Digitized Automation for a Changing World

DVP Series Module Manual

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DVP Series Module Manual

Revision History

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DVP Series Module Manual
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Chapter 1 Introduction

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1.1 Introduction

Weighing moduleThe manual covers the usage instructions for special modules in the DVP-E (DVP-ES3/EX3/ES2/EX2) series and DVP-S (DVP-SV3/SX3/SV2/SX2/SA2/SS2/SE/SE2) series. This includes analog modules, temperature modules, weighing modules, communication modules, etc. For specific details about the special modules in the DVP-EH series, please refer to the detailed installation manuals for each module.

1.1.1 DVP-E Series Modules

Classification	Model name	Description
Digital I/O Module	DVP08XM211N	8-point input · 24VDC · 5mA
	DVP08XP211R	4-point input · 24VDC · 5mA 4-point relay output · 250VAC · 30VDC or below · 2A/output · 5A/COM
	DVP08XP211T	4-point input · 24VDC · 5mA 4-point transistor output(sinking) · 5~30VDC · 0.5A/output · 4A/COM
	DVP08XN211R	8-point relay output · 250VAC · 30VDC or below · 2A/output · 5A/COM
	DVP08XN211T	8-point transistor output(sinking) · 5~30VDC · 0.5A/output · 4A/COM
	DVP16XM211N	16-point input · 24VDC · 5mA
	DVP16XP211R	8-point input · 24VDC · 5mA 8-point relay output · 250VAC · 30VDC or below · 2A/output · 5A/COM
	DVP16XP211T	8-point input · 24VDC · 5mA · 8-point input 8-point transistor output(sinking) · 5~30VDC · 0.5A/output · 4A/COM
	DVP16XN211R	16-point relay output · 250VAC · 30VDC or below · 2A/output · 5A/COM
	DVP16XN211T	16-point transistor output(sinking) · 5~30VDC · 0.5A/output · 4A/COM
	DVP24XP200R	16-point input · 24VDC · 5mA 8-point relay output · 250VAC · 30VDC OR BELOW · 2A/output · 5A/COM
	DVP24XP200T	16-point input · 24VDC · 5mA 8-point transistor output(sinking) · 5~30VDC · 0.5A/output · 4A/COM
	DVP24XN200R	24-point relay output · 250VAC · 30VDC or below · 2A/output · 5A/COM
	DVP24XN200T	24-point transistor output(sinking) · 5~30VDC · 0.5A/output · 4A/COM
	DVP32XP200R	16-point input · 24VDC · 5mA 16-point relay output · 250VAC · 30VDC or below · 2A/output · 5A/COM
	DVP32XP200T	16-point input · 24VDC · 5mA 16-point transistor output(sinking) · 5~30VDC · 0.5A/output · 4A/COM
Analog I/O module	DVP04AD-E2	4-channel analog signal input 14-bitresolution-bit resolution：-5V~+5V · -10~+10V · -20mA~+20mA 13-bitresolution-bit resolution：0/4~20mA conversion time：400μs/channel
Analog I/O module	DVP02DA-E2	2-channel analog signal output 14-bitresolution-bit resolution：-10V~10V · 0~20mA · 4~20mA conversion time：400μs/channel

Classification	Model name	Description
	DVP04DA-E2	4-channel analog signal output 14-bitresolution-bit resolution：-10V~10V，0~20mA，4~20mA conversion time：400μs/channel
	DVP06XA-E2	4-channel analog signal input 14-bitresolution-bit resolution：-5V~+5V，-10~+10V，-20mA~+20mA 13-bitresolution-bit resolution：0/4~20mA conversion time：400μs/channel 2-channel analog signal output 14-bitresolution-bit resolution：-10V~10V，0~20mA，4~20mA conversion time：400μs/channel
Temperature measurement module	DVP04PT-E2	4-channel 3-wire or 2-wire RTD temperature sensing. Sensor typeSensor type：Pt100、Pt1000、Ni100、Ni1000、0~300Ω、0~3000Ω resolution：0.1℃/0.1℉（16-bit） conversion time：200ms/channel Equipped with PID temperature control
	DVP06PT-E2	6-channel3-wire or 2-wire RTD temperature sensing. Sensor typeSensor type：Pt100、Pt1000、Ni100、Ni1000、Cu50、Cu100、0~300Ω、0~3000Ω、JPt100、LG-Ni1000 resolution：0.1℃/0.1℉（16-bit） conversion time：200ms/channel Equipped with PID temperature control
	DVP04TC-E2	4-channelthermocouplet emperature sensing Sensor type：J、K、R、S、T、E、N 或-80~+80mV resolution：0.1℃/0.1℉（16-bitconverter） conversion time：200ms/channel Equipped with PID temperature control
Positioning module	DVP02PU-E2	2-axispositioning control. 5~24VDC，one set of（A/B/Z phase）differential input, hardware input bandwidth up to a maximum of 200 kHz. 24VDC，5mA，5-point input, hardware input bandwidth up to a maximum of 1 kHz. 5VDC，2-axis（4 points）differential output, highest output frequency of 200 kHz
Extension cable interface module	DVPAEXT01-E2	Extension of I/O module usage

1.1.2 DVP-S Series Modules

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Classification	Model name	Description
Analog I/O module	DVP06SN11R	6-point relay output，250VAC/30VDC or below，6A/output
	DVP08SN11R	8-point relay output，250VAC/30VDC or below，1.5A/output，5A/COM
	DVP08SN11T	8-point transistor output(sinking)，30VDC，55°C 0.1A/output、50°C 0.15A/output、45°C 0.2A/output、40°C 0.3A/output，2A/COM
	DVP16SN11T	16-point transistor output(sinking)，30VDC，55°C 0.1A/output、50°C 0.15A/output、45°C 0.2A/output、40°C 0.3A/output，2A/COM
	DVP08SP11R	4-point input，24VDC，5mA 4-point relay output，250VAC，30VDC or below，1.5A/output，5A/COM
	DVP08SP11T	4-point input，24VDC，5mA 4-point transistor output(sinking)，30VDC，55°C 0.1A/output、50°C 0.15A/output、45°C 0.2A/output、40°C 0.3A/output，2A/COM
	DVP08SM11N	8-point input，24VDC，5mA
	DVP08SM10N	8-point input，85~132VAC（50~60Hz），9.2mA（10VAC/60Hz）
	DVP08SN11TS	8-bit transistor output(sourcing)，30VDC，55°C 0.3A/output，2A/COM
	DVP08ST11N	8-point input（Selector switch）
	DVP16SP11R	8-point input，24VDC，5mA 8-point relay output，250VAC/30VDC or below，1.5A/output，5A/COM
	DVP08SP11TS	4-point input，24VDC，5mA 4-bit transistor output(sourcing)，30VDC，55°C 0.3A/output，2A/COM
	DVP16SP11T	8-point input，24VDC，5mA 8-point transistor output(sinking)，30VDC，55°C 0.1A/output、50°C 0.15A/output、45°C 0.2A/output、40°C 0.3A/output，2A/COM
	DVP16SP11TS	8-point input，24VDC，5mA 8-bit transistor output(sourcing)，30VDC，55°C 0.3A/output，2A/COM
	DVP16SN11TS	16-bit transistor output(sourcing)，30VDC，55°C 0.3A/output，2A/COM
	DVP16SM11N	16-point input，24VDC，5mA
	DVP32SN11TN	32-point transistor output(sinking)，5~30VDC，0.1A/output，55°C 1.0A/COM、25°C 2.2A/COM
	DVP32SM11N	32-point transistor output(sinking)，5~30VDC，0.1A/output，55°C 1.0A/COM、25°C 2.2A/COM
Analog I/O module	DVP04AD-S2	4-channel-channel analog signal input（Differential mode） 14-bitresolution-bit resolution:-10~10V，-6~10V 13-bitresolution-bit resolution:-20~20mA，-12~20mA conversion time：3ms/channel

Classification	Model name	Description
Analog I/O module	DVP04DA-S2	4-channel-channel analog signal output 12-bitresolution-bit resolution:0~10V，2~10V，0~20mA，4~20mA conversion time：3ms/channel
	DVP06XA-S2	4-channel-channel analog signal input（Differential mode） 12-bitresolution-bit resolution:-10~10V，-6~10V 11-bitresolution-bit resolution:-20~20mA，-12~20mA conversion time：3ms/channel 2-channel analog signal output 12-bitresolution-bit resolution:0~10V，2~10V，0~20mA，4~20mA conversion time：3ms/channel
	DVP02DA-S	2-channel analog signal output 12-bitresolution-bit resolution:0~10V，2~10V，0~20mA，4~20mA conversion time：3ms/channel
	DVP06AD-S	6-channel-channel analog signal input（Single-ended mode） 14-bitresolution-bit resolution:-10~10V，-6~10V 13-bitresolution-bit resolution:-20~20mA，-12~20mA conversion time：3ms/channel
Left-side High-speed Analog I/O module	DVP04AD-SL	4-channel-channel analog signal input（Differential mode） 16-bitresolution-bit resolution:-10~10V，-5~5V，-20~20mA 15-bitresolution-bit resolution:0~20mA，4~20mA conversion time：250us/channel
	DVP04DA-SL	4-channel-channel analog signal output 16-bitresolution-bit resolution:0~10V，-10~10V 15-bitresolution-bit resolution:0~20mA，4~20mA conversion time：250us/channel
Left-side High-speed Load cell weighing module	DVP201LC-SL	one set ofLoad cellWeighing module 24-bitresolution-bit resolution Measurement range：0~80mV/V Built-in RS-485 communication port, capable of standalone operation.
	DVP211LC-SL	one set ofLoad cellWeighing module 24-bitresolution-bit resolution Measurement range：0~80mV/V Built-in I/O point control：2DI/4DO/1AO Built-in RS-485 communication port, capable of standalone operation.
Left-side High-speed Load cell weighing module	DVP202LC-SL	two set ofLoad cellWeighing module 24-bitresolution-bit resolution Measurement range：0~80mV/V Built-in RS-485 communication port, capable of standalone operation.

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Classification	Model name	Description
	DVP02LC-SL	two set ofLoad cellWeighing module 20-bitresolution-bit resolution Measurement range：0~6mV/V
	DVP01LC-SL	one set ofLoad cellWeighing module 20-bitresolution-bit resolution Measurement range：0~6mV/V
Temperature measurement module	DVP04PT-S	4-channel3-wire or 2-wire RTD temperature sensing. Sensor typeSensor type：Pt100、Pt1000、Ni100、Ni1000、LG-Ni1000、Cu100、Cu50、0~300Ω、0~3000Ω resolution：0.1℃/0.18℉ conversion time：200ms/channel Equipped with PID temperature control
	DVP06PT-S	6-channel3-wire or 2-wire RTD temperature sensing. Sensor typeSensor type：Pt100、Pt1000、Ni100、Ni1000、LG-Ni1000、Cu100、Cu50、0~300Ω、0~3000Ω resolution：0.1℃/0.18℉ conversion time：160ms/channel
	DVP04TC-S	4-channelthermocouple temperature sensing Sensor type：J、K、R、S、T resolution：0.1℃/0.18℉ conversion time：200ms/channel Equipped with PID temperature control
	DVP08NTC-S	8-channel Thermistor (NTC) temperature sensor input. Sensor typeSensor type：Pt1000、Ni1000、LG-Ni1000、CTN10K、CTN100K、NTC20K、NTC30K、PT-42H、PT-43、PT-51F、PT-25E2、PT-312、KTY81、two self-filled forms resolution：0.1°C
Temperature measurement module	DVP02TUN-S	2-point universal analog input：0~10V、0~20mA、4~20mA thermocouple：J、K、R、S、T、E、N、B 、C、L、U、TXK（L）、PLII input impedance：Pt100、JPt100、Pt1000、Cu50、Cu100、Ni100、Ni120、Ni1000、LG-Ni1000 resolution：16-bit、Sensor0.1°C 4-point transistor output(sinking)：24VDC/300mA Output points: PID control/manual control.

Classification	Model name	Description
	DVP02TUR-S	2-point universal analog input：0~10V、0~20mA、4~20mA thermocouple：J、K、R、S、T、E、N、B、C、L、U、TXK (L)、PLII input impedance：Pt100、JPt100、Pt1000、Cu50、Cu100、Ni100、Ni120、Ni1000、LG-Ni1000 resolution：16-bit、Sensor 0.1°C 4-point relay output：240VAC/2A Output points: PID control/manual control.
	DVP02TUL-S	2-point universal analog input：0~10V、0~20mA、4~20mA thermocouple：J、K、R、S、T、E、N、B 、C、L、U、TXK (L)、PLII input impedance：Pt100、JPt100、Pt1000、Cu50、Cu100、Ni100、Ni120、Ni1000、LG-Ni1000 resolution：16-bit、Sensor0.1°C 2-point analog output，12-bitresolution-bit resolution：0~10V、0~20mA、4~20mA Output points: PID control/manual control.
Remote temperature measurement module	DVP02TKN-S	2-point universal analog input：0~10V、0~20mA、4~20mA thermocouple：J、K、R、S、T、E、N、B 、C、L、U、TXK (L)、PLII input impedance：Pt100、JPt100、Pt1000、Cu50、Cu100、Ni100、Ni120、Ni1000、LG-Ni1000 resolution：16-bit、Sensor0.1°C 4 -point transistor output(sinking)：24VDC/300mA Output points: PID control/manual control.
	DVP02TKR-S	2-point universal analog input：0~10V、0~20mA、4~20mA thermocouple：J、K、R、S、T、E、N、B 、C、L、U、TXK (L)、PLII input impedance：Pt100、JPt100、Pt1000、Cu50、Cu100、Ni100、Ni120、Ni1000、LG-Ni1000 resolution：16-bit、Sensor0.1°C 4 -point relay output：240VAC/2A Output points: PID control/manual control.
Remote temperature measurement module	DVP02TKL-S	2-point universal analog input：0~10V、0~20mA、4~20mA thermocouple：J、K、R、S、T、E、N、B 、C、L、U、TXK (L)、PLII input impedance：Pt100、JPt100、Pt1000、Cu50、Cu100、Ni100、Ni120、Ni1000、LG-Ni1000 resolution：16-bit、Sensor0.1°C 2 -point analog output，12-bitresolution-bit resolution：0~10V、0~20mA、4~20mA Output points: PID control/manual control.

Classification	Model name	Description
Positioning module	DVP01PU-S	Single-axis 200 kHz positioning control expansion module
Left-side positioning module	DVP02PU-SL	2-axispositioning control. 5~24VDC，one set of（A/B/Z phase）differential input, Hardware input bandwidth up to a maximum of 1 kHz 24VDC，5mA，5-point input，Hardware input bandwidth up to a maximum of 1 kHz 5VDC，2-axis（4 points）differential output，Maximum output frequency of 200 kHz
Left-side High-speed communication module	DVPEN01-SL	Ethernet module，10/100Mbps
	DVPDNET-SL	DeviceNetMaster station module，500kbps
	DVPCOPM-SL	CANopenMaster station module，1Mbps
	DVPPF02-SL	PROFIBUS DPSlave station module，12Mbps
	DVPSCM12-SL	RS-485/RS-422Serial communication module，460kbps
	DVPSCM52-SL	BACnet MS/TPSlave station module，460kbps

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1.2 Specification

1.2.1 General Specification

Item	Specification
Operating environment temperature	0~55°C
Storage environment temperature	DVP-E Series：-40~70°C DVP-S Series：-25~70°C
Operating environment humidity	5~95%，non-condensing
Storage environment humidity	5~95%，non-condensing
Working environment.	No corrosive gases present.
Installation location	Inside the control box (indoor use only)
Pollution degree	2
Protection rating	IP20（Not UL certified）
EMCregulation	Please refer to Appendix C
Vibration resistance.	Tested with： 5Hz ≦ f ≦ 8.4Hz，constant amplitude 3.5mm； 8.4Hz ≦ f ≦ 150Hz，constant acceleration 1g Duration of oscillation：10 sweep cycles per axis on each direction of the 3 mutually perpendicular axes International standard specifications IEC 61131-2 & IEC 60068-2-6（TEST Fc）
Impact	Tested with： Half-sine wave： Strength of shock 15g peak value，11ms duration； Shock direction：The shocks in each in direction per axis，on 3 mutually perpendicular axes（total of 18 shocks） International standard specifications IEC 61131-2 & IEC 60068-2-27（TEST Ea）
Safety regulations	IEC 61131-2、UL 61010-2-201、UL 508
Applicable atmospheric pressure	Operating：1013~795hPa（Equivalent to an altitude of 0-2000 meters above sea level） Storage：1013~660hPa（Equivalent to an altitude of 0-3500 meters above sea level）
Enclosure fire protection rating	UL94V-0

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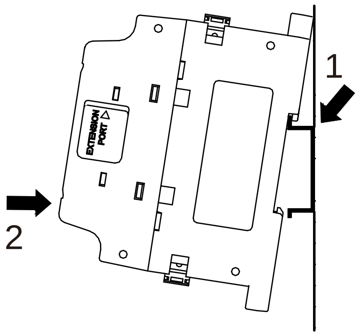
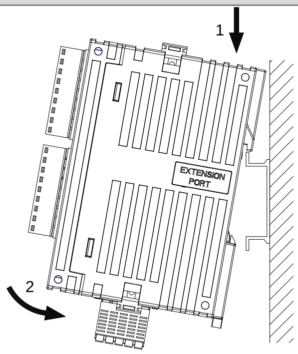
1.3 Installation Before Operation

1.3.1 Module Installation

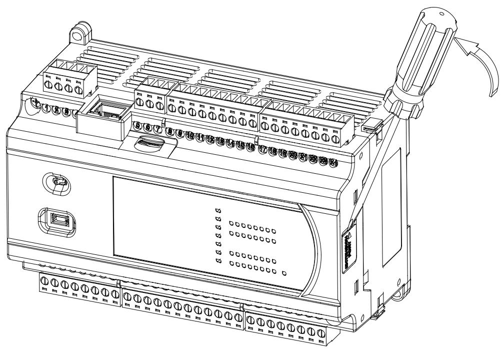
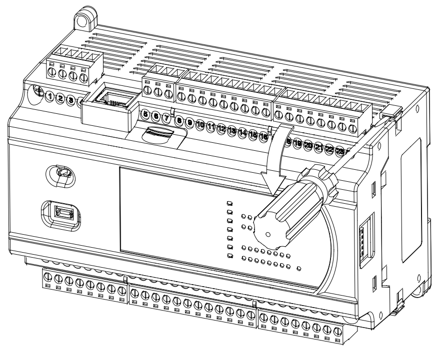
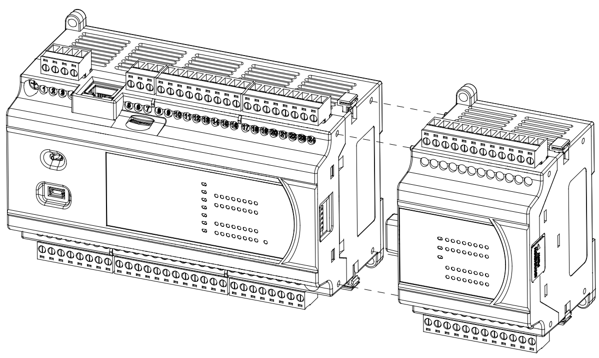
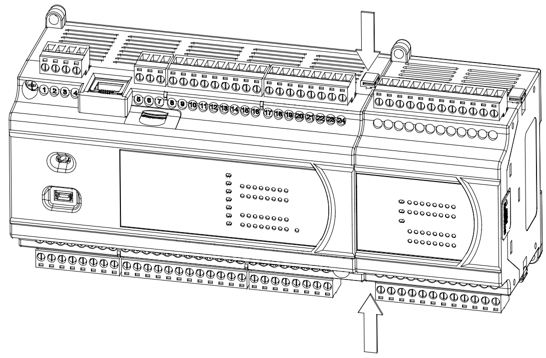
The installation methods for the module are illustrated as follows:

1. **Direct Screw Locking Method**: Please use M4 screws according to the product dimensions for direct locking.
2. **Installation on DIN Rail**: During installation, hang the groove at the back of the module in the direction of arrow 1 onto the aluminum rail. Press it down in the direction of arrow 2 until you hear a click sound, indicating the completion of the installation. To remove the module, use a flathead screwdriver to pry open the fixed plastic piece first, then lift and pull the module out in an upward direction.

DVP-ESeries	DVP-SSeries
	

1.3.2 Connection and Installation of the PLC and Modules

1.3.2.1 Connection and Installation of DVP-E Series PLC and Modules

Step One: Use a flathead screwdriver to open the module connector port cover on the side of the PLC.	Step Two: Use a flathead screwdriver to pry open the locking tab of the I/O module.
	
Step Three: Connect the PLC I/O module connector port with the module connector port.	Step Four: Press the upper and lower locking tabs of the I/O module in the direction of the arrow to secure the modules in place.
	

