# 8000 DIO Manual

**Warranty**

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Date:2001-10

# Table of Contents

# 1. Introduction

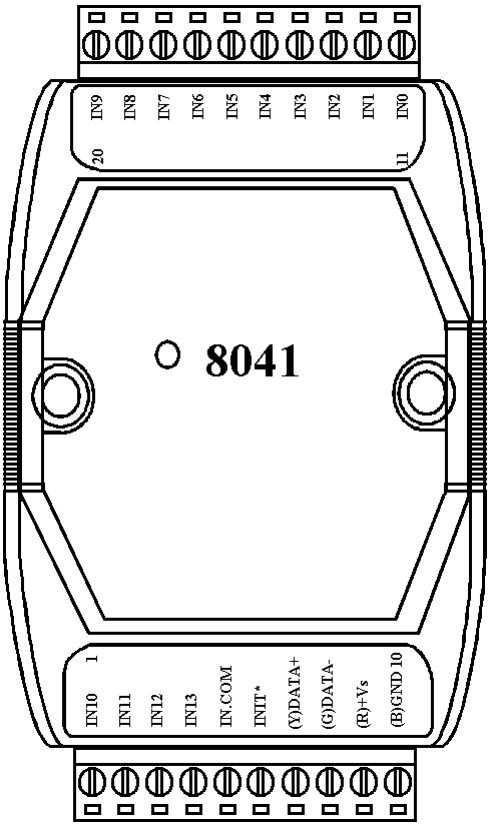
8000 is a family of network data acquisition and control modules. They provide analog-to-digital, digital-to-analog, digital input/output, timer/counter and other functions. These modules can be remote controlled by a set of commands. The DIO modules support TTL signal, photo-isolated digital input, relay contact output , solid-state relay output, PhotoMOS output and open-collector output. Reference *Sec.1.3* for detail information.

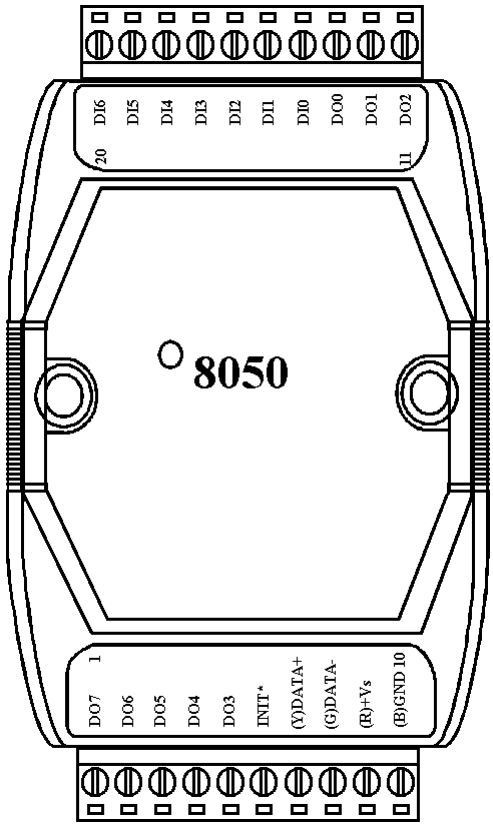
## 1.1 More Information

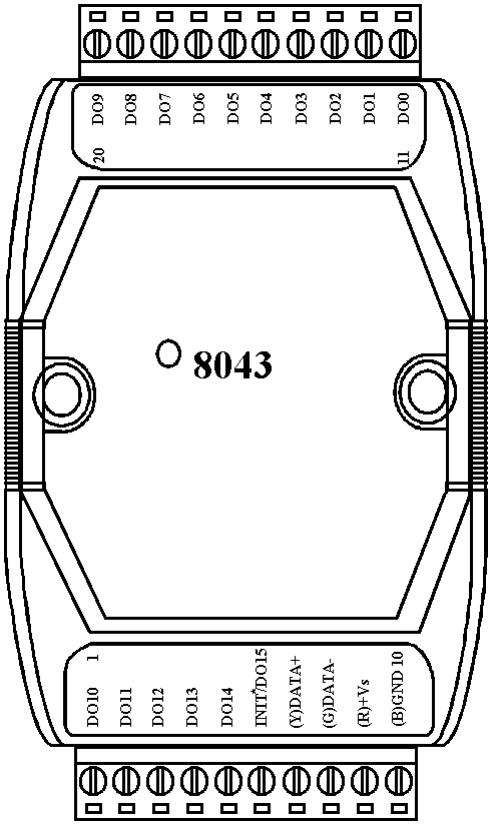
Refer to "**8000 Bus Converter User Manual**" chapter 1 for more information as following:

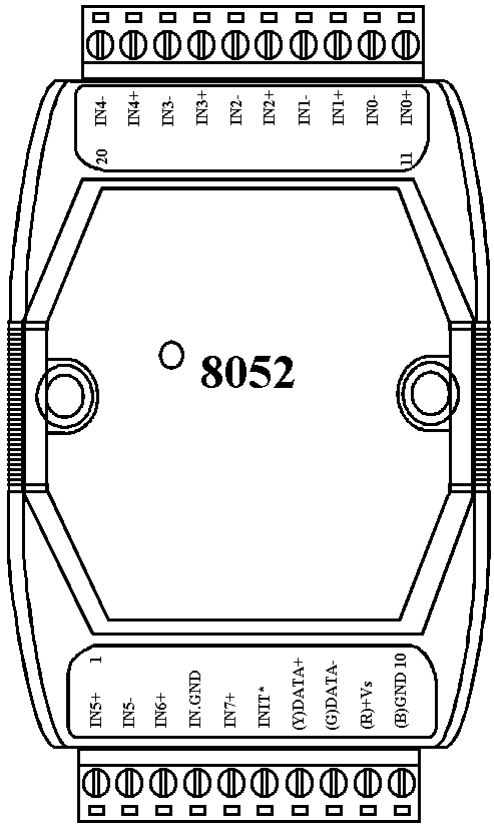
**1.1 8000 Overview**
**1.2 8000 Related Documentation**
**1.3 8000 Command Features**
**1.4 8000 System Network Configuration**
**1.5 8000 Dimension**

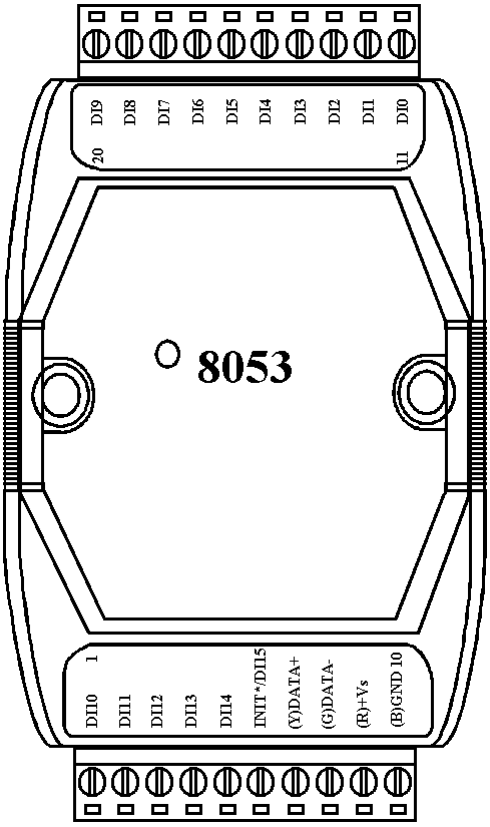
# 1.2 Pin Assignment

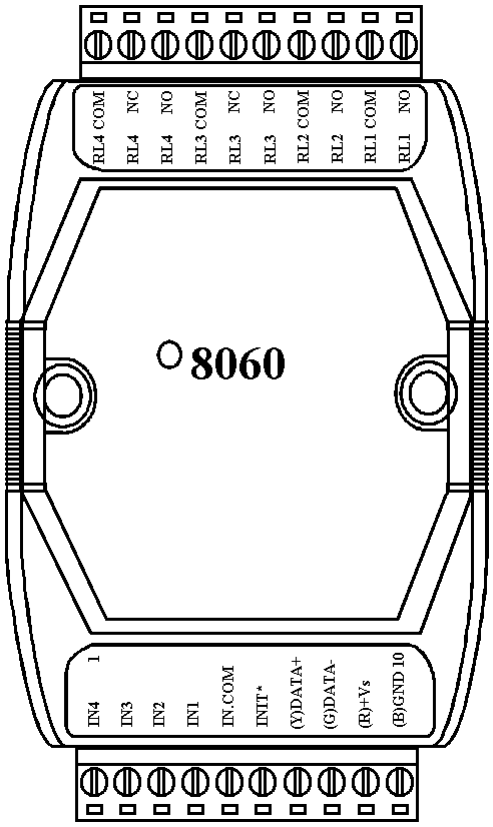


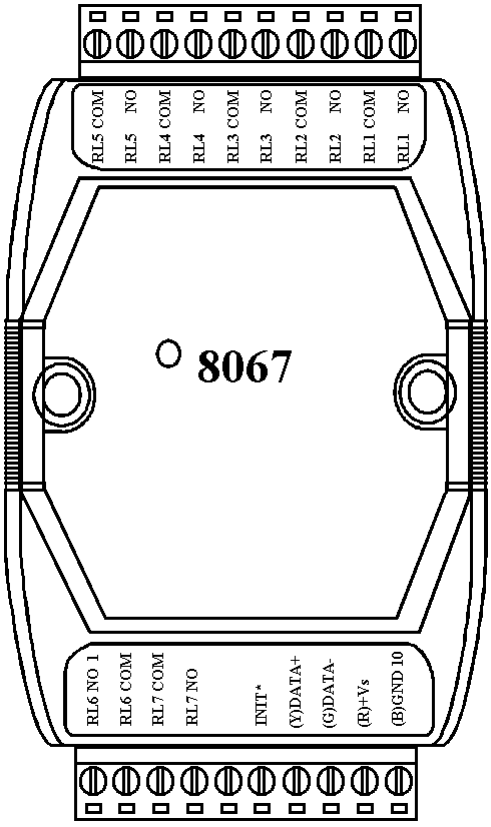




DI9
DI8
DI7
DI6
DI5
DI4
DI3
DI2
DI1
DI0
20
11
8053
1
DI10
DI11
DI12
DI13
DI14
INIT*/DI15
(Y)DATA+
(G)DATA-
(R)+Vs
(B)GND 10


RL4 COM
RL4 NC
RL4 NO
RL3 COM
RL3 NC
RL3 NO
RL2 COM
RL2 NO
RL1 COM
RL1 NO
8060
1
IN4
IN3
IN2
IN1
IN.COM
INIT*
(Y)DATA+
(G)DATA-
(R)+Vs
(B)GND 10


RL5 COM
RL5 NO
RL4 COM
RL4 NO
RL3 COM
RL3 NO
RL2 COM
RL2 NO
RL1 COM
RL1 NO
8067
RL6 NO 1
RL6 COM
RL7 COM
RL7 NO
INIT*
(Y)DATA+
(G)DATA-
(R)+Vs
(B)GND 10

