PLC500 Nseries

# Programmable Logic Controllers

Installation and Commissioning

Edition 1.3
August 2009

Layout of a typical PLC

IO modules of PLC500 Nseries are installed on an aluminum mounting rail. A connecting back plain is inserted into the rail. Modules will be placed into the rack at appropriate slots of the back plain. The left-most module is the CPU and Power supply module. Other input and output modules may be placed into the next slots with no restrictions.

Two types of rails and back plains are available. The small size (12 inches) can hold CPU and Power supply module plus a maximum of five IO modules. The larger size one (19 inches) can hold CPU and Power supply module plus up to ten signal modules.
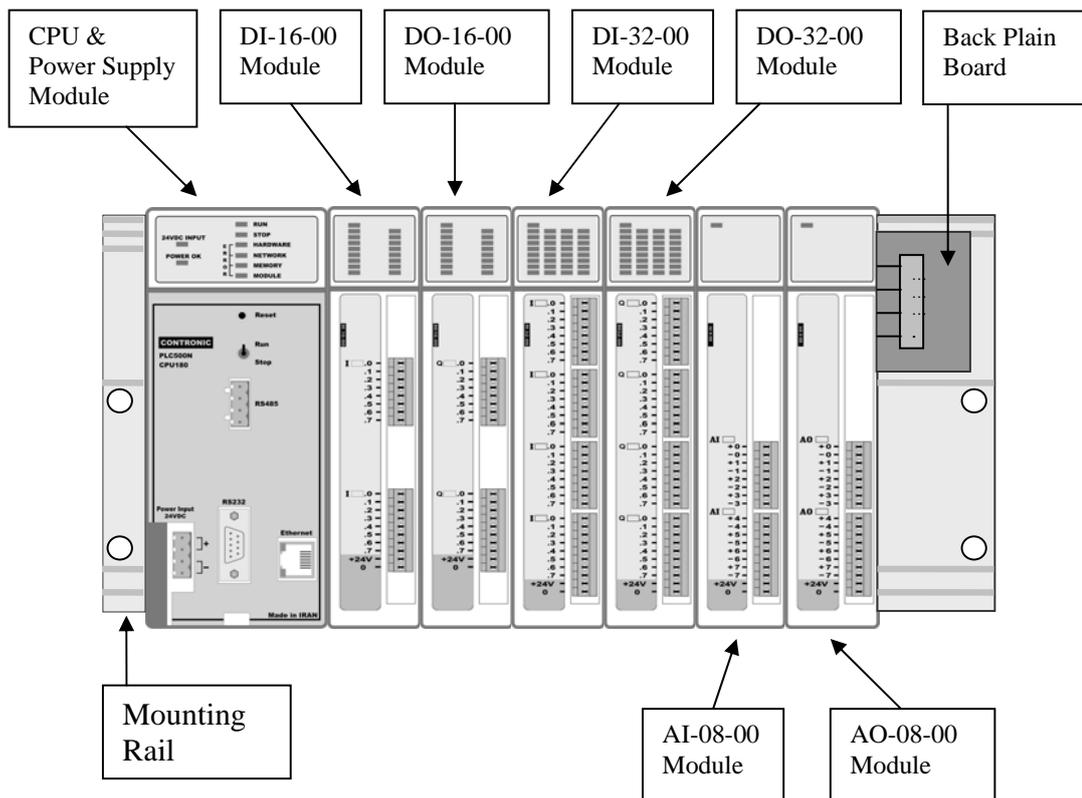
CPU and Power Supply Module

CPU and Power supply module requires an external +24VDC, 2000mA source of voltage. The power supply uses this voltage and converts it to the required internal voltage levels. The power supply part of the module -left side of the module- has two indicating green LEDs that indicate if external +24VDC and the internal +5VDC voltages are ok.

CPU part of the module-right side of the module- has 6 LEDs, 3 communication ports , one Run-Stop toggling switch and 1 reset button. These will be discussed as follows.
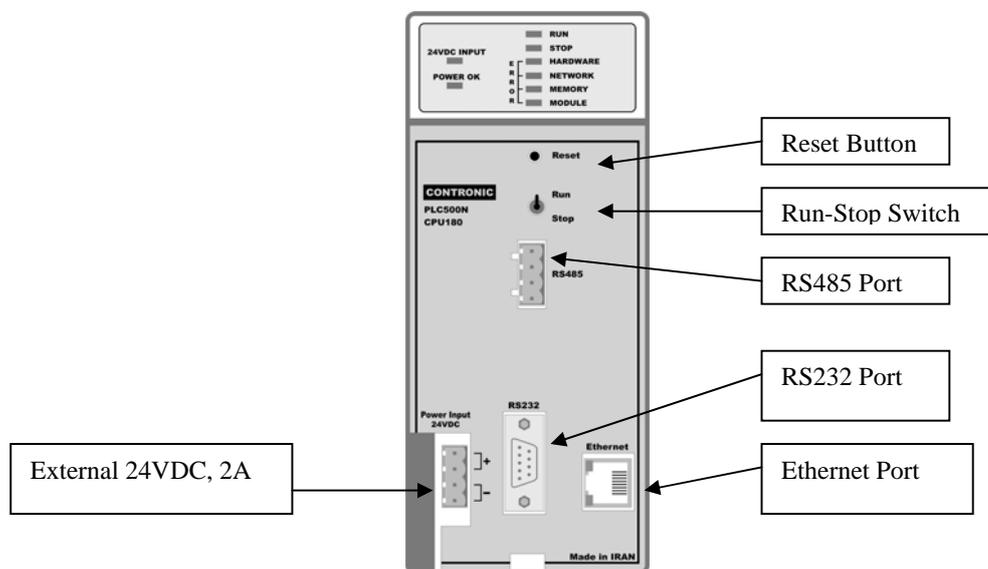
| Item	Device	Name	Description
1	Green LED	Run indicating LED	PLC is in Run mode
2	Red LED	Stop indicating LED	PLC is in Stop mode
3	Yellow LED	Hardware Error	Hardware Configuration error detected in start-up
4	Yellow LED	Network Error	Network error detected in start-up
5	Yellow LED	Memory Error	Blinks when memory is being fixed. Permanent ON when fixing into the flash memory fails.
6	Yellow LED	Module Error	Turns on when a module is removed in Run time
7	Button	Reset	Resets CPU if pushed temporarily down
8	Switch	Run / Stop switch	Switches CPU into Run or Stop modes

