

## EX9520 RS232 to RS485 converter

### Key Specifications/Special Features:

- Input: RS-232 protocol
- Speed: "AutoPro" designed auto switch baud rate, 300~115200Bps
- 256 modules max. in one RS-485 network without repeater
- 3000V isolation
- Multiple baud rate; multiple data format
- Communication distance:
  - 2.1km/9600Bs
  - 2.7km/4800Bps
  - 3.6km/2400Bps
  - Power requirements: +10V-30VDC
  - Power consumption 2.2W(max.)
  - Dimensions: 7 x 10 x 2cm
  - Series products: RS422/RS485/RS232; digital I/O AD/DA module

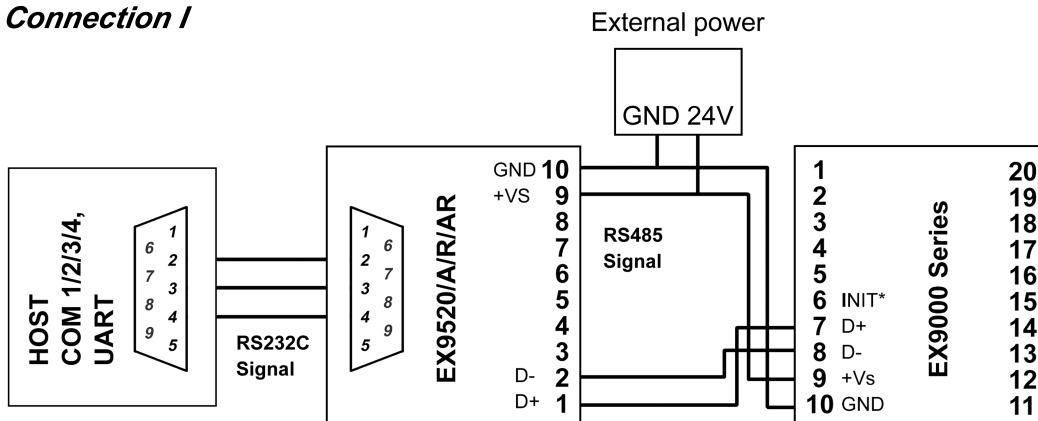
We offer the "AutoPro" function in RS232 to RS485 converter to solve different baud rate & data format for the whole RS485 network.

Because almost every RS232 to RS485 converter in the market which are uses the DIP switch to select the baud rate & data format. But "AutoPro" is auto configured to the same baud rate & data format. in whole RS485 network.

So, EX9520/A/R/AR can connect to different baud rate & data format in the same network.

	422	485	Isolate(PLC)	Repeater
EX9520		▼		
EX9520R		▼	▼	
EX9520A	▼	▼		
EX9520AR	▼	▼	▼	
EX9510		▼		▼
EX9510A	▼	▼		▼
EX9520 (ISA/PCI)		▼		
EX9520A(ISA/PCI)	▼	▼		

### Connection I



## EX9000 DIO Series

### INIT\* Pin Operation For DIO, AIO

Each EX9000 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 EX9000 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.

### Module Status For DIO, AIO

**Power On Reset** or **Module Watchdog Reset** will let all output goto **Power On 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.

### Dual Watchdog Operation For DIO, AIO

#### 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 soft ware 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 EX9000 module with Dual Watchdog may let the control system more reliable and stable.

### 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 rested, and the output is not changed

## Digital O/P

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 output command, like @AA(Date) 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.**

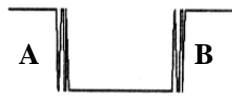
If user want to change the output, he need to clear the host watchdog timeout status firstly , and send output command to change the output into desired value.

<2>**PowerOn Value.** Only the module reseted, and the host watchdog timeout status is clear, the module's output is set to predefined Power On 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 reponse success(receive>).

## Latch Digital I/P

For example, use connect the key switch to grital input channel of a digital input/output module and want to



read the key stroke. The Key input is a pulse digital 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 solve 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 stroke.

General Command Sets			
Command	Response	Description	Page
%AANN TTCCFF	!AA	Set Module Configuration	
###	No Response	Synchronized Sampling	
\$AA2	!AATTCCFF	Read Configuration	
\$AA5	!AAS	Read Reset States	
\$AA6	!(Data)	Read States	
\$AAF	!AA(Data)	Read Firmware Version	
\$AAM	!AA(Data)	Read Module Name	
~AAO(Data)	!AA	Set Module Name	

## Special function for AIO & DIO

### Digital I/P and Event Counter For AIO

The digital input DIO may work as event counter. The counter updates while the input changes from high level to low level. The counter is 16-bit width and useful for low speed count, frequency is lower than 50Hz.

### Digital O/P For AIO

When the module power on, the host watchdog timeout status is checked first. If the status is set, the digital outputs (DO0 and DO1) of module will set to Safe Value. If the status is clear, the digital outputs will set to Power On Value.

If the host watchdog timeout status is set, the module will ignore the digital output command @AADO(Data).