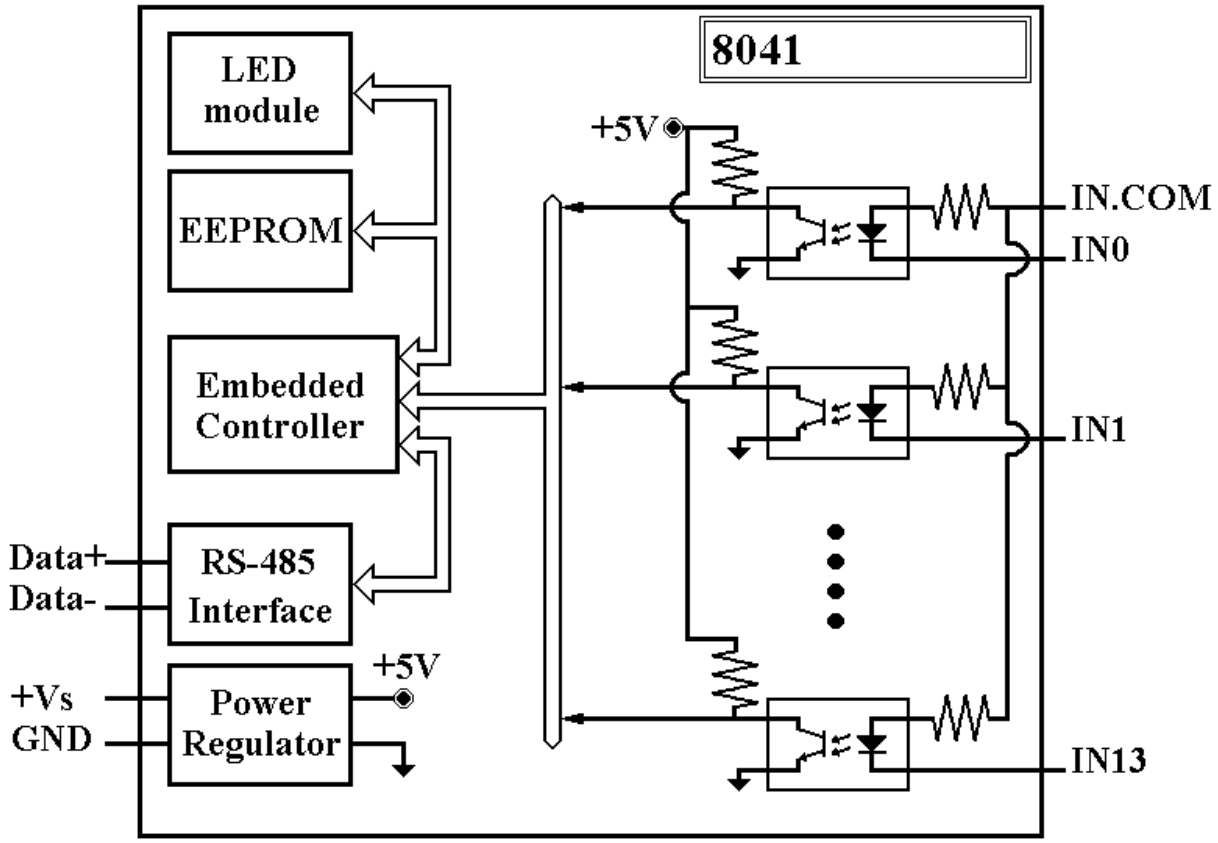
# 1.3 Specifications

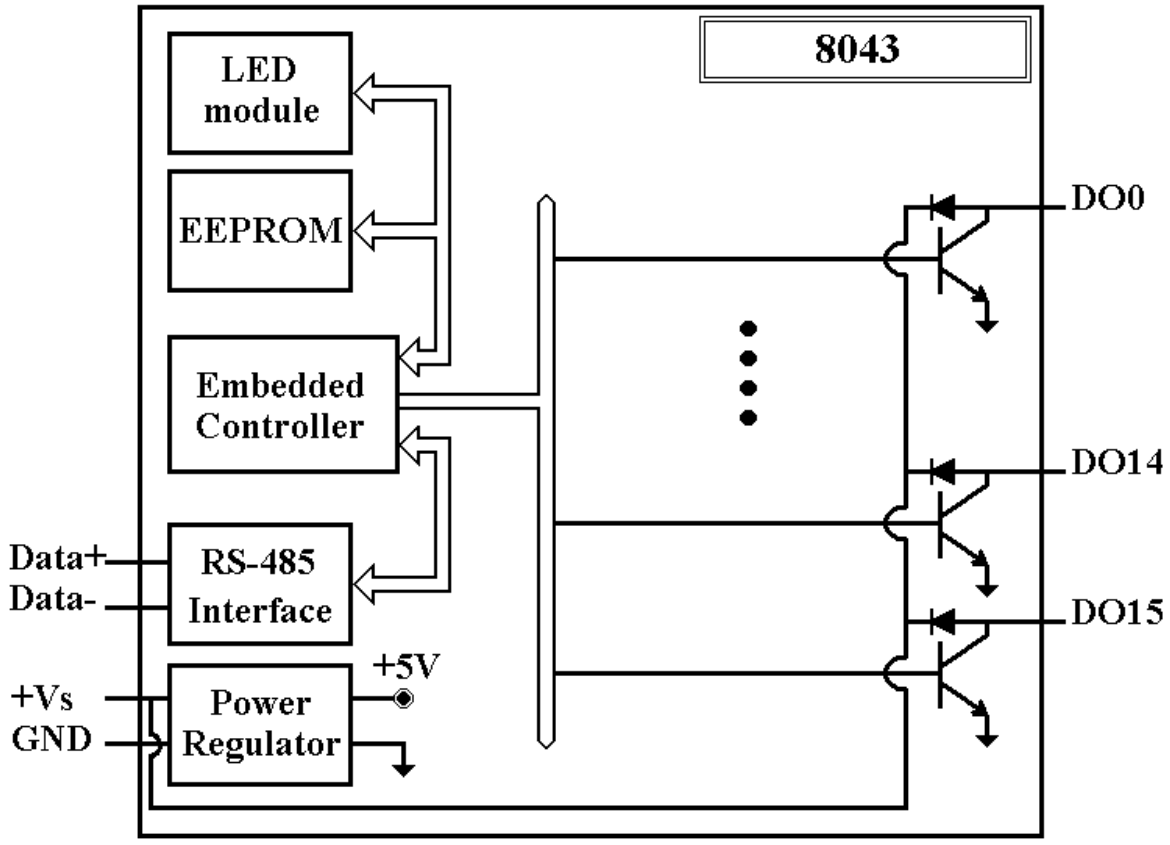
| Digital Input Modules | | | |
|---|---|---|---|
| | 8041 | 8052 | 8053 |
| Input Channels | 14 | 8 | 16 |
| Isolation | Isolation with Common Source | 6 differential and 2 common ground | Non-Isolated |
| Isolation Voltage | 3750 Vrms | 5000 Vrms | Non-Isolated |
| Digital Level 0 | +1V max | +1V max | +2V max |
| Digital Level 1 | +4 to +30 V | +4 to +30 V | +4 to +30 V |
| Input Impedance | 3K ohms | 3K ohms | 820 ohms |
| Power Input | +10 to +30 VDC | | |
| Power Consumption | 0.2W (8041) | 0.2W (8052) | 0.7W (8053) |

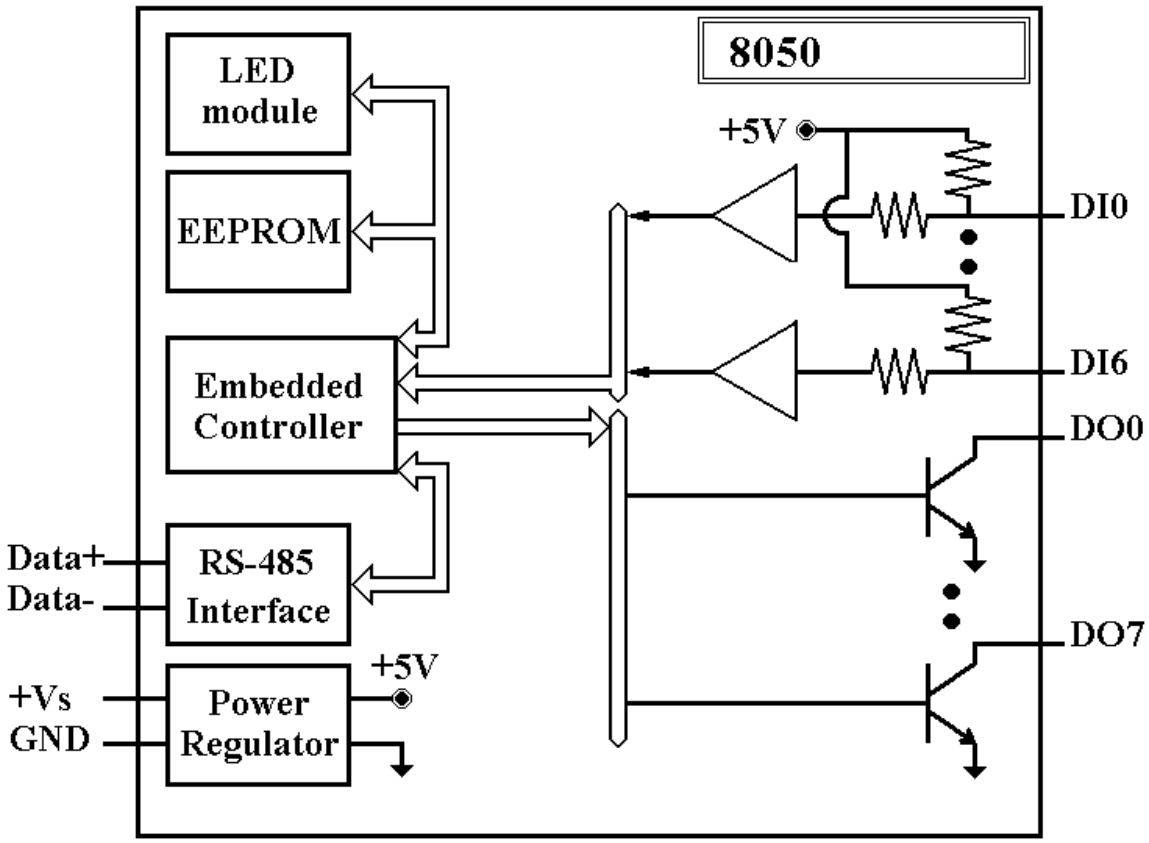
| Open Collector Output Modules | | |
|---|---|---|
| | 8043 | 8050 |
| Output Channels | 16 | 8 |
| Isolation | Non-Isolation | |
| Isolation Voltage | | |
| Load Voltage | Max +30V | |
| Load Current | 100mA | 30mA |
| Input Channels | No Input | 7 |
| Isolation | | Non-Isolation |
| Isolation Voltage | | |
| Digital Level 0 | | 1V max |
| Digital Level 1 | | 3.5 to 30V |
| Input Impedance | | |
| Power Input | +10 to +30 VDC | |
| Power Consumption | 0.4W (8043) | 0.4W (8050) |