Digital Input Module DI-16-00

DI-16-00 is a sixteen channel isolated digital input module arranged in two successive bytes. The bytes are enumerated from top to bottom.. For example if the upper connector is assigned as IB4 (Input Byte 4) then the lower one will be IB5 (Input Byte 5).
Each channel accepts a nominal +24VDC voltage as high and 0VDC as a low level signal.
In order to activate the module an external +24VDC voltage must be applied to its lowest two terminals +24V and 0 terminals. The CPU cannot detect the module if this voltage is not applied to the module properly. In this way the power supply to the module is checked by the CPU.
You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on.
There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and reads its input channels. If it fails to turn on, it indicates that the module is not addressed by the CPU.
There are 16 green LEDS in the display area of the module indicating status of each of the 16 digital input channels. They turn on when the corresponding channel has received a high +24VDC level.
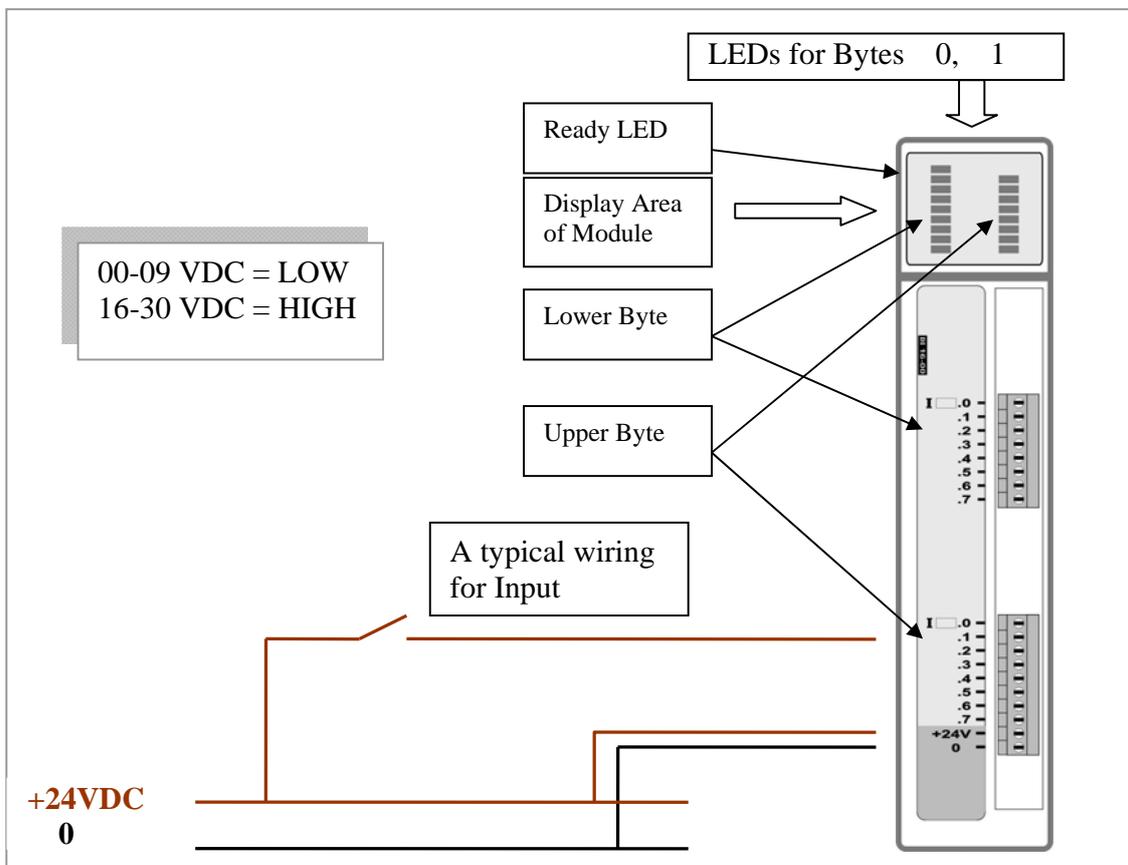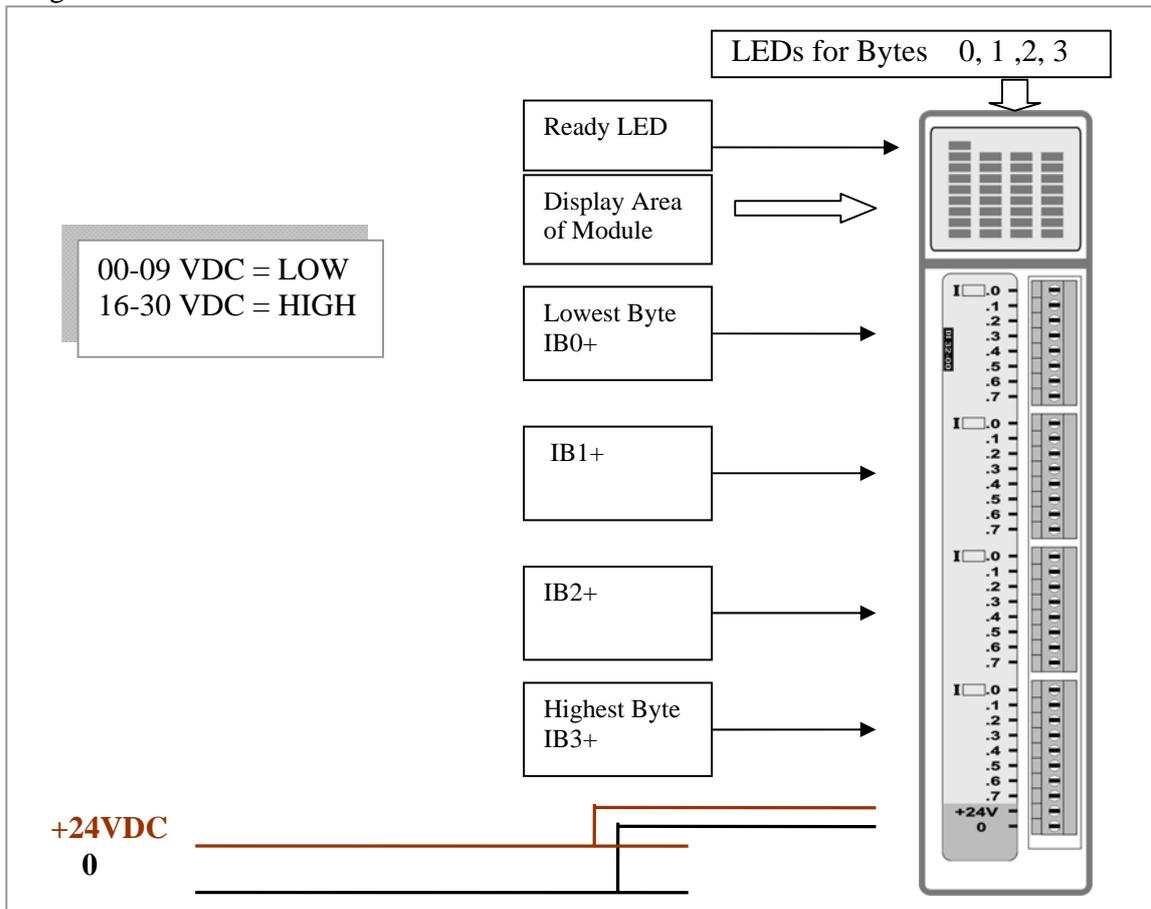
Digital Input Module DI-32-00

DI-32-00 is a 32 channel isolated digital input module arranged in four successive bytes. The bytes are enumerated from top to bottom.. For example if the upper connector is assigned as IB4 (Input Byte 4) then the lowest one will be IB7 (Input Byte 7).

Each channel accepts a nominal +24VDC voltage as high, and 0VDC as a low level signal.

In order to activate the module an external +24VDC voltage must be applied to its lowest two terminals +24V and 0 terminals. The CPU cannot detect the module if this voltage is not applied to the module properly. In this way the power supply to the module is checked by the CPU.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or by removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on.

There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and reads its input channels. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.