### H/L Alarm For AIO

Some analog input modules, like Ex9012, equip with the high/low alarm function. When the alarm function is enabled, the digital output DO0 is the low alarm indicator, DO1 is the high alarm indicator, and the digital output command to change the DO0 and DO1 is ignored. The alarm function is to compare the analog input value with given high alarm value and low alarm value. There are two alarm types as follows:

- **Momentary Alarm:** the alarm status is cleared while the analog input is not exceed the alarm value.  
If Analog Input Value > High Alarm, DO1(High alarm) is on, else DO1 is off.  
If Analog Input Value < Low Alarm, DO0(Low alarm) is on, else DO0 is off.
- **Latch Alarm:** the alarm is cleared only the user send command to clear.  
If Analog Input Value > High Alarm, DO1(High alarm) is on, else if Analog Input Value < Low Alarm, DO0(Low alarm) is on.

### Transmitter For AIO

Transmitter is an instrument to convert the signal from the sensor to 4-20mA or 0-5V signal level. Transmitters may support driving or compensation circuit for sensor, and the output is after linearization and amplification.

2-wire transmitter, typical 4 to 20mA current output signal. One for power input, the other is signal output.

3-wire transmitters, typical 0 to 5V voltage output signal. One pair for power input and ground and the other is signal output.

### Linear Mapping (For EX9017F/14FD/16PD only)

Linear mapping function is to translate the input value to the desired output value. The linear mapping is a mechanism that convert the analog input value into physical quantity.

Linear mapping have some values to given: mapping source low value(SL) to target low value(TL). source high value (SH) to target high value(TH). For input value (AI), the output value is:

If  $AI < SL$ , output value = -19999.(under limit)

else if  $AI > SH$ , output value = +19999.(over limit)

else output value= $(AI-SL)/(SH-SL)*(TH-TL)+TL$

For example, if we connect a temperature sensor to

EX9014D, and the sensor output is 4mA while the temperature is 0 degree Celsius, 20mA while the temperature is 100 degree Celsius. We want to read the temperature directly. We have the source values, 4 to 20mA, and target values, 0 to 100 degree Celsius.

Suppose the EX9014D is address 01, and baud 9600 bps, no checksum.

1.Set the EX9014D to read  $\pm 20\text{mA}$  type.

Command:%01010D0600 Receive:!01 (Ref %AANNTTCCFF)

2.Set the source low value(SL)=4 and source high value (SH)=20.

Command:\$016+04.000+20.000 Receive:!01 (Ref~AA6(SL)(SH))

3.Set the target low value(TL)=0 and target high value (TH)=100.

Command:\$017+000.00+100.00 Receive:!01 (Ref \$AA7(TL)(TH))

4.Enable linear mapping function.

Command:\$01A1 Receive:!01 (Ref \$AAAV)

Then we'll get the temperature value from EX9014D directly for command #AA.

## Thermocouple Measurement (for 9018P)

When two wires composed of dissimilar metal are joined at one end and heated, the open circuit voltage is a function of the junction temperature and the composition of the two metals. All dissimilar metals exhibit this effect. The voltage is called "seebeck voltage". For small changes in temperature the Seebeck voltage is linearly proportional to temperature.

To measure the Seebeck voltage directly is not available because we must first connect a voltmeter to the thermocouple, and the voltmeter leads themselves create a new thermoelectric circuit. Therefore we need to eliminate the uncton thermoelectric to measure to correct Seebeck voltage, and this is called "Cold Junction Compensation".

For most thermocouples, the Seebeck voltage is 0V while in 0 . One simple way to cancel the junction voltage is to put the junction into 0K enviroment and the junction voltage is 0V. Normally, this is not a good method for most application. Typical method is to measure the junction temperature by thermistor, and measure the junction voltage from the junction temperature. Then we may get the Seebeck voltage from measured thermocouple voltage and junction voltage, and we may calculate the temperature from the Seebeck voltage.

## 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)

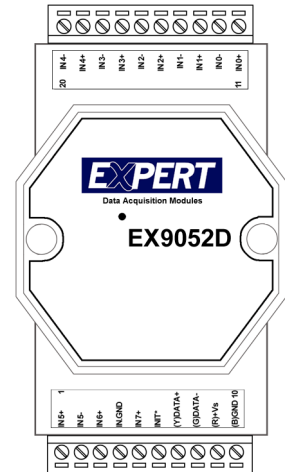
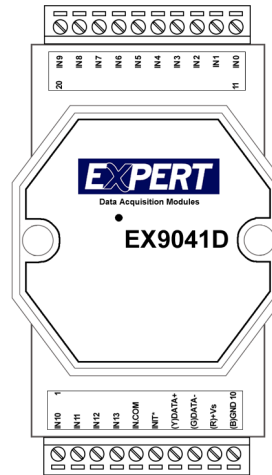
<b>General Command Sets</b>			
<b>Command</b>	<b>Response</b>	<b>Description</b>	<b>Page</b>
%AANNTTCCFF	!AA	Set Module Configuration	
#**	No Response	Synchronized Sampling	
\$AA2	!AATTCCFF	Read Configuration	
\$AA5	!AAS	Read Reset States	
\$AA6	!(Data)	Read States	
\$AAF	!AA(Data)	Read Firmware Version	
\$AAM	!AA(Data)	Read Module Name	
~AAO(Data)	!AA	Set Module Name	

