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RemoDAQ-8018B Module

User's Manual

Beijing DSLC Technology Co.，Ltd

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Additional Information and Assistance

1. Visit the DSLC websites at **www.DSLC.com.cn** where you can find the latest information about the product.

2. Contact your distributor, sales representative, or DSLC's customer service center for technical support if you need additional assistance. Please have the following information ready before you call：

- Product name and serial number
- Description of your peripheral attachments
- Description of your software (operating system, version，application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

Table of Contents

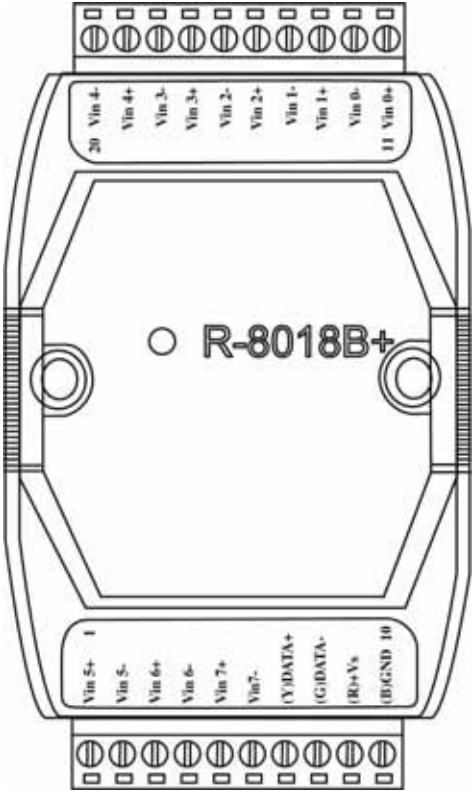
1 Introduction

The RemoDAQ-8000 Series is data collection and control module based on RS-485 net. They provide analog input, analog output, digital input/output, timer/counter, collection AC, wireless communication, and other functions. These modules can be long-range controlled by command.

RemoDAQ-8018B is RemoDAQ-8018 with Modbus protocol, its features are given as following：

- 3000VDC Isolated
- Software calibration
- 24-bits sigma-delta ADC to provide excellent accuracy.
- CJC inside, can connect thermocouple directly.
- TVS over Voltage protect
- PTC over Current protect

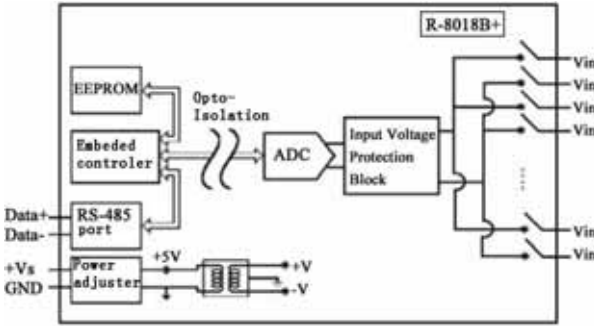
1.1 Pin Assignment & Specifications



1.2 Features

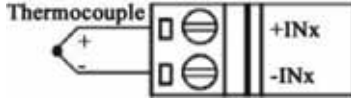
- Input Channels：8 differential analog
- Input type：thermocouple
- Thermocouple type：J, K, T, E, R, S, B
- Conversion rate：10samples/sec
- Bandwidth：15.7Hz
- Accuracy：±0.1%
- Zero drift：0.5μV/°C
- Span drift：25ppm/°C
- CMR(50/60Hz)：150dB
- NMR(50/60Hz)：100dB
- Input impedance：20M Ohms
- Over-voltage protection：±35V
- Isolation voltage：3000VDC
- Power input：+10V~+30VDC
- Power consumption：1.2W/24VDC
- Operating Temperature：-20 ~ 70° C
- Humidity：5 ~ 90%, non-condensing