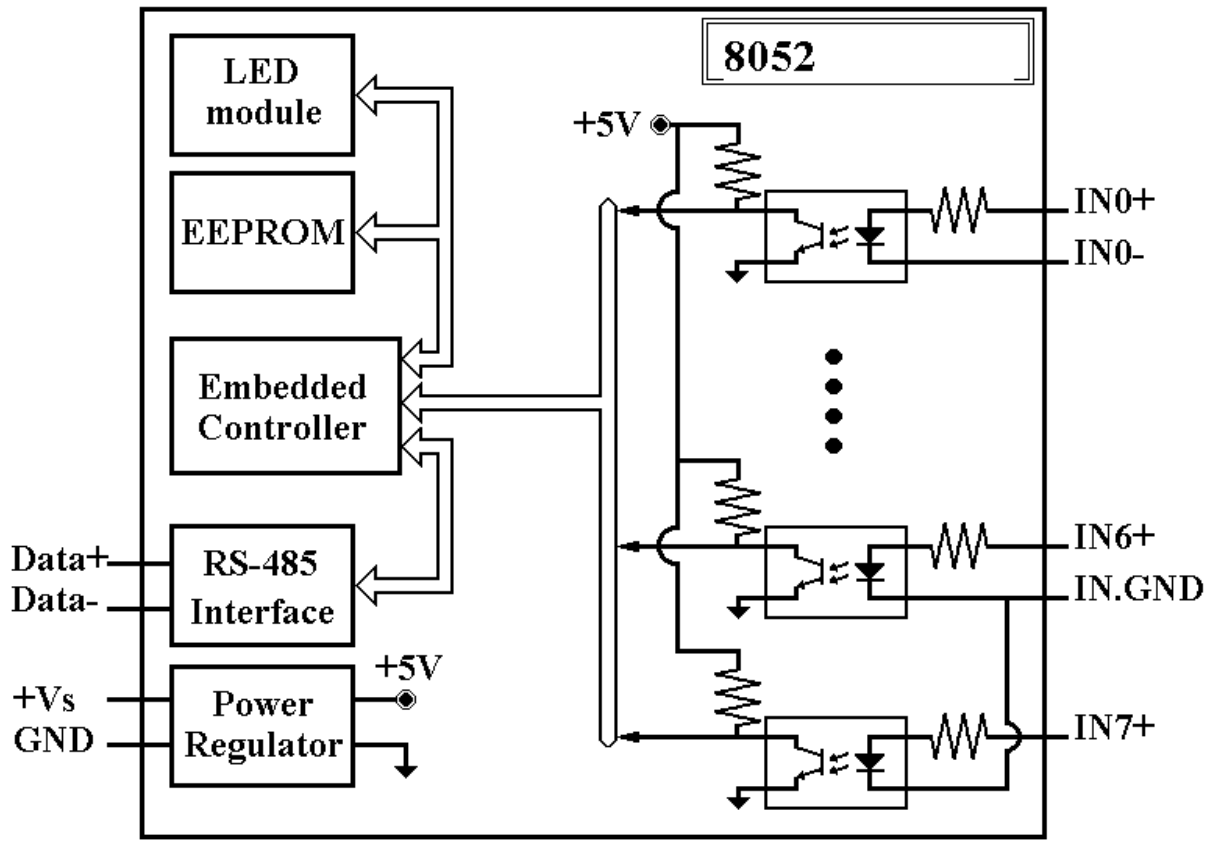
| Relay Output Modules | | |
|---|---|---|
| | 8060 | 8067 |
| Output Channels | 4 | 7 |
| Relay Type | RL1, RL2:<br>Form A<br>RL3, RL4:<br>Form C | Form A |
| Contract Rating | 0.6A<br>@125VAC<br>2A<br>@30VDC | 0.5A<br>@125VAC<br>1.0A<br>@24VDC |
| Surge Strength | 500V | 1500V |
| Operate Time | 3mS | 5mS max |
| Release Time | 2mS | 2mS Max |
| Min. Life | $5*10^5$ ops | $10^5$ ops |
| Input Channels | 4 | No Input |
| Isolation | Isolation with Common Source | |
| Isolation Voltage | 3750 Vrms | |
| Digital Level 0 | +1 V max | |
| Digital Level 1 | +4 to +30 V | |
| Input Impedance | 3K ohms | |
| Power Input | +10 to +30 VDC | |
| Power Consumption | 1.3W (8060) | 1.5W(8067) |