## EX9000 series

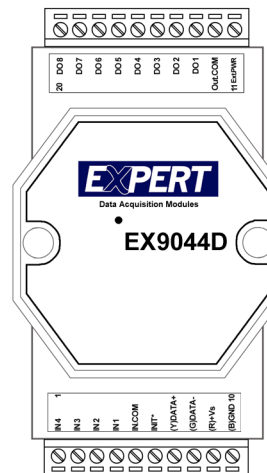
### DIO module

EX9052D, EX9041D, EX9044D

Digital Input Modules		
	EX9041D	EX9052D
Input Channels	14	8
Isolation	Isolation with Common Sources	6 diff & 2 common ground
Isolation Voltage	3750 Vrms	5000 Vrms
Digital Level 0	+1V max	+1V max
Digital Level 1	+4V to +30V	+4V to +30V
Input Impedance	3K Ohms	3K Ohms
Power Input	+10V to +30VDC	
Power Consumption	0.9W	0.6W



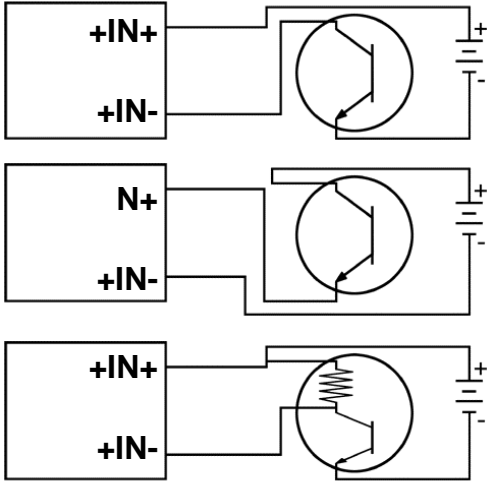
Open Collector Output Modules	
	EX9044D
Output Channel	8
Isolation	Isolation with Common power
Isolation Voltage	3750Vrms
Load Voltage	Max +30V
Max Load Current	375mA
Input Channel	4
Isolation	Isolation with Common Sources
Isolation Voltage	3750Vrms
Digital Level 0	1V Max
Digital Level 1	4V to 30V
Input Impedance	3K Ohms
Power Input	+10V to +30VDC
Power Consumption	1.7W



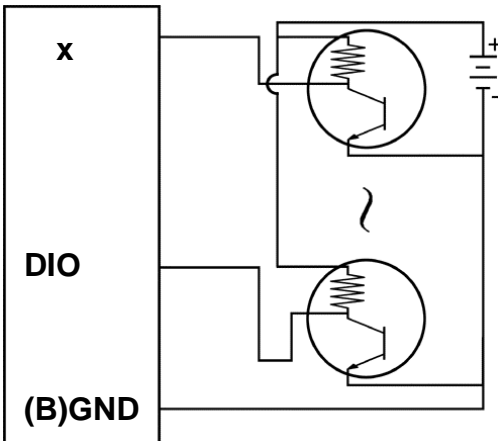
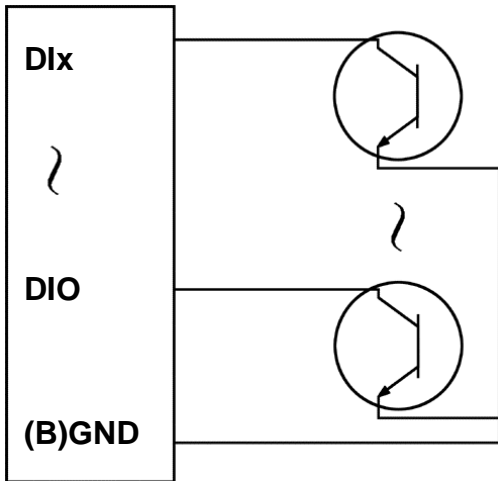
## Wire Connection for D I/O

### Open Collector signal I/P

**EX9052D**

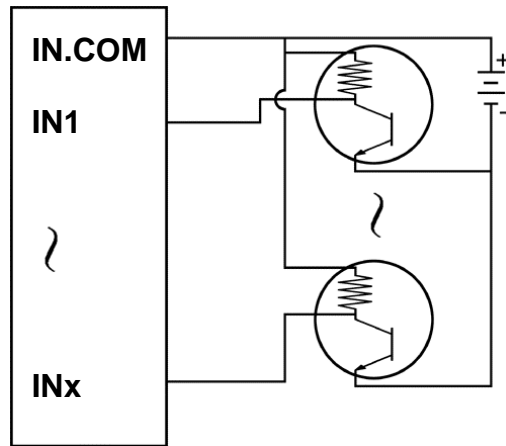
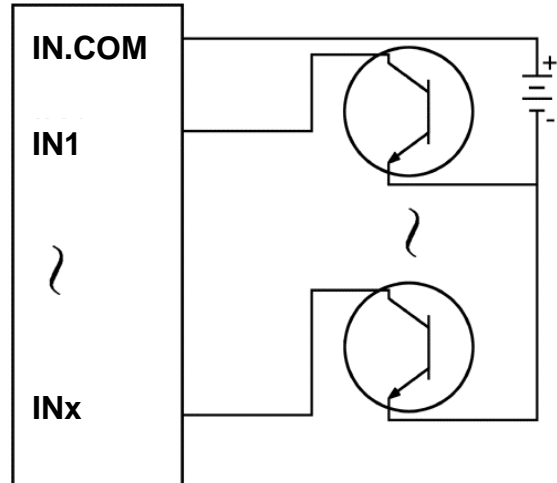