1.3 Block Diagram



1.4 Wiring Illumination

RemoDAQ-8018B： Thermocouple Wire Connection



1.5 Default Setting

- **Address:**01
- **Analog output type：**type 0F, K type thermocouple
- **Baudrate：**9600 bps
- Checksum disable, 60Hz filter rejection, engineer unit format

1.6 Jumper Setting

The jumper setting of RemoDAQ-8018+ are as follows：

Channel input mode (JP0~JP7)：

20mA input setting	Voltage input setting
	 Default

INIT* mode setting (JP9~10)：

6-diff and 2 single- ended	8-diff mode
	

In 8-diff mode use SW1 set Init* state：

 INIT mode

1.7 Calibration

Don’t implement calibration before you understand the exact meaning of calibration!

Calibration for RemoDAQ-8018B

Type	00	01	02	03	04	05	06
Min	0mV	0mV	0mV	0mV	0V	0V	0mA
Max	+15mV	+50mV	+100mV	+500mV	+1V	+2.5V	+20mA

Calibration step for RemoDAQ-8018B

1. The calibration type is 0F
2. Connect the calibration resistance to channel 0

3. Before calibration, in order to get better precision, please apply power to the module and let it warm up for about 30 minutes.

Calibrate Order Example：

1. Setting type to 0F
2. Give zero calibration resistance
3. Perform zero calibration command
4. Give span calibration resistance
5. Perform span calibration command
6. Repeat step 2 to step 5 three times.

The calibration orders of other types are similar, but the setting type in first step is different.

1.8 Install List

Baudrate Setting (CC)

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

Analog Input Type Setting (TT)

Type code	0E	0F	10	11	12	13	14	15	16	17	18
T.C. type	J	K	T	E	R	S	B	N	C	L	M
Min temp.	-200	-250	-250	-250	0	0	0	-250	0	-200	-200

Max temp.	1100	1400	400	900	1750	1750	1800	1300	2320	800	100
The temperature unit is centigrade.											

Data format setting（FF）

7	6	5	4	3	2	1	0
*1	*2	0	0	0	0	*3	

*****1：0=60Hz Restrain　　1=50Hz Restrain

*****2：Checksum：0=Disabled; 1=Enable

*3：00 = Engineer Unit Format

01 = Percent Format

10 = 2's Complement HEX Format

Analog Input Type And Data Format Table

Code	Input span	Data format	+F.S.	Zero	-F.S
02	-100~+100mV	Project Unit	+100.000	+000.000	-100.000
		%（FSR）	+100.000	+000.000	-100.000
		2's Complement HEX	7FFF	0000	8000
03	-500~+500mV	Project Unit	+500.000	+000.000	-500.000
		%（FSR）	+100.000	+000.000	-100.000
		2's Complement HEX	7FFF	0000	8000
04	-1~+1V	Project Unit	+1.000	+000.000	-1.000
		%（FSR）	+100.000	+000.000	-100.000
		2's Complement HEX	7FFF	0000	8000
05	-2.5~+2.5V	Project Unit	+2.5000	+0.0000	-2.5000
		%（FSR）	+100.000	+000.000	-100.000
		2's Complement HEX	7FFF	0000	8000

08	-10V~+10V	Project Unit	+10.000	+000.000	-10.000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000
09	-5V~+5V	Project Unit	+5.000	+0.0000	-5.000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000
0D	-20mA~+20mA	Project Unit	+20000	+0.0000	-20000
		%（FSR）	+100.000	+000.00	-100.00
		2's Complement HEX	7FFF	0000	8000
0E	J type -200~1100	Project Unit	+1100.00	+00.000	-200.00
		%（FSR）	+100.000	+000.00	-018.18
		2's Complement HEX	7FFF	0000	E8B9
0F	K type -250~1400	Project Unit	+1400.00	+00.000	-0250.0
		%（FSR）	+100.000	+000.00	-017.86
		2's Complement HEX	7FFF	0000	E924
10	T type -250~400	Project Unit	+400.00	+000.00	-0250.0
		%（FSR）	+100.000	+000.00	-062.50
		2's Complement HEX	7FFF	0000	AFFF
11	E type -250~900	Project Unit	+900.00	+000.00	-0250.0
		%（FSR）	+100.000	+000.00	-027.78
		2's Complement HEX	7FFF	0000	DC71
12	R type 0~1750	Project Unit	+1750.0	+0000.0	+0000.0
		%（FSR）	+100.00	+0000.0	+0000.0
		2's Complement HEX	7FFF	0000	0000
13	S type 0~1750	Project Unit	+1750.0	+0000.0	+0000.0
		%（FSR）	+100.00	+0000.0	+0000.0