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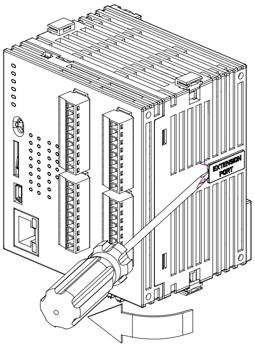
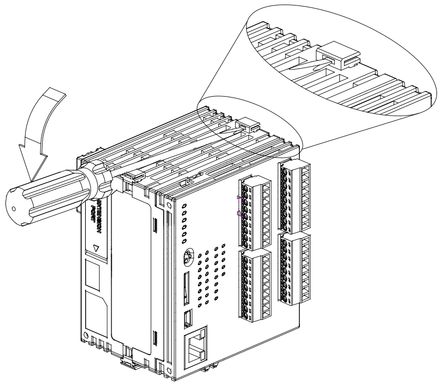
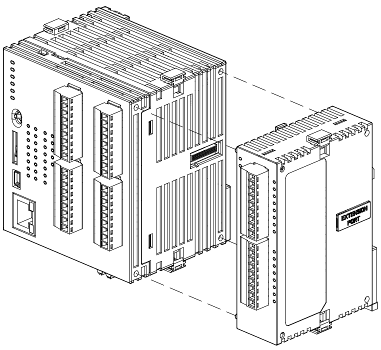
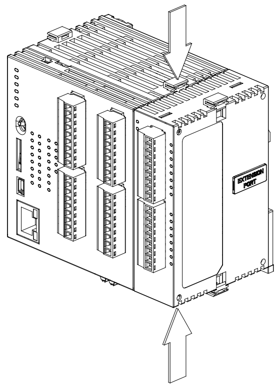
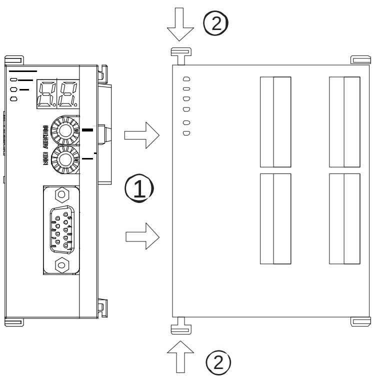
1.3.2.2 Connection and Installation of DVP-S Series PLC and Modules

Step One: Use a screwdriver to open the expansion side cover, revealing the expansion module connection interface.	Step Two: Use the screwdriver to flip the expansion module locking tab upwards. 。
	
Step Three: Align the positioning holes of the host and the expansion module, then connect the host's expansion module interface with the expansion module. At this point, the PLC and the expansion module are tightly coupled.	Step Four: Press the expansion module locking tab downward to secure it, completing the assembly with the host system.
	
Note: The connection and installation method of the host with the left-side modules are the same as the installation with the right-side modules described above, as shown in the following diagram.	
	

1.4 Wiring

1.4.1 DVP-E Series

1. Wiring Precautions

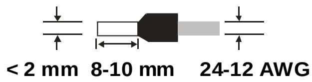
- During installation or wiring, it is imperative to ensure that all external power sources are switched off. Failure to turn off all power sources may result in electric shock to users or damage to the product.
- Lors de l'installation ou du câblage, il est impératif de s'assurer que toutes les sources d'alimentation externes soient éteintes. Le non-respect de cette consigne pourrait entraîner un risque de choc électrique pour les utilisateurs ou des dommages au produit.
- After completing the installation or wiring, when powering on or operating the module, it is essential to confirm the correct installation of the module terminal cover. Failure to do so may lead to electric shock or operational errors.
- Une fois l'installation ou le câblage terminé, lors de la mise sous tension ou de l'utilisation du module, il est essentiel de vérifier que le capot terminal du module est correctement installé. Ne pas le faire pourrait entraîner un risque de choc électrique ou des erreurs opérationnelles.
- The ⏚ (Protective Ground) / ⏚ (Functional Ground) terminals must be grounded using protective grounding conductors. Failure to do so may result in electric shock or operational errors.
- Les bornes ⏚ (Protective Ground) / ⏚ (Functional Ground) doivent être mises à la terre à l'aide de conducteurs de mise à la terre de protection. Ne pas le faire pourrait entraîner un risque de choc électrique ou des erreurs opérationnelles.
- When wiring the PLC, check the rated voltage and terminal configuration defined in the product specifications to ensure correct and safe wiring. Connecting an incorrect power supply or improperly wiring the product contrary to the rated values may pose risks such as fire or damage.
- Lors du câblage du PLC, vérifiez la tension nominale et la configuration des bornes définies dans les spécifications du produit pour garantir un câblage correct et sûr. Connecter une alimentation incorrecte ou câbler le produit de manière contraire aux valeurs nominales peut entraîner des risques tels que l'incendie ou des dommages.
- External wiring configurations should be carried out using dedicated tools for bending, welding, and proper soldering. Poor wiring configurations may lead to short circuits, fires, or operational errors.
- Les configurations de câblage externe doivent être réalisées à l'aide d'outils dédiés pour le pliage, la soudure et un soudage approprié. Des configurations de câblage médiocres peuvent entraîner des courts-circuits, des incendies ou des erreurs opérationnelles.
- It is crucial to ensure that each module is free of foreign objects such as iron filings or wiring residues. These foreign objects may cause fires, damage, or operational errors.
- Il est crucial de s'assurer que chaque module est exempt de corps étrangers tels que des limailles de fer ou des résidus de câblage. Ces objets étrangers peuvent provoquer des incendies, des dommages ou des erreurs opérationnelles

2. Module Wiring

(1) Definitions of Two-Wire, Three-Wire, and Four-Wire Configurations

- Two-Wire, Three-Wire (Passive Sensors): The sensor shares a power circuit with the system
- Four-Wire (Active Sensors): The sensor utilizes an independent power supply and is recommended not to share the power circuit with the system.

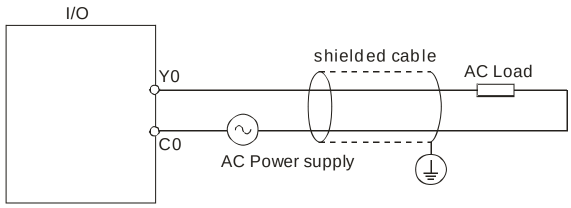
(2) Wiring for terminal connections should use 24-12AWG single-core or multi-core wires. It is recommended to use needle-type terminals with a hole diameter smaller than 2mm (insulated with a protective sleeve) for wiring, as specified in the diagram. The screw torque for PLC terminal screws is 3.8kgf-cm (3.3lbf-in), and only copper wires rated at 60/75°C should be used.



Note: For relay output wiring, the wire diameter specifications vary depending on the provided power type. Refer to section 2.6.2.1 for details.

(3) Please separate the input, output, and power lines.

(4) When it is not possible to keep a certain distance between the main circuit and power lines, use grouped shielded cables and ground them at the I/O end. In some environments, ground the other end.



(5) When using cable conduits for wiring, ensure proper grounding of the conduits.

(6) Separate the DC 24V input line from the AC 110V and 220V input lines.

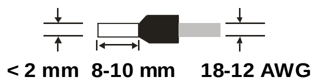
(7) When the wiring length exceeds 200m (686.67 inches), leakage current may be generated by line capacitance, leading to system equipment malfunctions and damage.

3. Grouding

Grounding of the cable should be done according to steps (1) to (3).

(1) Use the correct independent grounding method.

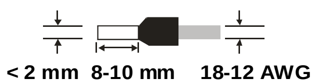
(2) Use 18-12AWG single-core or multi-core wires for grounding, and it is recommended to use needle-type terminals with a hole diameter smaller than 2mm for wiring, as specified in the diagram.



(3) Place the grounding point close to the PLC and securely connect the grounding cable.

Caution:

1. For wiring of 110V/220V and 24VDC power cables, use 18-12AWG conductors. Twist the power conductors at the terminal connections, and it is recommended to use needle-type terminals with a hole diameter smaller than 2mm for wiring, as specified in the diagram.



2. When wiring is connected to the ⏚ / ⏚ terminals, ensure that it is grounded. Apart from grounding, do not connect the ⏚ / ⏚ terminals to any other devices. Failure to ground the ⏚ / ⏚ terminals may result in interference affecting the PLC or pose a risk of electric shock due to the potential of the ⏚ / ⏚ terminals.

1.4.2 DVP-S Series

1. **Wiring Precautions**

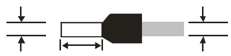
- During installation or wiring, it is imperative to ensure that all external power sources are switched off. Failure to turn off all power sources may result in electric shock to users or damage to the product.
- Lors de l'installation ou du câblage, il est impératif de s'assurer que toutes les sources d'alimentation externes soient éteintes. Le non-respect de cette consigne pourrait entraîner un risque de choc électrique pour les utilisateurs ou des dommages au produit.
- After completing the installation or wiring, when powering on or operating the module, it is essential to confirm the correct installation of the module terminal cover. Failure to do so may lead to electric shock or operational errors.
- Une fois l'installation ou le câblage terminé, lors de la mise sous tension ou de l'utilisation du module, il est essentiel de vérifier que le capot terminal du module est correctement installé. Ne pas le faire pourrait entraîner un risque de choc électrique ou des erreurs opérationnelles.
- The ⏚ (Protective Ground) / ⏚ (Functional Ground) terminals must be grounded using protective grounding conductors. Failure to do so may result in electric shock or operational errors.
- Les bornes ⏚ (Protective Ground) / ⏚ (Functional Ground) doivent être mises à la terre à l'aide de conducteurs de mise à la terre de protection. Ne pas le faire pourrait entraîner un risque de choc électrique ou des erreurs opérationnelles.
- When wiring the PLC, check the rated voltage and terminal configuration defined in the product specifications to ensure correct and safe wiring. Connecting an incorrect power supply or improperly wiring the product contrary to the rated values may pose risks such as fire or damage.
- Lors du câblage du PLC, vérifiez la tension nominale et la configuration des bornes définies dans les spécifications du produit pour garantir un câblage correct et sûr. Connecter une alimentation incorrecte ou câbler le produit de manière contraire aux valeurs nominales peut entraîner des risques tels que l'incendie ou des dommages.
- External wiring configurations should be carried out using dedicated tools for bending, welding, and proper soldering. Poor wiring configurations may lead to short circuits, fires, or operational errors.
- Les configurations de câblage externe doivent être réalisées à l'aide d'outils dédiés pour le pliage, la soudure et un soudage approprié. Des configurations de câblage médiocres peuvent entraîner des courts-circuits, des incendies ou des erreurs opérationnelles.
- It is crucial to ensure that each module is free of foreign objects such as iron filings or wiring residues. These foreign objects may cause fires, damage, or operational errors.
- Il est crucial de s'assurer que chaque module est exempt de corps étrangers tels que des limailles de fer ou des résidus de câblage. Ces objets étrangers peuvent provoquer des incendies, des dommages ou des erreurs opérationnelles.

2. **Module Wiring**

(1) Definitions of Two-Wire, Three-Wire, and Four-Wire Configurations:

- Two, Three-Wire (Passive Sensors): Sensors share a power circuit with the system.
- Four-Wire (Active Sensors): Sensors use an independent power supply, and it is recommended not to share the power circuit with the system.

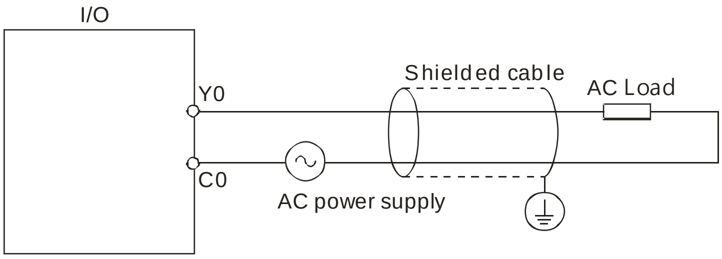
(2) Wiring to the connection terminals should use 24-16AWG single-core or multi-core wires. It is recommended to use needle-type terminals with a hole diameter smaller than 2mm (insulated with a protective sleeve) for wiring, as specified in the diagram. The specifications are as follows: PLC terminal screw torque is 2.0kgf-cm (1.77lbf-in), and only copper wires rated at 60/75°C should be used



Note: For relay models, the output wiring specifications vary depending on the provided power type. Refer to section 7.6.2.1 for details.

(3) Please separate the input, output, and power lines.

(4) When it is not possible to keep a certain distance between the main circuit and power lines, use grouped shielded cables and ground them at the I/O end. In some environments, ground the other end.



(5) When wiring using conduit, ensure that the conduit is grounded in the correct manner.

(6) Please separate the DC 24V input line from the AC 110V and 220V input lines.

(7) When the wiring length exceeds 200m (686.67 inches), leakage current may be generated by line capacitance, leading to system equipment malfunctions and damage.

Caution:

When wiring is connected to the ⏚/⏚ terminals, ensure that it is grounded. Apart from grounding, do not connect the ⏚/ ⏚terminals to any other devices. Failure to ground the ⏚/ ⏚terminals may result in interference affecting the PLC or pose a risk of electric shock due to the potential of the ⏚/ ⏚terminals.

2

Chapter 2 DVP-E Series Digital Input/Output Module

Table of Contents

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2.1 General Specifications

Model (DVP) / Item	08XM 211N	08XN 211R	08XN 211T	08XP 211R	08XP 211T	16XM 211N	16XP 211T	16XN 211T	16XP 211R	16XN 211R
Power supply	24VDC (Provided by CPU module)									
Weight (g)	105	135	109	120	107	148	149	143	179	209

Model (DVP) / Item	24XN 200R	24XN 200T	24XP 200R	24XP 200T	32XP 200R	32XP 200T
Power supply	100VAC~240VAC					
Weight (g)	390	310	300	260	340	280

- **Electrical specifications for the inputs on digital input/output modules**
  (The signals passing through the inputs are 24 VDC signals.)

Model（DVP） / Item		08XM 211N	08XP 211R	08XP 211T	16XM 211N	16XP 211R	16XP 211T	24XP 200R	24XP 200T	32XP 200R	32XP 200T
Number of inputs		8	4	4	16	8	8	16	16	16	16
Connector type		Removable terminal block									
Input type		Digital input									
Input form		Direct current (sinking or sourcing)									
Input voltage		24VDC，5mA									
Action level	**OFF→ON**	>15VDC									
	ON→OFF	<5VDC									
Response time	**OFF→ON**	10ms±10%									
	ON→OFF	15ms±10%									
Input impedance		4.7kΩ									
Input isolation		500VAC									
Input display		When the optocoupler is driven, the input LED indicator is ON.									

- **Electrical specifications for the outputs on a digital input/output module**

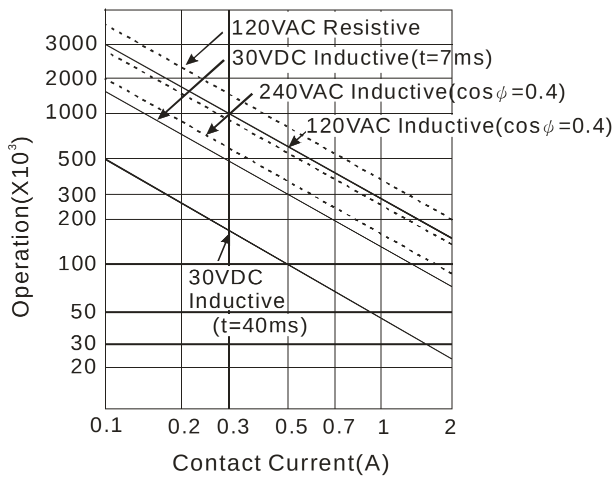
Item \ Model（DVP）		08XP 211R	08XN 211R	16XP 211R	16XN 211R	24XP 200R	24XN 200R	32XP 200R	08XP 211T	08XN 211T	16XP 211T	16XN 211T	24XP 200T	24XN 200T	32XP 200T
Number of outputs		4	8	8	16	8	24	16	4	8	8	16	8	24	16
Connector type		Removable terminal block													
Output type		Relay-R							Transistor-T						
Voltage		10~250VAC，5~30VDC							5~30VDC						
Leakage current		–							<10uA						
Max. load	**Resistance**	2A/output，5A/COM*3							0.3A/output，1.2A/COM*2						
	Inductance	Life cycle curve*4							N/A						
	Bulb	20WDC/100WAC							N/A						
Minimum load		1mA/5V													
Output isolation		1500VAC							500VAC						
Switching frequency*1		≦1Hz							≦100Hz						
Response time	**OFF→ON**	Approximately 10ms							50μs						
	ON→OFF								200μs						

*1. The scan cycle affects the frequency.

*2. UP, ZP should include external aid power 24VDC (-15% ~ +20%) and the rated comsumption is around 1mA/point

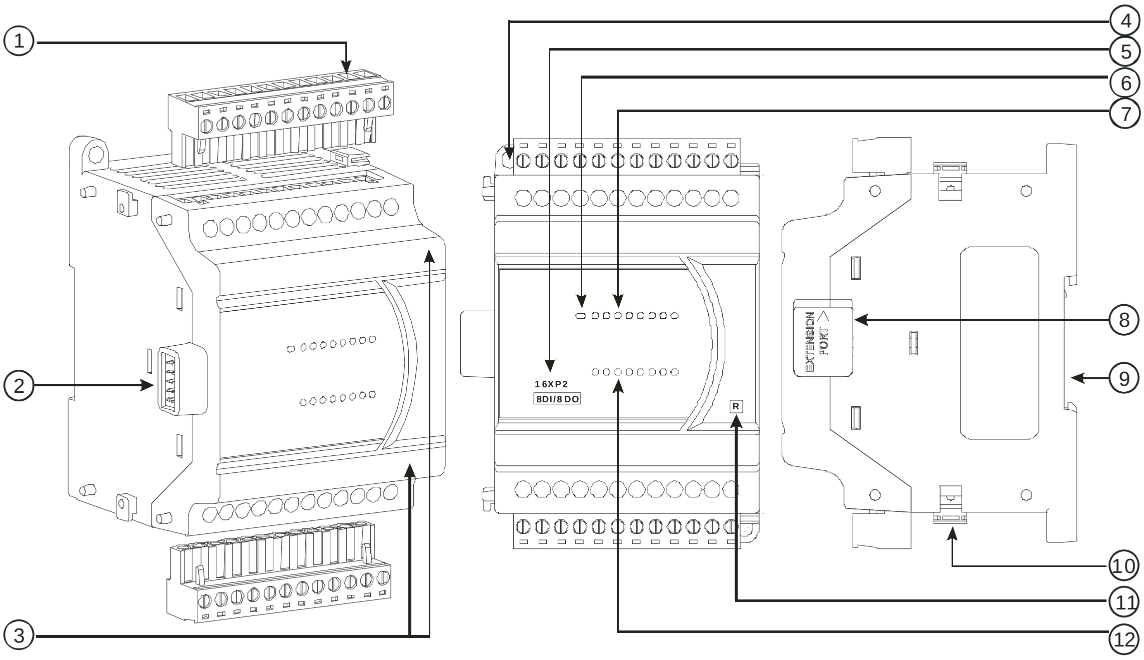
*3. DVP16XN211R and DVP16XP211R should include external aid power 24VDC (-15% ~ +20%) and the rated comsumption is around 5mA/point

*4. Life cycle curve: The lifetime of a relay terminal varies with the working voltage, the load type (the power factor cosø, the time constant t(L/R)), and the current passing through the terminal. The life cycle curve is shown below.



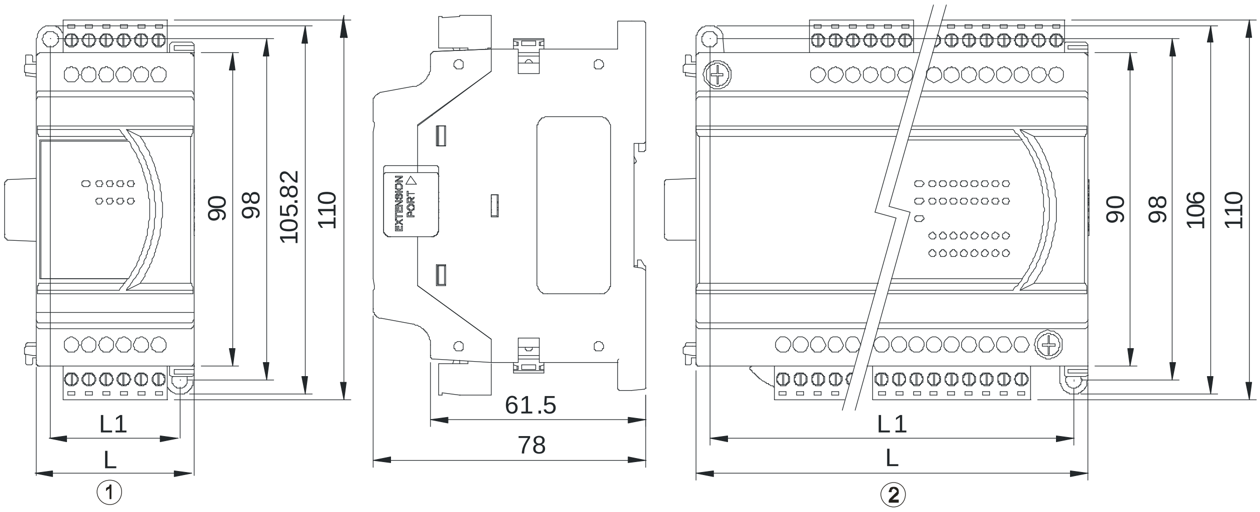
2

2.2 Module Profiles



No.	Name	Description
1	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads to be driven.
2	External module connection port	Connect the modules.
3	Terminal number	Terminal number
4	Mounting hole	Secure the module on the set
5	Model name	Model name of the module
6	Power LED	Indicates the power status of the CPU module.
7	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
8	External module connection port	Connect the modules.
9	DIN rail slot (35mm)	For the DIN rail.
10	I/O module securing clip	Secure the modules
11	Output type	R: Relay output T: Transistor output.
12	Input/Output LED	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.