**EX9050D/53D**



### Open Collector signal I/P

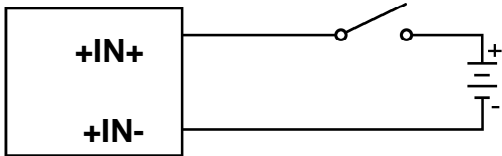
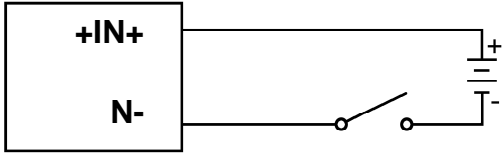
**EX9041D/44D/60D/63D/63AD/  
63BD/65AD/65BD**



## Wire Connection for D I/O

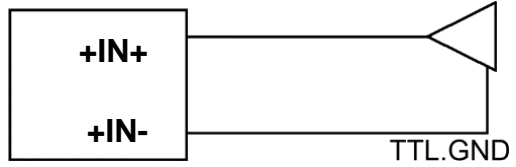
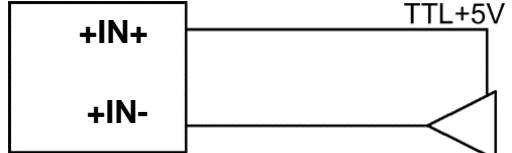
### Dry Contact signal I/P