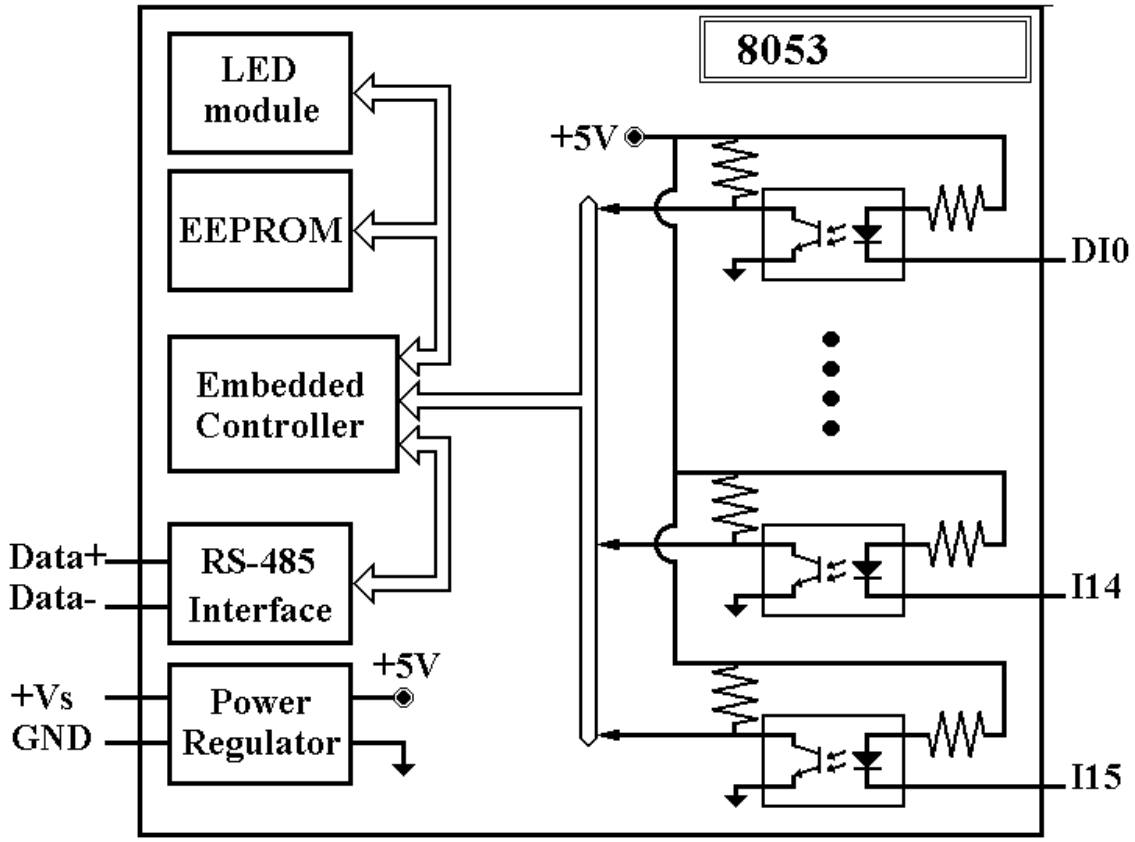
# 1.4 Block Diagram

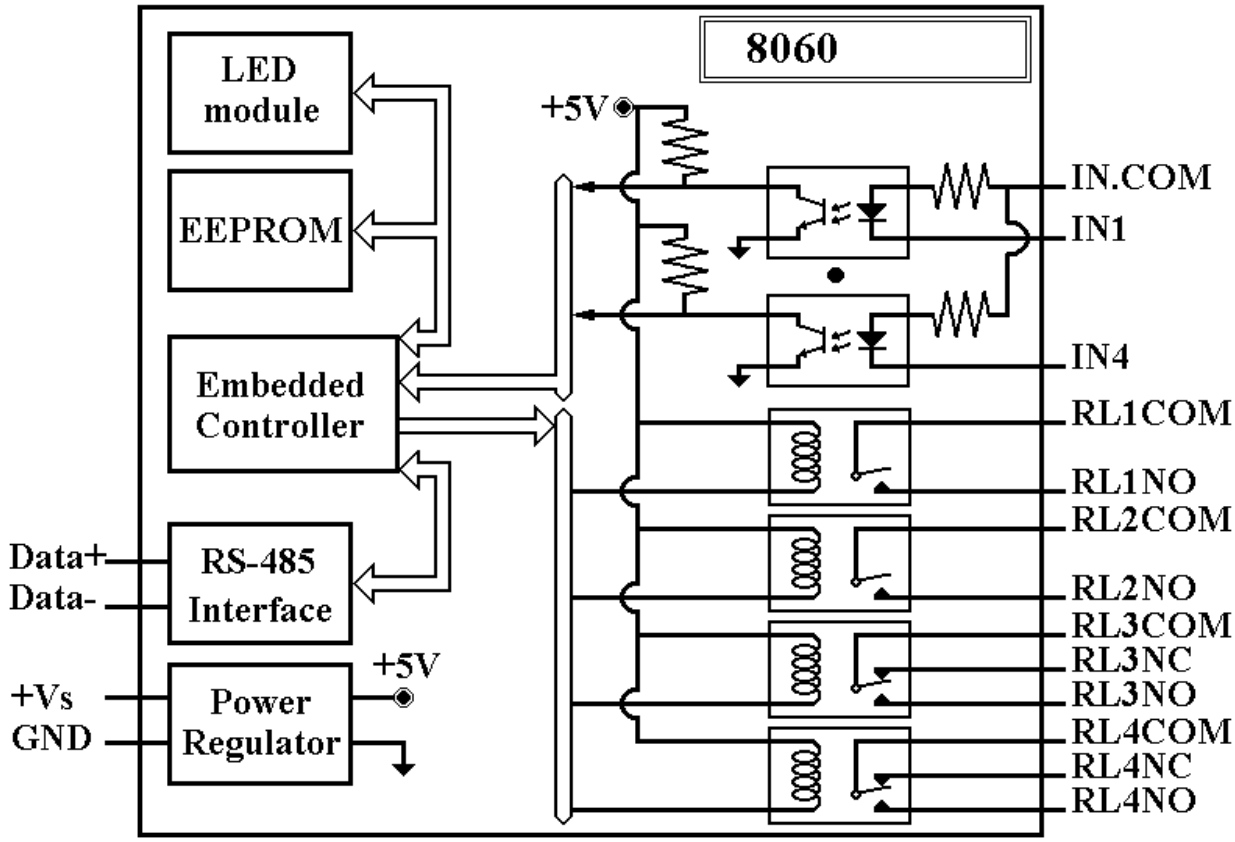


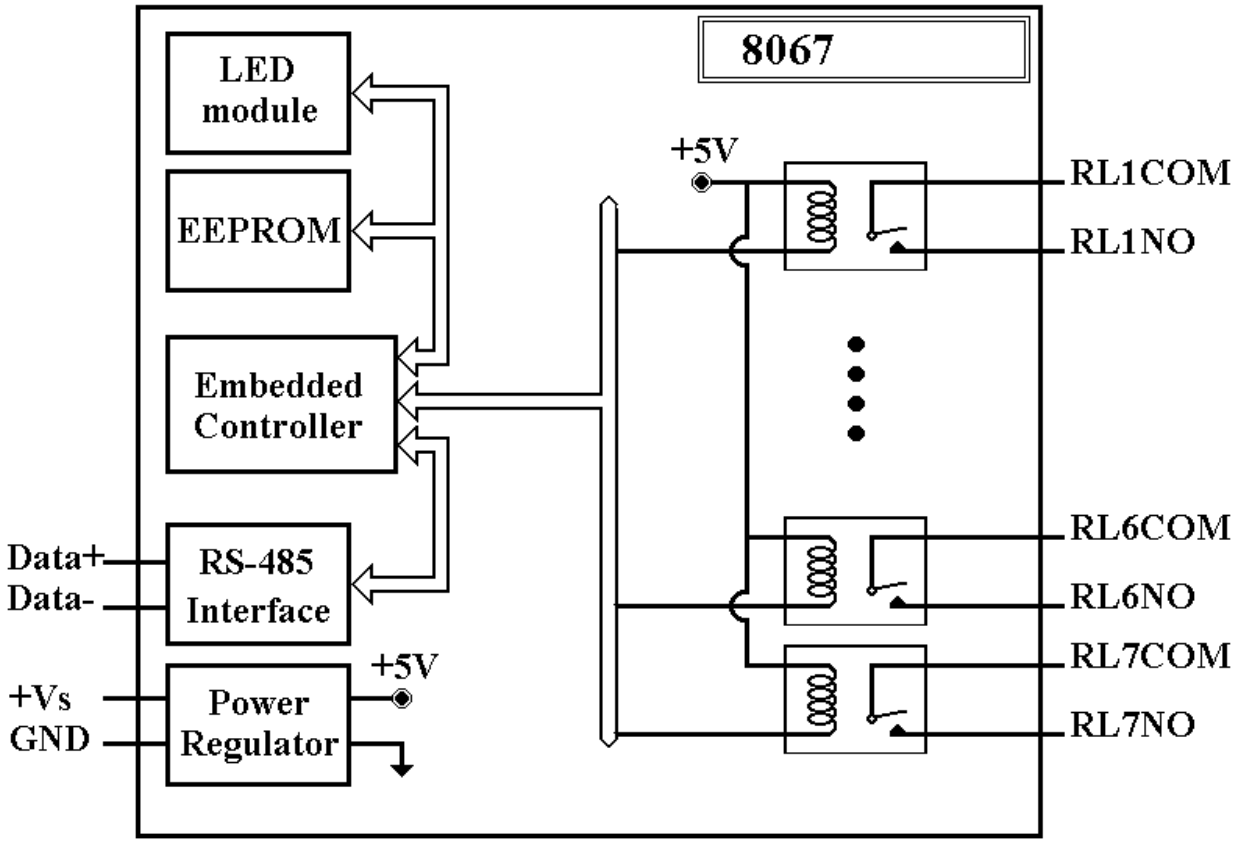




8050
LED module
EEPROM
Embedded Controller
RS-485 Interface
Power Regulator
Data+
Data-
+Vs
GND
+5V
+5V
DI0
DI6
DO0
DO7


8052
LED module
EEPROM
Embedded Controller
RS-485 Interface
Power Regulator
Data+
Data-
+Vs
GND
+5V
+5V
IN0+
IN0-
IN6+
IN.GND
IN7+


8053
LED module
EEPROM
Embedded Controller
RS-485 Interface
Power Regulator
Data+
Data-
+Vs
GND
+5V
+5V
DI0
I14
I15

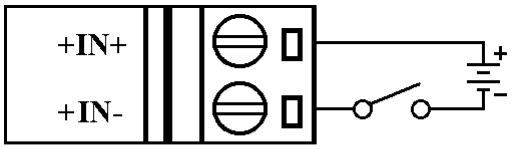

8060
LED module
EEPROM
Embedded Controller
RS-485 Interface
Power Regulator
Data+
Data-
+Vs
GND
+5V
+5V
IN.COM
IN1
IN4
RL1COM
RL1NO
RL2COM
RL2NO
RL3COM
RL3NC
RL3NO
RL4COM
RL4NC
RL4NO

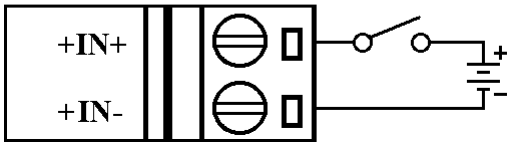

8067
LED module
EEPROM
Embedded Controller
RS-485 Interface
Power Regulator
Data+
Data-
+Vs
GND
+5V
+5V
RL1COM
RL1NO
RL6COM
RL6NO
RL7COM
RL7NO

# 1.5 Wire Connection

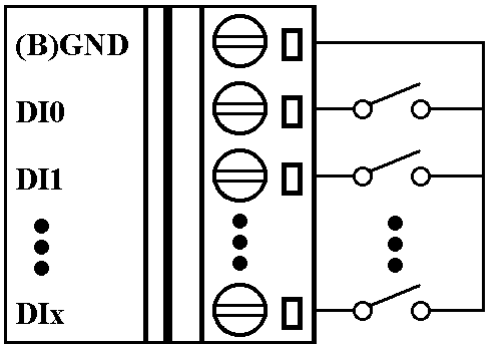
**Dry Contact signal input**

8052

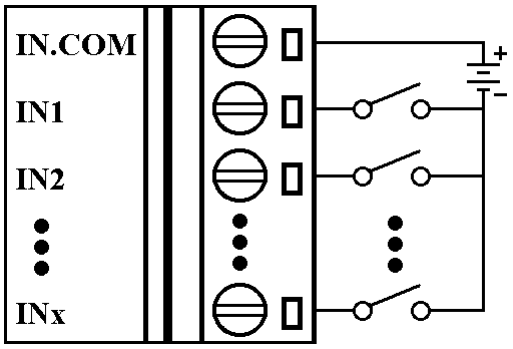



8050/53

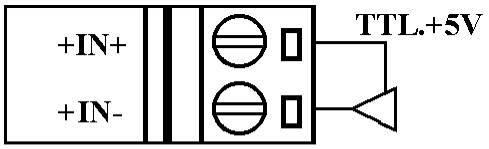


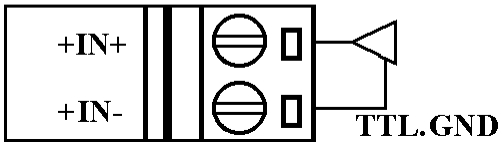

8041/60



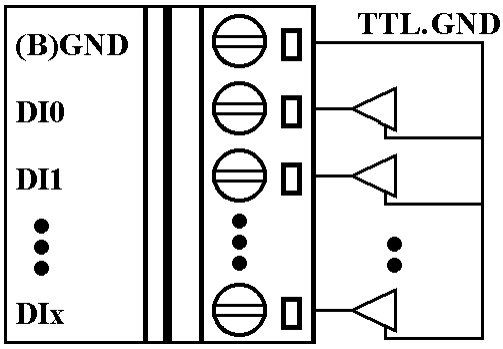

**TTL/CMOS signal input**

8052

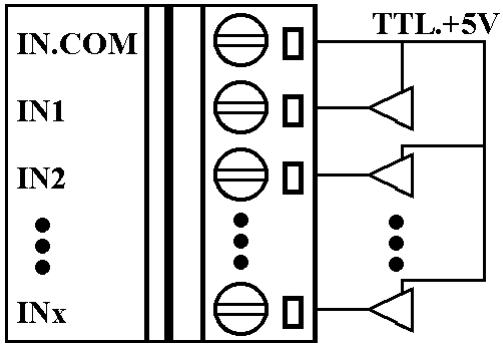



8050/53

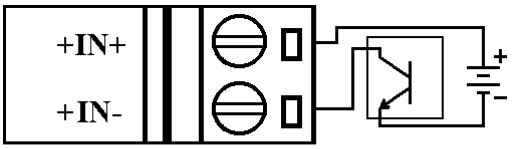


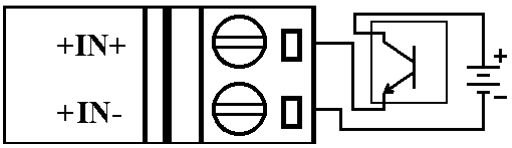

8041/60

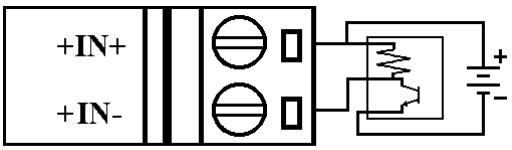


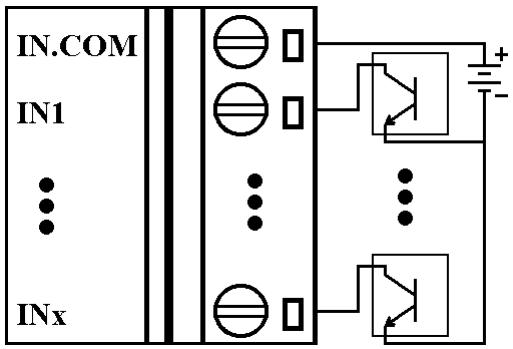
**Open Collector signal input** 8041/60

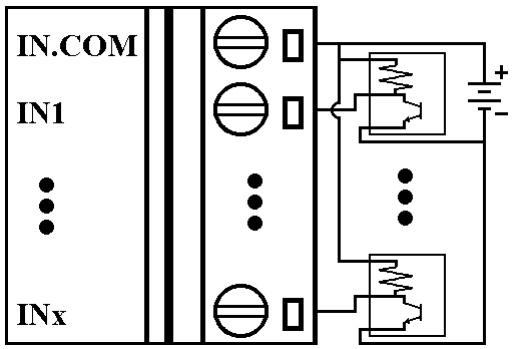
8052/



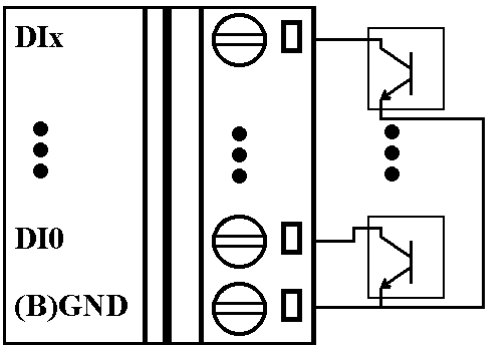



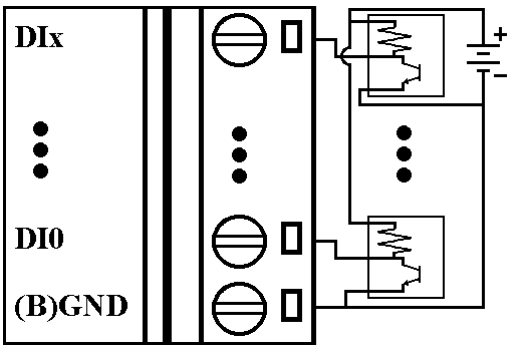




8050/53

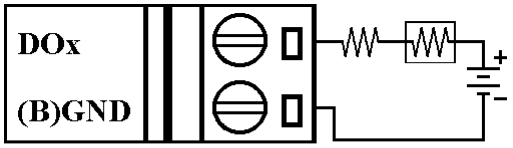


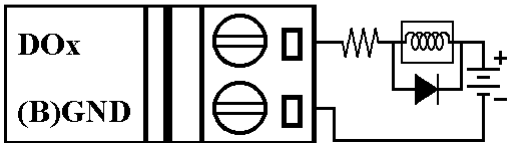



**Open Collector output**

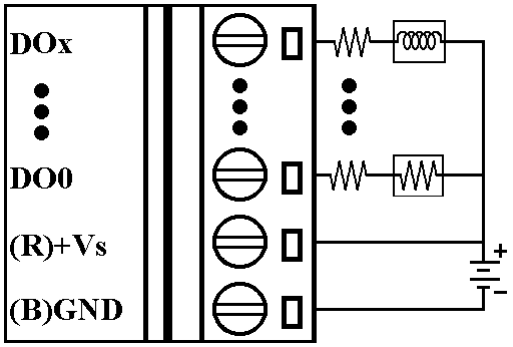
8050

Note : while connect inductive load(for example to drive relay), the diode is needed for prevent the counter EMF.




