO power on value.
		05	W	Word		Write word to set one DO power on value. 0xFF00 : set ON 0x0000 : set OFF
		0F	W	Byte		Write byte to set all DO power on value.
00257	256 (0x100)	01, 02	R	Bit	Use protocol	Read use protocol. 0 : DCON, 1 : Modbus RTU
00260	259 (0x103)	01, 02,	R	Bit	WDT mode	Read the mode of the host watchdog 0 : same as I-7000 1: can use AO and DO command to clear host watchdog timeout status.
		05	W	Word		Set the mode of the host watchdog 0xFF00 : Set 1, 0x0000 : Set 0.

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Address (base1)	Address (base0) (Dec/Hex)	Function Code(s)	Access	Data Type	Name	Comments
00261	260 (0x104)	01, 02,	R	Bit	WDT enable	Read the status of the host watchdog 1 : Enable 0 : Disable
		05	W	Word		Write the status of the host watchdog 0xFF00 : enable 0x0000 : disable
00108	263 (0x107)	05	W	Byte	Clear latched	Write word to Clear latched. 0xFF00 : Clear.
00270	269 (0x10D)	01, 02,	R	Byte	WDT status	Read the status of the host watchdog Bit2 : WDT enable Bit7 : WDT timeout
		05	W	Word		Clear the status of the host watchdog 0xFF00 : Clear status.
00273	272 (0x110)	01, 02	R	Bit	Reset status	Read reset status 1 : first read after powered on. 0 : not first read after powered on.

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Address (base1)	Address (base0) (Dec/Hex)	Function Code(s)	Access	Data Type	Name	Comments
00513	512~515 (0x200~0x203)	05	W	Byte	Clear DI count	Clear DI count 0xFF00 : Clear times.
		0F	W	Byte		Write byte to clear count 1 : Clear times. 0 : Ignore.
30001~30004	0~3 (0x00~0x03)	03, 04	R	Word	Digital input counter value of channel 0 ~ 3	Read the status of the digital input count.
30481	480 (0x01E0)	03, 04	R	Byte	Firmware version (low byte)	Read the firmware version. (low byte)
30482	481 (0x01E1)	03, 04	R	Byte	Firmware version (high byte)	Read the firmware version. (high byte)
30483	482 (0x01E2)	03, 04	R	Byte	Module name (low byte)	Read the module name. (low byte)
30484	483 (0x01E3)	03, 04	R	Byte	Module name (high byte)	Read the module name. (high byte)
30485	484 (0x01E4)	03, 04	R	Word	Module address	Read node ID.
		06	W	Word		Write node ID.
		10	W	Word		Write node ID.
30489	488 (0x01E8)	03, 04,	R	Word	Timeout value	Read watchdog timeout value.
		06	W	Word		Write watchdog timeout value.
30492	491 (0x01EB)	03, 04,	R	Byte	Timeout count	Read watchdog timeout times.
		06	W	Byte		Clear watchdog timeout times.

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Address (base1)	Address (base0) (Dec/Hex)	Function Code(s)	Access	Data Type	Name	Comments
30503	502 (0x01F6)	03, 04	R	Byte	RF Power value	Read RF Power.
		06	W	Byte		Write RF Power.
30504	503 (0x01F7)	03, 04	R	Byte	RF Channel	Read RF Channel.
		06	W	Byte		Write RF Channel.
30505	504 (0x01F8)	03, 04	R	Word	Pan ID	Read Pan ID.
		06	W	Word		Write Pan ID.
312345	12344 (0x3038)	03, 04	W	--	Host OK	Informs all modules that the host is OK.

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4.3.3 Read/Write the Module Settings (0x46)

Sub-function	Access	Data Type	Name	Comments
0 (0x00)	R	Word	Module name	Read the Name of the module. tZT-P4C4 : byte0(Address) 46 00 17 44 00 00
4 (0x04)	W	Byte	Module address	Write the module node ID.
5 (0x05)	R	Long	Communication setting	Read the communication setting.
32 (0x20)	R	Word	Firmware version	Read the firmware version.
33 (0x21)	W	Byte	DI Counter Edge Value	Write DI counter edge value.
34 (0x21)	R	Byte	DI Counter Edge Value	Read DI counter edge value.
39 (0x27)	W	Byte	Power on value of digital output channel 0 ~ 3	Write the status of the digital output power on value.
40 (0x28)	R	Byte	Power on value of digital output channel 0 ~ 3	Read the status of the digital output power on value.
41 (0x29)	W	Byte	DI/O Active Status	Write the DI/O active status.
42 (0x2A)	R	Byte	DI/O Active Status	Read the DI/O active status.

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5. Troubleshooting

(1) Technical Support.

If you have any difficulties using your tZT-P4C4, please send a description of the problem to service@icpdas.com