There are 32 green LEDS in the display area of the module indicating status of each of the 32 digital input channels. They turn on when the corresponding channel has received a high +24VDC level.
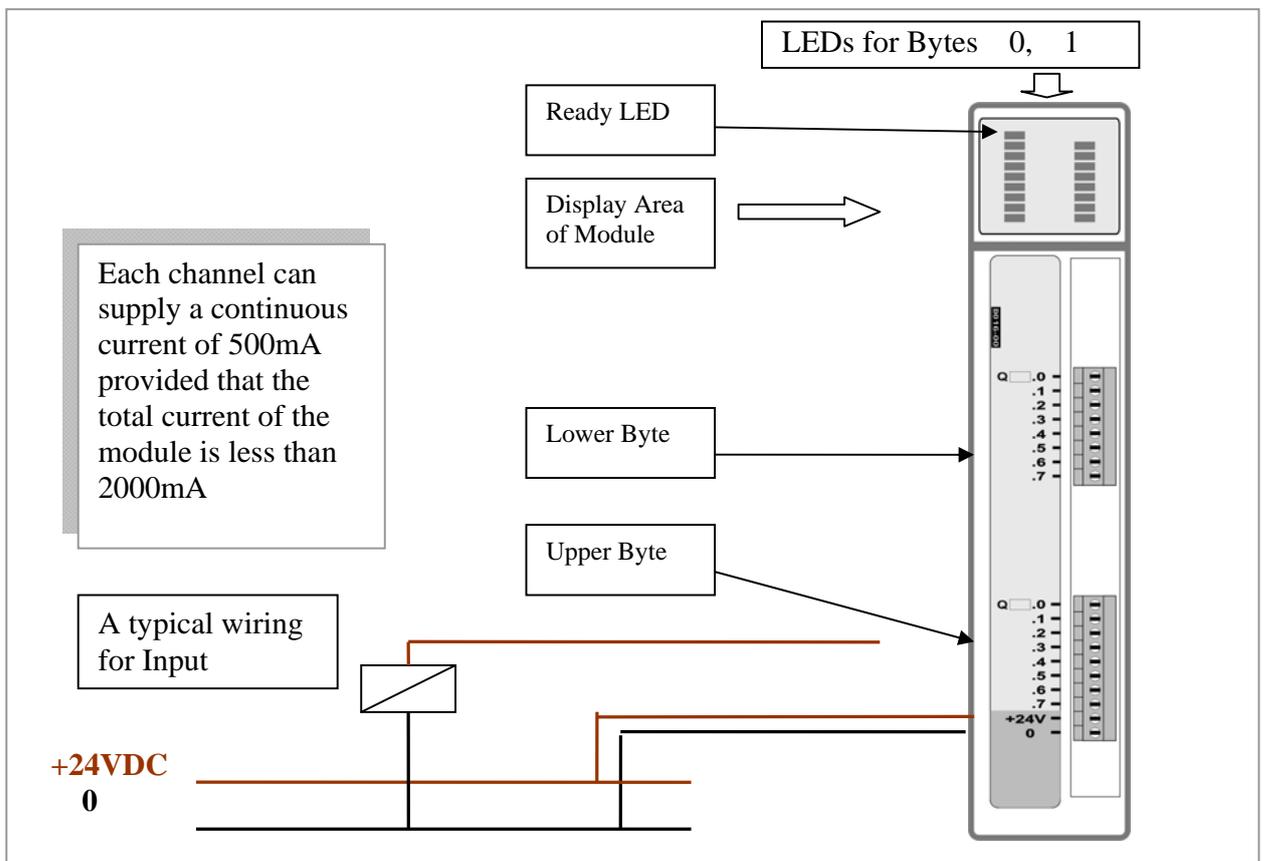
Digital Output Module DO-16-00

DO-16-00 is a sixteen channel isolated digital output module arranged in two successive bytes. The bytes are enumerated from top to bottom.. For example if the upper connector is assigned as QB4 (Output Byte 4) then the lower one will be QB5 (Output Byte 5). Each channel provides a nominal +24VDC voltage as high and 0VDC as a low level signal on its terminal.

In order to activate the module an external +24VDC voltage must be applied to its lowest two terminals +24V and 0 terminals. The CPU cannot detect the module if this voltage is not applied to the module properly. In this way the power supply to the module is checked by the CPU.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on.

There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and writes to its output channels. If it fails to turn on, it indicates that the module is not addressed by the CPU.

There are 16 green LEDS in the display area of the module indicating status of each of the 16 digital output channels. They turn on when the corresponding channel has provided a high +24VDC level on its terminal.

Digital Output Module DO-32-00

DO-32-00 is a 32 channel digital output module arranged in four successive bytes. The bytes are enumerated from top to bottom.. For example if the upper connector is assigned as QB4 (Output Byte 4) then the lowest one will be QB7 (Output Byte 7).

Each channel provides a nominal +24VDC voltage as high, and 0VDC as a low level signal.

In order to activate the module an external +24VDC voltage must be applied to its lowest two terminals +24V and 0 terminals. The CPU cannot detect the module if this voltage is not applied to the module properly. In this way the power supply to the module is checked by the CPU.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on.

There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and writes to the outputs. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.

There are 32 green LEDS in the display area of the module indicating status of each of the 32 digital output channels. They turn on when the corresponding channel has provided a high +24VDC level.
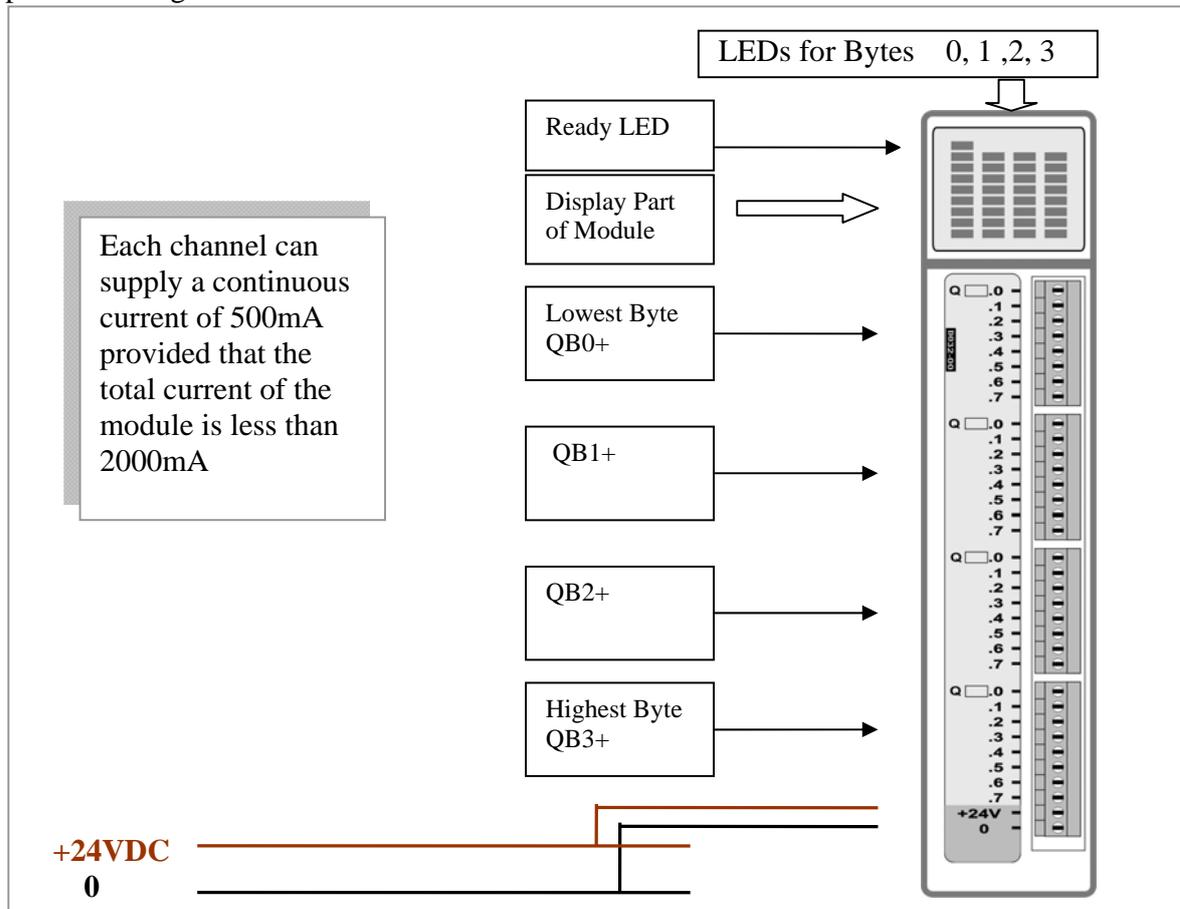
Analog Input Module AI-08-00

AI-08-00 is an 8-channel 10-bit isolated analog input module occupying 16 successive bytes in Input image area of the CPU. These 16 bytes are arranged into 8 words that can be configured in 8 integer values. These words are enumerated from top to bottom. For example if the upper channel is assigned as IW8 (Input Word 8) then the next channels will be IW10, IW12, IW14, IW16, IW18, IW20 and IW22.