2.3 Dimension



Unit:mm

DVP	08XM2 11N	08XP2 11R/T	08XN2 11R/T	16XM2 11N	16XP2 11R/T	16XN2 11R/T	24XP2 00R/T	24XN2 00R/T	32XP2 00R/T
L	45			70			145		
L1	37			62			137		
Refer to	①			②			②		

2.4 Module Terminals

- **DVP08XM211N**

1	2	3	4	5	6
S/S	X0	X1	X2	X3	NC
DVP08XM2 (8DI)					
NC	X4	X5	X6	X7	NC
1	2	3	4	5	6

- **DVP08XN211R/T**

1	2	3	4	5	6
C0	Y0	Y1	Y2	Y3	NC
DVP08XN2-R (8DO)					
C1	Y4	Y5	Y6	Y7	NC
1	2	3	4	5	6

1	2	3	4	5	6
NC	NC	Y0	Y1	Y2	Y3
DVP08XN2-T (8DO)					
UP	ZP	Y4	Y5	Y6	Y7
1	2	3	4	5	6

- **DVP08XP211R/T**

1	2	3	4	5	6
S/S	X0	X1	X2	X3	NC
DVP08XP2-R (4DI/4DO)					
C0	Y0	Y1	Y2	Y3	NC
1	2	3	4	5	6

1	2	3	4	5	6
S/S	X0	X1	X2	X3	NC
DVP08XP2-T (4DI/4DO)					
UP	ZP	Y0	Y1	Y2	Y3
1	2	3	4	5	6

- **DVP16XM211N**

1	2	3	4	5	6	7	8	9	10		
S/S	X0	X1	X2	X3	X4	X5	X6	X7	NC		
DVP16XM2 (16DI)											
S/S	X10	X11	X12	X13	X14	X15	X16	X17	NC	NC	NC
1	2	3	4	5	6	7	8	9	10	11	12

- **DVP16XN211R/T**

1	2	3	4	5	6	7	8	9	10		
C0	Y0	Y1	Y2	Y3	C1	Y4	Y5	Y6	Y7		

DVP16XN2-R (16DO)

24V	0V	⏚	C2	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17
1	2	3	4	5	6	7	8	9	10	11	12

1	2	3	4	5	6	7	8	9	10		
UP0	ZP0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7		

DVP16XN2-T (16DO)

UP1	ZP1	⏚	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	NC
1	2	3	4	5	6	7	8	9	10	11	12

- **DVP16XP211R/T**

1	2	3	4	5	6	7	8	9	10		
S/S	X0	X1	X2	X3	X4	X5	X6	X7	NC		

DVP16XP2-R (8DI/8DO)

24V	0V	⏚	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
1	2	3	4	5	6	7	8	9	10	11	12

1	2	3	4	5	6	7	8	9	10		
S/S	X0	X1	X2	X3	X4	X5	X6	X7	NC		

DVP16XP2-T (8DI/8DO)

UP	ZP	⏚	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	NC
1	2	3	4	5	6	7	8	9	10	11	12

- **DVP24XP200R/T**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
L	N	⏚	NC	S/S	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17

DVP24XP2-R (16DI/8DO)

+24V	24G	NC	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
1	2	3	4	5	6	7	8	9	10	11	12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
L	N	⏚	NC	S/S	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17

DVP24XP2-T (16DI/8DO)

+24V	24G	UP	ZP	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
1	2	3	4	5	6	7	8	9	10	11	12

2

- **DVP24XN200R/T**

DVP24XN2-R (24DO)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
L	N	⏚	NC	C0	Y0	Y1	Y2	Y3	C1	Y4	Y5	Y6	Y7	C4	Y20	Y21	Y22	Y23	NC	NC

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
+24V	24G	NC	NC	C2	Y10	Y11	Y12	Y13	C3	Y14	Y15	Y16	Y17	C5	Y24	Y25	Y26	Y27	NC	NC

DVP24XN2-T (24DO)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
L	N	⏚	NC	UP0	ZP0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	UP2	ZP2	Y20	Y21	Y22	Y23	NC

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
+24V	24G	NC	NC	UP1	ZP1	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	UP3	ZP3	Y24	Y25	Y26	Y27	NC

- **DVP32XP200R/T**

DVP32XP2-R (16DI/16DO)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
L	N	⏚	NC	S/S	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
+24V	24G	NC	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	C1	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17

DVP32XP2-T (16DI/16DO)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
L	N	⏚	NC	S/S	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17

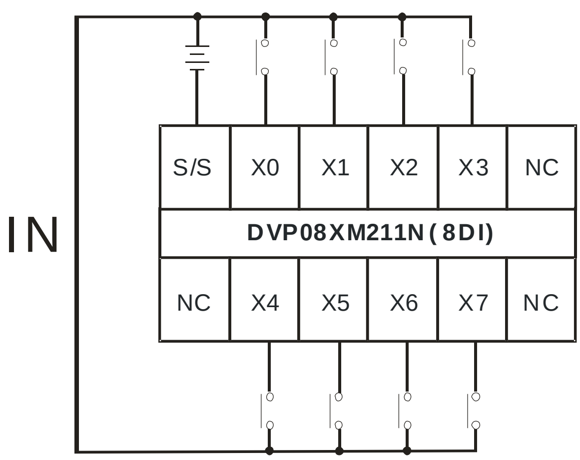
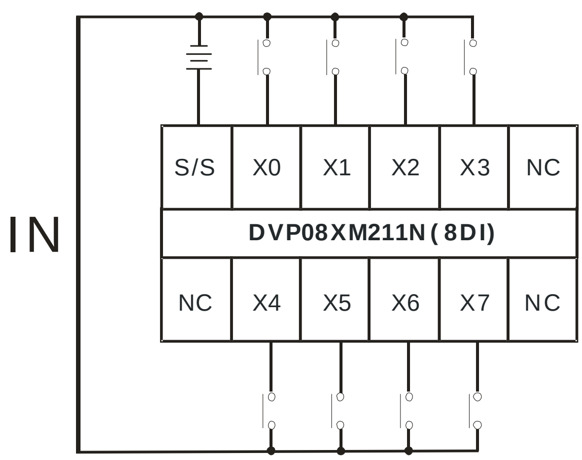
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
+24V	24G	UP	ZP0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	ZP1	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17

2.5 Wiring

This section illustrates how to wire digital input/output modules. The wiring diagrams below also illustrate how the power supplies are connected to S/S, and COM. If you need more information about wiring of digital input/output terminals, refer to Section 2.6 in this manual.

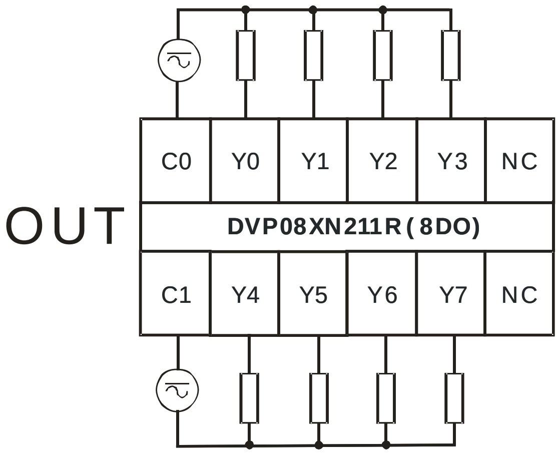
2.5.1 Wiring DVP08XM211N

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA

Sinking	Sourcing
	

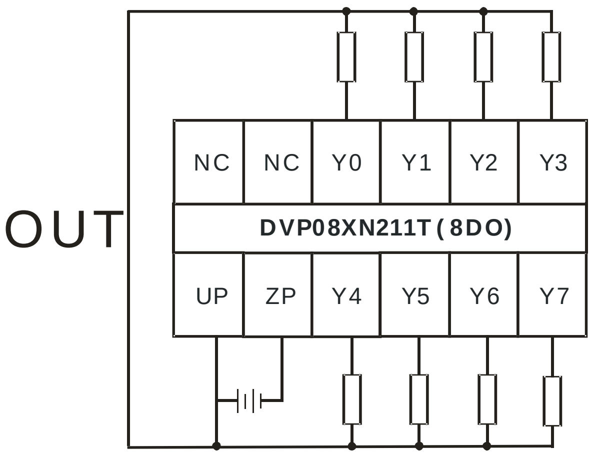
2.5.2 Wiring DVP08XN211R

Output form	Relay
Voltage specifications	10~250VAC，5~30VDC，2A/output，5A/COM



2.5.3 Wiring DVP08XN211T

Output form	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM

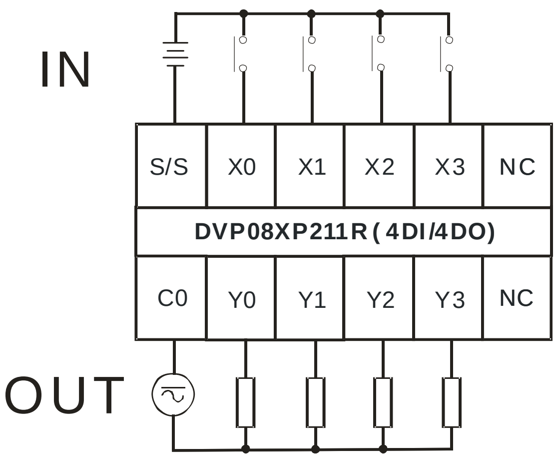


Note: You need to add external power supply 24 VDC (-15% ~ +20%) for UP and ZP; power consumption is up to 10 mA

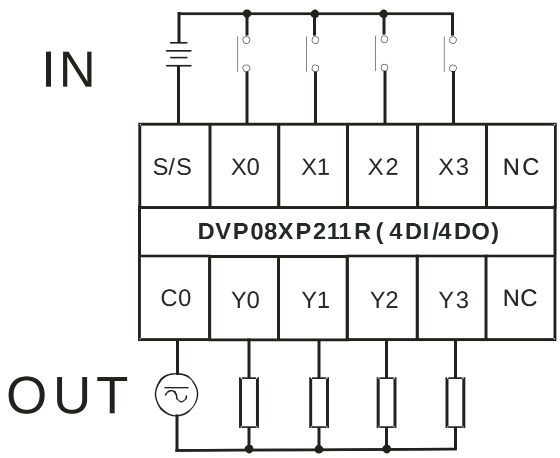
2.5.4 Wiring DVP08XP211R

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output type	Relay
Voltage specifications	10~250VAC，5~30VDC，2A/output，5A/COM

Sinking input and relay output



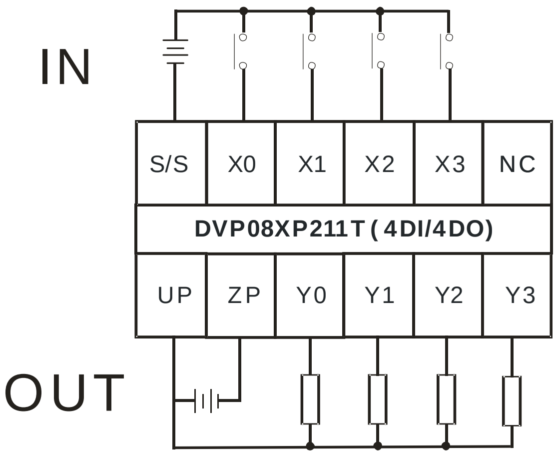
Sourcing input and relay output



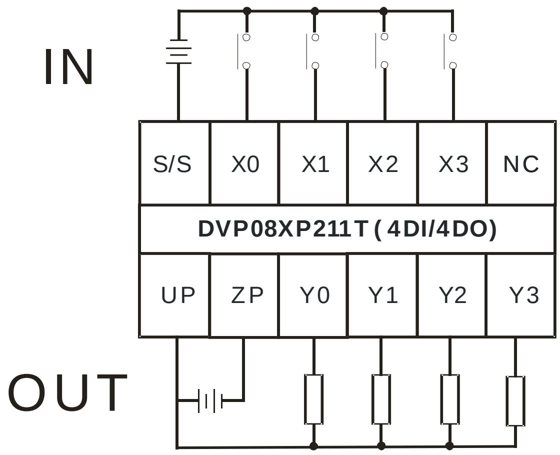
2.5.5 Wiring DVP08XP211T

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output type	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM

Sinking input and output



Sourcing input and sinking output

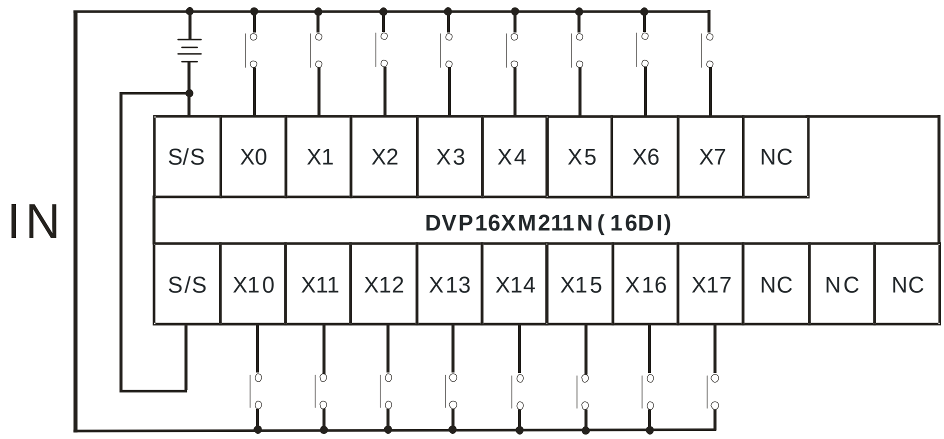
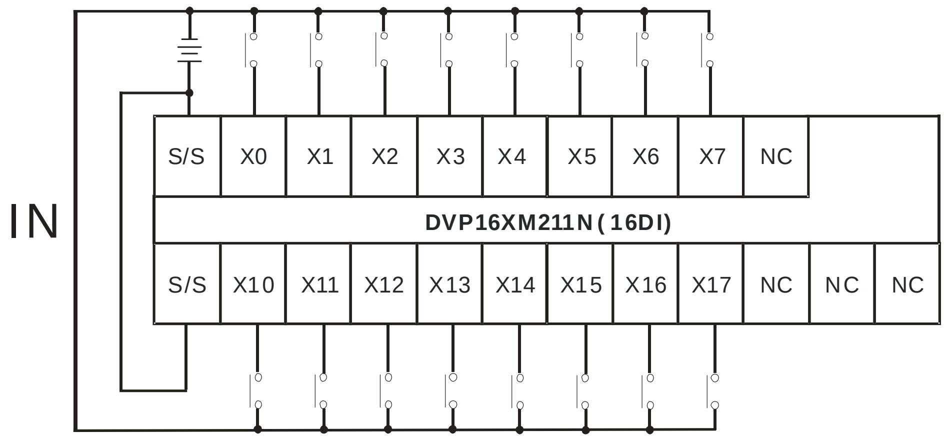


Note: You need to add external power supply 24 VDC (-15% ~ +20%) for UP and ZP; power consumption is up to 5 mA.

2

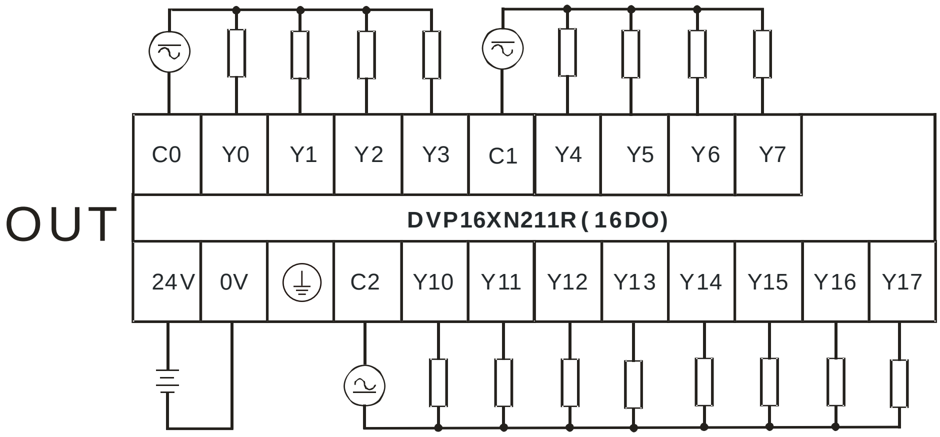
2.5.6 Wiring DVP16XM211N

Input from	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA

<table>
<tr><td>Sinking input</td><td>
</td></tr>
<tr><td>Sourcing input</td><td>
</td></tr>
</table>

2.5.7 Wiring DVP16XN211R

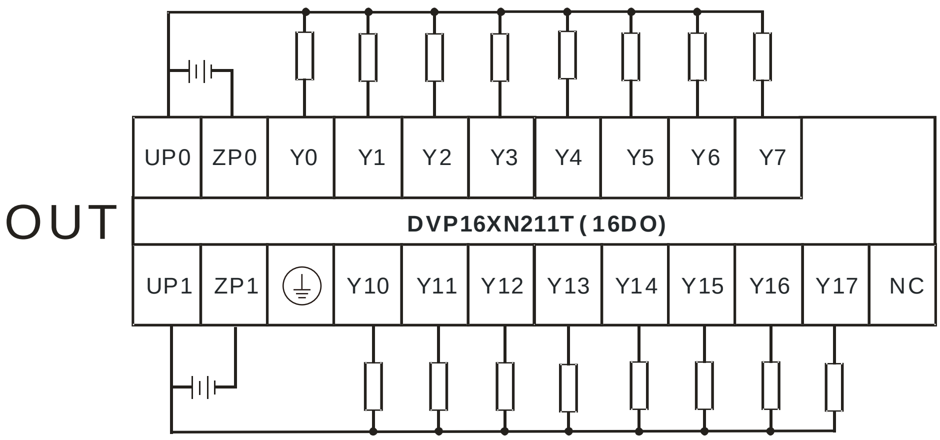
Output type	Relay
Voltage specifications	10~250VAC，5~30VDC，2A/output，5A/COM



Note: Connect the terminal ⏚ to ground.

2.5.8 Wiring DVP16XN211T

Output type	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM



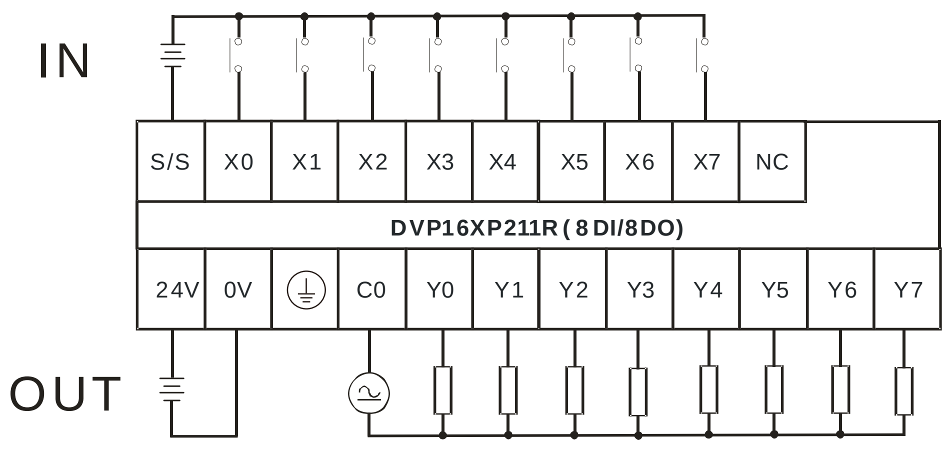
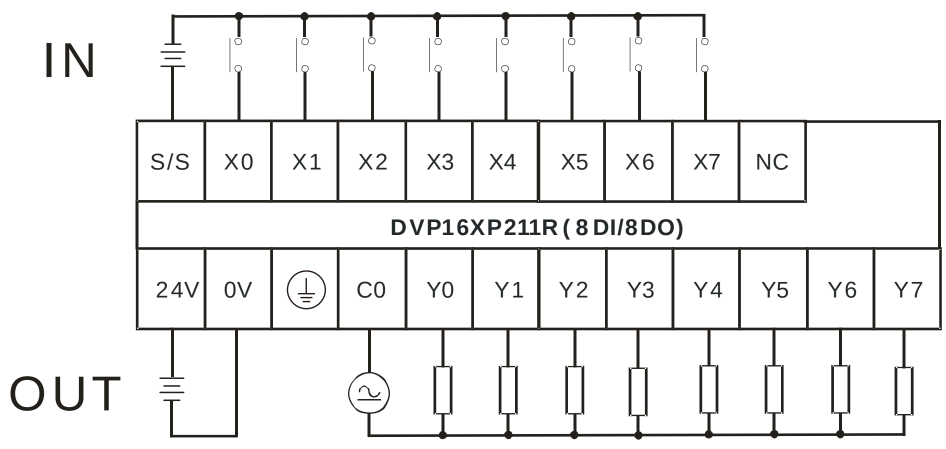
Note:

1. You need to add external power supply 24 VDC (-15% ~ +20%) for UP0, ZP0 and UP1, ZP1; power consumption is up to 30 mA.