		2's Complement HEX	7FFF	0000	0000
14	B type 0~1800	Project Unit	+1800.0	+0000.0	+0000.0
		%（FSR）	+100.00	+0000.0	+0000.0
		2's Complement HEX	7FFF	0000	0000

2 Command Set

Command Format:

(Leading)(Address)(Command)(CHK)(cr)

Response Format:

(Leading)(Address)(Data)(CHK)(cr)

[CHK] two character checksum

[cr] is the terminating character, carriage return(0x0D)

Calculate Checksum：

1. Calculate ASCII sum of all characters of command (or response) string except the character return(cr).
2. Mask the sum of string with 0ffh.

Example：

Command string：$012(cr)

Sum of string='$'+'0'+'1'+'2'=24h+30h+31h+32h=B7h

The checksum is B7h，and [CHK] = "B7"

Command string with checksum：$012B7(cr)

Response string：!01070600(cr)

Sum of string：‘!’+‘0’+‘1’+‘0’+‘7’+‘0’+‘6’+‘0’+‘0’
=1h+30h+31h+30h+37h+30h+36h+30h+30h=1AFh
The checksum is AFh，and [CHK] = “AF”
Response string with checksum：!01070600AF(cr)

General Command Sets			
Command Syntax	**Response Syntax**	**Command Description**	**Notes**
%AANNTTCCFF	!AA	Sets the address,input range, baudrate,dataformat,checksum status	2.1
#AA	>(Data)	Return the input value from the module in the currently configured data format	2.2
#AAN	>(Data)	Return the input value from the module channels N in the currently configured data format	2.3
$AA0Ci	!AA	Implement Span Calibrates to correct for gain errors	2.4
$AA1Ci	!AA	Implement Zero Calibrates to correct for gain errors	2.5
$AA2	!AATTCCFF	Return the configuration parameters for the module	2.6
$AA3	>(Data)	Read CJC temperature	2.7
$AA9SNNNN	!AA	Setting the offset value of CJC	2.8
$AA5VV	!AA	Enable or disable the individual channels	2.9

$AA6	!AAVV	Get the enable/disable status of all channels	2.10
$AAF	!AA(Data)	Return the firmware version code	2.11
$AA7CiRrr	!AA	Configure the input type and range of the specified channel	2.12
$AA8Ci	!AACIRRR	Get the input type and range of the specified channel	2.13
$AAXnnnn	!AA	Set communication WDT cycle time from 0000~9999	2.14
$AAY	!AAXNNNN	Read the cycle time setting of communication WDT	2.15
$AAB	!AAN	Diagnose channel test range	2.16

2.1 %AANNTTCCFF

Name：Configuration

Description：Sets address, type code, baudrate, data format

Syntax：%AANNTTCCFF(cr)

% delimiter character.

AA address of setting module (00-FF)

NN New address (00-FF)

TT New type

CC New baudrate

FF New data format

When changing baudrate or checksum, we should terminate INIT* to land.

Response：!AA(cr)　if the command was valid.

?AA(cr)　if an invalid operation was entered.

Syntax error or communication error may get no response.

!　command is valid.

?　command is invalid.

Not terminate INIT* to land will return invalid command.

AA　address of setting module (00-FF)

Example：

Command：%0102050600(cr)　Response：!02(cr)

Change address from 01 to 02, the response indicates that the command was received.