Every channel occupies two places in terminal front connector so that analog inputs will be connected via a pair of copper wires in differential mode with positive voltage in higher position.

An external 24VDC supply is required to drive the module's internal circuits providing isolation of signals. CPU monitors this voltage in order to activate the module. Therefore, an external +24VDC voltage must be applied to the lowest two +24V and 0 terminals of the module. The CPU cannot detect the module if this voltage is not applied to the module properly.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or by removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on indicating the malfunction.
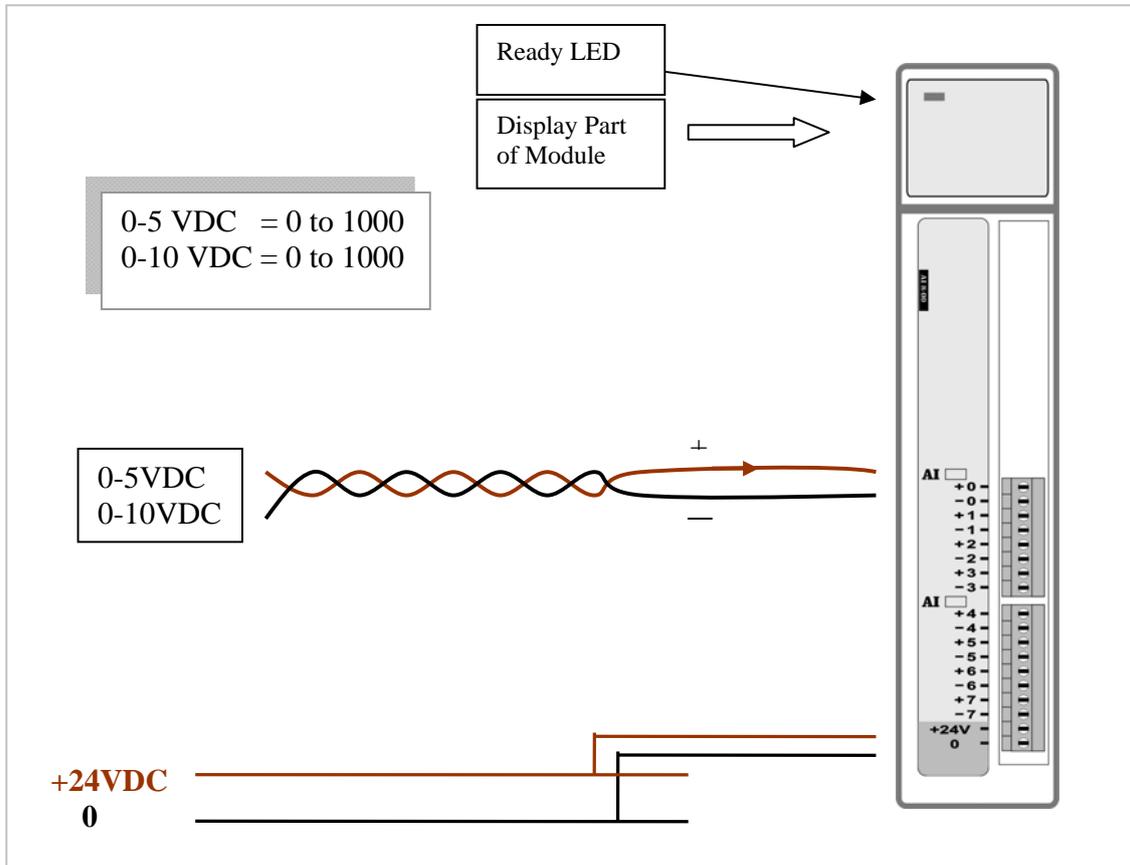
There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and reads its input channels. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.

Every channel accepts analog inputs of 0-5VDC or 0-10VDC depending on your order and provides an integer value between 0 to1000 accordingly.

Example:

Below you can see an example that shows how to define an analog signal named Level100. Let's this signal be applied to AI-08-00 module at an address of IW8 and is desired to be represented as an unsigned integer value.

VAR_GLOBAL (*AUTOINSERT*)
      …..
      Level100   AT   %IW8   :   UINT;
END_VAR

0-5 VDC   = 0 to 1000
0-10 VDC = 0 to 1000

Ready LED

Display Part
of Module

0-5VDC
0-10VDC

+24VDC
0

Contronic Co.   August 2009

Analog Input Module AI-08-01

   AI-08-01 is an 8 or 4 channel 12-bit isolated analog input module occupying 16 successive bytes in input image area of the CPU. These 16 bytes are arranged into 8 words that can be configured in 8 integer values. These words are enumerated from top to bottom. For example if the upper channel is assigned as IW8 (Input Word 8) then the next channels will be IW10, IW12, IW14, IW16, IW18, IW20 and IW22.

   Every channel occupies four terminal places in the front connector. Terminal A can supply a 24VDC voltage with respect to terminal D to drive current transmitters if required. Terminals B and C are the main input sense terminals. Connection of voltage and current transmitters are described as shown in the following figure.

   An external 24VDC supply is required to drive the module's internal circuits providing isolation of signals. The CPU monitors this voltage in order to activate the module. Therefore, an external +24VDC voltage must be applied to the lowest two +24V and 0 terminals of the module. The CPU cannot detect the module if this voltage is not applied to the module properly.

   You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or by removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on indicating the malfunction.

   There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and reads its input channels. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.

AI-08-01 has following hardware versions.

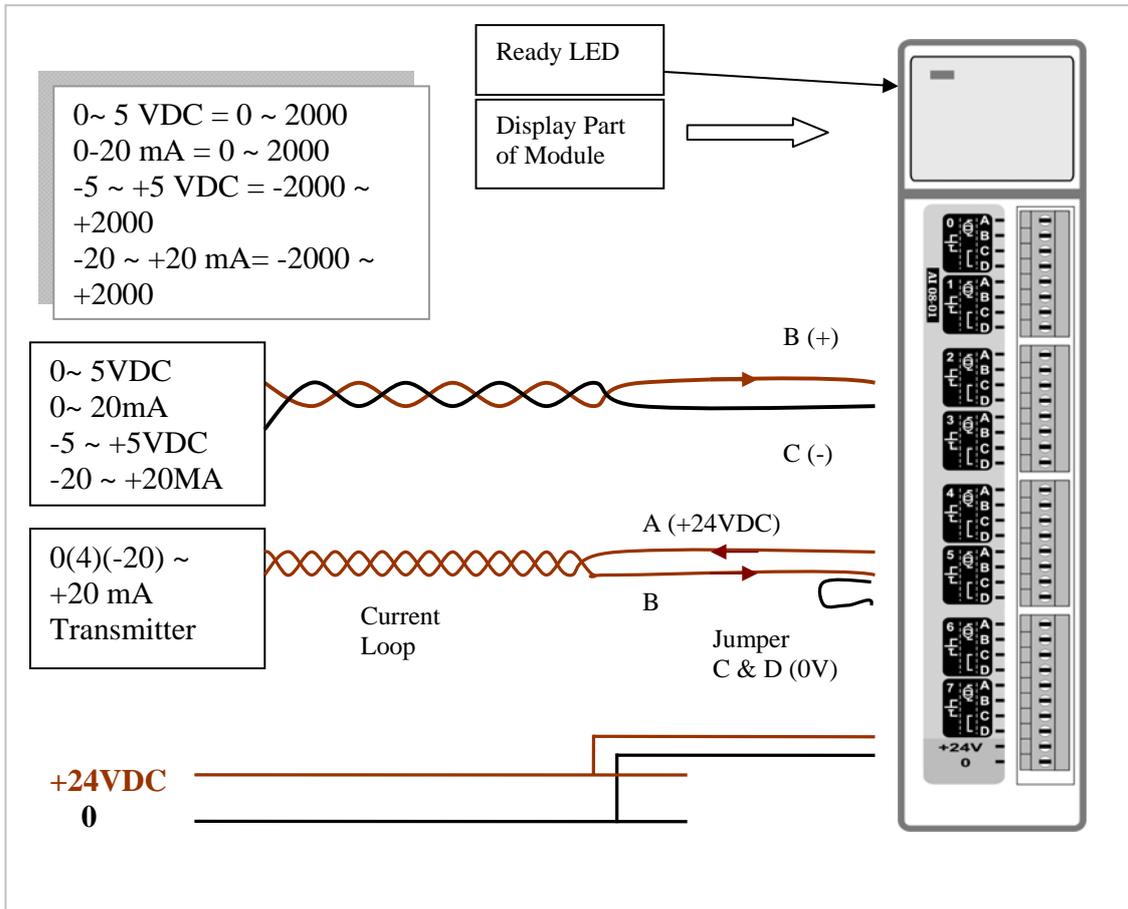| Hardware Version	Number of Channels	Bipolar	Measuring Range	Read Value
AI08-01-S4	4	No	0 ~ 5 VDC, 0 ~ 20mA	0 ~ +2000
AI08-01-S4B	4	Yes	-5 ~ +5 VDC, -20 ~ +20 mA	-2000 ~ +2000
AI08-01-S8	8	No	0 ~ 5VDC, 0 ~ 20mA	0 ~ +2000
AI08-01-S8B	8	Yes	-5 ~ +5VDC, -20 ~ +20 mA	-2000 ~ +2000