2. Connect the terminal ⏚ to ground.

2.5.9 Wiring DVP16XP211R

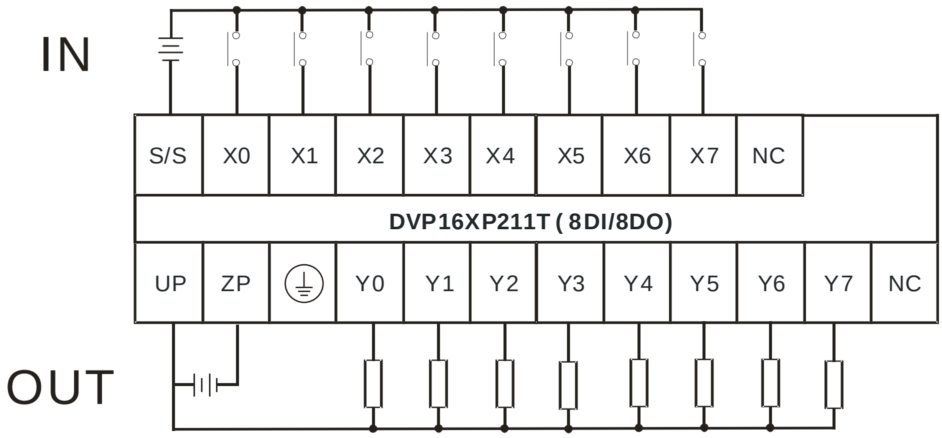
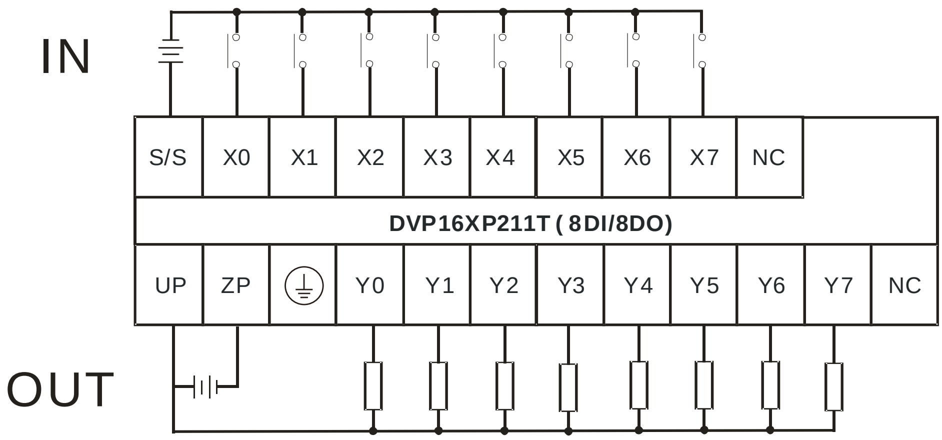
Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output type	Relay
Voltage specifications	10~250VAC，5~30VDC，2A/output，5A/COM

<table>
<tr><td>Sinking input and relay output</td><td>
</td></tr>
<tr><td>Sourcing input and relay output</td><td>
</td></tr>
</table>

Note: Connect the terminal ⏚ to ground.

2.5.10 Wiring DVP16XP211T

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output type	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM

Sinking input and output	
Sourcing input and sinking output	

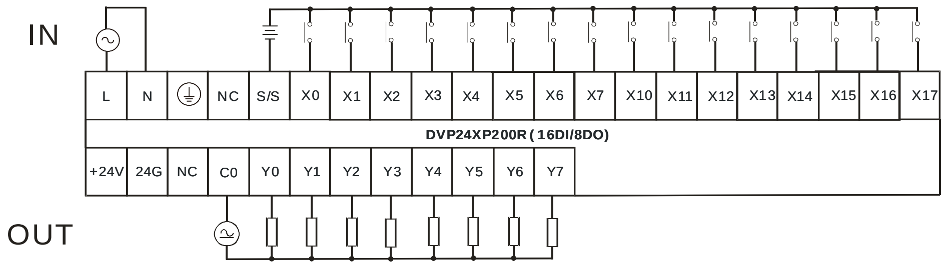
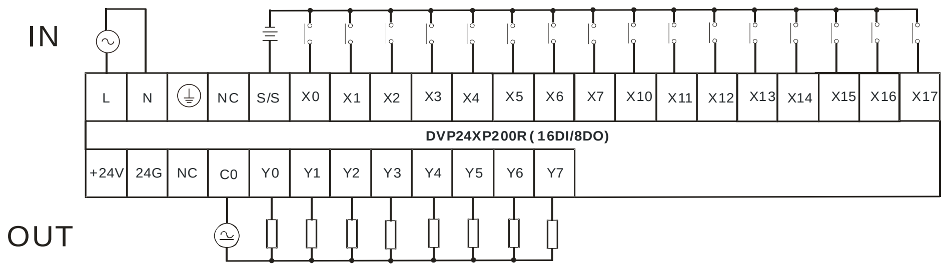
Note:

1. You need to add external power supply 24 VDC (-15% ~ +20%) for UP and ZP; power consumption is up to 15 mA.

2. Connect the terminal ⏚ to ground.

2.5.11 Wiring DVP24XP200R

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output type	Relay
Voltage specifications	10~250VAC，5~30VDC，2A/output，5A/COM

<table>
<tr>
<td>Sinking input and relay output</td>
<td>
</td>
</tr>
<tr>
<td>Sourcing input and relay output</td>
<td>
</td>
</tr>
</table>

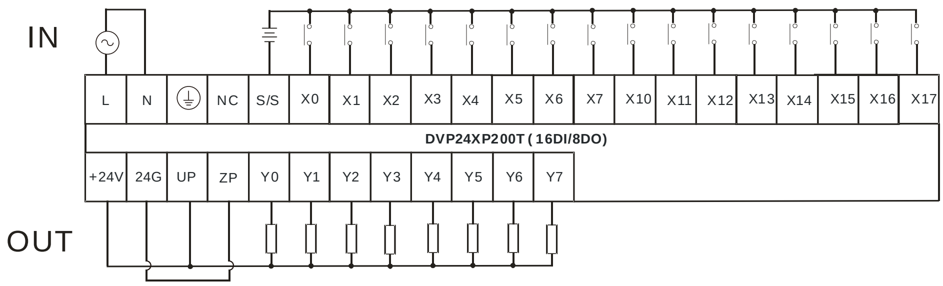
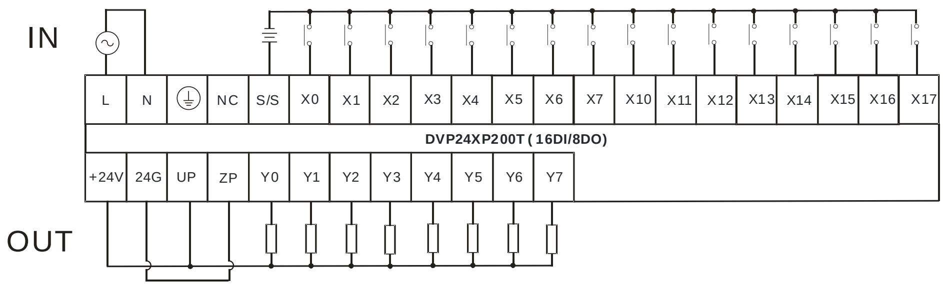
Note:

1. Connect the terminal ⏚ to ground.

2. The module is built-in with a +24 V power supply for I/Os to use.

2.5.12 Wiring DVP24XP200T

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output type	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM

Sinking input and output	
Sourcing input and sinking output	

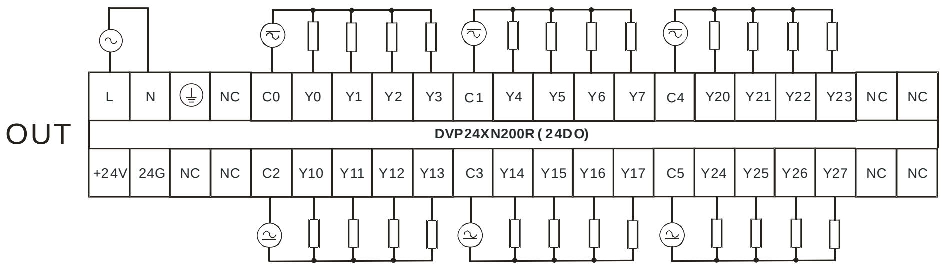
Note:

1. You need to add external power supply 24 VDC (-15% ~ +20%) for UP and ZP; power consumption is up to 15 mA.

2. Connect the terminal to ground.

2.5.13 Wiring DVP24XN200R

Output type	Relay
Voltage specifications	10~250VAC，5~30VDC，2A/output，5A/COM



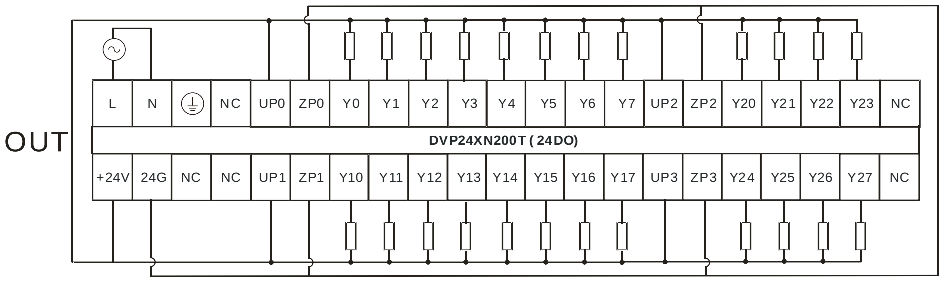
Note:

1. Connect the terminal to ground.

2. The module is built-in with a +24 V power supply for I/Os to use.

2.5.14 Wiring DVP24XN200T

Output type	Transistor-T (sinking)
Voltage specifications	5~30VDC · 0.3A/output · 1.2A/COM



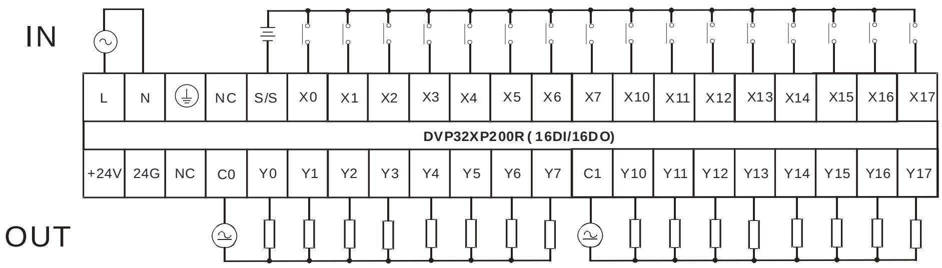
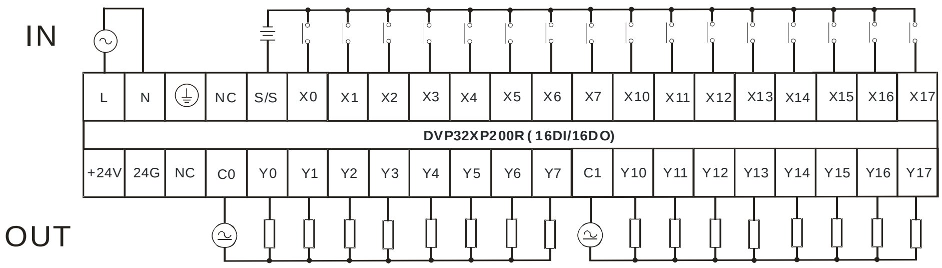
Note:

1.You need to add external power supply 24 VDC (-15% ~ +20%) for UP0, UP1, UP2, UP3 and ZP0, ZP1, ZP2, ZP3; power consumption is up to 30 mA.

2.Connect the terminal ⏚ to ground.

2.5.15 Wiring DVP32XP200R

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC · 5mA
Output type	Relay
Voltage specifications	10~250VAC · 5~30VDC · 2A/output · 5A/COM

Sinking input and relay output	
Sourcing input and relay output	

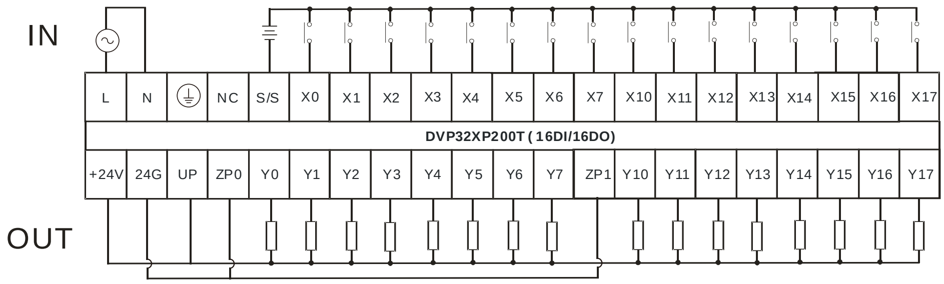
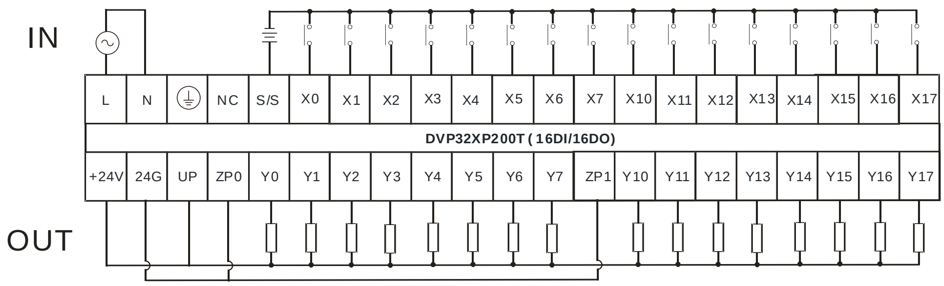
Note:

1. Connect the terminal ⏚ to ground.

2. The module is built-in with a +24 V power supply for I/Os to use.

2.5.16 Wiring DVP32XP200T

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output type	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM

<table>
<tr><td>Sinking input and output</td><td>
</td></tr>
<tr><td>Sourcing input and sinking output</td><td>
</td></tr>
</table>

Note:

1.You need to add external power supply 24 VDC (-15% ~ +20%) for UP, ZP0 and ZP1; power consumption is up to 30 mA.

2. Connect the terminal ⏚ to ground.

2

2.6 Wiring Digital Input / Output

2.6.1 Wiring Digital Input

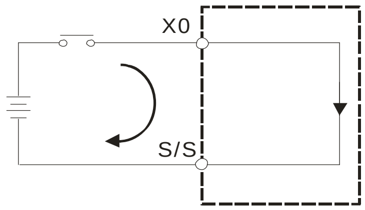
2.6.1.1 Direct Current Power Supply (24 VDC)

When the digital input signal is DC input, there are two DC input types, Sinking and Sourcing. See the definition below.

<table>
<tr>
<td>

● Sinking

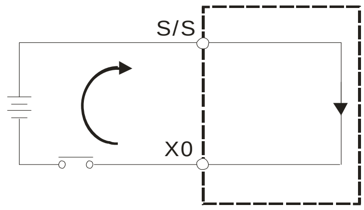
Sink= The current flows into the terminal X0.



</td>
<td>

● Sourcing

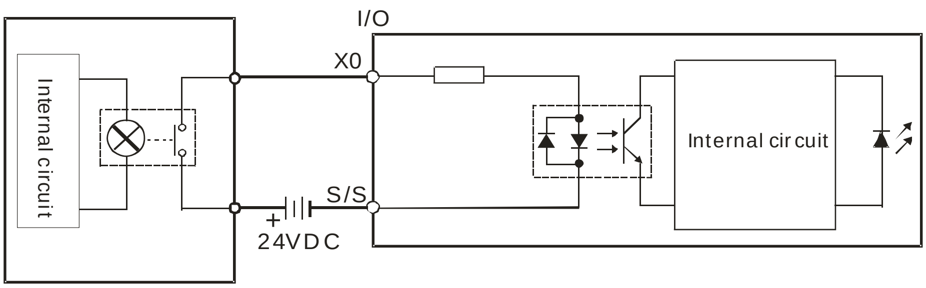
Source= The current flows from the terminal X0.



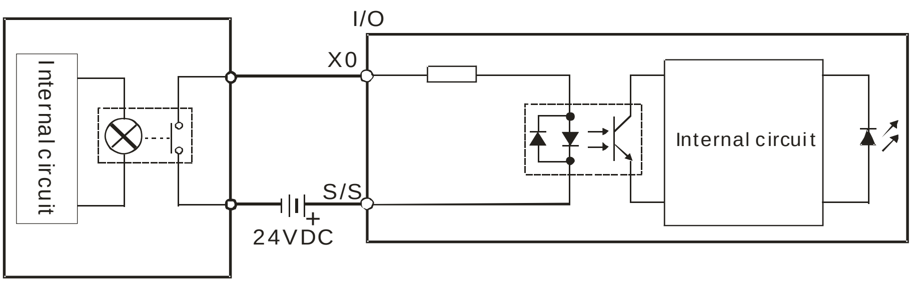
</td>
</tr>
</table>

2.6.1.2 Wiring Input V.S. Relay Types

● **Sinking**

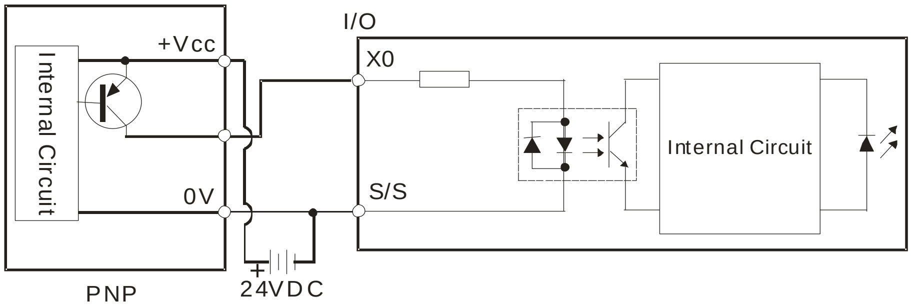


● **Sourcing**

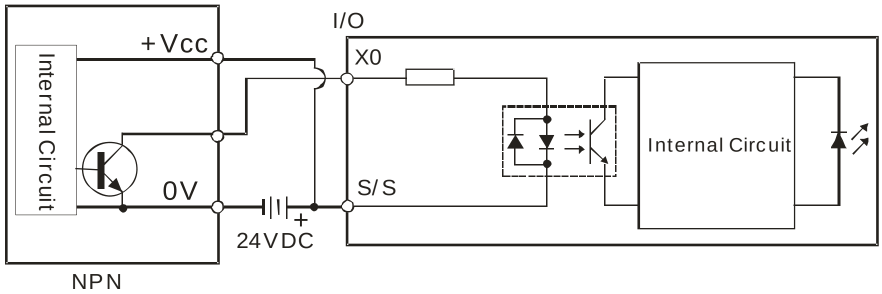


2.6.1.3 Wiring Input V.S. Open-collector Input Types

- **Sinking (PNP input type)**



- **Sourcing (NPN input type)**



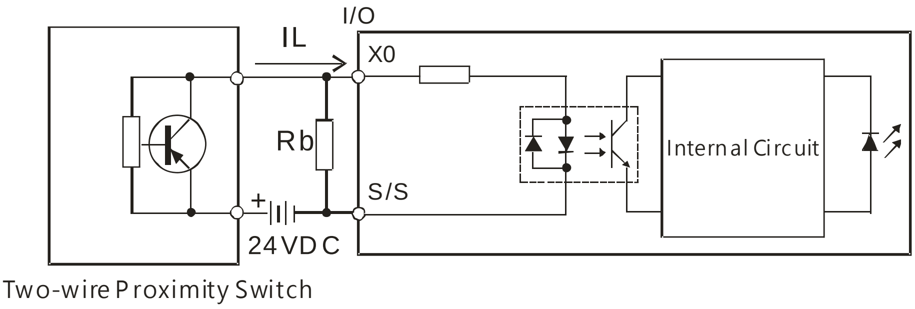
2

2.6.1.4 Wiring Input V.S. Two-Wire Proximity Switch

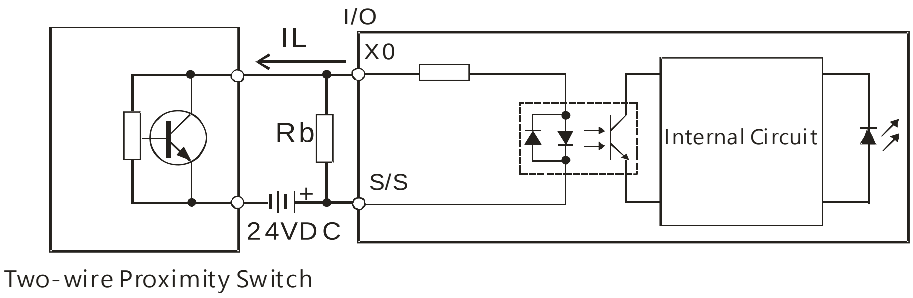
Use the two-wire proximity switch whose leakage current I_L is less than 1.5 mA when the switch is OFF. If the leakage current I_L is larger than 1.5 mA, connect the divider resistance Rb using the formula below.

$$Rb \leq \frac{6}{IL - 1.5} \ (k\Omega)$$

- **Sinking**

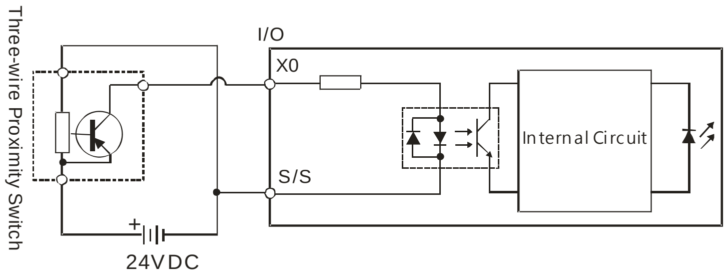


- **Sourcing**

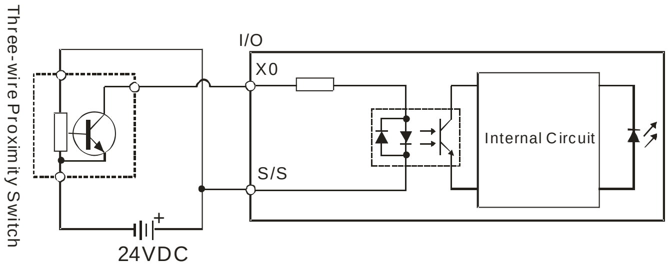


2.6.1.5 Wiring Input V.S. Three-Wire Proximity Switch

- **Sinking**

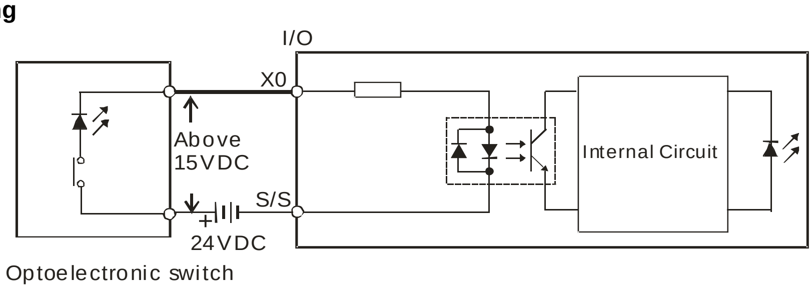


- **Sourcing**

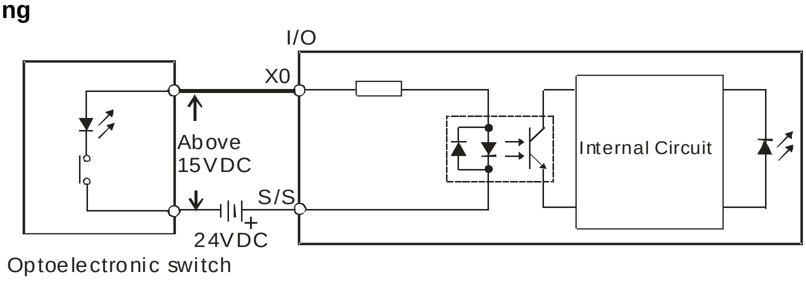


2.6.1.6 Wiring Input V.S. Optoelectronic Switch

- **Sinking**



- **Sourcing**



2

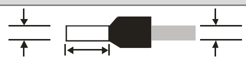
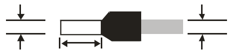
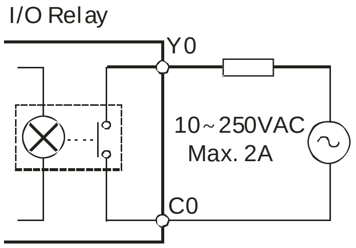
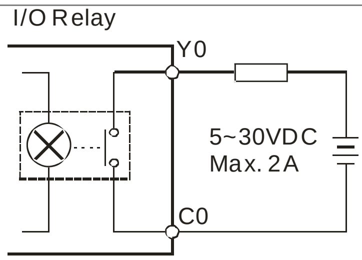
2.6.2 Wiring Digital Output

2.6.2.1 Output Circuits

There are two types of output units: relay outputs and transistor outputs.