Relative command: Section 2.6, $AA2

Relative theme: Sec.1.8 setting list; Sec.3.1 pin INIT* operation

2.2 #AA

Name：Analog Data In

Description：Command will return the input value from module in the currently configured data format.

Syntax　#AA[CHK](cr)

#　delimiter character.

AA address of reading module(00~FF)

Response：>(data)[CHK](cr)

Syntax error or communication error may get no response.

> valid command delimiter character.

data AI input value, when use #AA command (R-8018/18BL/18ID/18RC/18B+), the data is the combination for each channel respectively.

Example：

Command：#01 Response：>+02.635

Read analog input value at address 01, return with +02.635

Command：#02 Response：>+4C53

Read analog input value at address 02, return with HEX data successful.

Command：#04 Response：>+05.123+04.153+07.234 -02.356+10.000-05.133+2.345+08.234

Read analog input value at address 04 (RemoDAQ-8018 /18BL/ 18ID/18RC), return values of 8 channels.

Relative command: Sec.2.1, %AANNTTCCFF; Sec.2.6, $AA2

Relative theme: Sec.1.8, setting list

2.3 #AAN

Name：Analog Data From channel N

Description：The command will return the input value from one of the 8 channels of a specified (AA) module in

the currently configured data format.

Syntax：#AAN[CHK](cr)

delimiter character.

AA address of reading module(00~FF)

N channel (0~7)

Response：valid command: >(data)[CHK](cr)

invalid command: ?AA[CHK](cr)

Syntax error or communication error may get no response.

> valid command delimiter character.

? invalid command delimiter character.

data AI input value.

Example：

Command：#32 Response：>+02.513

Read channel 2 of the module at address 03, return +02.513

Command：#29 Response：?02

Read channel 9 of the module at address 02, return error channel number.

Relative command: Sec.2.1, %AANNTTCCFF;
Sec.2.6, $AA2

Relative theme: Sec.1.8, setting list

2.4 $AA0Ci

Name：Span Calibration
Description：The command calibrates a specified channel to correct for gain errors.
Syntax：$AA0Ci[CHK](cr)
$ delimiter character.
AA address of the module that is to be calibrated(00~FF)
0 span calibration command.
Ci the specified input channel you want to calibrate.
Response：!AA(cr) if the command was valid.
?AA(cr) if an invalid operation was entered.
Syntax error or communication error may get no response.
! command is valid.
? command is invalid.
AA address of the module (00~FF)
Example：
Command：$010C5 Response：!01
Span calibration of channel 5 of the module at address 01, and return success.
Relative theme: Sec.1.7, calibration.

2.5 $AA1Ci

Name：Zero Calibration
Description：Calibrates module to correct for gain errors

Syntax：$AA1[CHK](cr)

$ delimiter character.

AA address of the module that is to be calibrated(00~FF)

1 zero calibration command.

Ci the specified input channel you want to calibrate.

Response：!AA(cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

Example：

Command：$011C5 Response：!01

Zero calibration of channel 5 of the module at address 01, and return success.

Relative theme: Sec.1.7, calibration.

2.6 $AA2

Name：Configuration Status

Description：The command requests the return of the configuration data from the analog input module at address AA.

Syntax：$AA2[CHK](cr)

$ delimiter character.

AA address of reading module(00~FF)

2 the Configuration Status command.

Response：!AATTCCFF[CHK](cr) if the command is valid.

?AA[CHK](cr)if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.
? command is invalid.
AA address of module(00~FF)
TT represents the type code.
CC represents the baud rate code.
FF data format

Example：

Command：$012 Response：!01050600

Read address 01 configuration, and return success.

Command：$022 Response：!02030602

Read address 02 configuration, and return success.

Relative command: Sec.2.1, %AANNTTCCFF;

Relative theme: Sec.1.8, setting list; Sec.3.1, pin INIT* operation

2.7 $AA3

Name：CJC Status

Description：Instructs the addressed analog input module to read its CJC sensors and return the acquired data.

Syntax：$AA3[CHK](cr)

$ delimiter character.
AA address of reading module(00~FF)
3 the CJC Status command.