**EX9052D**

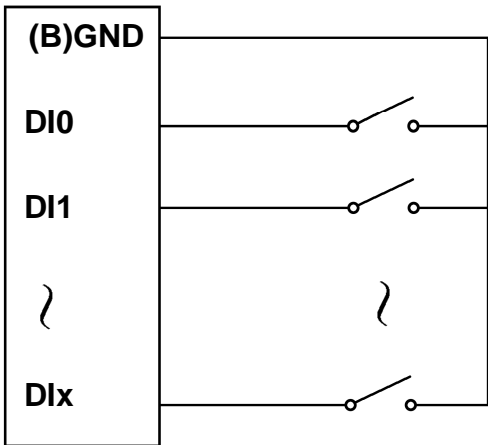


### TTL/CMOS signal I/P

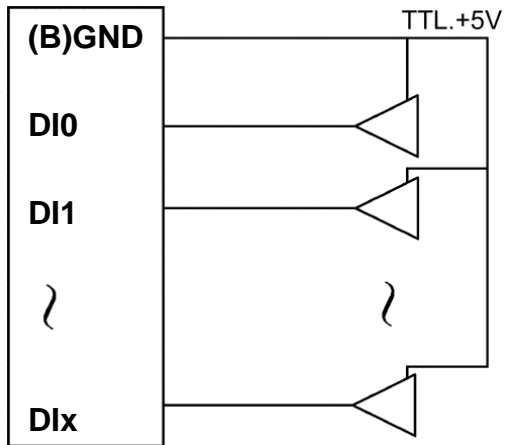
**EX9052D**



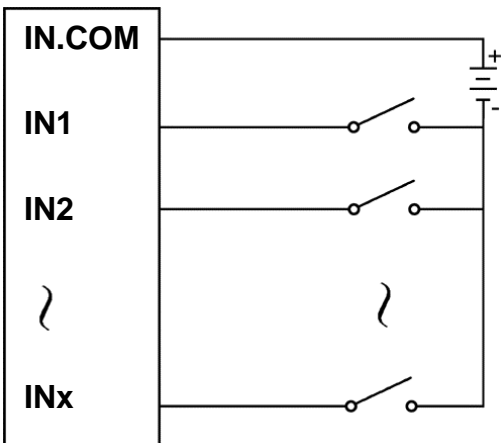
**EX9050D/53D**



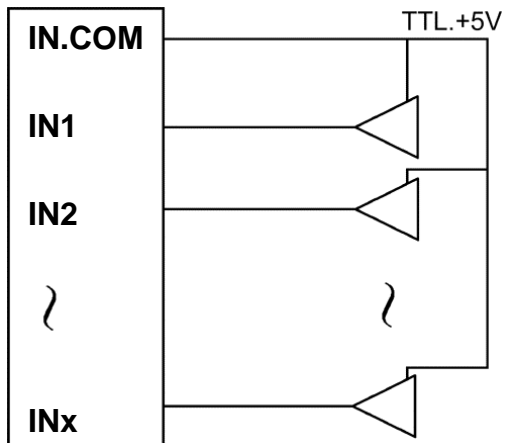
**EX9050D/53D**



**EX9041D/44D/60D/63D/63AD  
/63BD/65AD/65BD**



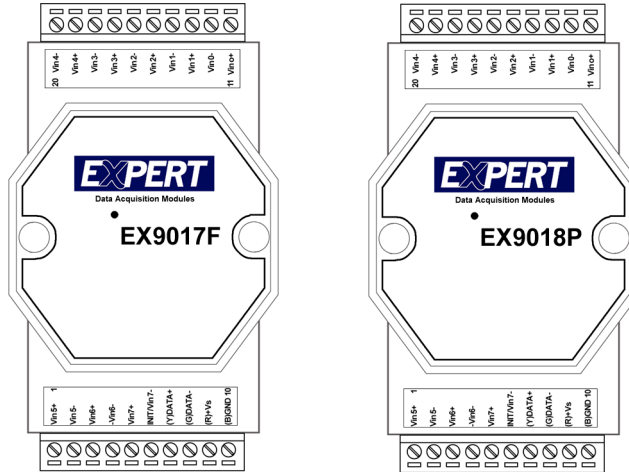
**EX9041D/44D/60D/63D/63AD  
/63BD/65AD/65BD**



# EX9000 series

## AIO module

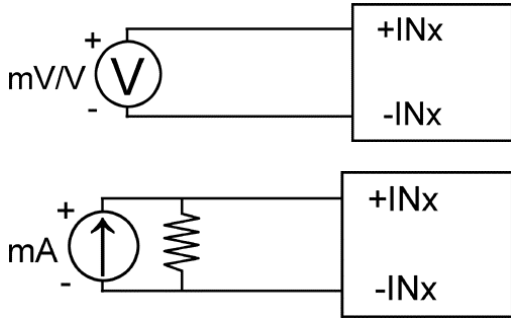
### EX9017F/9018P



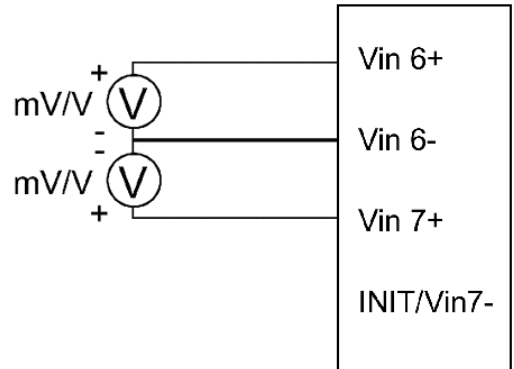
		EX9017F	EX9018P
Analog I/P	<b>Resolution</b>	12bit	16bit
	<b>Input Channel</b>	8 diff	8 diff
	<b>Sampling rate</b>	75Hz/100Hz	10Hz
	<b>Voltage I/P</b>	+/- 150mV +/- 500mV +/- 1V +/- 5V +/- 10V	+/- 15mV +/- 50mV +/- 100mV +/- 500mV +/- 1V +/- 2.5V
	<b>Current I/P</b>	+/- 20mA*	+/- 20mA*
	<b>Sensor I/P</b>	X	J.K.T.E.R.S.B.N.C.L.M
	<b>4.5 digit LED</b>	X	X
	<b>Isolated loop Power</b>	X	X
	<b>I/P Linear Scaling</b>	X	X
	<b>Isolation</b>	3000V	3000V
Digital I/P & Digital O/P	<b>Digital I/P Channels</b>	X	X
	<b>Digital O/P Channels</b>	X	X
	<b>Event Counter</b>	X	X
	<b>H/L Alarm</b>	X	X
<b>Dual Watchdog Timer</b>	v	v	
<b>Power I/P</b>	+10V to +30V	+10V to +30V	
<b>Power Consumption</b>	1.3W	1.0W	

## Wire Connection for A I/O

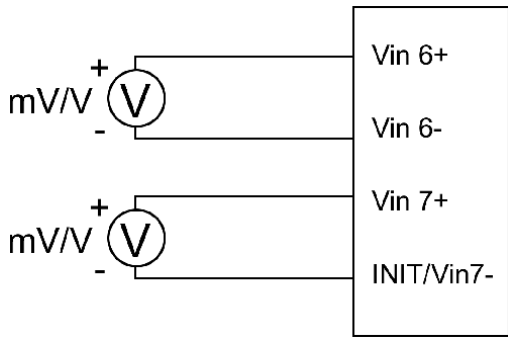
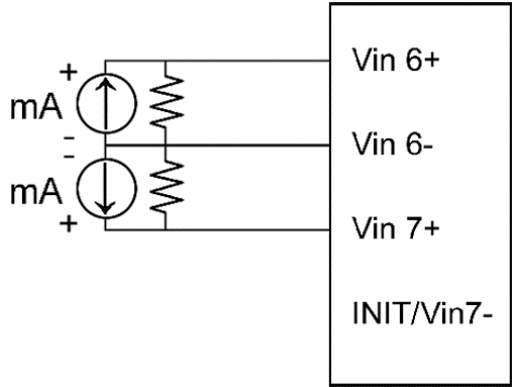
**EX9017F** Analog I/P Channel 0 to 5 wire connection