1. **Relay output**

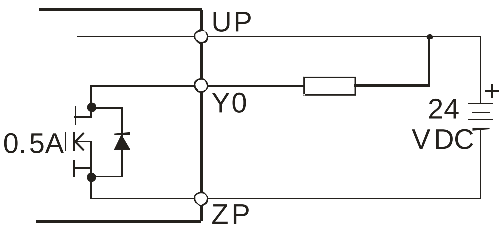
Relay output wiring varies according to the provided power type and requires different wire sizes for different applications. The specifications are as shown in the diagram. The terminal screw torque at the PLC is 3.8 kgf-cm (3.3 lbf-in). Only copper wires rated for 60/75°C can be used.

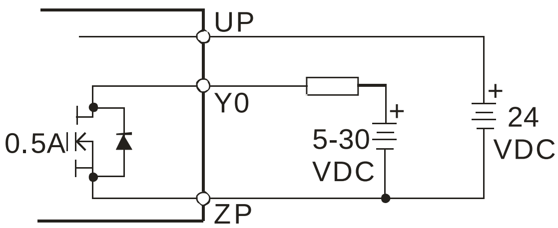
<table>
<tr><th></th><th>AC power supply</th><th>DC power supply</th></tr>
<tr><td>Terminal Specifications</td><td>
< 2 mm 8-10 mm 18-16 AWG</td><td>
< 2 mm 8-10 mm 24-12 AWG</td></tr>
<tr><td>Wiring</td><td>
</td><td>
</td></tr>
</table>

*1. For the relays output terminals within the common point COM (those with the same color in the diagram below), it is necessary to use the same voltage (10~250VAC or 5~30VDC).

C0	Y0	Y1	Y2	Y3	•	C1	Y4	Y5	Y6	Y7

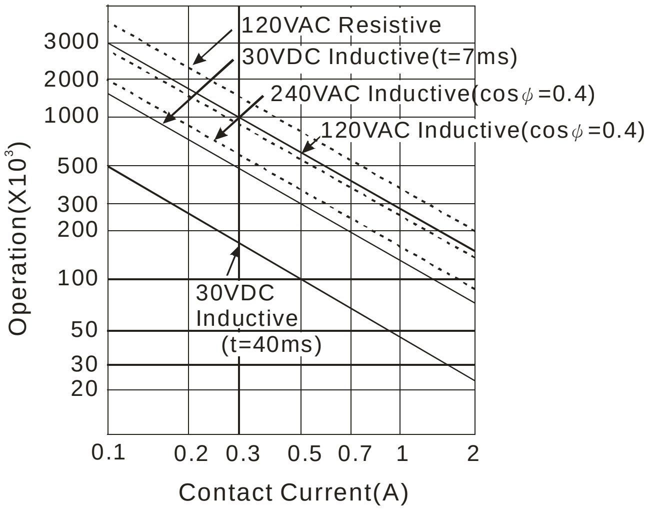
2. **Transistor output**



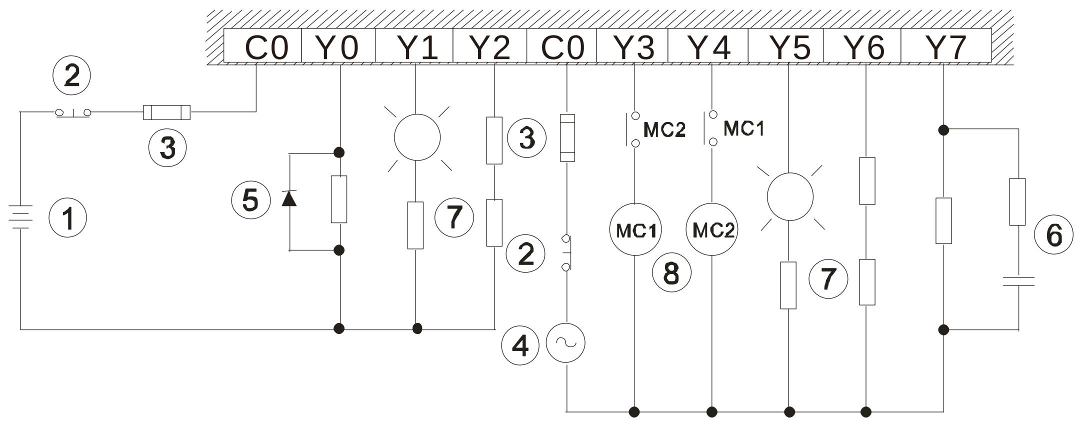


2.6.2.2 Relay Output Circuit

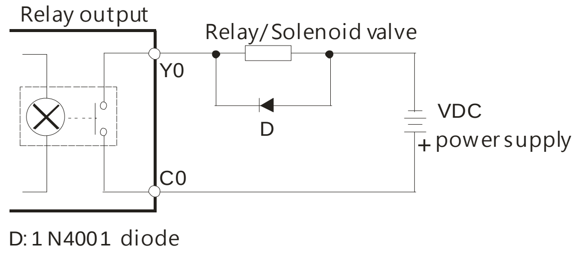
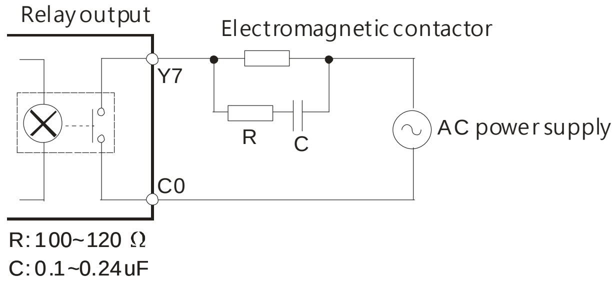
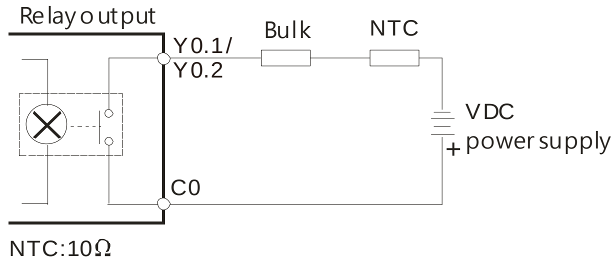
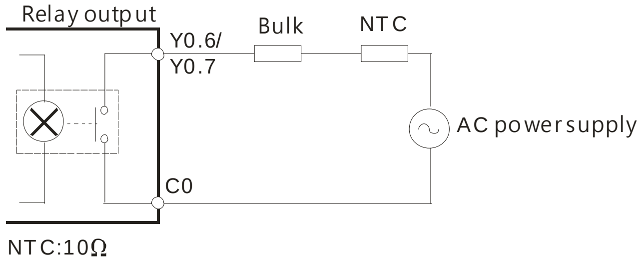
Relay terminals have no polarity. They can be used with alternating current that passes through a load, or with direct current that passes through a load. The maximum current that can pass through every relay terminal is 2A and refer to each product specification for the maximum current that can pass through every common terminal. The lifetime of a relay terminal varies with the working voltage, the load type (the power factor cosψ), and the current passing through the terminal. The relation is shown in the life cycle curve below.



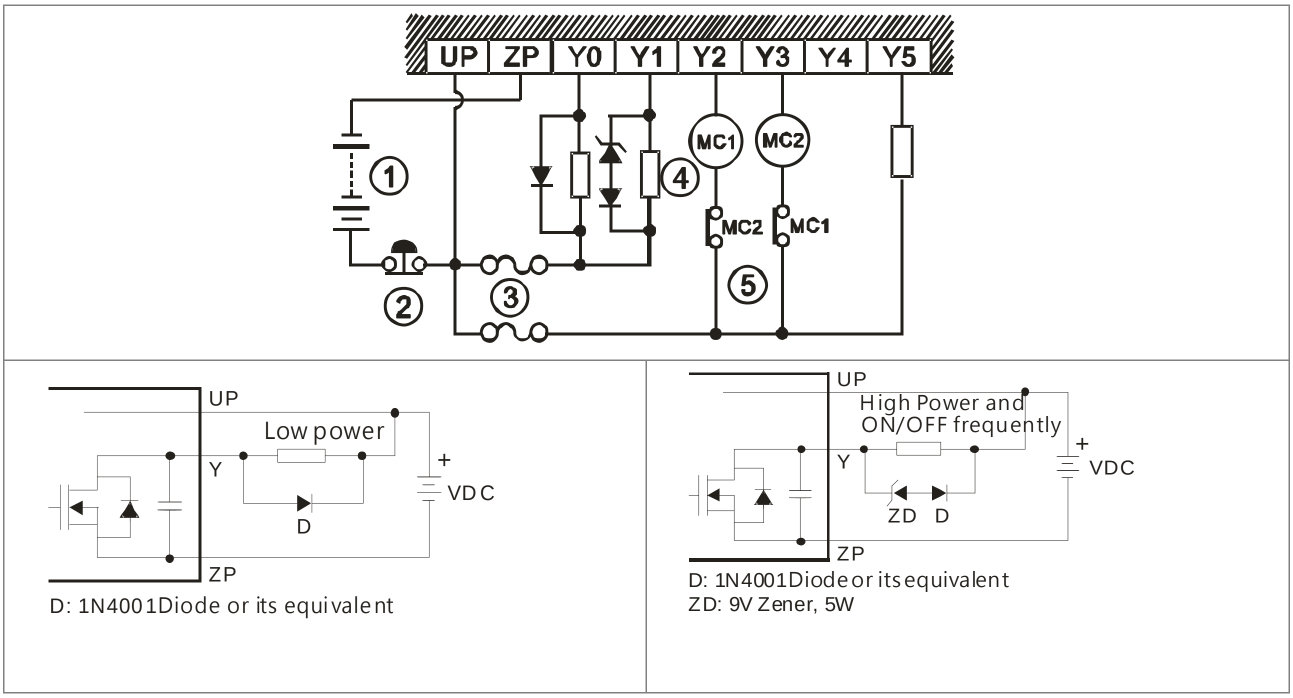
- **Relay output circuit**



①	Direct-current power supply
②	Emergency stop using an external switch.
③	Fuse: to protect the output circuit, a fuse having a breaking capacity between 5 A to 10 A is connected to the common terminal.
④	Alternating-current power supply

⑤	A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage that occurs when the load is OFF. 
⑥	An electromagnetic contactor is used as an AC load. A resistor and a capacitor are connected in parallel to absorb the surge voltage that occurs when the load is OFF. 
⑦	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current that occurs when the load is ON. 
⑦	A bulb (neon lamp) is used as an AC load. A thermistor is connected in series to absorb the surge current that occurs when the load is ON.  .
⑧	Mutually exclusive output: For example, Y0.3 controls the clockwise rotation of the motor, and Y0.4 controls the counterclockwise rotation of the motor. This interlock circuit and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

2.6.2.3 Transistor Output Circuit (NPN)



①	Direct-current power supply
②	Emergency stop
③	Fuse
④	The output terminals of a transistor module are open-collector output terminals. If Y0.0/Y0.1 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally. 1. A diode is connected in parallel to absorb the surge voltage: used in low-power situations (refer to Figure 1). 2. A diode and Zener are connected in parallel to absorb the surge voltage: used in high-power and power-on/off frequently situations (refer to Figure 2).
⑤	Mutually exclusive output: For example, Y2 controls the clockwise rotation of the motor, and Y3 controls the counterclockwise rotation of the motor. This interlock circuit and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

3

Chapter 3 DVP-E Series Analog Input/Output Module

Table of Content

3

3.1 General Specifications

3.1.1 DVP04AD-E2 Specifications

- **Electrical specifications**

Module name	DVP04AD-E2
Number of inputs	Four
Analog-to-digital conversion	Voltage input/Current input
Supply voltage	24VDC（20.4~28.8VDC）(-15%~+20%）
Connector type	Removable terminal block(distance to the terminal is 5mm)
Conversion time	400μs/channel
Weight	204g

Things to note when connecting the module to a PLC CPU:

1. Up to 8 modules can be connected to a PLC CPU.

2. The connected module is numbered automatically from 0 (nearest to the PLC CPU) to 7 (furthest away from the PLC CPU).

3. The connected modules do NOT take up any digital I/O points.

- **Functional specifications**

Analog/digital module	Voltage input		Current input		
Analog input channel	4channels				
Rated input range	±10V	±5V	±20mA	0~20mA	4~20mA
Digital conversion range	±32,000	±32,000	±32,000	0~32,000	0~32,000
Hardware input limit*1	±10.12V	±5.06V	±20.24mA	-0.24~20.24 mA	3.81~20.19mA
Digital conversion limit*2	±32,384	±32,384	±32,384	-384 ~+32,384	-384 ~+32,384
Hardware resolution	14-bit	14-bit	14-bit	13-bit	13-bit
Input impedance	≧1MΩ		250Ω		
Absolute input range*3	±15V		±32mA		
Digital data format	16 -bit two's complement number				
Average function	Yes, CR#8 ~ CR#11, setting range: K1 ~ K100				
Self-diagnosis function	Detecting if exceeding upper and lower limits or channel disconnection				
Overall Accuracy	25° C/77° F: The allowed error range is ±0.5% of full scale. 0° C to 55° C/32° F to 131° F: The allowed error range is ±1% of full scale				
Response time	400μs/channel				

Analog/digital module	Voltage input	Current input
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground:500VAC Isolation between an analog circuit and a ground:500VAC Isolation between an analog circuit and a digital circuit:500VAC Isolation between the 24 VDC and a ground: 500VAC	

*1. If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value.

*2. If the input signal exceeds the hardware input limit, it also exceeds the digital conversion limit, and a conversion limit error appears. For example, in the voltage input mode (-10 V to +10 V), when the input signal is 10.15 V, exceeding the hardware upper limit, it also exceeds the conversion upper limit. The module uses the upper limit value (32387) as the input signal and a conversion limit error appears.

*3. If an input signal exceeds the absolute range, it might damage the channel.

3.1.2 DVP02DA-E2 / DVP04DA-E2 Specifications

- **Electrical specifications**

Module name	DVP02DA-E2	DVP04DA-E2
Number of outputs	Two	Four
Analog-to-digital conversion	Voltage output/Current output	
Supply voltage	24VDC（20.4~28.8VDC）(-15%~+20%）	
Connector type	Removable terminal block (distance to the terminal is 5mm)	
Conversion time	400μs /channel	
Short circuit protection*1	Yes	
Weight	194g	207g

*1: The module is with short circuit protection, but if the duration of a short circuit is too long, it can cause circuit damage. Current output can be open circuit.

Things to note when connecting the module to a PLC CPU:

1. Up to 8 modules can be connected to a PLC CPU.

2. The connected module is numbered automatically from 0 (nearest to the PLC CPU) to 7 (furthest away from the PLC CPU).

3. The connected modules do NOT take up any digital I/O points.

- **Functional specifications**

Digital/analog module	Voltage output	Current output	
Rated output range	-10~10V	0~20mA	4~20mA
Digital conversion range	-32,000~+32,000	0~+32,000	0~+32,000
Digital conversion limit	-32,768~+32,767	0~+32,767	-6,400~+32,767
Hardware resolution	14-bit	14-bit	14-bit
Maximum output current	5mA	-	
Load impedance	1KΩ~2MΩ	0~500Ω	
Output impedance	0.5Ω or lower		
Overall accuracy	25° C/77° F: The allowed error range is ±0.5% of full scale. 0° C to 55° C / 32° F to 131° F: The allowed error range is ±1% of full scale.		
Response time	400μs/channel		
Digital data format	16-bit two's complement number		
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground:500VAC Isolation between an analog circuit and a ground:500VAC Isolation between an analog circuit and a digital circuit:500VAC Isolation between the 24 VDC and a ground: 500VAC		

3.1.3 DVP06XA-E2 Specification

- **Electrical specifications**

Module name	DVP06XA-E2
Number of inputs/outputs	Inputs: four; Outputs: two
Analog-to-digital conversion	Voltage input/Current input; Voltage output/Current output
Supply voltage	24VDC (20.4~28.8VDC) (-15%~+20%)
Connector type	Removable terminal block (distance to the terminal is 5mm)
Weight	213g

Things to note when connecting the module to a PLC CPU:

1. Up to 8 modules can be connected to a PLC CPU.

2. The connected module is numbered automatically from 0 (nearest to the PLC CPU) to 7 (furthest away from the PLC CPU).

3. The connected modules do NOT take up any digital I/O points.

- **A/D Functional specifications**

	Voltage input		Current input		
Analog input channel	4 channels				
Rated input range	±10V	±5V	±20mA	0~20mA	4~20mA
Digital conversion range	±32,000	±32,000	±32,000	0~32,000	0~32,000
Hardware input limit[*1]	±10.12V	±5.06V	±20.24mA	-0.24~20.24mA	3.81~20.19mA
Digital conversion limit[*2]	±32,384	±32,384	±32,384	-384 ~+32,384	-384 ~+32,384
Hardware resolution	14-bit-bit	14-bit-bit	14-bit-bit	13-bit-bit	13-bit-bit
Input impedance	≧1MΩ		250Ω		
Absolute input range[*3]	±15V		±32mA		
Digital data format	16-bit two's complement numbe				
Conversion time	400 μs /channel				
Average function	Yes, CR#8 ~ CR#11, setting range: K1 ~ K100				
Self-diagnosis function	Detecting if exceeding upper and lower limts or channel disconnection				
Overall Accuracy	25° C/77° F: The allowed error range is ±0.5% of full scale. 0° C to 55° C/-32° F to 131° F: The allowed error range is ±1% of full scale.				
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VAC. Isolation between an analog circuit and a ground: 500 VAC. Isolation between an analog circuit and a digital circuit: 500 VAC. Isolation between the 24 VDC and a ground: 500 VAC.				

*1: If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value.