8043



# 1.6 Quick Start

Refer to "**8000 Bus Converter User Manual**" and "**Getting Start**" for detail.

# 1.7 Default Setting

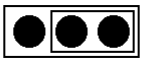
Default setting for 8000 DIO modules :

- Address : 01
- Baudrate : 9600 bps
- Type : Type 40 for DIO mode
- Checksum Disable
- 8053 jumper setting at INIT*
- 8043 jumper setting at INIT

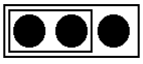
# 1.8 Jumper Setting

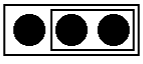
8043 : Jumper J3 for select the pin INIT*/DO15

Select DO15 DO15  INIT*

Select INIT* DO15  INIT* (default)

8053 : Jumper J1 for select the pin INIT*/DI15

Select DI15 DI15  INIT*

Select INIT* DI15  INIT* (default)

# 1.9Configuation Tables

Configuration Table of 8000 DIO modules

**Baudrate Setting (CC)**

**Type Setting (TT)**

Type = **40** for DIO mode

**Data Format Setting (FF)**

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

*1 : Counter Update Direction : 0=Falling Edge, 1=Rising Edge

*2 : Checksum Bit : 0=Disable, 1=Enable

*3 : 8050 = 0 (Bit[2.1.0] = 000), 8060 = 1 (Bit[2.1.0] = 001)
8052 = 2 (Bit[2.1.0] = 010), 8053 = 3 (Bit[2.1.0] = 011)

**Read Digital Input/Output Data Format**

Data of $AA6,$AA4,$AALS : (First Data)(Second Data)00

Data of @AA : (First Data)(Second Data)

| | First Data | | Second Data | |
|---|---|---|---|---|
| 8041 | DI(8-13) | 00 to 3F | DI(0-7) | 00 to FF |
| 8043 | DO(8-15) | 00 to FF | DO(0-7) | 00 to FF |
| 8050 | DO(0-7) | 00 to FF | DI(0-6) | 00 to 7F |
| 8052 | DI(0-7) | 00 to FF | 00 | 00 |
| 8053 | DI(8-15) | 00 to FF | DI(0-7) | 00 to FF |
| 8060 | DO(1-4) | 00 to FF | DI(1-4) | 00 to FF |
| 8067 | DO(0-7) | 00 to FF | 00 | 00 |

# 2. Command

Command Format : **(Leading)(Address)(Command)[CHK](cr)**

Response Format : **(Leading)(Address)(Data)[CHK](cr)**

**[CHK]** 2-character checksum

**(cr)** end-of-command character, character 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 : !01400600(cr)

Sum of string : '!'+'0'+'1'+'4'+'0'+'0'+'6'+'0'+'0'

= 21h+30h+31h+34h+30h+30h+36h+30h+30h = 1ACh

The checksum is ACh, and [CHK] = "AC"

Response string with checksum : !01400600AC(cr)

| General Command Sets | | | |
|---|---|---|---|
| **Command** | **Response** | **Description** | **Section** |
| %AANNTTCCFF | !AA | Set Module Configuration | ***Sec.2.1*** |
| #** | No Response | Synchronized Sampling | ***Sec.2.2*** |
| #AABBDD | > | Digital Ouput | ***Sec.2.3*** |
| #AAN | !AA(Data) | Read Digital Input Counter | ***Sec.2.4*** |
| $AA2 | !AATTCCFF | Read Configuration | ***Sec.2.5*** |
| $AA4 | !S(Data) | Read Synchronized Data | ***Sec.2.6*** |
| $AA5 | !AAS | Read Reset Status | ***Sec.2.7*** |
| $AA6 | !(Data) | Read Digital I/O Status | ***Sec.2.8*** |
| $AAF | !AA(Data) | Read Firmware Version | ***Sec.2.9*** |
| $AAM | !AA(Data) | Read Module Name | ***Sec.2.10*** |
| $AAC | !AA | Clear Latched Digital Input | ***Sec.2.11*** |
| $AACN | !AA | Clear Ditial Input Count | ***Sec.2.12*** |
| $AALS | !(Data) | Read Latched Digital Input | ***Sec.2.13*** |
| @AA | >(Data) | Read Digital Input | ***Sec.2.14*** |
| @AA(Data) | > | Set Digital Output | ***Sec.2.15*** |
| ~AAO(Data) | !AA | Set Module Name | ***Sec.2.16*** |

| Host Watchdog Command Sets | | | |
|---|---|---|---|
| **Command** | **Response** | **Description** | **Section** |
| ~** | No Response | Host OK | ***Sec.2.17*** |
| ~AA0 | !AASS | Read Module Status | ***Sec.2.18*** |
| ~AA1 | !AA | Reset Module Status | ***Sec.2.19*** |
| ~AA2 | !AAVV | Read Host Watchdog Timeout Value | ***Sec.2.20*** |
| ~AA3EVV | !AA | Set Host Watchdog Timeout Value | ***Sec.2.21*** |
| ~AA4V | !AA(Data) | Read PowerOn/Safe Value | ***Sec.2.22*** |
| ~AA5V | !AA | Set PowerOn/Safe Value | ***Sec.2.23*** |

# 2.1 %AANNTTCCFF

**Description** : Set module Configuration

**Syntax** : **%AANNTTCCFF[CHK](cr)**

% a delimiter character

AA address of setting module(00 to FF)

NN new address for setting module(00 to FF)

TT type 40 for DIO module

CC new baudrate for setting module (Ref *Sec.1.9*). It is needed to short the INIT* to ground while change baudrate. (Ref *Sec.3.1*)

FF new data format for setting module (Ref *Sec.1.9*). It is needed to short the INIT* to ground to change checksum setting. (Ref *Sec.3.1*)

**Response** : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

**Example** :

Command : %0102400600 Receive : !02

Set module address 01 to 02, return success.

**Related Command** :

*Sec.2.5* $AA2

**Related Topics** :

*Sec.1.9* Configuration Tables, *Sec.3.1* INIT* pin Operation

# 2.2 #**

**Description** : Synchronized Sampling

**Syntax** : **#**[CHK](cr)**

# a delimiter character

** synchronized sampling command

**Response** : No response

**Example** :

Command : #** No response

Send synchronized sampling command to all modules.

Command : $014 Receive : !10F0000

Read synchronized data from address 01, return S=1, first read and data

Command : $014 Receive : !00F0000

Read synchronized data from address 02, return S=0, have readed and data.

**Related Command** :

*Sec.2.6* $AA4

# 2.3 #AABBDD

**Description** : Digital Output

**Command** : **#AABBDD[CHK](cr)**

# delimiter character

AA address of reading module(00 to FF)

BBDD output command and parameter

For output multi-channel, the BB = 00, 0A or 0B the select which output group, and the DD is the output value.

| Parameter for Multi-Channel Output | | | | | |
|---|---|---|---|---|---|
| | Output Channels | DD for command #AABBDD | | | |
| | | BB=00/0A | | BB=0B | |
| 8043 | 16 | 00 to FF | DO(0-7) | 00 to FF | DO(8-15) |
| 8050 | 8 | 00 to FF | DO(0-7) | NA | NA |
| 8060 | 4 | 00 to 0F | RL(1-4) | NA | NA |
| 8067 | 7 | 00 to 7F | RL(1-7) | NA | NA |

For output single-channel, the BB = 1c, Ac or Bc where c is the selected channel, and the DD must be 00 to clear output and 01 to set output.

| Parameter for SingleChannel Output | | | | |
|---|---|---|---|---|
| | Single channel output command #AABBDD | | | |
| | c for BB=1c/Ac | | c for BB=Bc | |
| 8043 | 0 to 7 | DO(0-7) | 0 to 7 | DO(8-15) |
| 8050 | 0 to 7 | DO(0-7) | NA | NA |
| 8060 | 0 to 3 | RL(1-4) | NA | NA |
| 8067 | 0 to 6 | RL(1-7) | NA | NA |

**Response** : Valid Command : **>[CHK](cr)**

Invalid Command : **?[CHK](cr)**

Ignored Command : **![CHK](cr)**

Syntax error or communication error may get no response.

> delimiter for valid command

? delimiter for invalid command

! delimiter for ignore the command. The module's host watchdog timeout status is set, and the output is set to Safe Value.

**Example** :

Command : #0100FF Receive : >

Assume module is 8041, set address 01 output value FF, return success.

Command : #021001 Receive : >

Assume module is 8067, set address 02 channel 0 on, return success.

Command : #021701 Receive : ?

Set address 02 channel 7 on, return the channel is invalid for 8067 only have 7-channel outputs (0 to 6).

Command : #0300FF Receive : !

Set address 03 output value FF, return ignore. The module's host watchdog timeout status is set, and the output is set to Safe Value.

**Related Command** :

*Sec.2.15* @AA(Data), *Sec.2.18* ~AA0, *Sec.2.19* ~AA1

**Related Topics** :

*Sec.1.9* Configuration Tables, *Sec.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation

**Note** :

The command is useless for 8041/52/53.

# 2.4 #AAN

**Description** : Read Digital Input Counter from channel N

**Command** : **#AAN[CHK](cr)**

| | |
|---|---|
| # | delimiter character |
| AA | address of reading module (00 to FF) |
| N | channel to read |

**Response** : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

| | |
|---|---|
| ! | delimiter for valid command |
| ? | delimiter for invalid command |
| AA | address of response module(00 to FF) |
| (Data) | digital input counter value in decimal, from 00000 to 65535 |

**Example** :

Command : #032 Receive : !0300103

Read address 03 digital input counter value of channel 2, return value 103.

Command : #025 Receive : ?02

Read address 02 digital input counter value of channel 5, return the channel is not available.

**Related Command** :

*Sec.2.12* $AACN

**Note** :

The command is useless for 8043/8067

# 2.5 $AA2

**Description** : Read Configuration

**Command** : **$AA2[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

2 command for read configuration

**Response** : Valid Command :

**!AATTCCFF[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

TT type code of module, it must be 40

CC baudrate code of module (Ref *Sec.1.9*)

FF data format of module (Ref *Sec.1.9*)

**Example** :

Command : $012 Receive : !01400600

Read address 01 status, return DIO mode, baud 9600, no checksum.