Response：>data[CHK](cr) if the command is valid.
?AA[CHK](cr) if an invalid command was

issued.

Syntax error or communication error may get to response

! command is valid.

? command is invalid.

AA address of response module(00~FF)

(data) CJC temperature (Celsius).

Example：

Command：$033 Response：>+0025.4

Read the CJC temperature at address 03, and return 25.4℃.

Relative command: Sec.2.8, %AA9SNNNN;

Relative theme: Sec.1.7, calibration

2.8 $AA9SNNNN

Name：CJC Offset Calibration command

Description：Calibrates the module to adjust for offset errors of its CJC sensors.

Syntax：$AA9SNNNN[CHK](cr)

$ delimiter character.

AA address of reading module(00~FF)

9 the CJC offset calibration command.

S sign，+ or –

NNNN CJC offset value (0000~FFFF), Each count equals approximately 0.009℃

Response：>!AA (cr) if the command is valid.

?AA(cr)if an invalid operation was entered.

Syntax error or communication error may get to response

> command is valid.

? command is invalid.

AA address of response module(00~FF)

Example：

Command：$0390042 Response：!03

The command increases the CJC offset value of the module at address 03 with 66 counts (42 hex) which equals about 0.6 ℃

2.9 $AA5VV

Name：Enable/Disable Channels for Multiplexing

Description：Enables/disables multiplexing simultaneously for separate channels of a specified input module

Syntax：$AA5VV[CHK](cr)

$ is a delimiter character.

AA address of reading module (00~FF)

5 is the enable/disable channels command.

VV channel enable/disable, 00 is all disabled and FF is all enable

Response：!AA(cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

Example：

Command：$0155A　Receive：!01

Set address 01 to enable channel 1，3，4，6 and disable channel 0，2，5，7，return success.

Command：$016　Receive：!015A

Read status of channels at address 01, return channel 1，3，4，6 enable and channel 0，2，5，7 disable.

Relative command: Sec.2.8, $AA6

2.10 $AA6

Name：Read Channel Status

Description：Asks a specified input module to return the status of all channels

Syntax：$AA6[CHK](cr)

$ is a delimiter character.

AA address of reading module(00~FF)

6 is the read channel status command.

Response：!AAVV[CHK](cr) if the command was valid.

?AA[CHK](cr)　if an invalid operation was entered.

Syntax error or communication error may get no response.

!　command is valid.

?　command is invalid.

AA　address of the module (00~FF)

VV channel enable/disable, 00 is all disabled and FF is all enable

Example：

Command：$015A5　Receive：!01

Set address 01 to enable channel 1，3，4，6 and disable channel 0，2，5，7，return success.

Command：$016　Receive：!01A5

Read status of channels at address 01, return channel 1，3，4，6 enable and channel 0，2，5，7 disable.

Relative command: Sec.2.9, $AA5VV

2.11 $AAF

Name：Read Module Version

Description：The command requests the module at address AA to return the version code of module

Syntax：$AAF[CHK] (cr)

$　delimiter character.

AA address of reading module(00~FF)

F identifies the version command.

Response：!AA(data)[CHK](cr) if the command is valid.

?AA[CHK] (cr) if an invalid command was issued.

Syntax error or communication error may get no response.

!　command is valid.

?　command is invalid.

AA address of response module(00~FF)

Data is the version code of the module.

Example：

Command：$01F Receive：!0120050412

Read address 01 firmware version，return version 20050412

Command：$02F Receive：!0120040101

Read address 02 firmware version，return version 20040101

2.12 $AA7CiRrr

Name：Channel Range Configuration command

Syntax：$AA7CiRrr[CHK](cr)

$ delimiter character.

AA address of setting module(00~FF)

7 channel range configuration command.

Ci the specified input channel you want to configure.

Rrr represents the type and range you want to set

Response：!AA(cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

Example：

Command：$017C5R05 Response：!01

The command configures the range of channel 5 in the module at address 01 as ±2.5V, and return success.