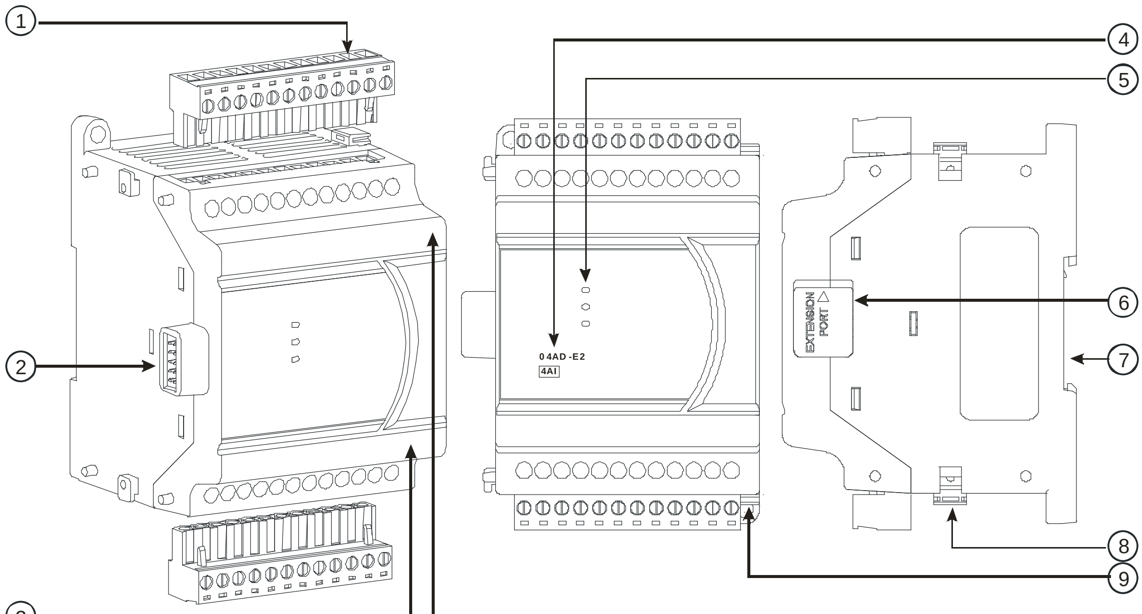
*2: If the input signal exceeds the hardware input limit, it also exceeds the digital conversion limit, and a conversion limit error appears. For example, in the voltage input mode (-10 V to +10 V), when the input signal is 10.15 V, exceeding the hardware upper limit, it also exceeds the conversion upper limit. The module uses the upper limit value (32387) as the input signal and a conversion limit error appears.

*3: If an input signal exceeds the absolute range, it might damage the channel.

- **D/A Functional specifications**

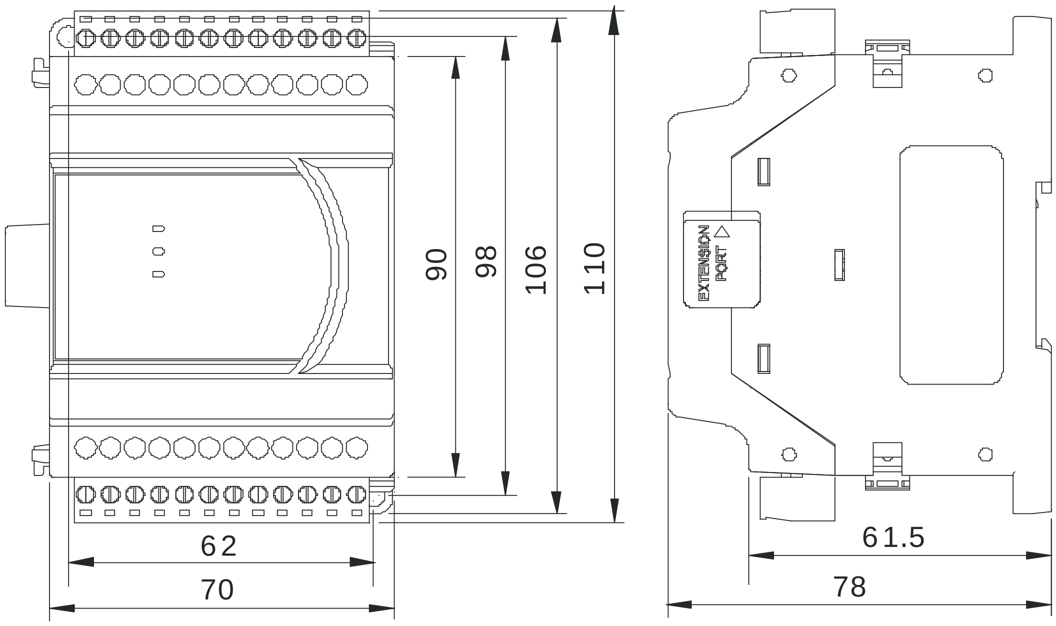
	Voltage output	Current output	
Analog output channel	2 channels		
Rated output range	-10~10V	0~20mA	4~20mA
Digital conversion range	-32,000~+32,000	0~+32,000	0~+32,000
Digital conversion limit	-32,768~+32,767	0~+32,767	-6,400~+32,767
Hardware resolution	14-bit	14-bit	14-bit
Maximum output current	5mA	-	
Load impedance	1KΩ~2MΩ	0~500Ω	
Output impedance	5Ω or lower		
Short circuit Protection	Yes. The module is with short circuit protection, but if the duration of a short circuit is too long, it can cause circuit damage. Current output can be open circuit.		

3.2 Module Profiles



Number	Name	Description
1	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads to be driven.
2	External module connection port	Connect the modules.
3	Terminal number	Terminal number
4	Model name	Model name of the module
5	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	ERROR LED indicator	Indicates Error status of the module ON: a serious error occurs in the module. OFF: the module is normal. Blinking: a minor error occurs in the module.
	Analog to digital conversion indicator	Indicates the analog to digital conversion status Blinking: conversion is taking place OFF: stop conversion
6	External module connection port	Connects the modules
7	DIN rail slot（35mm）	For the DIN rail
8	I/O module securing clip	Secures the modules
9	Mounting hole	Secures the module on the set

3.3 Dimension



Unit: mm

3.4 Module I/O Terminals

- DVP04AD-E2

1	2	3	4	5	6	7	8	9	10	11	12
V1+	I1+	VI1-	FE	V2+	I2+	VI2-	FE	V3+	I3+	VI3-	FE

DVP04AD-E2 (4AI)

1	2	3	4	5	6	7	8
24V	0V	⏚	FE	V4+	I4+	VI4-	FE

- DVP02DA-E2

DVP02DA-E2 (2AO)

1	2	3	4	5	6	7	8	9	10	11	12
24V	0V	⏚	FE	FE	FE	VO1	IO1	AG	VO2	IO2	AG

- DVP04DA-E2

1	2	3	4	5	6	7	8	9	10	11	12
VO1	IO1	AG	FE	VO2	IO2	AG	FE	VO3	IO3	AG	FE

DVP04DA-E2 (4AO)

1	2	3	4	5	6	7	8
24V	0V	⏚	FE	VO4	IO4	AG	FE

- DVP06XA-E2

1	2	3	4	5	6	7	8	9	10	11	12
V1+	I1+	VI1-	V2+	I2+	VI2-	V3+	I3+	VI3-	V4+	I4+	VI4-

DVP06XA-E2 (4AI/2AO)

1	2	3	4	5	6	7	8	9	10	11	12
24V	0V	⏚	FE	FE	FE	VO1	IO1	AG	VO2	IO2	AG

3.5 Control Registers

3.5.1 DVP04AD-E2Control Registers

CR#	Attrib.		Register name	Description
0	O	R	Model name	Set up by the system: DVP04AD-E2 model code = H'0080 For detailed explanation, please see the list below.
1	O	R	Firmware version	Display the current firmware version in hex. format
2	O	R/W	CH1 input mode setting	Input mode: Default = H'0000. Mode0（H'0000）: Voltage input（±10V） Mode1（H'0001）: Voltage input（±5V） Mode2（H'0002）: Voltage input（0~+10V） Mode3（H'0003）: Voltage input（0~+5V） Mode4（H'0004）: Current input（±20mA） Mode5（H'0005）: Current input（0~+20mA） Mode6（H'0006）: Current input（4~+20mA） Mode-1（H'FFFF）: Not in use
3	O	R/W	CH2 input mode setting	
4	O	R/W	CH3 input mode setting	
5	O	R/W	CH4 input mode setting	
8	O	R/W	CH1 sampling range	Set sampling range in CH1~CH4 Range = K1~K100 Default = K10
9	O	R/W	CH2 sampling range	
10	O	R/W	CH3 sampling range	
11	O	R/W	CH4 sampling range	
12	X	R	CH1 average input value	Average value of input signals at CH1 ~ CH4
13	X	R	CH2 average input value	
14	X	R	CH3 average input value	
15	X	R	CH4 average input value	
20	X	R	CH1 present input value	Present value of input signals at CH1 ~ CH4
21	X	R	CH2 present input value	
22	X	R	CH3 present input value	
23	X	R	CH4 present input value	
28	O	R/W	Adjusted Offset value of CH1	Set the adjusted Offset value of CH1 ~ CH4. Default = K0
29	O	R/W	Adjusted Offset value of CH2	
30	O	R/W	Adjusted Offset value of CH3	
31	O	R/W	Adjusted Offset value of CH4	
34	O	R/W	Adjusted Gain value of CH1	Set the adjusted Gain value in CH1 ~ CH4. Default = K16,000
35	O	R/W	Adjusted Gain value of CH2	
36	O	R/W	Adjusted Gain value of CH3	
37	O	R/W	Adjusted Gain value of CH4	
Adjusted Offset Value, Adjusted Gain Value: Note1: When using Mode 6 for input, the channel do NOT provide setups for adjusted Offset or Gain value. Note2: When input mode changes, the adjusted Offset or Gain value automatically returns to defaults.				

CR#	Attrib.		Register name	Description
40	O	R/W	Function: Set value changing prohibited	Prohibit set value changing in CH1 ~ CH4. Default= H’0000
41	X	R/W	Function: Save all the set values	Save all the set values, Default =H’0000
43	X	R	Error status	Register for storing all error status. Refer to table of error status for more information.
100	O	R/W	Function: Enable/Disable limit detection	Upper and lower bound detection, b0~b3 corresponds to Ch1~Ch4 (0: Disable/1: Enable). Default= H’0000
101	X	R/W	Upper and lower bound status	Display the upper and lower bound status (0: Not exceed /1: Exceeds upper or lower bound value), b0~b3 corresponds to Ch1~Ch4 for lower bound detection result; b8~b11 corresponds to CH1~CH4 for upper bound detection result
102	O	R/W	Set value of CH1 upper bound	Set value of CH1~CH4 upper bound. Default = K32000.
103	O	R/W	Set value of CH2 upper bound	
104	O	R/W	Set value of CH3 upper bound	
105	O	R/W	Set value of CH4 upper bound	
108	O	R/W	Set value of CH1 lower bound	Set value of CH1~CH4 lower bound. Default = K-32000.
109	O	R/W	Set value of CH2 lower bound	
110	O	R/W	Set value of CH3 lower bound	
111	O	R/W	Set value of CH4 lower bound	
Symbols: O: When CR#41 is set to H’5678, the set value of CR will be saved. X: Set value will not be saved. R: You can use FROM instruction to read data. W: You can use TO instruction to write data.				

※ **CR#0 for mudule reset**

You can use CR#0 to reset all the settings by simply writing H’4352 in CR#0 and wait for one second before turning the power OFF and then ON again, all the modules connected will be initialized. It is suggested to connect to only one module for module reset. And this is only available for firmware V1.10 or later.

※ **CR#43Error status value. See the table below:**

Description					
bit0	K1 (H'1)	Power supply error	bit6	K64 (H'40)	CH4 Conversion error
bit1	K2 (H'2)	Reserved	bit9	K512 (H'0200)	Mode setting error
bit2	K4 (H'4)	Upper/lower bound error	bit10	K1024 (H'0400)	Sampling range error
bit3	K8 (H'8)	CH1 Conversion error	bit11	K2048 (H'0800)	Upper/lower bound setting error
bit4	K16 (H'10)	CH2 Conversion error	bit12	K4096 (H'1000)	Set balue changing prohibited
bit5	K32 (H'20)	CH3 Conversion error	bit13	K8192 (H'2000)	Communication breakdown on next module
Note: Each error status is determined by the corresponding bit (b0 ~ b13) and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error.					

※ **Adjust A/D Conversion Curve**

Users can adjust the conversion curves according to the actual needs by changing the Offset value (CR#28 ~ CR#31) and Gain value (CR#34 ~ CR#37).

- **Equation for voltage input Mode 0 / Mode 2:**

$$Y = 16000 \times \left(\frac{X(V)}{10(V)} \times 32000 - Offset \right) \Big/ (Gain - Offset)$$

Y=Digital output, X=Voltage input

Resolution: 0.3125mV = 20V/64,000 = 10V/32,000

- **Equation for voltage input Mode 1 / Mode 3:**

$$Y = 16000 \times \left(\frac{X(V)}{5(V)} \times 32000 - Offset \right) \Big/ (Gain - Offset)$$

Y=Digital output, X=Voltage input

Resolution: 0.15625mV = 10V/64,000 = 5V/32,000

- **Equation for current input Mode 4/ Mode 5:**

$$Y = 16000 \times \left(\frac{X(mA)}{20(mA)} \times 32000 - Offset \right) \Big/ (Gain - Offset)$$

Y=Digital output, X=Current input

Resolution: 0.625μA = 40mA/64,000 = 20mA/32,000

- **Equation for current input Mode 6:**

$$Y = 16000 \times \left(\frac{X(mA)}{20(mA)} \times 32000 - 6400 \right) \Big/ (19200 - 6400)$$

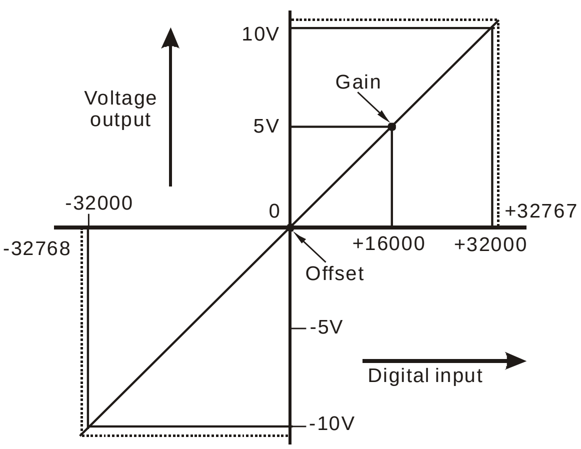
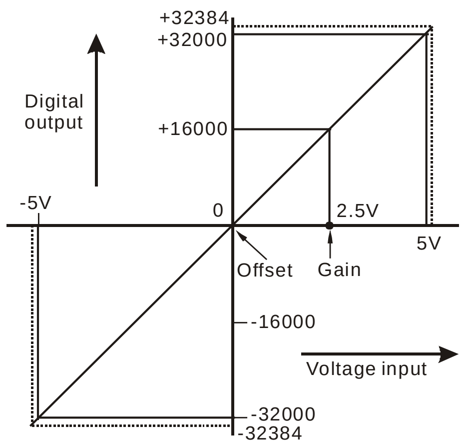
Y=Digital output, X=Current input

Resolution: 0.5μA = 16mA/32,000

Gain: The corresponding voltage/current input value when the digital output value = 16,000.

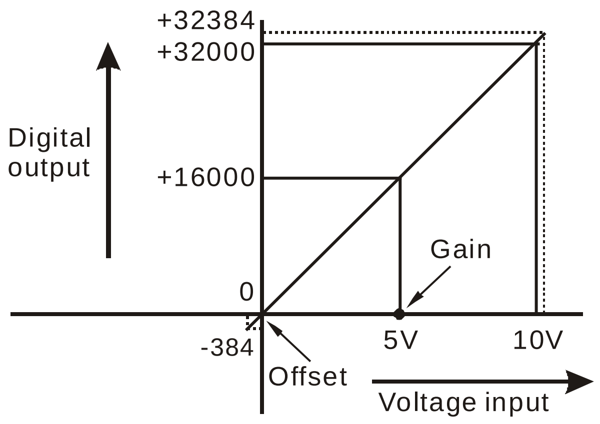
Offset: The corresponding voltage/current input value when the digital output value = 0.

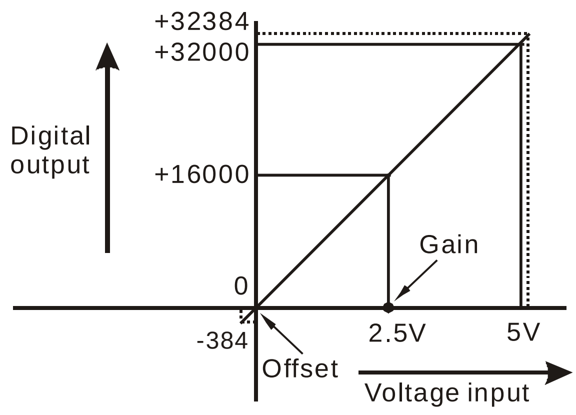
Mode 0 of CR#2~CR#5	-10V~+10V, Gain=16,000 ($=5V/312.5uV$), Offset=0
Mode 1 of CR#2~CR#5	-5V~+5V, Gain=16,000 ($=2.5V/156.25uV$), Offset=0
Range of digital conversion	-32,000 LSB~+32,000 LSB
Max./Min. range of digital conversion	-32,384 LSB~+32,384 LSB

Mode 0	Mode 1
	

Mode 2 of CR#2~CR#5	0V~+10V，Gain=16,000 ($=5V/312.5uV$)，Offset=0
Mode 3 of CR#2~CR#5	0V~+5V，Gain=16,000 ($=2.5V/156.25uV$)，Offset=0
Range of digital conversion	0 LSB~+32,000 LSB
Max./Min. range of digital conversion	-384 LSB~+32,384 LSB

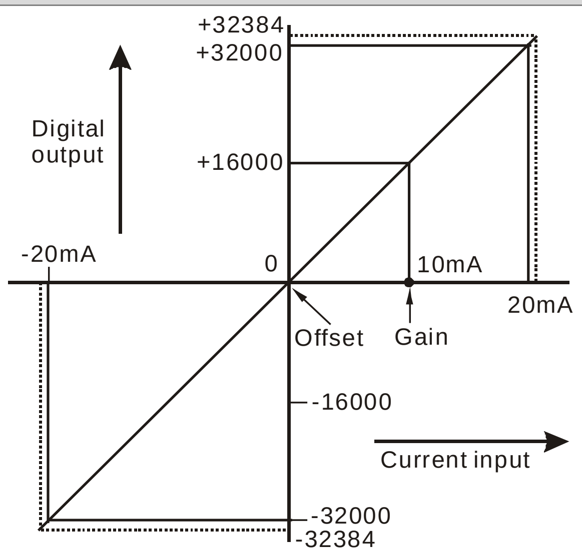
Mode 2	Mode 3



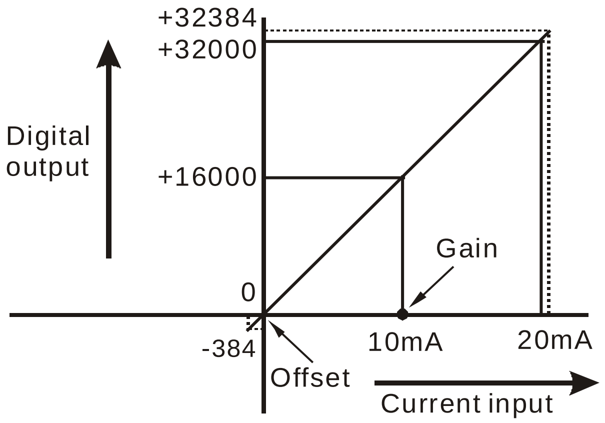
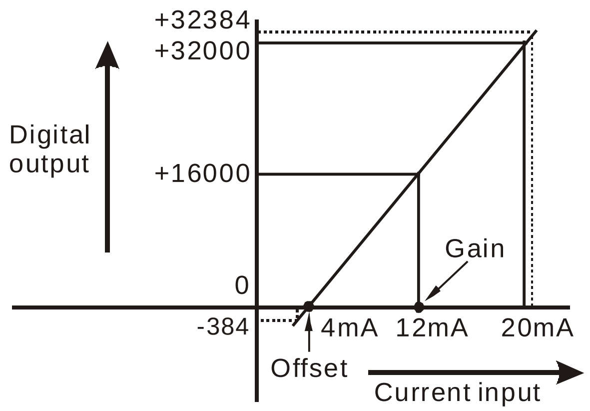


Mode 4 of CR#2~CR#5	-20mA~+20mA，Gain=16,000 ($=10mA/625nA$)，Offset=0
Range of digital conversion	-32,000 LSB~+32,000 LSB
Max./Min. range of digital conversion	-32,384 LSB~+32,384 LSB

Mode 4



Mode 5 of CR#2~CR#5	0mA~+20mA, default: Gain=16,000 ($=10mA/625nA$), Offset=0
Mode 6 of CR#2~CR#5	+4mA~+20mA, Gain=19,200 ($=12mA/625nA$), Offset=6,400 ($=4mA/625nA$)
Range of digital conversion	0 LSB~+32,000 LSB
Max./Min. range of digital conversion	-384 LSB~+32,384 LSB

Mode 5	Mode 6
	

3.5.2 DVP02DA-E2 / DVP04DA-E2Control Registers

CR#	Attrib.		Register name	Description
0	O	R	Model name	Set up by the system, model code: DVP02DA-E2=H'0041; DVP04DA-E2=H'0081
1	O	R	Firmware version	Display the current firmware version in hex.
2	O	R/W	CH1output mode setting	Output mode: Default = H'0000. Mode 0 (H'0000): Voltage output (±10V). Mode 1 (H'0001): Current output (0~+20mA). Mode 2 (H'0002): Current output (+4~+20mA). Mode -1 (H'FFFF): All channels are unavailable
3	O	R/W	CH2output mode setting	
4	O	R/W	CH3output mode setting	
5	O	R/W	CH4output mode setting	
16	X	R/W	CH1output signal value	Voltage output range: K-32,000~K32,000 Current output range: K0~K32,000 Default: K0 CR#18~CR#19 of DVP02DA-E2 are reserved.
17	X	R/W	CH2output signal value	
18	X	R/W	CH3output signal value	
19	X	R/W	CH4output signal value	
28	O	R/W	Adjusted Offset value of CH1	Set the adjusted Offset value of CH1 ~ CH4. Default = K0
29	O	R/W	Adjusted Offset value of CH2	
30	O	R/W	Adjusted Offset value of CH3	
31	O	R/W	Adjusted Offset value of CH4	
34	O	R/W	Adjusted Gain value of CH1	Set the adjusted Gain value of CH1 ~ CH4. Default = K16,000
35	O	R/W	Adjusted Gain value of CH2	
36	O	R/W	Adjusted Gain value of CH3	
37	O	R/W	Adjusted Gain value of CH4	
Adjusted Offset Value, Adjusted Gain Value: *1. When using Mode 2, the channel do NOT provide setups for adjusted Offset or Gain value. *2. When output mode changes, the adjusted Offset or Gain value automatically returns to defaults.				
40	O	R/W	Function: Set value changing prohibited	Prohibit set value changing in CH1 ~ CH4. Default= H'0000
41	X	R/W	Function: Save all the set values	Save all the set values. Default = H'0000。
43	X	R	Error status	Register for storing all error status. Refer to table of error status for more information.
100	O	R/W	Function: Enable/Disable limit detection	Upper and lower bound detection, b0~b3 corresponds to CH1~CH4 (0: Disable/ 1: Enable). Default= H'0000.