**Related Command** :

*Sec2.1* %AANNTTCCFF

**Related Topics** :

*Sec.1.9* Configuration Tables, *Sec3.1* INIT* pin Operation

# 2.6 $AA4

**Description** : Read Synchronized Data

**Command** : **$AA4[CHK](cr)**

| | |
|---|---|
| $ | delimiter character |
| AA | address of reading module (00 to FF) |
| 4 | command for read synchronized data |

**Response** : Valid Command : **!S(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

| | |
|---|---|
| ! | delimiter for valid command |
| ? | delimiter for invalid command |
| AA | address of response module(00 to FF) |
| S | status of synchronized data, 1 = first read, 0 = been readed |
| (Data) | synchronized DIO value (Ref *Sec.1.9*) |

**Example** :

Command : $014 Receive : ?01

Read address 01 synchronized data, return no data available.

Command : #** Receive : no response

Send synchronized sampling to all modules.

Command : $014 Receive : !1000F00

Read address 01 synchronized data, return S=1, first read, and synchronized data 0F00

**Related Command** :

*Sec2.2* #**

**Related Topics** :

*Sec.1.9* Configuration Tables

# 2.7 $AA5

**Description** : Read Reset Status

**Command** : **$AA5[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

5 command for read reset status

**Response** : Valid Command : **!AAS[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

S reset status, 1 = the module is been reset, 0 = the module is not been reseted

**Example** :

Command : $015 Receive : !011

Read address 01 reset status, return first read.

Command : $015 Receive : !010

Read address 01 reset status, return no reset occurred.

**Related Topics** :

*Sec3.4* Reset Status

# 2.8 $AA6

**Description** : Read Digital I/O Status

**Command** : **$AA6[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

6 command for read digital input/output status

**Response** : Valid Command : **!(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) digital input/output value (Ref *Sec.1.9*)

**Example** :

Command : $016 Receive : !0F0000

Assume module is 8060, read address 01 DIO status, return 0F00, digital input IN1 to IN4 are open, digital output RL1 to RL4 are off.

**Related Command** :

*Sec.2.14* @AA

**Related Topics** :

*Sec1.9* Configuration Tables

# 2.9 $AAF

**Description** : Read Firmware Version

**Command** : **$AAF[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

F command for read firmware version

**Response** : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) firmware version of module

**Example** :

Command : $01F Receive : !01A2.0

Read address 01 firmware version, return version A2.0.

Command : $02F Receive : !01B1.1

Read address 01 firmware version, return version B1.1.

# 2.10 $AAM

**Description** : Read Module Name

**Command** : **$AAM[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

M command for read module name

**Response** : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) Name of module

**Example** :

Command : $01M Receive : !017041

Read address 01 module name, return name 8041.

Command : $03M Receive : !037060D

Read address 03 module name, return name 8060D.

**Related Command** :

*Sec.2.16* ~AAO(Data)

# 2.11 $AAC

**Description** : Clear Latched Digital Input

**Command** : **$AAC[CHK](cr)**

$ delimiter character

AA address of setting module (00 to FF)

C command for clear latched digital input

**Response** : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

**Example** :

Command : $01L0 Receive : !01FFFF00

Read address 01 latch-low data, return FFFF.

Command : $01C Receive : !01

Clear address 01 latched data, return success.

Command : $01L0 Receive : !01000000

Read address 01 latch-low data, return 0000.

**Related Command** :

*Sec2.13* $AALS

**Note** :

The command is useless for 8043/8067.

# 2.12 $AACN

**Description** : Clear Digital Input Counter

**Command** : **$AACN[CHK](cr)**

| | |
|---|---|
| $ | delimiter character |
| AA | address of setting module (00 to FF) |
| C | command for clear digital input counter |
| N | digital counter channel N to clear |

**Response** : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

| | |
|---|---|
| ! | delimiter for valid command |
| ? | delimiter for invalid command |
| AA | address of response module(00 to FF) |

**Example** :

Command : #010 Receive : !0100123

Read address 01 input channel 0 counter value, return 123.

Command : $01C0 Receive : !01

Clear address 01 input channel 0 counter value, return success.

Command : #010 Receive : !0100000

Read address 01 input channel 0 counter value, return 0.

**Related Command** :

*Sec2.4* #AAN

**Note** :

The command is useless for 8043/8067.

# 2.13 $AALS

**Description** : Read Latched Digital Input

**Command** : **$AALS[CHK](cr)**

$ delimiter character

AA address of reading module (00 to FF)

L command for read latched digital input

S 1 = select latch high status, 0 = select latch low status

**Response** : Valid Command : **!(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) readed status (Ref *Sec.1.9*).1= the input channel is latched, 0=the input channel is not latched.

**Example** :

Command : $01L1 Receive : !012300

Read address 01 latch-high data, return 0123.

Command : $01C Receive : !01

Clear address 01 latched data, return success.

Command : $01L1 Receive : !000000

Read address 01 latch-high data, return 0.

**Related Command** :

*Sec2.11* $AAC

**Note** :

The command is useless for 8043/8067.

# 2.14 @AA

**Description** : Read Digital Input/Output Status

**Command** : **@AA[CHK](cr)**

@ delimiter character

AA address of reading module (00 to FF)

**Response** : Valid Command : **>(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

> delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

(Data) readed DIO status (Ref *Sec.1.9*)

**Example** :

Command : @01 Receive : >0F00

Read address 01 DIO status, return 0F00.

**Related Command** :

*Sec.2.8* $AA6

**Related Topics** :

*Sec.1.9* Configuration Tables

# 2.15 @AA(Data)

**Description** : Set Digital Output

**Command** : **@AA(Data)[CHK](cr)**

@ delimiter character

AA address of setting module (00 to FF)

(Data) output value, the data format is following :

(Data) is one character for output channel less than 4

For 8060, from 0 to F

(Data) is two characters for output channel less than 8

For 8050, from 00 to FF

For 8067, from 00 to 7F

(Data) is four characters for output channel less than 16

For I-7043/43D, from 0000 to FFFF

**Response** : Valid Command : **>[CHK](cr)**

Invalid Command : **?[CHK](cr)**

Ignore Command : **![CHK](cr)**

Syntax error or communication error may get no response.

> delimiter for valid command.

? delimiter for invalid command.

! delimiter for ignore command. The module is in Host Watchdog Timeout Mode, and the output is set to safe value.

**Example** :

Command : @017 Receive : >

Output address 02 value 7, return success.(The example is suitable for 8060)

Command : @0200 Receive : >

Output address 01 value 00, return success.(The example is suitable for 8050/67)

Command : @030012 Receive : !

Output address 03 value 0012, return the module is in host watchdog timeout mode, the output command is ignored.

**Related Command** :

*Sec.2.3* #AABBDD, *Sec.2.18* ~AA0, *Sec.2.19* ~AA1

**Related Topics** :

*Sec.1.9* Configuration Tables, *Set.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation, *Sec.3.5* Digital Output

**Note** :

The command is useless for 8041/52/53.

# 2.16 ~AAO(Data)

**Description** : Set Module Name

**Command** : **~AAO(Data)[CHK](cr)**

| | |
|---|---|
| ~ | delimiter character |
| AA | address of setting module (00 to FF) |
| O | command for set module name |
| (Data) | new name for module, max 6 characters |

**Response** : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

| | |
|---|---|
| ! | delimiter for valid command |
| ? | delimiter for invalid command |
| AA | address of response module(00 to FF) |

**Example** :

Command : ~01O7050 Receive : !01

Set address 01 module name 7050, return success.

Command : $01M Receive : !017050

Read address 01 module name, return name 8050.

**Related Command** :

*Sec.2.10* $AAM

# 2.17 ~**

**Description** : Host OK.

Host send this command to all modules for send the information “Host OK”.

**Command** : **~**[CHK](cr)**

~ delimiter character

** command for all modules

**Response** : No response.

**Example** :

Command : ~** No response

**Related Command** :

*Sec.2.18* ~AA0, *Sec.2.19* ~AA1, *Sec.2.20* ~AA2, *Sec.2.21* ~AA3EVV, *Sec.2.22* ~AA4V, *Sec.2.23* ~AA5V

**Related Topic** :

*Sec.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation

# 2.18 ~AA0

**Description** : Read Module Status

**Command** : **~AA0[CHK](cr)**

~ delimiter character

AA address of reading module (00 to FF)

0 command for read module status

**Response** : Valid Command : **!AASS[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

SS module status, 00=host watchdog timeout status is clear, 04=host watchdog timeout status is set. The status will store into EEPROM and only may reset by the command ~AA1.

**Example** :

Refer *Sec.2.21* ~AA3EVV example

**Related Command** :

*Sec.2.17* ~**, *Sec.2.19* ~AA1, *Sec.2.20* ~AA2, *Sec.2.21* ~AA3EVV, *Sec.2.22* ~AA4V, *Sec.2.23* ~AA5V

**Related Topic** :

*Sec.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation

# 2.19 ~AA1

**Description** : Reset Module Status

**Command** : **~AA1[CHK](cr)**

~ delimiter character

AA address of setting module (00 to FF)

1 command for reset module status

**Response** : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

**Example** :

Refer *Sec.2.21* ~AA3EVV example

**Related Command** :

*Sec.2.17* ~**, *Sec.2.18* ~AA0, *Sec.2.20* ~AA2, *Sec.2.21* ~AA3EVV, *Sec.2.22* ~AA4V, *Sec.2.23* ~AA5V

**Related Topic** :

*Sec.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation

# 2.20 ~AA2

**Description** : Read Host Watchdog Timeout Value

**Command** : **~AA2[CHK](cr)**

~ delimiter character

AA address of reading module (00 to FF)

2 command for read host watchdog timeout value

**Response** : Valid Command : **!AAEVV[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

E host watchdog enable status, 1=Enable, 0=Disable

VV timeout value in HEX format, each count is 0.1 second, 01=0.1 second and FF=25.5 seconds

**Example** :

Refer *Sec.2.21* ~AA3EVV example

**Related Command** :

*Sec.2.17* ~**, *Sec.2.18* ~AA0, *Sec.2.19* ~AA1, *Sec.2.21* ~AA3EVV, *Sec.2.22* ~AA4V, *Sec.2.23* ~AA5V

**Related Topic** :

*Sec.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation

# 2.21 ~AA3EVV

**Description** : Set Host Watchdog Timeout Value

**Command** : **~AA3EVV[CHK](cr)**

| | |
|---|---|
| ~ | delimiter character |
| AA | address of setting module (00 to FF) |
| 3 | command for set host watchdog timeout value |
| E | 1=Enable/0=Disable host watchdog |
| VV | timeout value, from 01 to FF, each for 0.1 second |

**Response** : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

| | |
|---|---|
| ! | delimiter for valid command |
| ? | delimiter for invalid command |
| AA | address of response module(00 to FF) |

**Example** :

Command : ~010 Receive : !0100

Read address 01 module status, return host watchdog timeout status is clear.

Command : ~013164 Receive : !01

Set address 01 host watchdog timeout value 10.0 seconds and enable host watchdog, return success.

Command : ~012 Receive : !01164

Read address 01 host watchdog timeout value, return that host watchdog is enabled, and time interval is 10.0 seconds.

Command : ~** No response

Reset the host watchcdog timer.