Example:
Below you can see an example that shows how to define an analog signal named Level100. Let's this signal be applied to AI-08-01 module at an address of IW8 and is desired to be represented as an unsigned integer value.

VAR_GLOBAL (*AUTOINSERT*)
      …..
      Level100   AT   %IW8   :   UINT;
END_VAR

0~ 5 VDC = 0 ~ 2000
0-20 mA = 0 ~ 2000
-5 ~ +5 VDC = -2000 ~ +2000
-20 ~ +20 mA= -2000 ~ +2000

Ready LED

Display Part of Module

0~ 5VDC
0~ 20mA
-5 ~ +5VDC
-20 ~ +20MA

0(4)(-20) ~
+20 mA
Transmitter

Current
Loop

B (+)

C (-)

A (+24VDC)

B

Jumper
C & D (0V)

+24VDC
0

Every channel has 4 pins A, B, C& D. The external 24VDC supply is also connected internally to pin A of each channel to drive standard 2-wire 0(4)(-20) ~ 20mA transmitters. Connect these types of transmitters as shown above.

Note 1: An external 24VDC is required to enable the module. The same voltage source is used to drive current transmitters. Therefore, if you are driving current transmitters this supply must be a clean ripple-free voltage source. Using separate 24VDC supply voltages for digital and analog modules is highly recommended.

Note 2: You may use an external voltage source instead of the voltage supply at pin A.

Note 3: All versions of AI08-01 occupy 16 bytes of the input image. In case of 4-channel units, the upper bytes (lower two connectors) will be invalid.

Analog Input Module AI-08-02 (RTD Temperature Measuring Module)

AI-08-02 is an 8 or 4 channel isolated RTD temperature measuring input module occupying 16 successive bytes in Input image area of the CPU. These 16 bytes are arranged into 8 words that can be configured in 8 integer values. These words are enumerated from top to bottom. For example if the upper channel is assigned as IW8 (Input Word 8) then the next channels will be IW10, IW12, IW14, IW16, IW18, IW20 and IW22.

Every channel occupies four places in terminal front connector. Terminal A is left open and terminal B supplies a 0.5 mA test current into the RTD. The voltage developed between terminals B and C is proportional to the temperature being measured The lower pin D compensates for the resistance of wirings..

An external 24VDC supply is required to drive the module's internal circuits providing isolation of signals. CPU monitors this voltage in order to activate the module. Therefore, an external +24VDC voltage must be applied to the lowest two +24V and 0 terminals of the module. The CPU cannot detect the module if this voltage is not applied to the module properly.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or by removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on indicating the malfunction.

There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and reads its input channels. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.
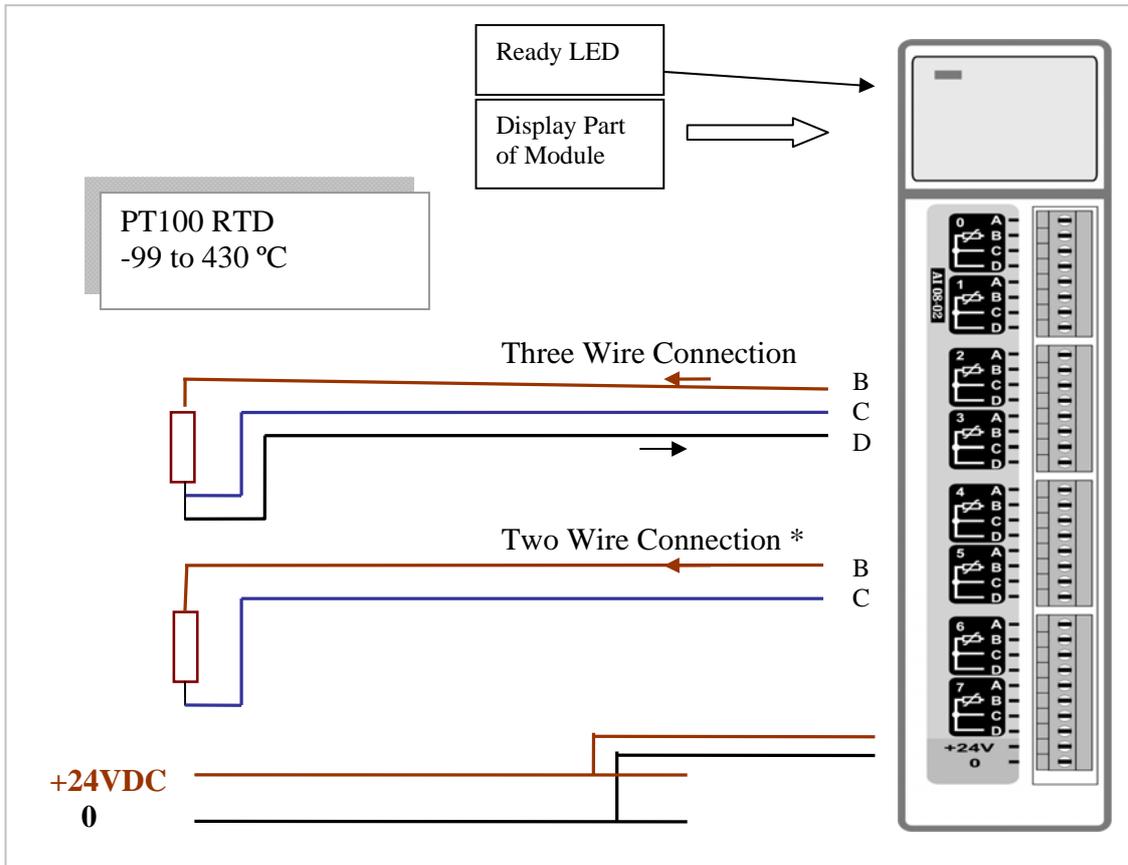
AI-08-02 provides an integer value between -99.0 to 430.0 ℃ for standard PT100 sensors.