CR#	Attrib.		Register name	Description
101	X	R/W	Upper and lower bound status	Display the upper and lower bound status. (0: Not exceed /1: Exceeds upper or lower bound value), b0~b3 corresponds to Ch1~Ch4 for lower bound detection result; b8~b11 corresponds to CH1~CH4 for upper bound detection result.
102	O	R/W	Set value of CH1 upper bound	Set value of CH1~CH4 upper bound. Default = K32000。
103	O	R/W	Set value of CH2 upper bound	
104	O	R/W	Set value of CH3 upper bound	
105	O	R/W	Set value of CH4 upper bound	
108	O	R/W	Set value of CH1 lower bound	Set value of CH1~CH4 lower bound. Default = K-32000。
109	O	R/W	Set value of CH2 lower bound	
110	O	R/W	Set value of CH3 lower bound	
111	O	R/W	Set value of CH4 lower bound	
114	O	R/W	Output update time of CH1	Set value of CH1~CH4 output update time. Setting range: K0~K100. Default = H'0000。
115	O	R/W	Output update time of CH2	
116	O	R/W	Output update time of CH3	
117	O	R/W	Output update time of CH4	
118	O	R/W	LV output mode setting	Set the output mode of CH1~CH4 when the power is at LV (low voltage) condition. Default= H'0000
Symbols: O: When CR#41 is set to H'5678, the set value of CR will be saved. X: Set value will not be saved. R: You can use FROM instruction to read data. W: You can use TO instruction to write data.				

※ **CR#0 for module reset**

You can use CR#0 to reset all the settings by simply writing H'4352 in CR#0 and wait for one second before turning the power OFF and then ON again, all the modules connected will be initialized. It is suggested to connect to only one module for module reset. And this is only available for firmware V1.12 or later.

※ **CR#43Error status value. See the table below:**

Description					
bit0	K1 (H'1)	Power supply error	bit11	K2048 (H'0800)	Upper / lower bound setting error
bit1	K2 (H'2)	Reserved	bit12	K4096 (H'1000)	Set value changing prohibited
bit2	K4 (H'4)	Upper/lower bound error	bit13	K8192 (H'2000)	Communication breakdown on next module
bit9	K512 (H'0200)	Mode setting error	-		
Note: Each error status is determined by the corresponding bit (b0 ~ b13) and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error					

※ **Adjust D/A Conversion Curve**

You can adjust the conversion curves according to the actual needs by changing the Offset value (CR#28 ~ CR#31) and Gain value (CR#34 ~ CR#37).

Gain: The corresponding voltage/current input value when the digital output value = 16,000.

Offset: The corresponding voltage/current input value when the digital output value = 0.

- **Equation for voltage output Mode0:**

$$Y(V)=\left[\frac{X\times(Gain-Offset)}{16000}+Offset\right]\times\left(\frac{10(V)}{32000}\right)$$

Y=Voltage output, X=Digital input

Resolution: 0.3125mV = 20V/64,000

- **Equation for current output Mode1:**

$$Y(mA)=\left[\frac{X\times(Gain-Offset)}{16000}+Offset\right]\times\left(\frac{20(mA)}{32000}\right)$$

Y=Current output, X=Digital input

Resolution: 0.625μA = 20mA/32,000

- **Equation for current output Mode2:**

$$Y(mA)=\left[\frac{X\times(19200-6400)}{16000}+6400\right]\times\left(\frac{20(mA)}{32000}\right)$$

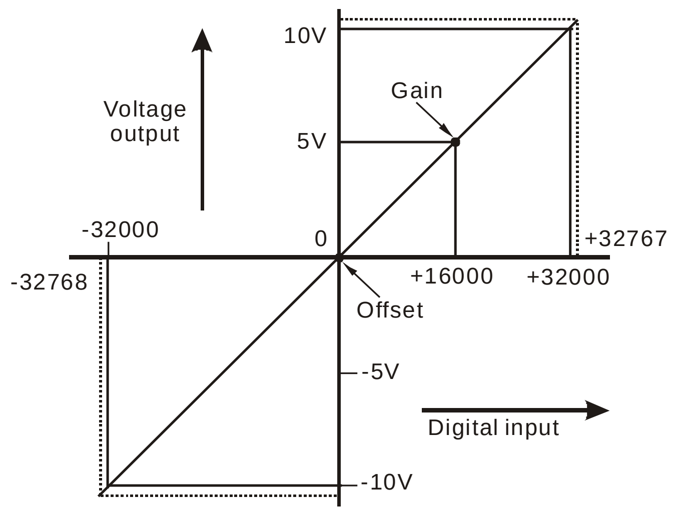
Y=Current output, X=Digital input

Resolution: 0.5μA = 16mA/32,000

3

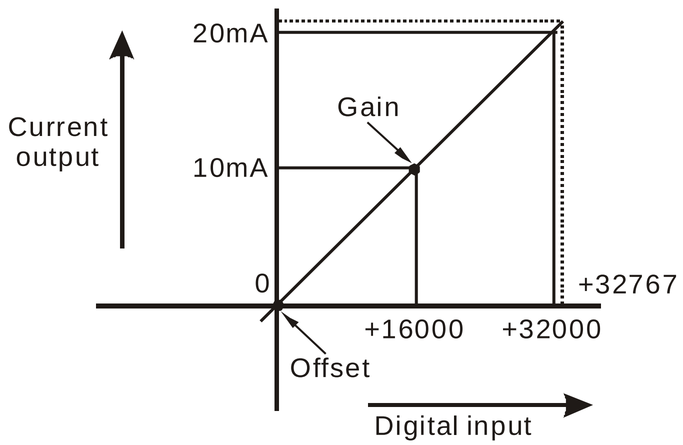
Mode 0 of CR#2~CR#5	-10V~+10V，Gain=16,000 ($=5V/312.5uV$)，Offset=0
Range of digital conversion	-32,000~+32,000
Max./Min. range of digital conversion	-32,768~+32,767

Mode 0



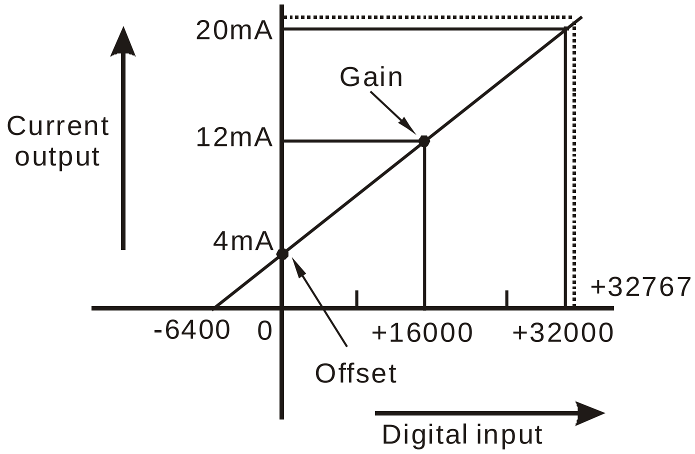
Mode 1 of CR#2~CR#5	0mA~+20mA，Gain=16,000 ($=10mA/625nA$)，Offset=0
Range of digital conversion	0 LSB~+32,000 LSB
Max./Min. range of digital conversion	0 LSB~+32,767 LSB

Mode 1



Mode 2 of CR#2~CR#5	+4mA~+20mA，Gain=19,200（=$12mA/0.625\mu A$），Offset=6,400（=$4mA/0.625\mu A$）
Range of digital conversion	0 LSB~+32,000 LSB
Max./Min. range of digital conversion	-6400 LSB~+32,767 LSB

Mode 2



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3.5.3 DVP06XA-E2Control Register

CR#	Attrib.		Register name	Description
0	O	R	Model name	Set up by the system: DVP06XA-E2 model code = H'00C4
1	O	R	Firmware version	Display the current firmware version in hex
2	O	R/W	CH1 Input mode setting	Input mode: Default = H'0000 Mode 0 (H'0000) :Voltage input (±10V) Mode 1 (H'0001) :Voltage input (±5V) Mode 2 (H'0002) :Voltage input (0~+10V) Mode 3 (H'0003) :Voltage input (0~+5V) Mode 4 (H'0004) :Current input (±20mA) Mode 5 (H'0005) :Current input (0~+20mA) Mode 6 (H'0006) :Current input (4~+20mA) Mode -1 (H'FFFF) : Channel 1 unavailable
3	O	R/W	CH2 Input mode setting	
4	O	R/W	CH3 Input mode setting	
5	O	R/W	CH4 Input mode setting	
6	O	R/W	CH5 output mode setting	Output mode: Default = H'0000Take CH5 for example: Mode 0 (H'0000) : Voltage output (±10V) Mode 1 (H'0001) : Current output (0~+20mA) Mode 2 (H'0002) : Current output (4~+20mA) Mode -1 (H'FFFF) : Channel 5 unavailable
7	O	R/W	CH6 output mode setting	
8	O	R/W	CH1 average times	Average times setting of CH1~CH4: Range = K1~K100 Default = K10
9	O	R/W	CH2 average times	
10	O	R/W	CH3 average times	
11	O	R/W	CH4 average times	
12	X	R	CH1 average input value	Average value of input signals at CH1~CH4
13	X	R	CH2 average input value	
14	X	R	CH3 average input value	
15	X	R	CH4 average input value	
16	X	R/W	CH5 output signal value	Voltage output range: K-32,000~K32,000 Current output range: K0~K32,000. Default: K0
17	X	R/W	CH6 output signal value	
20	X	R	CH1 present input value	Present value of input signals at CH1~CH4
21	X	R	CH2 present input value	
22	X	R	CH3 present input value	
23	X	R	CH4 present input value	
28	O	R/W	Adjusted Offset value of CH1	Set the adjusted Offset value of CH1 ~ CH3 Default = K0.
29	O	R/W	Adjusted Offset value of CH2	
30	O	R/W	Adjusted Offset value of CH3	

CR#	Attrib.		Register name	Description
31	O	R/W	Adjusted Offset value of CH4	Set the adjusted Offset value of CH4 ~ CH6 Default = K0.
32	O	R/W	Adjusted Offset value of CH5	
33	O	R/W	Adjusted Offset value of CH6	
34	O	R/W	Adjusted Gain value of CH1	Set the adjusted Gain value in CH1 ~ CH6 Default = K16,000
35	O	R/W	Adjusted Gain value of CH2	
36	O	R/W	Adjusted Gain value of CH3	
37	O	R/W	Adjusted Gain value of CH4	
38	O	R/W	Adjusted Gain value of CH5	
39	O	R/W	Adjusted Gain value of CH6	
Adjusted Offset Value, Adjusted Gain Value: Note 1: When using Mode 6 for input or Mode 2 for output, the channel do NOT provide setups for adjusted Offset and Gain value. Note 2: When mode changes, the adjusted Offset and Gain value returns to defaults.				
40	O	R/W	Set value changing prohibited	Prohibit set value changing in CH1 ~ CH4. Default= H’0000.
41	X	R/W	Save all the set values	Save all the set values. Default =H’0000
43	X	R	Error status	Register for storing all error status. Refer to table of error status for more information.
100	O	R/W	Enable/Disable limit detection	Upper and lower bound detection, b0~b5 corresponds to CH1~CH6 (0: Disable/ 1: Enable). Default= H’0000.
101	X	R/W	Upper and lower bound status	Display the upper and lower bound status. (0: Not exceed /1: Exceeds upper or lower bound value), b0~b5 corresponds to Ch1~Ch6 for lower bound detection result; b8~b13 corresponds to CH1~CH6 for upper bound detection result.
102	O	R/W	Set value of CH1 upper bound	Set value of CH1~CH6 upper bound. Default = K32000.
103	O	R/W	Set value of CH2 upper bound	
104	O	R/W	Set value of CH3 upper bound	
105	O	R/W	Set value of CH4 upper bound	
106	O	R/W	Set value of CH5 upper bound	
107	O	R/W	Set value of CH6 upper bound	
108	O	R/W	Set value of CH1 lower bound	Set value of CH1~CH6 lower bound. Default = K-32000.
109	O	R/W	Set value of CH2 lower bound	
110	O	R/W	Set value of CH3 lower bound	
111	O	R/W	Set value of CH4 lower bound	
112	O	R/W	Set value of CH5 lower bound	
113	O	R/W	Set value of CH1 lower bound	
114	O	R/W	Output update time of CH5	Set output update time of CH5 ~ CH6. Default = H’0000.
115	O	R/W	Output update time of CH6	
118	O	R/W	LV output mode setting of Ch5~Ch6	Set the output mode of CH5~CH6 when the power is at LV (low voltage) condition. Default= H’0000

CR#	Attrib.	Register name	Description
Symbols: O: When CR#41 is set to H'5678, the set value of CR will be saved X: Set value will not be saved. R: You can use FROM instruction to read data. W: You can use TO instruction to write data.			

※ **CR#0 for module reset**

You can use CR#0 to reset all the settings by simply writing H'4352 in CR#0 and wait for one second before turning the power OFF and then ON again, all the modules connected will be initialized. It is suggested to connect to only one module for module reset. And this is only available for firmware V1.14 or later.

3

※ **CR#43Error status value. See the table below:**

Description					
bit0	K1（H'1）	Power supply error	bit6	K64（H'40）	CH4Conversion error
bit1	K2（H'2）	Reserved	bit9	K512（H'0200）	Mode setting error
bit2	K4（H'4）	Upper/lower bound error	bit10	K1024（H'0400）	Sampling range error
bit3	K8（H'8）	CH1Conversion error	bit11	K2048（H'0800）	Upper/lower bound setting error
bit4	K16（H'10）	CH2Conversion error	bit12	K4096（H'1000）	Set value changing prohibited
bit5	K32（H'20）	CH3Conversion error	bit13	K8192（H'2000）	Communication breakdown on next module
Note: Each error status is determined by the corresponding bit (b0 ~ b13) and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error					

※ **Adjust A/D Conversion Curve**

You can adjust the conversion curves according to the actual needs by changing the Offset value (CR#28 ~ CR#31) and Gain value (CR#34 ~ CR#37).

Offset: The corresponding voltage/current input value when the digital output value = 0.

Gain: The corresponding voltage/current input value when the digital output value = 16,000.

- **Equation for voltage input Mode0 / Mode2:**

$$Y = 16000 \times \left(\frac{X(V)}{10(V)} \times 32000 - Offset \right) \Big/ \left(Gain - Offset \right)$$

Y=Digital output, X=Voltage input

Resolution: 0.3125mV = 20V/64,000 = 10V/32,000

- **Equation for voltage input Mode1 / Mode3:**

$$Y = 16000 \times \left(\frac{X(V)}{5(V)} \times 32000 - Offset \right) \Big/ \left(Gain - Offset \right)$$

Y=Digital output, X=Voltage input

Resolution: 0.15625mV = 10V/64,000 = 5V/32,000

- **Equation for current input Mode4 / Mode5:**

$$Y = 16000 \times \left(\frac{X(mA)}{20(mA)} \times 32000 - Offset \right) \Big/ \left(Gain - Offset \right)$$

Y=Digital output, X=Current input

Resolution: 0.625μA = 40mA/64,000 = 20mA/32,000

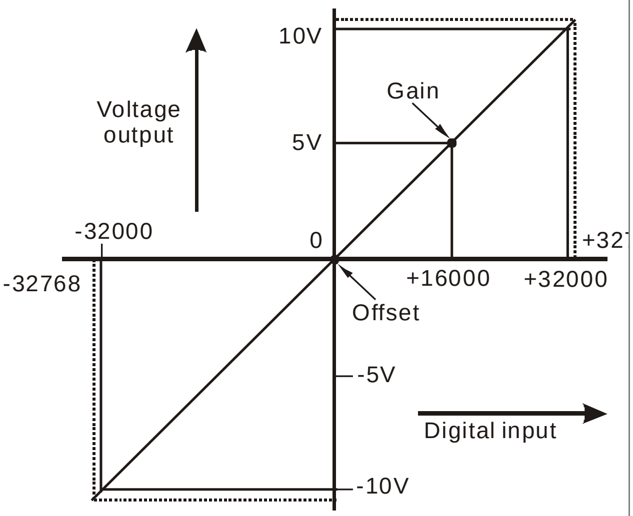
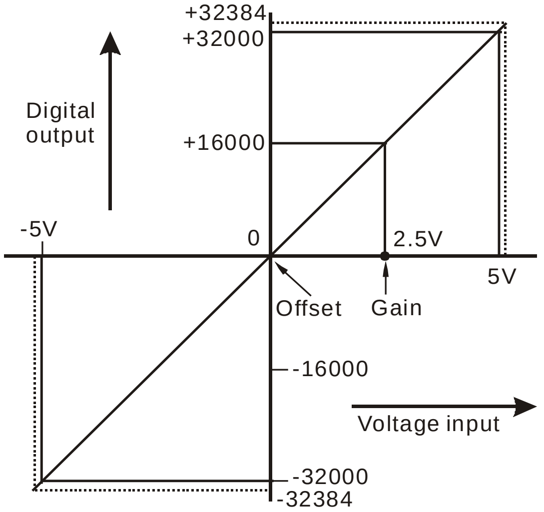
- **Equation for current input Mode6:**

$$Y = 16000 \times \left(\frac{X(mA)}{20(mA)} \times 32000 - 6400 \right) \Big/ \left(19200 - 6400 \right)$$

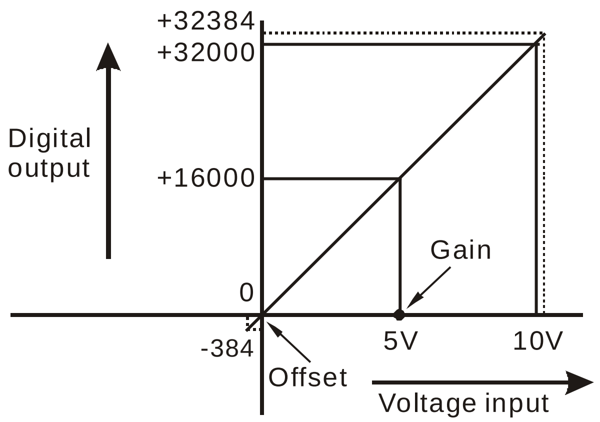
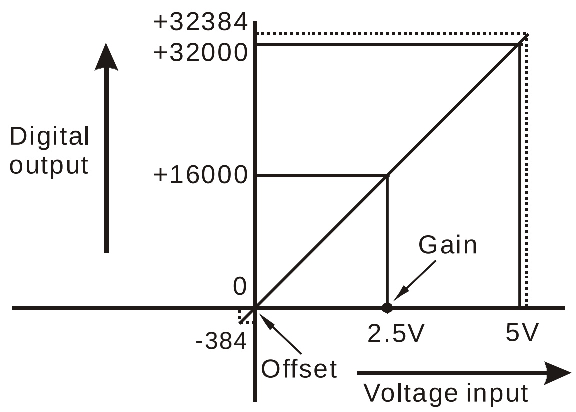
Y=Digital output, X=Current input

Resolution: 0.5μA = 16mA/32,000

Mode 0 of CR#2~CR#5	-10V~+10V，Gain=16,000（=$5V/312.5uV$）, Offset=0
Mode 1 of CR#2~CR#5	-5V~+5V，Gain=16,000（=$2.5V/156.25uV$）, Offset=0
Range of digital conversion	-32,000 LSB~+32,000 LSB
Max./Min. range of digital conversion	-32,384 LSB~+32,384 LSB

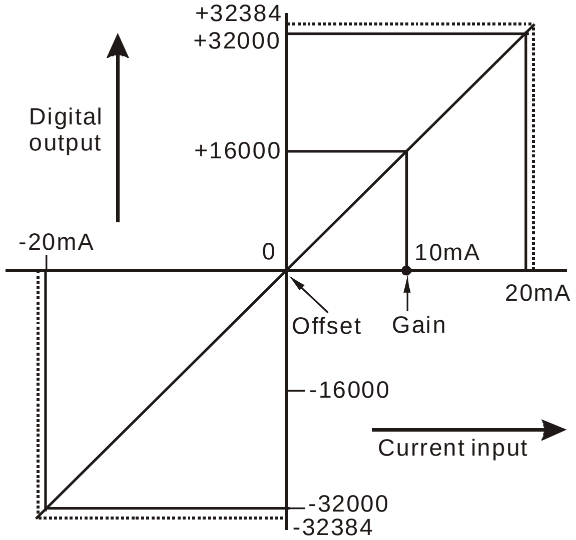
Mode 0	Mode 1
	

Mode 2 of CR#2~CR#5	0V~+10V，Gain=16,000 ($=5V/312.5uV$)，Offset=0
Mode 3 of CR#2~CR#5	0V~+5V，Gain=16,000 ($=2.5V/156.25uV$)，Offset=0
Range of digital conversion	0 LSB~+32,000 LSB
Max./Min. range of digital conversion	-384 LSB~+32,384 LSB