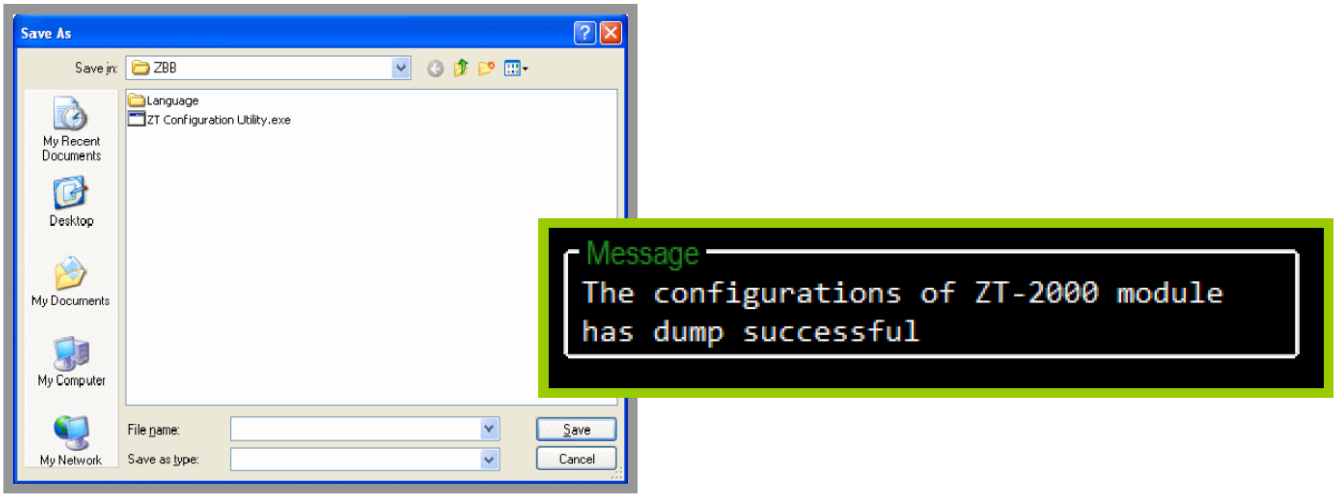
Include the following items in your email:

- A copy of the configuration file for the coordinator. This file can be obtained using the procedure outlined below and should be attached to your email.

a. Set the DIP switch of the ZT-25xx device to the [ZBSET] position then reboot the device. Launch the ZT Configuration Utility and select [Save Log] icon to save the configuration of the ZT-25xx as a file.



After clicking the [Save Log] icon, enter the “File Name” and the “File Path” in the Windows “Save” dialog box. Once the configuration has been successfully saved, the following message will be displayed.



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6. Appendix A

6.1 Dual Watchdog Operation

Dual Watchdog = Module Watchdog + Host Watchdog

The Module Watchdog is a hardware reset circuit that monitors the operating status of the module. While working in harsh or noisy environments, the module may be shut down by external signals. The Watchdog circuit allows the module to operate continuously without disruption.

The Host Watchdog is a software function that monitors the operating status of the host. Its purpose is to prevent problems due to network/communication errors or host malfunctions. When a Host Watchdog timeout occurs, the module will reset all outputs to a safe state in order to prevent any erroneous operations of the controlled target.

tZT-P4C4 include an internal Dual Watchdog, making the control system more reliable and stable.

6.2 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, and is cleared after responding to the first $AA5 command. This can be used to check whether the module had been previously reset. When the response $AA5 to the command indicates that the reset status has been cleared, it means that the module has not been reset since the last $AA5 command was sent. When the response $AA5 to the command indicates that the reset status has been set, and it is not the first time the $AA5 command has been sent, it means that the module has been reset and the digital output value has been changed to the power-on value.

6.3 Digital Output

In addition to configuring the module using digital output commands, the digital output channels can be configured under two other conditions.

Safe Value

When the Host Watchdog is enabled and a Host Watchdog timeout occurs, the “safe value” is loaded to the digital output channels. Any digital output commands have no

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effect on the digital output ports until the Host Watchdog timeout status is cleared. The Host Watchdog timeout status is saved in the EEPROM, and the status will not be changed, even after a power-on reset. The timeout status can only be cleared by sending the Reset Host Watchdog timeout status command, ~AA1. See Section 6.1 for detailed information regarding the Host Watchdog.

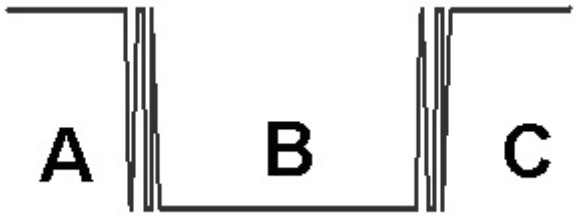
Power-on Value

When the module is powered on and the Host Watchdog timeout status is cleared, the “power-on value” will be loaded to the digital output channels after a power-on reset. If the Host Watchdog timeout status has not been cleared during the power-on process, then the safe value will be loaded to the digital output channels. ◦

6.4 Latched Digital Input

tZT-P4C4 module allows commands to be used to read the status of both the latched high digital input channels and latched low digital input channels. The following is an example that shows the usefulness of latched digital input.

If we read the input of a key switch that is connected to the digital input channel of a module, the input signal is a pulse signal, as shown in the following figure.



In this diagram, it can be seen that during periods A and C, the signal is active, but during period B, the signal is inactive for some unknown reason.

If we attempt to use the Read Digital Input Status command (@AA) to read the signal, but we cannot send the command during period B because of an unknown reason, then the input information will be lost. However, by using the Read Latched Digital Input command ($AALS), we can still retrieve the input information, even if we are not able to send a command during period B.

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6.5 LED Display Status

An LED indicator is used to display the status of the power (PWR), the ZigBee network.

LED	Status	Introduction
ZigBee Net (Green LED)	ZigBee Coordinator (Host)	
	Steady Lit	ZigBee network is Establish
	Blink to Steady Lit	Rejoin ZigBee network or it has occupied
	ZigBee Router (Slave)	
	Steady Lit	The Signal is Strong
	Blink (500 ms)	The Signal is Available
	Blink (1s)	The Signal is Weak
	Blink (2s)	The Signal is unstable or there is no available
ZigBee PWR (Red LED)	The status of module board	
	Steady Lit	The Power is ON and the Module Initialization is Correct
	Blink (500 ms)	Module Initialization Failure
	Blink (1s)	Watchdog is Enabled and the status of the I/O channel has been changed to the Safe Value. Reset the module via the power switch or configuration commands.
	Steady Unlit	The Power is OFF

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7. Appendix B. Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
1.0.0	January 2018	Initial issue(Written by Bernie Wu)

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