Example:
Below you can see an example that shows how to define an analog signal named Temp100. Let's this signal be applied to AI-08-02 module at an address of IW8 and is desired to be represented as an integer value.

VAR_GLOBAL (*AUTOINSERT*)
     …..
     Temp100   AT   %IW8   :   INT;
END_VAR

In two wire connection, Resistance of connecting wires must be compensated in PLC program by introducing an offset temperature.

Note 1: All versions of AI08-02 occupy 16 bytes of the input image. In case of 4-channel units, the upper bytes (lower two connectors) will be invalid.

Note 2: In order to reduce power consumption of the module, please connect a 100 ohm resistor between terminals B and C of all unused channels.

Thermo-Couple (Type-J) Module TJ-08-01 (Temperature Measuring Module)

TJ-08-01 is an 8 or 4 channel isolated thermocouple (TC) temperature measuring module occupying 16 successive bytes in Input image area of the CPU. These 16 bytes are arranged into 8 words that can be configured in 8 integer values. These words are enumerated from top to bottom. For example if the upper channel is assigned as IW8 (Input Word 8) then the next channels will be IW10, IW12, IW14, IW16, IW18, IW20 and IW22.

Every channel occupies four places in terminal front connector. Terminals A and B are positive and negative terminals of the TC respectively. Terminal C is provided to be connected to the shield of the TC cable. Terminal D must be left open.

An external 24VDC supply is required to drive the module's internal circuits providing isolation of signals. CPU monitors this voltage in order to activate the module. Therefore, an external +24VDC voltage must be applied to the lowest two +24V and 0 terminals of the module. The CPU cannot detect the module if this voltage is not applied to the module properly.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or by removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on indicating the malfunction.

There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and reads its input channels. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.

TJ-08-01 provides an integer value representing temperatures between 0 to 750 ºC for standard thermo-couples of type J. Accuracy is better than +/- 3ºC and inherent nonlinearity of thermo-couples are compensated in software driver of the module.

Example:
Below you can see an example that shows how to define an analog signal named Temp100. Let's this signal be applied to TJ-08-01 module at an address of IW8 and is desired to be represented as an integer value.

VAR_GLOBAL (*AUTOINSERT*)
    …..
    Temp100   AT   %IW8   :   INT;
END_VAR
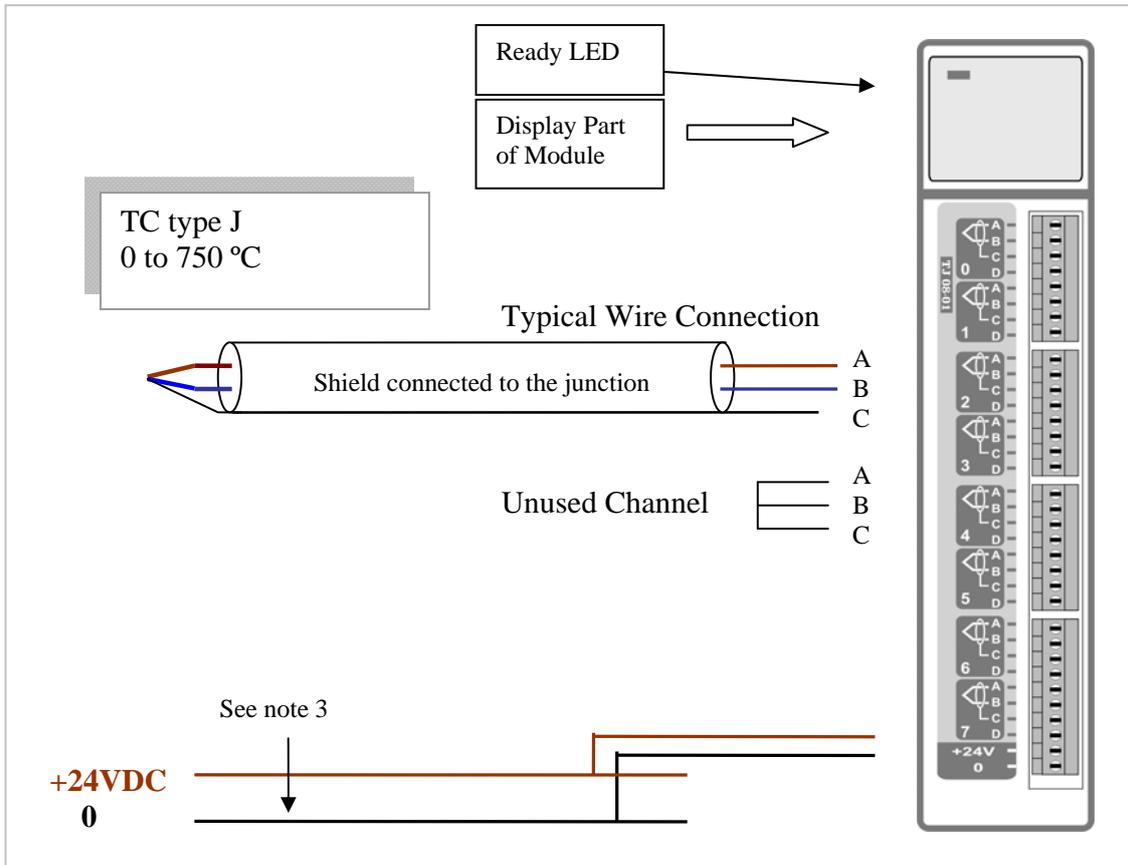
Note 1: All versions of TJ08-01 occupies 16 bytes of the input image. In case of 4-channel units, the upper bytes (lower two connectors) will be invalid.

Note 2: In case of unused channels, terminals A, B and C of the respective channel must be short circuited together. This is necessary in order to reduce power consumption of the module and increase accuracies.

Note 3: If thermo-couple junctions are earthed in installation locations, the earth must be connected to the negative side of the external 24VDC of the module by a 3mm² earth wire.

Note 4: Negative pole of external 24VDC power supply (0) is internally shorted to the terminals C of the all channels in front connectors. Therefore, shields of all thermocouples must be earthed properly so that there is no possibility of current flow through the shields.

Thermo-Couple (Type-K) Module TK-08-01 (Temperature Measuring Module)

TK-08-01 is an 8 or 4 channel isolated thermocouple (TC) temperature measuring module occupying 16 successive bytes in Input image area of the CPU. These 16 bytes are arranged into 8 words that can be configured in 8 integer values. These words are enumerated from top to bottom. For example if the upper channel is assigned as IW8 (Input Word 8) then the next channels will be IW10, IW12, IW14, IW16, IW18, IW20 and IW22.

Every channel occupies four places in terminal front connector. Terminals A and B are positive and negative terminals of the TC respectively. Terminal C is provided to be connected to the shield of the TC cable. Terminal D must be left open.

An external 24VDC supply is required to drive the module's internal circuits providing isolation of signals. CPU monitors this voltage in order to activate the module. Therefore, an external +24VDC voltage must be applied to the lowest two +24V and 0 terminals of the module. The CPU cannot detect the module if this voltage is not applied to the module properly.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or by removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on indicating the malfunction.

There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and reads its input channels. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.

TK-08-01 provides an integer value representing temperatures between 0 to 1250 ºC for standard thermo-couples of type J. Accuracy is better than +/- 3ºC and inherent nonlinearity of thermo-couples are compensated in software driver of the module.

Example:

Below you can see an example that shows how to define an analog signal named Temp100. Let's this signal be applied to TK-08-01 module at an address of IW8 and is desired to be represented as an integer value.