Wait for about 10 seconds and don't send command ~**, the LED of module will go to flash. The flash LED indicates the host watchdog timeout status is set.

Command : ~010 Receive : !0104

Read address 01 module status, return host watchdog timeout status is set.

Command : ~012 Receive : !01064

Read address 01 host watchdog timeout value, return that host watchdog is disabled, and time interval is 10.0 seconds.

Command : ~011 Receive : !01

Reset address 01 host watchdog timeout status, return success. And the LED of this module stop flash.

Command : ~010 Receive : !0100

Read address 01 module status, return host watchdog timeout status is clear.

**Related Command** :

*Sec.2.17* ~**, *Sec.2.18* ~AA0, *Sec.2.19* ~AA1, *Sec.2.20* ~AA2, *Sec.2.22* ~AA4V, *Sec.2.23* ~AA5V

**Related Topic** :

*Sec.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation

# 2.22 ~AA4V

**Description** : Read PowerOn/Safe Value.

**Command** : **~AA4V[CHK](cr)**

| | |
|---|---|
| ~ | delimiter character |
| AA | address of reading module (00 to FF) |
| 4 | command for read PowerOn/Safe value |
| V | P = read PowerOn value, S = read Safe value |

**Response** : Valid Command : **!AA(Data)[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

| | |
|---|---|
| ! | delimiter for valid command |
| ? | delimiter for invalid command |
| AA | address of response module(00 to FF) |
| (Data) | PowerOn Value or Safe Value |

For 8043 (Data) is VVVV, where VVVV is the PowerOn Value (or Safe Value).

For modules, (Data) is VV00, where VV is the PowerOn Value(or Safe Value).

**Example** :

Command : @010000 Receive : >

Output address 01 value 0000, return success.

Command : ~015S Receive : !01

Set address 01 Safe Value, return success.

Command : @01FFFF Receive : >

Output address 01 value FFFF, return success.

Command : ~015P Receive : !01

Set address 01 PowerOn Value, return success.

Command : ~014S Receive : !010000

Read address 01 Safe Value, return 0000.

Command : ~014P Receive : !01FFFF

Read address 01 PowerOn Value, return FFFF.

**Related Command** :

*Sec.2.17* ~**, *Sec.2.18* ~AA0, *Sec.2.19* ~AA1, *Sec.2.20* ~AA2, *Sec.2.21* ~AA3EVV, *Sec.2.23* ~AA5V

**Related Topic** :

*Sec.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation

**Note** :

The command is useless for 8041/52/53.

# 2.23 ~AA5V

**Description** : Set PowerOn/Safe Value.

**Command** : **~AA5V[CHK](cr)**

~ delimiter character

AA address of setting module (00 to FF)

5 command for set PowerOn/Safe Value

V P = set current output as PowerOn Value, S = set current output as Safe Value

**Response** : Valid Command : **!AA[CHK](cr)**

Invalid Command : **?AA[CHK](cr)**

Syntax error or communication error may get no response.

! delimiter for valid command

? delimiter for invalid command

AA address of response module(00 to FF)

**Example** :

Command : @01AA Receive : >

Output address 01 value AA, return success.

Command : ~015P Receive : !01

Set address 01 PowerOn Value, return success.

Command : @0155 Receive : >

Output address 01 value 55, return success.

Command : ~015S Receive : !01

Set address 01 Safe Value, return success.

Command : ~014P Receive : !01AA00

Read address 01 PowerOn Value, return PowerOn Value AA.

Command : ~014S Receive : !015500

Read address 01 Safe Value, return Safe Value 55.

**Related Command** :

*Sec.2.17* ~**, *Sec.2.18* ~AA0, *Sec.2.19* ~AA1, *Sec.2.20* ~AA2, *Sec.2.21* ~AA3EVV, *Sec.2.22* ~AA4V

**Related Topic** :

*Sec.3.2* Module Status, *Sec.3.3* Dual Watchdog Operation

**Note** :

The command is useless for 8041/52/53.

# 3. Application Note

## 3.1 INIT* pin Operation

Each 8000 module has a build-in EEPROM to store configuration information such as address, type, baudrate and other information. Sometimes, user may forget the configuration of the module. Therefore, the 8000 have a special mode named "**INIT mode**", to help user to resolve the problem. The "**INIT mode**" is setting as **Address=00, baudrate=9600bps, no checksum**

To enable INIT mode, please following these steps:

Step1. Power off the module

Step2. Connect the INIT* pin with the GND pin.

Step3. Power on

Step4. Send command $002(cr) in 9600bps to read the configuration stored in the module's EEPROM.

Refer to "**8000 Bus Converter User Manual**" *Sec.5.1* and "**Getting Start**" for more information.

## 3.2 Module Status

**PowerOn Reset** or **Module Watchdog Reset** will let all output goto **PowerOn Value**. And the module may accept the host's command to change the output value.

**Host Watchdog Timeout** will let all output goto **Safe Value**.The module's status (readed by command ~AA0) will be 04, and the output command will be ignored.

# 3.3 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 from communication problem or host halt. When the timeout interval expired, the module will turn all outputs to predefined Safe Value. This can prevent the controlled target from unexpected situation.

The 8000 module with Dual Watchdog may let the control system more reliable and stable.

# 3.4 Reset Status

The Reset Status is set while the module power on or reset by Module Watchdog, and is cleared while the command read Reset Status ($AA5) applied. This is useful for user to check the module's working status. When the Reset Status is set means the module is reset and the output may be changed to the PowerOn Value. When the Reset Status is clear means the module is not reseted, and the output is not changed.

# 3.5 Digital Output

The module's output have 3 different situation :

<1> **Safe Value**. If the host watchdog timeout status is set, the output is set to Safe Value.While the module receive the out-

put command, like @AA(Data) or #AABBDD, the module will ignore the command and return '!', and will not change the output to the output command value. **The host watchdog timeout status is set and store into EEPROM while the host watchdog timeout interval expired, and only can be cleared by command ~AA1.** If user want to change the output, he need to clear the host watchdog timeout status firstly, and send output command to change the output into desired value.

<2> **PowerOn Value**. Only the module reseted, and the host watchdog timeout status is clear, the module's output is set to predefined PowerOn Value.

<3> **Output command value**. If the host watchdog timeout status is clear, and user issue a digital output command, like @AA(Data) or #AABBDD, to module for changing the output value. The module will response success (receive >).

# 3.6 Latch Digital Input

For example, user connect the key switch to digital input channel of a digital input/output module and want to read the key stoke. The key input is a pulse digial input, and user will lost the strike. While reading by command $AA6 in A and B position, the response is that no key stroke and he will lose the key stroke information. Respectly, the read latch-low digital input command $AAL0 will slove this problem. When issue $AAL0 command in A and B position, the response denote that there is a low pulse between A and B position for a key storke.

# 4 DN Module

## 4.1 DN-SSR4

Output Channel : 4 Solid State Relay Contact

Output Specification :

Type : Zero-Cross AC Solid-State Relay Output

Rated Load Voltage : 200 to 240 VAC

Rated Load Current : 4 Arms

Surge Current : 50A

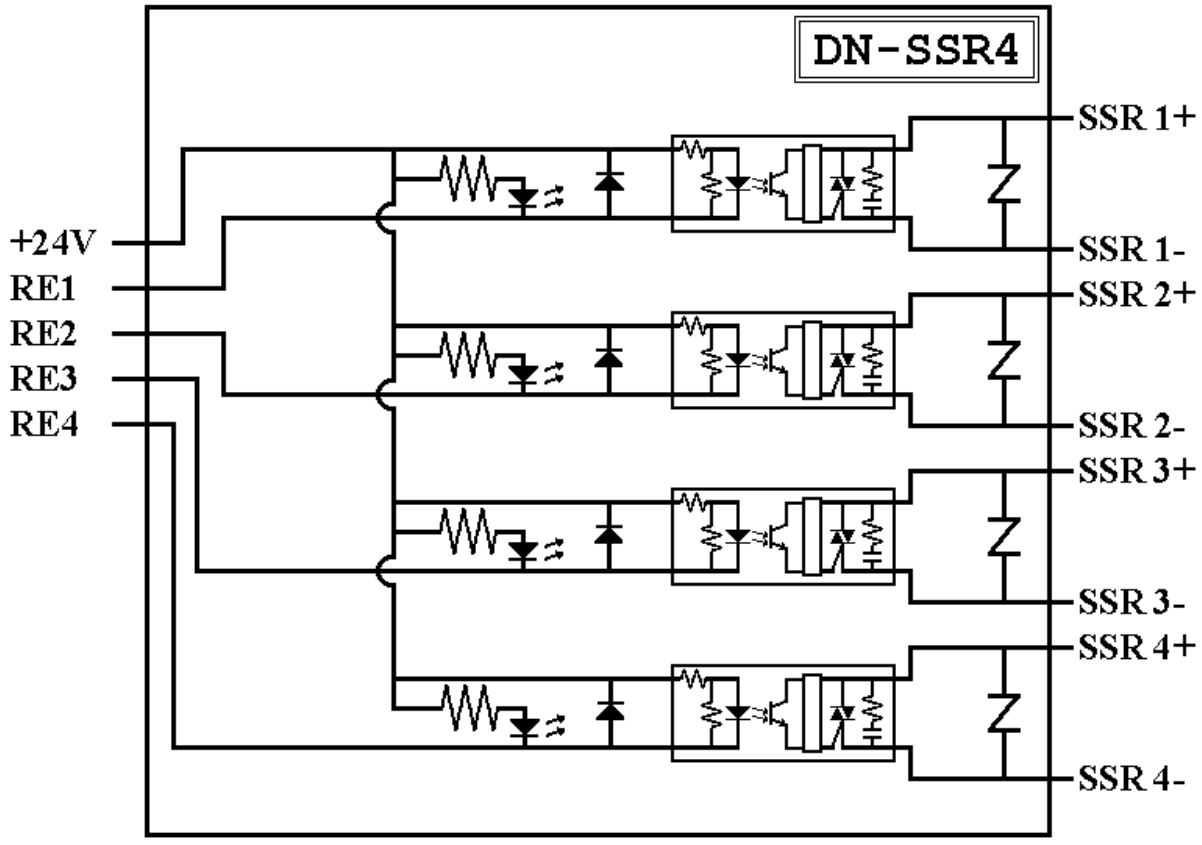
Max. Off-State Leakage Current : 5.0 mA

Operate Time : 1/2 cycle of voltage sine wave + 1mS

Input Impedance : 1.5K Ohms

Din-Rail mounted

Power Input : +24VDC



# 4.2 DN-PR4

Output Channel : 4 Relay Contact

Output Specification :

Type : 1 FormC Relay Contact

Norminal Load : 5A@250VAC, 5A@30VDC

Max. Switching Power : 1250 VAC

Max. Switching Voltage : 250VAC, 150VDC

Max. Switching Current : 5A

Mechanical/Electrical Life : Min. $10*10^6/100*10^3$ ops.