2.13 $AA8Ci

Name：Read Channel Range Configuration command

Syntax：$AA8Ci[CHK](cr)

$ delimiter character.

AA address of reading module(00~FF)

8 read channel range configuration command.

Ci the specified input channel you want to read

Response：!AACiRrr[CHK](cr) if the command was valid.

?AA[CHK](cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

Ci the specified input channel you want to read.

Rrr represents the type and range you want to set

Example：

Command：$018C5 Response：!01C5R05

The command read the range of channel 5 in the module at address 01.The response ‘R05’ means ±2.5V.

2.14 $AAXnnnn

Name：Watchdog Timer Setting command

Description：This command set the communication watchdog timer (WDT) cycle time

Syntax：$AAXnnnn[CHK](cr)

$ delimiter character.

AA address of setting module(00~FF)

X the watchdog timer setting command

nnnn watchdog timer value 0000~9999

Response：!AA [CHK](cr) if the command was valid.

?AA[CHK](cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

Example：

Command：$01X1234 Response：!01

The command set the WDT cycle as 1234 in the input module at address 01, and return success.

2.15 $AAY

Name：Read Watchdog Timer Setting command

Description：This command read the setting of communication watchdog timer (WDT) cycle time

Syntax：$AAY[CHK](cr)

$ delimiter character.

AA address of reading module(00~FF)

Y the read watchdog timer setting command

Response：!AAnnnn [CHK](cr) if the command was valid.

?AA[CHK](cr) if an invalid operation was entered.

Syntax error or communication error may get no response.

! command is valid.

? command is invalid.

AA address of the module (00~FF)

nnnn watchdog timer value 0000~9999

Example：

Command：$01Y Response：!011234

Read the WDT in the module at address 01, and return 1234.

2.16 $AAB

Name：Channel Diagnose Command

Description：Diagnose channel status in over range, under range, and wire opening.

Syntax：$AAB[CHK](cr)

$ delimiter character.

AA address of setting module(00~FF)

B the channel diagnose command

Response：!AAN (cr) if the command was valid.

?AA(cr) if an invalid operation was entered.

Syntax error or communication error may get to response

! command is valid.

? command is invalid.

AA address of the module (00~FF)

N Bit value .0 means normal status and bit value and 1 means channel over range, under range, or open wiring.

Example：

Command：$01B Response：!011

Diagnose channel status at address 01, and return success.

3 Application Notes

3.1 pin INIT* operation

Every RemoDAQ-8000 module has an EEPROM inside, use to save the configuration information of the module, such as: address, baudrate, message type and other parameters. Sometimes, user may forget to configure the module. So, RemoDAQ-8000 series have a special mode: “INIT mode”, which can help user to solve this problem. Under “INIT mode”, the module is forced to set as **Address=00, baudrate=9600, no checksum**.

If you want to enable INIT mode, only need to do as follows:

1. Power off module.
2. Connect the INIT pin to GND.
3. Power on the module.
4. Set command $002(cr) at 9600bps, then it will read module configuration information from EEPROM.

3.2 Module Status

Power on the module again will make the current output value change to power-on value, and the module output value

can set by receive the command of PC.

When main watchdog overtime and overflow, the current output value will change to safe value. Here, the module status is set as overtime and overflowing, all output command will be omitted. The LED of module begin twinkling. The user must restore module status by command, so the module will return right operation mode.

3.3 Double Watchdog Operation

Double watchdog= module watchdog+ main watchdog

The module watchdog is the hardware restoration circuitry of module. When work at atrocious or serious interfere environment, this hardware circuitry will make the module restore on time when the module suffer interfere. This make the module can't crash forever and advanced the reliability.

The main watchdog is the watchdog implement by software in the module. It mainly uses to prevent the net communication happen problems or the PC crash. When the main watchdog overflows, the module will output the "safe valve". This can make sure the control object can't occur accident.

The double watchdog function of RemoDAQ-8000 series modules will insure the system more reliability and safety.