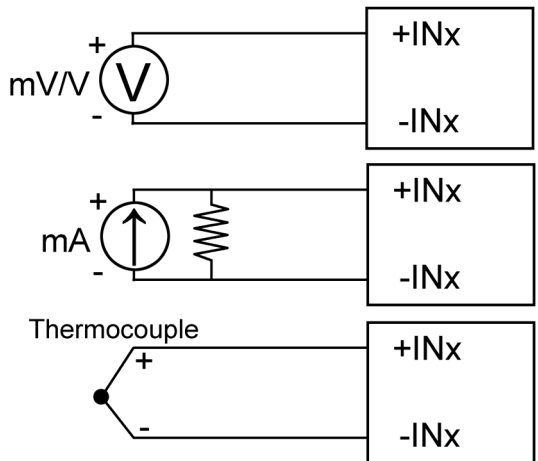
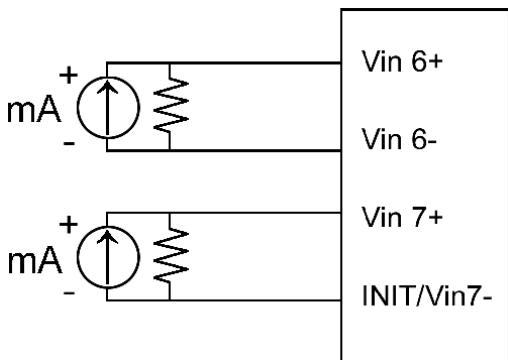
**EX9017F** Analog I/P Channel 6 and 7 wire connection, while the jumper JP1 setting is INIT\* mode.



**EX9017P** Analog I/P Channel 6 and 7 wire connection, while the jumper JP1 setting is 8 differential mode.



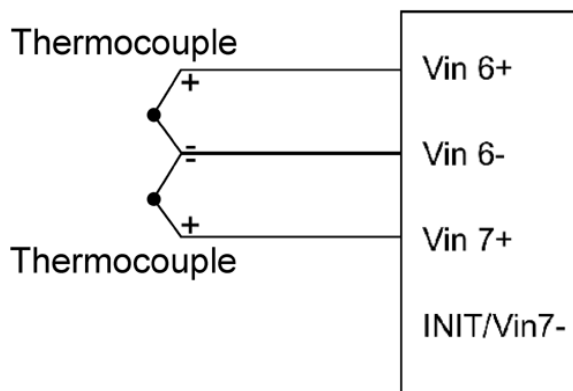
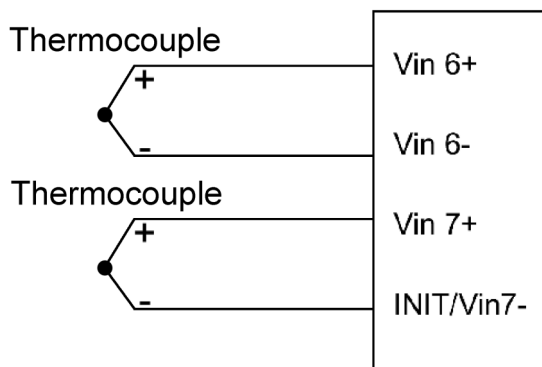
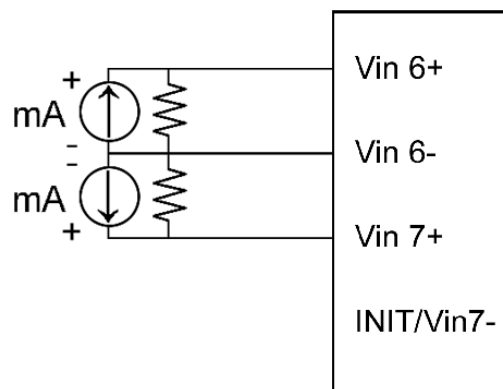
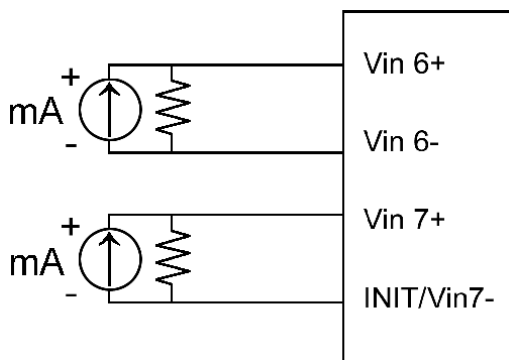
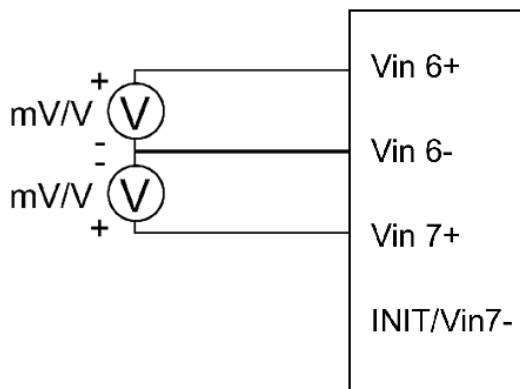
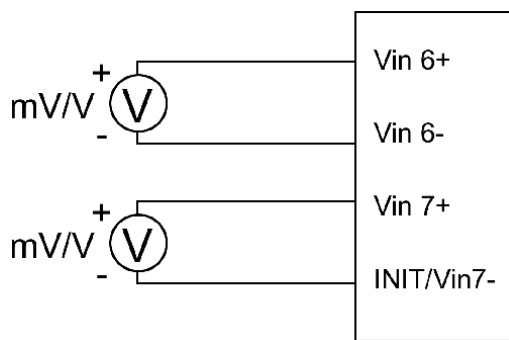
**EX9018P** Analog I/P Channel 0 to 5 wire connection