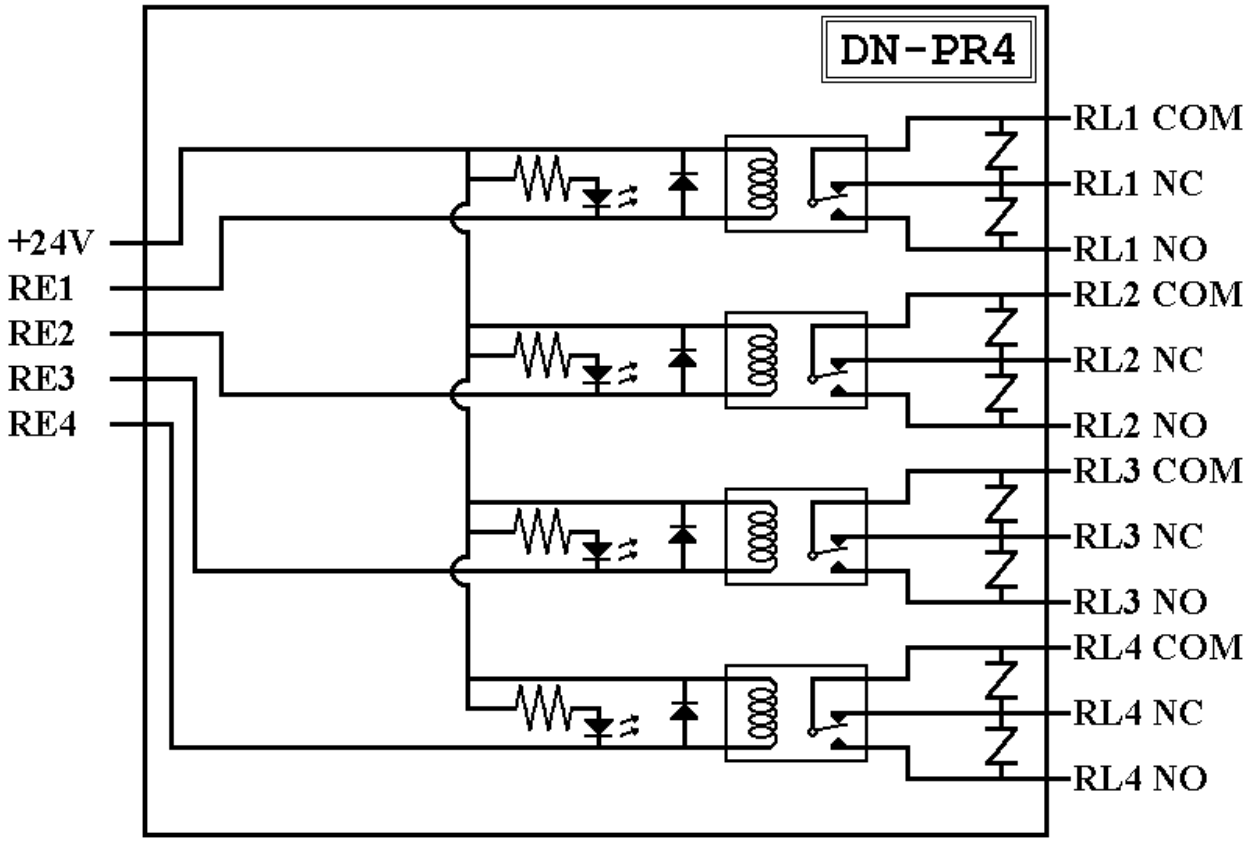
Operate/Release Time : Max. 10mS/5mS

Dielectric Strength : 2000VAC 1 minute

Nominal Coil Power : 360mW

Din-Rail mounted

Power Input : 24VDC



# 4.3 RM-104, RM-108, RM-116

Output Channel : 4/8/16 Relay Contact

Output Specification :

Type : 1 FormC Relay Contact

Rated Load : 16A@250VAC

Max. Switching Voltage : 400VAC

Max. Peak Current : 30A

Standard Contact Material : AgCd0

Min. Life : 100,000 ops.

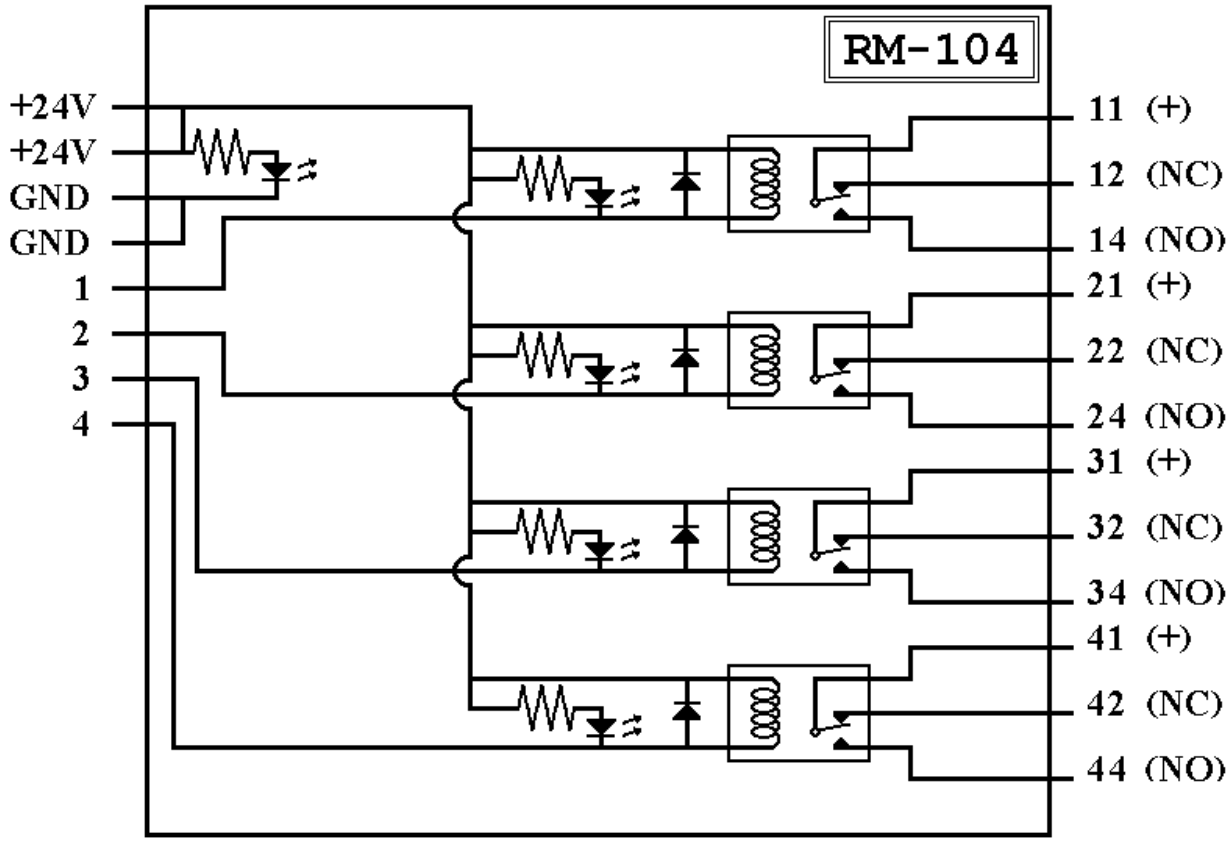
Din-Rail mounted

Dimension :

RM-104 : 78mm * 77mm  RM-108 : 135mm * 77mm

RM-116 : 270mm * 77mm

Power Input : 24VDC



# 4.4 RM-204, RM-208, RM-216

Output Channel : 4/8/16 Relay Contact

Relay Specification :

Type : 2 FormC

Rated Load : 5A@250VAC

Max. Switching Voltage : 400VAC

Max. Peak Current : 10A

Standard Contact Material : Ag Nt

Min. Life : 100,000 ops.

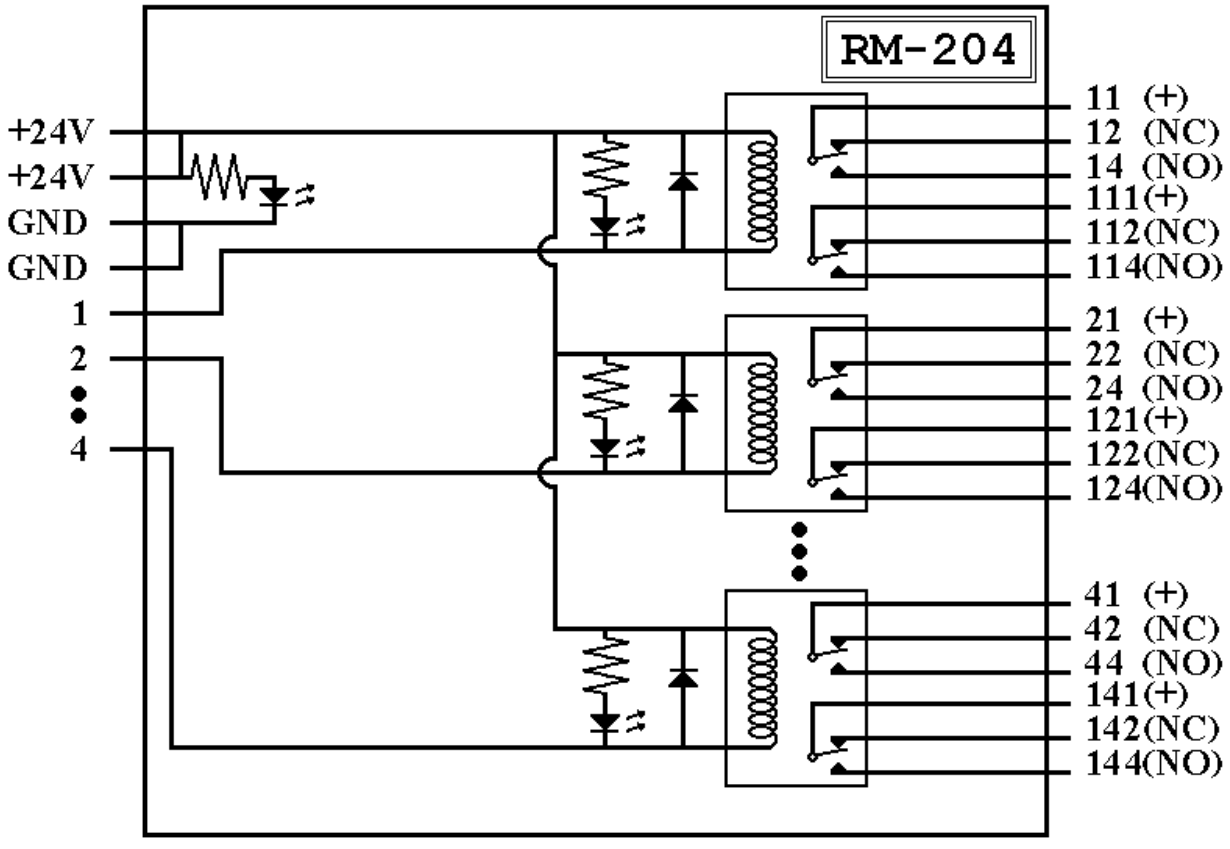
Din-Rail mounted

Dimension :

RM-204 : 78mm * 77mm  RM-208 : 135mm * 77mm

RM-216 : 270mm * 77mm

Power Input : 24VDC



# 4.5 Application

The DN Modules are the IO extension of 8000 modules. These modules may drive more power and heavy load in application. User may use 8000 modules, like 8043 or others, to control the DN modules to drive loads.