VAR_GLOBAL (*AUTOINSERT*)
    …..
    Temp100   AT   %IW8   :   INT;
END_VAR
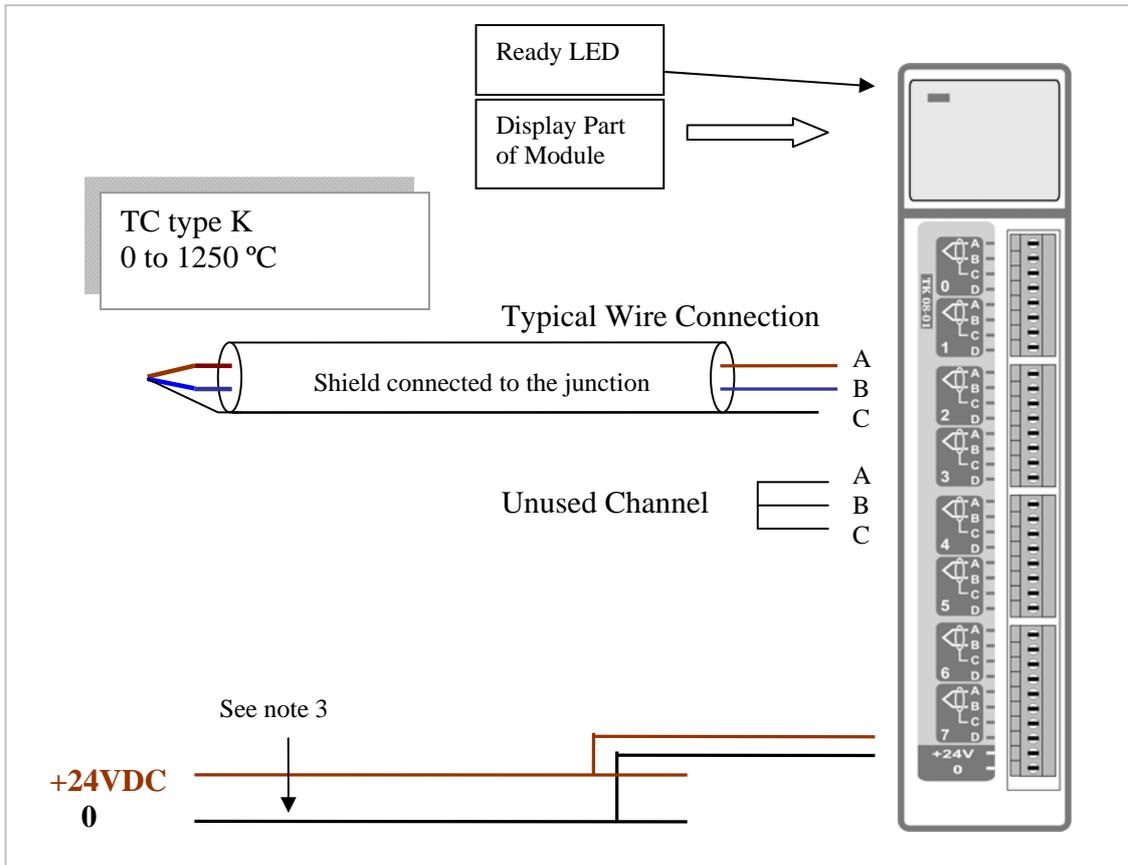
Note 1: All versions of TK08-01 occupies 16 bytes of the input image. In case of 4-channel units, the upper bytes (lower two connectors) will be invalid.

Note 2: In case of unused channels, terminals A, B and C of the respective channel must be short circuited together. This is necessary in order to reduce power consumption of the module and increase accuracies.

Note 3: If thermo-couple junctions are earthed in installation locations, the earth must be connected to the negative side of the external 24VDC of the module by a 3mm² earth wire.

Note 4: Negative pole of external 24VDC power supply (0) is internally shorted to the terminals C of the all channels in front connectors. Therefore, shields of all thermocouples must be earthed properly so that there is no possibility of current flow through the shields.

Analog Output Module AO-08-00

AO-08-00 is an 8-channel isolated analog output module occupying 16 successive bytes in Output image area of the CPU. These 16 bytes are arranged into 8 words that can be configured in 8 integer values. These words are enumerated from top to bottom. For example if the upper channel is assigned as QW8 (Output Word 8) then the next channels will be QW10, QW12, QW14, QW16, QW18, QW20 and QW22.

Every channel occupies two places in terminal front connector so that analog outputs can be connected via a pair of copper wires in differential mode with positive voltage in higher position.

An external 24VDC supply is required to drive the module's internal circuits providing isolation of signals. CPU monitors this voltage in order to activate the module. Therefore, an external +24VDC voltage must be applied to the lowest two +24V and 0 terminals of the module. The CPU cannot detect the module if this voltage is not applied to the module properly.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or by removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on indicating the malfunction.

There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and writes to its output channels. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.

AO-08-00 may be ordered to provide different types of unipolar or bipolar output voltage levels for the integer values shown below.

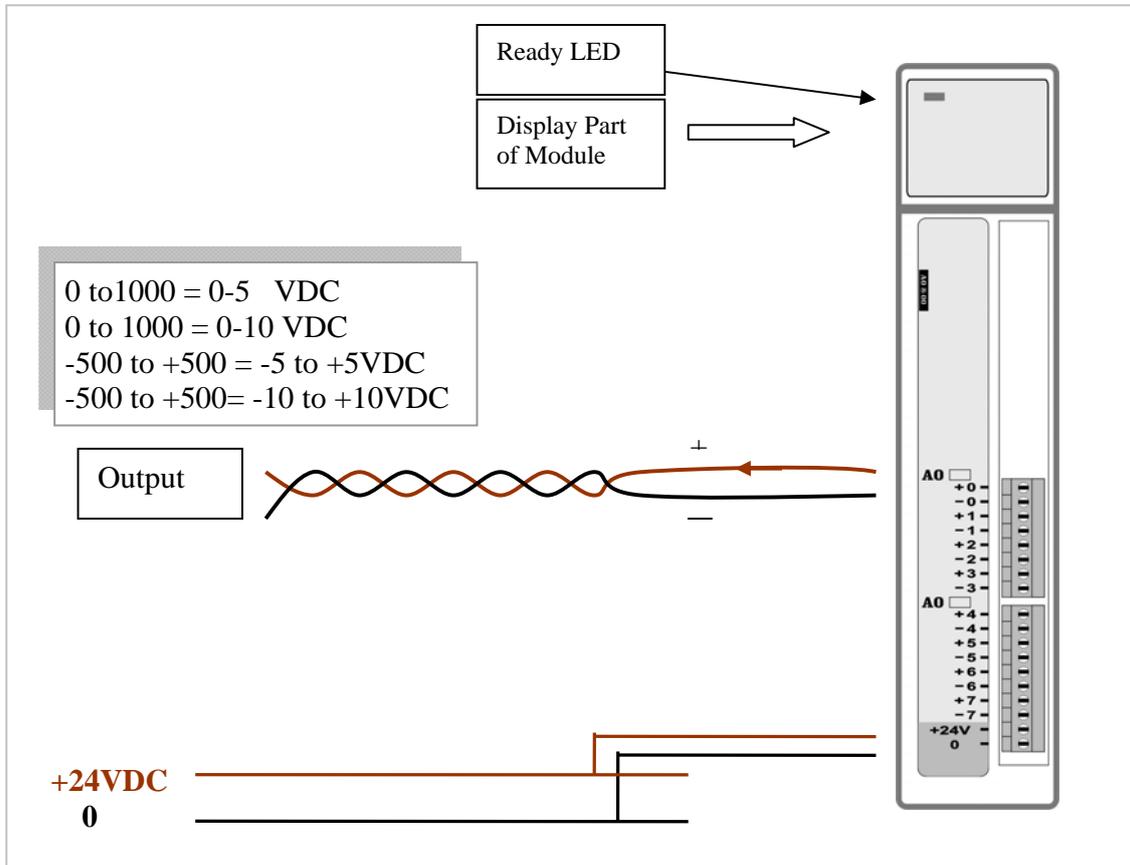| AO-08-00 Module	INTEGER	OUTPUT
Type 0-5V	0 to 1000	0 to 5 VDC
Type 0-10V	0 to 1000	0 to 10 VDC
Type -5 to +5V	-500 to + 500	-5 to +5 VDC
Type -10 to +10V	-500 to + 500	-10 to +10 VDC

Example:
Below you can see an example that shows how to define an analog output signal named SpeedCommand_161. Let's this signal is being received from AO-08-00 module at an address of QW8 as a 0 ~5 VDC or 0~20 mA.