## Wire Connection for A I/O

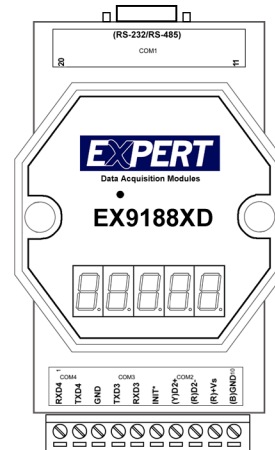
**EX9018P** Analog I/P Channel 6 and 7 wire connection, while the jumper JP1 setting is 8 differential mode.

**EX9018P** Analog I/P Channel 6 and 7 wire connection, while the jumper JP1 setting is INIT\* mode.



## EX9188 series

Model NO	EX9188AD	EX9188BD	EX9188CD
RAM	256	256	128
ROM	512	256	256



COM1 : Program download RS232 (5wire) / RS485 (2wire)

EX9188AD Program download from COM4

### 1. Introduction

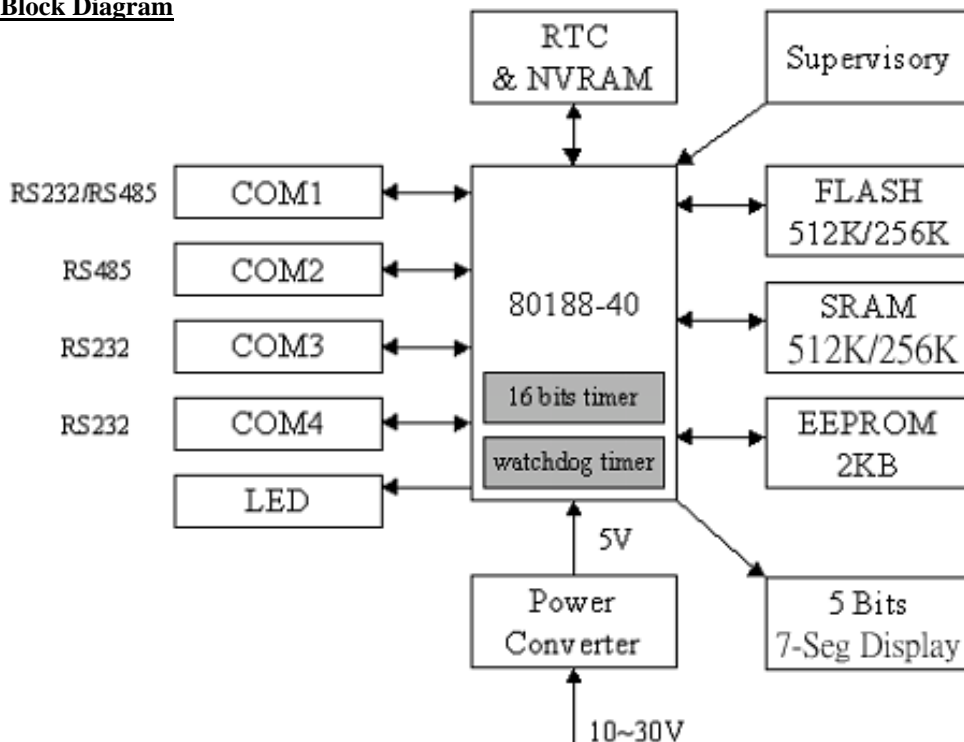
EX9188 module is a multi-purpose embedded controller and provides a low-cost, high –performance solution for various industry applications. The multi serial ports of EX9188 can operate several control interfaces simultaneously so that different devices can connect together. It can also be used to replace the PC or PLC under industrial control.

EX9188 is equipped with AMD 80188 microprocessor, SRAM, flash ROM, EEPROM, 4 communication ports, 5-digit LED display and a real time clock (RTC). There are two RS232 ports (COM3 and COM4), one RS485 port (COM2) and one RS232/RS485 selectable port (COM1).

The operation system (ROM-DOS) is included in EX9188 module. ROM-DOS is functionally equivalent to other brands of DOS. A standard DOS executable program is able to run in ROM-DOS. Users can use control programs to download or upload any data via COM4 port under ROM-DOS.