VAR_GLOBAL (*AUTOINSERT*)
       …..
       SpeedCommand_161 AT   %QW8   :   INT;
END_VAR

Ready LED

Display Part
of Module

0 to1000 = 0-5   VDC
0 to 1000 = 0-10 VDC
-500 to +500 = -5 to +5VDC
-500 to +500= -10 to +10VDC

Output

$+$

$-$

A0
+0
-0
+1
-1
+2
-2
+3
-3
A0
+4
-4
+5
-5
+6
-6
+7
-7
+24V
0

+24VDC
0

Analog Output Module AO-08-01 and AO-08-02

AO-08-01(2) is a 12-bit 4 or 8-channel isolated analog output module occupying 16 successive bytes in Output image area of the CPU. These 16 bytes are arranged into 8 words that can be configured in 8 integer values. These words are enumerated from top to bottom. For example if the upper channel is assigned as QW8 (Output Word 8) then the next channels will be QW10, QW12, QW14, QW16, QW18, QW20 and QW22.

Every channel occupies two places in terminal front connector so that analog outputs can be connected via a pair of copper wires in differential mode with positive voltage in higher position.

An external 24VDC supply is required to drive the module's internal circuits providing isolation of signals. CPU monitors this voltage in order to activate the module. Therefore, an external +24VDC voltage must be applied to the lowest two +24V and 0 terminals of the module. The CPU cannot detect the module if this voltage is not applied to the module properly.

You may isolate and remove the module either by removing the lowest connector to the module that carries 24VDC, or by removing the whole module from the rack in run-time. In this case, the lowest yellow LED on the CPU, "Module error LED" will turn on indicating the malfunction.

There is a yellow ready LED on the highest left corner of the module display area. This LED lights on normally when the CPU scans the module and writes to its output channels. If it fails to turn on, it indicates that the module is not scanned or addressed by the CPU.
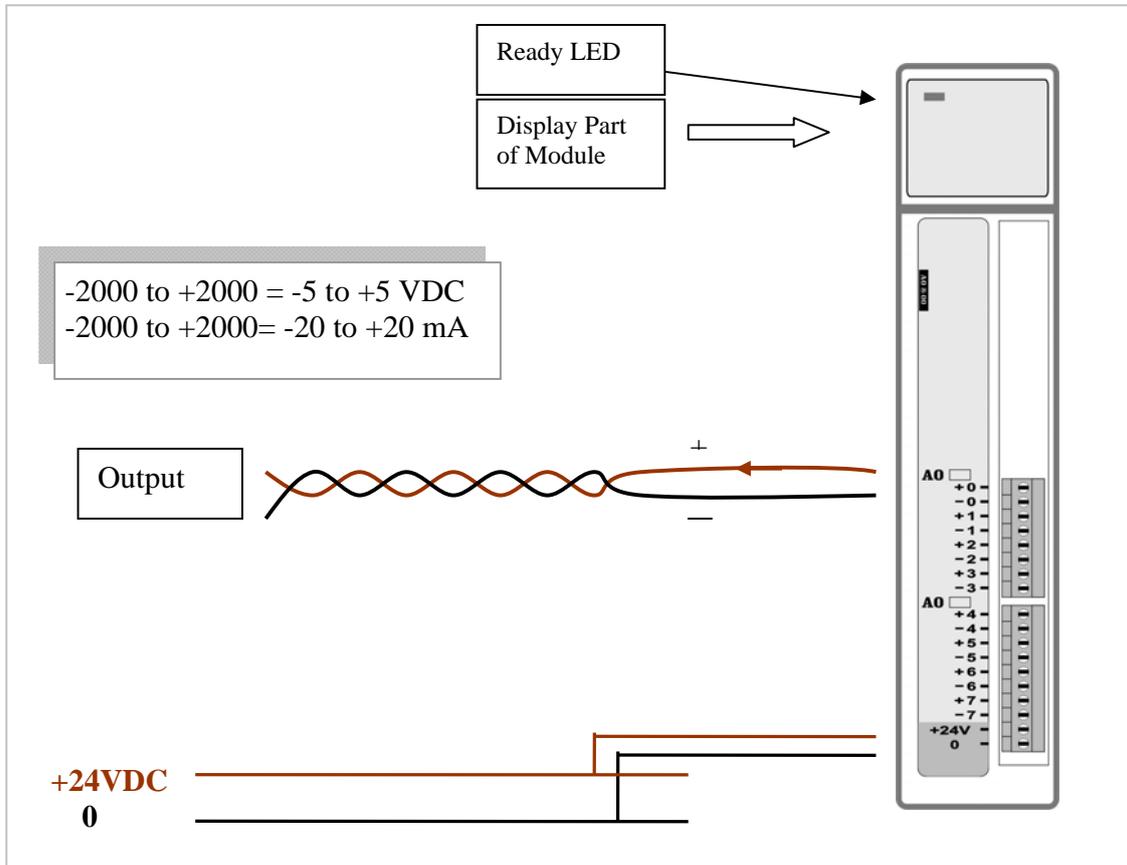
Output of AO-08-01 is bipolar and that of AO-08-02 is unipolar. They may be ordered to provide 4/8 channels of different types of output voltage or current levels.

Example:

Below you can see an example that shows how to define an analog output signal named SpeedCommand_161. Let's this signal is being received from AO-08-01 module at an address of QW8 as a -5 ~ +5 VDC or -20 ~ +20 mA.

VAR_GLOBAL (*AUTOINSERT*)
    …..
    SpeedCommand_161 AT   %QW8   :   INT;
END_VAR

Ready LED

Display Part
of Module

-2000 to +2000 = -5 to +5 VDC
-2000 to +2000= -20 to +20 mA

Output

+

−

+24VDC
0

AO
+0
−0
+1
−1
+2
−2
+3
−3
AO
+4
−4
+5
−5
+6
−6
+7
−7
+24V
0

Ordering Information

AO-08-01(02) Module	Number of Channels	Bipolar or Unipolar	Output Signal & Range	Integer Value
AO08-01-S8VA	8	Bipolar	-5 ~ +5 V	-2000 ~ +2000
AO08-01-S4VA	4	Bipolar	-5 ~ +5 V	-2000 ~ +2000
AO08-01-S8VB	8	Bipolar	-10 ~ +10 V	-2000 ~ +2000
AO08-01-S4VB	4	Bipolar	-10 ~ +10 V	-2000 ~ +2000
AO08-02-S8VA	8	Unipolar	0 ~ +5 V	0 ~ +4000
AO08-02-S4VA	4	Unipolar	0 ~ +5 V	0 ~ +4000
AO08-02-S8VB	8	Unipolar	0 ~ +10 V	0 ~ +4000
AO08-02-S4VB	4	Unipolar	0 ~ +10 V	0 ~ +4000
AO08-01-S8I	8	Bipolar	-20 ~ +20 mA	-2000 ~ +2000
AO08-01-S4I	4	Bipolar	-20 ~ +20 mA	-2000 ~ +2000
AO08-02-S8I	8	Unipolar	0 ~ +20 mA	0 ~ +4000
AO08-02-S4I	4	Unipolar	0 ~ +20 mA	0 ~ +4000