### 2. System Specification

#### 2.1 Block Diagram



## **2.2 Features & Specifications**

### **CPU:**

Am188™ ES CPU, 40MHz, 1MB Memory size, 1MB I/O Size, 32 GPIOs, 6 Interrupts, 2 Timers.

### **SRAM:**

Static Memory A617308V-12x2, 256KB, for storing control programs and ROM-DOS can make it to be a RAM-DISK drive.

### **Flash Memory:**

Flash ROM Am29F010-70EC, 512KB, ROM-DOS can make it to be a ROM-DISK drive.

### **NVSRAM:**

DS1302 build-in NVSRAM, 32 bytes for keeping data for 10 years on battery support.

### **EEPROM:**

EEPROM, 2048bytes, for storing parameters or variable data.

### **Real Time Clock:**

DS1302, Y2K-compliant real time clock from year 1980 to 2079.

### **COM1:**

COM1 is selectable for RS232/RS485. Maximum baud rate is 115,200bps.

### **COM2:**

COM2 for RS485 communications. Maximum baud rate is 115,200bps.

### **COM3**

COM3 for RS232 communication. Maximum baud rate is 115,200bps.

### **COM4:**

COM4 for RS232 communication. Maximum baud rate is 115,200bps.

### **Mini BIOS**

The Datalight's miniBIOS, as the name implies, is the minimum BIOS need to run Datalight's ROM-DOS. It is not intended to replace full BIOS but to serve those embedded situations that do not require full BIOS support.

### **ROM-DOS**

EX9188 Module is equipped with DataLight ROM-DOS. ROM-DOS is a disk operating system that can be loaded in Read Only Memory (ROM) and can run entirely from within ROM and also from a hard or floppy disk, such as in a desktop system.

ROM-DOS is functionally equivalent to other brands of DOS and can run programs that are executable under a standard DOS (which executes from RAM). With ROM-DOS, the executable program resides on a disk or is placed in ROM along with ROM-DOS.

### **Hyper Terminal**

After H/W installation (refer to H/W manual), Hyper Terminal can be used to control the EX9188 module. COMM.exe can be executed under DOS of 9188 by using Hyper Terminal.

### **File Transfer**

Please use "transfer.exe" when using "comm.exe" to communicate with 9188.

Please use "xm.exe" when using HyperTerminal to communicate with 9188.

**comm.exe ↔ transfer.exe**

**HyperTerminal ↔ xm.exe**

### **ROMDISK.EXE**

ROMDISK.EXE is a utility of ROM-DOS. It is for making a ROM-DOS image file.

### **TOROM.EXE**

TOROM.EXE is used to transfer the ROMDISK image file to Flash ROM of EX9188 module and the contents of Flash ROM of ROM disk will then be updated.

### **VDISK**

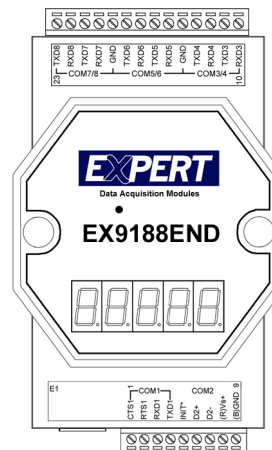
Vdisk is a device driver which can create a virtual disk or RAM DISK from system memory. The contents of virtual disk will be lost when power-off. Vdisk.sys is a system file which can be configured in config.sys.

### **9188 Library**

9188 library provides all the necessary functions for controlling COM ports, LED, data storage, watchdog timer, timers and etc. By applying the 9188 library functions, the programmers are able to have easy access to EX9188 and develop all kinds of applications for controlling EX9188.

## EX9188END series

Model No.	EX9188E4D	EX9188E8D
Ethernet port	10 BASE T	10 BASE T
COM1	RS232/RS485	RS232/RS485
COM2	RS485(Isolate)	RS485(Isolate)
COM3	RS232(5wire)	RS232(3wire)
COM4	RS485	RS232(5wire)/RS485
COM5	x	RS232(5wire)/RS485
COM6	x	RS232(5wire)/RS485
COM7	x	RS232(5wire)/RS485
COM8	x	RS232(5wire)/RS485
Digital I/O	4/4	-/-



- EX9188E8D Support 7 RS232/RS485 devices
- Ethernet port for TCP/IP features TCP, UDP, IP, ICMP, ARP, RARP
- COM1 Can be used to download program and can be RS232/RS485 port
- COM2 3000V Isolation
- Dual Watchdog support for system recovery
- "AutoPro" inside on RS485 port
- CPU 80188, 40MHZ
  - SRAM 256KB
  - FLASH ROM 512KB
  - EEPROM 2KB
  - EMBEDDED OS MiniDOS
- Advantech / ICP fully compatible
- Series EX9188E1, EX9188E2, EX9188E3, EX9188E4, EX9188E5, EX9188E8

## EX8000 series 2003 March OK

### OEM/ODM

Specialist for:

1. Value control
2. Factory automation
3. Building/office automation
4. Sensing element design
5. Electronic-hydraulic

New interface of converter:

1. Canbus converter & repeater
2. Ethernet to modbus server
3. 2.4Ghz radio modem module
4. Fiber optic to RS232/422/485 converter