Mode 2	Mode 3
	

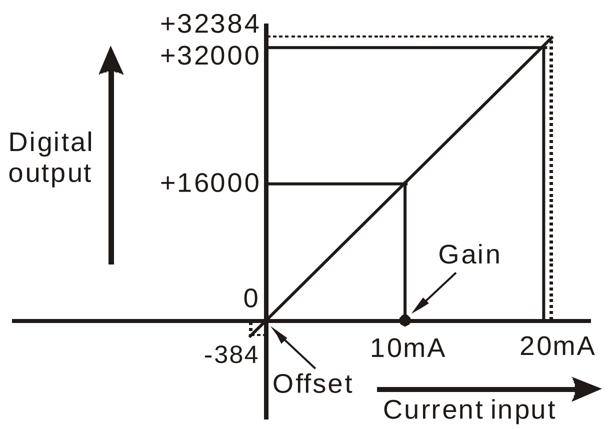
Mode 4 of CR#2~CR#5	-20mA~+20mA, Gain=16,000 ($=10mA/625nA$), Offset=0
Range of digital conversion	-32,000 LSB~+32,000 LSB
Max./Min. range of digital conversion	-32,384 LSB~+32,384 LSB

Mode 4

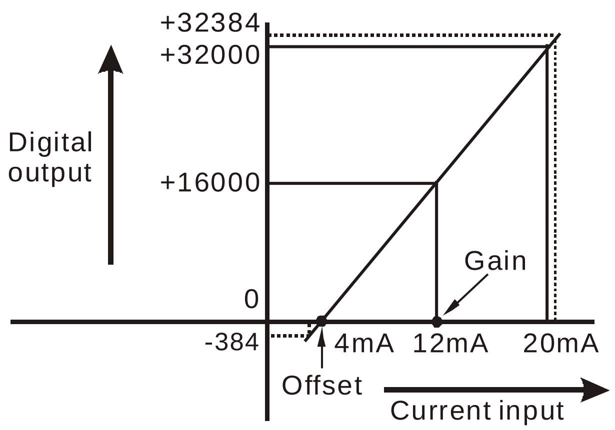


Mode 5 of CR#2~CR#5	0mA~+20mA，Gain=16,000（=$10mA/625nA$）, Offset=0
Mode 6 of CR#2~CR#5	+4mA~+20mA，Gain=19,200（=$12mA/625nA$）, Offset=6,400（=$4mA/625nA$）
Range of digital conversion	0 $_{LSB}$~+32,000 $_{LSB}$
Max./Min. range of digital conversion	-384 $_{LSB}$~+32,384 $_{LSB}$

Mode 5



Mode 6



※ **Adjust D/A Conversion Curve**

You can adjust the conversion curves according to the actual needs by changing the Offset value (CR#32 ~ CR#33) and Gain value (CR#38 ~ CR#39).

Offset: The corresponding voltage/current input value when the digital output value = 0.

Gain: The corresponding voltage/current input value when the digital output value = 16,000.

- **Equation for voltage output Mode0:**

$$Y(V)=\left[\frac{X\times(Gain-Offset)}{16000}+Offset\right]\times\left(\frac{10(V)}{32000}\right)$$

Y=Voltage output, X=Digital input

Resolution: 0.3125mV = 20V/64,000

- **Equation for current output Mode1:**

$$Y(mA)=\left[\frac{X\times(Gain-Offset)}{16000}+Offset\right]\times\left(\frac{20(mA)}{32000}\right)$$

Y=Current output, X=Digital input

Resolution: 0.625μA = 20mA/32,000

- **Equation for current output Mode2:**

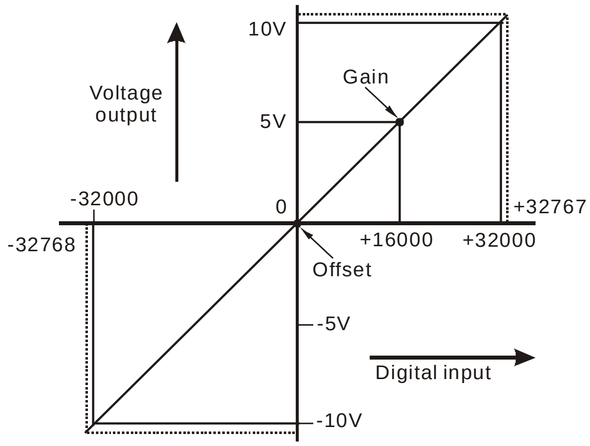
$$Y(mA)=\left[\frac{X\times(19200-6400)}{16000}+6400\right]\times\left(\frac{20(mA)}{32000}\right)$$

Y=Current output, X=Digital input

Resolution: 0.5μA = 16mA/32,000

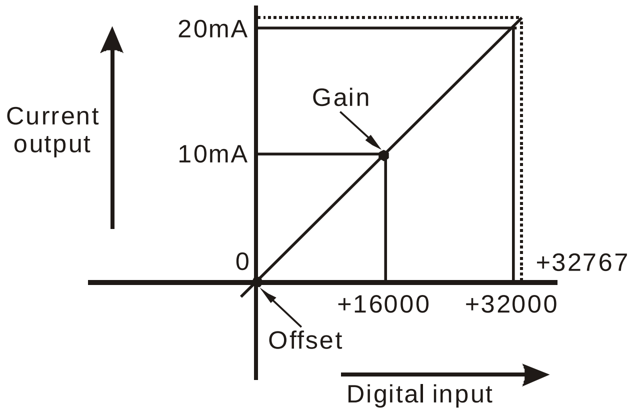
Mode 0 of CR#6~CR#7	-10V~+10V，Gain=16,000 (=$5V/312.5uV$)，Offset=0
Range of digital conversion	-32,000 LSB~+32,000 LSB
Max./Min. range of digital conversion	-32,768 LSB~+32,767 LSB

Mode 0



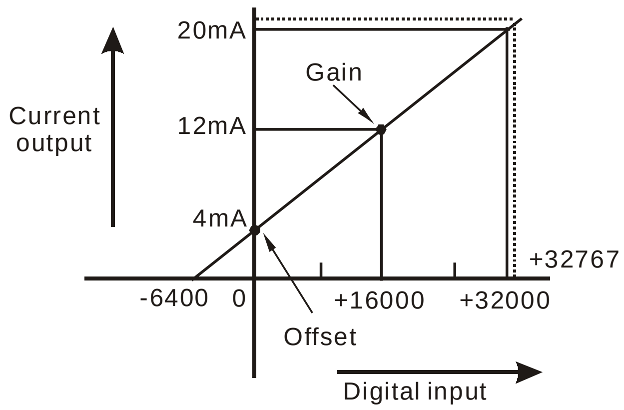
Mode 1 of CR#6~CR#7	0mA~+20mA，Gain=16,000 (=$10mA/625nA$)，Offset=0
Range of digital conversion	0 LSB~+32,000 LSB
Max./Min. range of digital conversion	0 LSB~+32,767 LSB

Mode 1



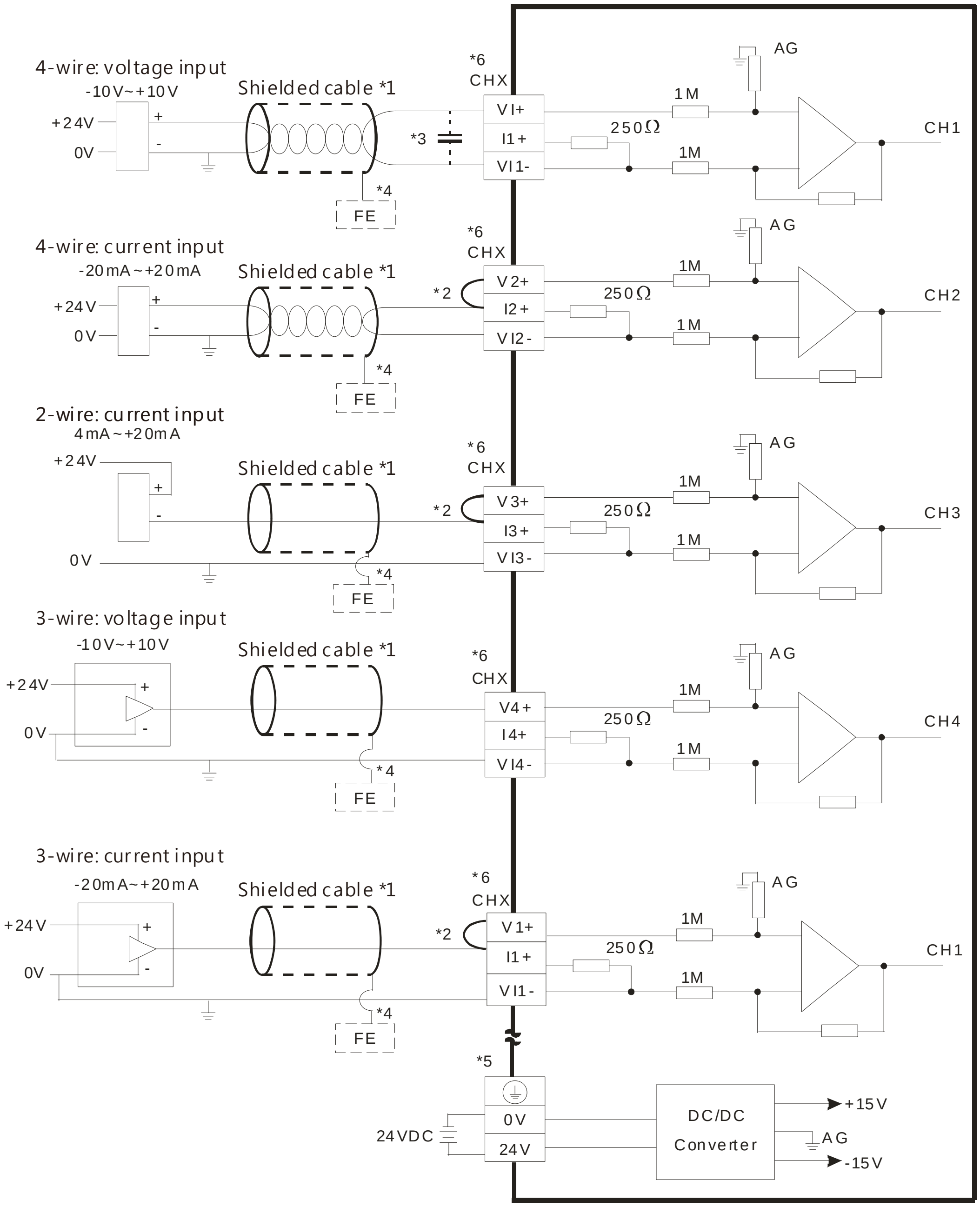
Mode 2 of CR#6~CR#7	+4mA~+20mA，Gain=19,200（= $12mA/625nA$ ），Offset=6,400（= $4mA/625nA$ ）
Range of digital conversion	0 LSB~+32,000 LSB
Max./Min. range of digital conversion	-6400 LSB~+32,767 LSB

Mode 2



3.6 Wiring

3.6.1 Wiring DVP04AD-E2



*1. Use shielded cables to isolate the analog input signal cable from other power cables

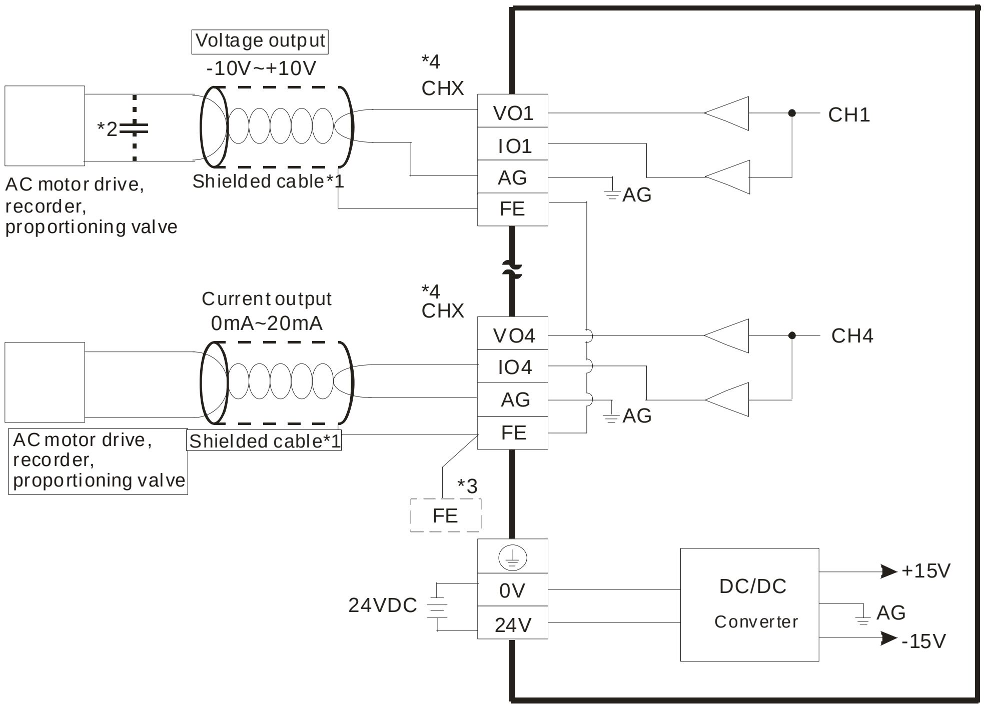
*2. If the module is connected to a current signal, the terminals Vn and In+ (n=1–4) must be short-circuited.

*3. If noise in the input voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47 μF with a working voltage of 25 V.

*4. Connect FE of the shielded cable to ground.*5. Connect the terminal ⏚ to ground.

*6. Every channel can work with the wiring shown above.

3.6.2 Wiring DVP02DA-E2 / DVP04DA-E2



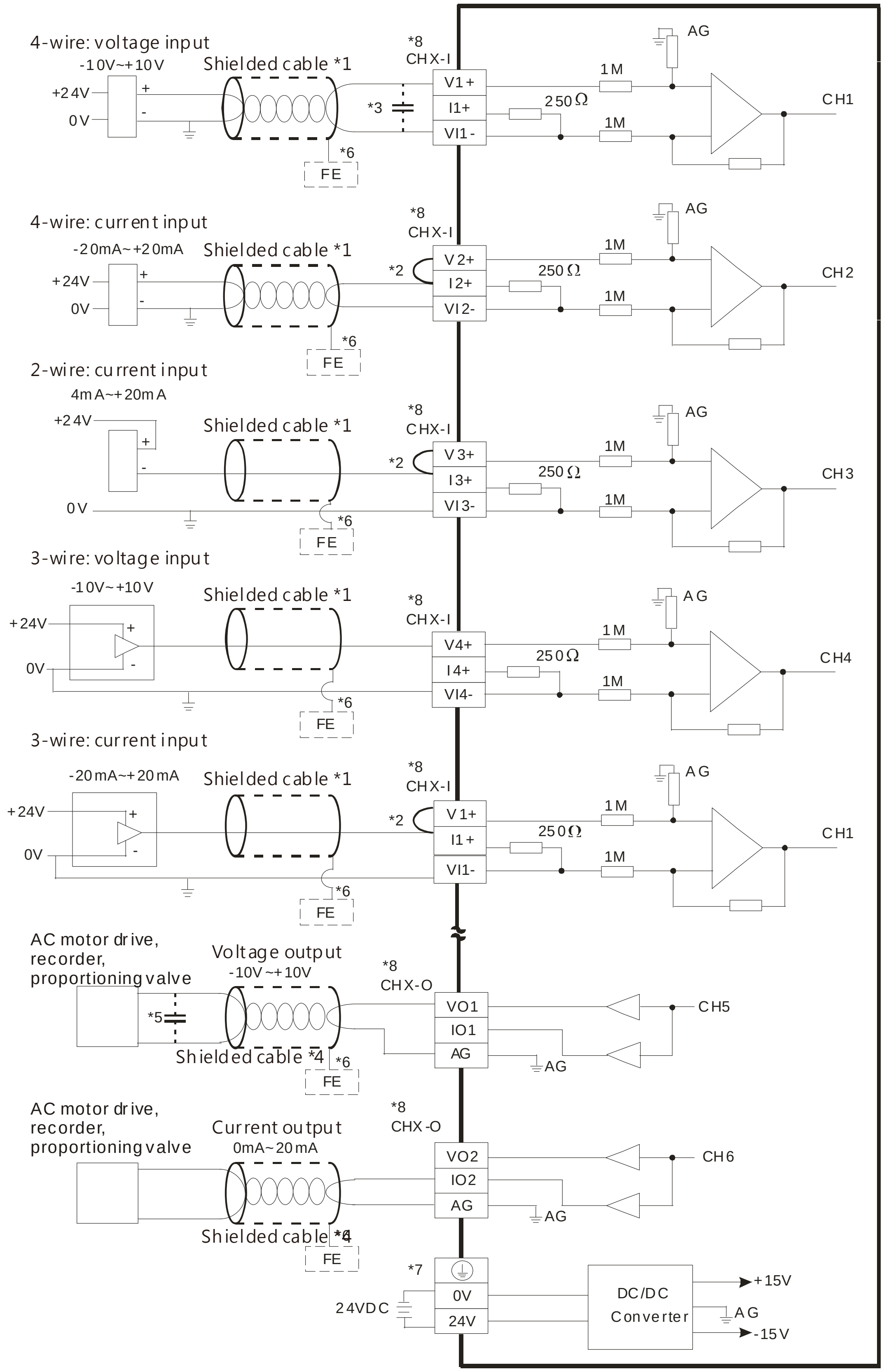
*1. Use shielded cables to isolate the analog input signal cable from other power cables.

*2. If noise in the input voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47 μF with a working voltage of 25 V.

*3. Connect the terminal ⏚ to ground.

*4. Every channel can work with the wiring shown above.

3.6.3 Wiring DVP06XA-E2



*1. Use shielded cables to isolate the analog input/output signal cable from other power cables.

*2. If the module is connected to a current signal, the terminals Vn and In+ (n=1–4) must be short-circuited.

*3. If noise in the input voltage results in noise interference with the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47 μF with a working voltage of 25 V.

*4. Use shielded cables to isolate the analog output signal cable from other power cables.

*5. If noise in the output voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between 0.1 μF–0.47 μF with a working voltage of 25 V.

*6. Connect FE of the shielded cable to ground.

*7. Connect the terminal ⏚ to ground.

*8. CHX-I: Every channel can work with the input wiring shown above. CHX-O: Every channel can work with the output wiring shown above.

3.7 Troubleshooting

When an error occurs in AD, DA, XA modules, an error indicator will start blinking. Once you see an error indicator starts blinking, you can use the FROM instruction to read the error codes stored in CR#43. The bit 0 to bit 13 indicates the error codes. It is possible to have two errors at the same time. 0 indicates normal and 1 indicates error. Refer to the following table for more the causes and the solutions for troubleshooting.

<table>
<tr><th>Bit No.</th><th>RUN LED</th><th>ERROR LED</th><th>Description</th><th>Solution</th></tr>
<tr><td>bit0</td><td>OFF</td><td>ON</td><td>The external voltage is abnormal.</td><td>Check the power supply</td></tr>
<tr><td>bit1</td><td rowspan="11">Blinking every 0.2 seconds</td><td rowspan="11">Blinking every 0.2 seconds</td><td>Hardware error</td><td>Contact the factory</td></tr>
<tr><td>bit2</td><td>Conversion value exceeds the set upper/lower value</td><td>Check the upper and lower value</td></tr>
<tr><td>bit3</td><td>Conversion value at Channel 1 is abnormal</td><td>Check the Conversion value at Channel 1</td></tr>
<tr><td>bit4</td><td>Conversion value at Channel 2 is abnormal</td><td>Check the Conversion value at Channel 2</td></tr>
<tr><td>bit5</td><td>Conversion value at Channel 3 is abnormal</td><td>Check the Conversion value at Channel 3</td></tr>
<tr><td>bit6</td><td>Conversion value at Channel 4 is abnormal</td><td>Check the Conversion value at Channel 4</td></tr>
<tr><td>bit9</td><td>Mode setting error</td><td>Check the mode setting</td></tr>
<tr><td>bit10</td><td>Average time setting error</td><td>Check the average time setting</td></tr>
<tr><td>bit11</td><td>Upper/lower value setting error</td><td>Check the upper/lower value setting</td></tr>
<tr><td>bit12</td><td>Set value cannot be changed.</td><td>Check the value in CR#40 (set value changing prohibited)</td></tr>
<tr><td>bit13</td><td>The later module is disconnected.</td><td>Check the wiring of the modules.</td></tr>
</table>

4

Chapter 4 DVP-E Series Temperature Measurement Module

Table of Contents

4.1 General Specifications

4.1.1 DVP04PT-E2 / DVP06PT-E2 Specifications

- **Electrical specifications**

Model name	DVP04PT-E2	DVP06PT-E2
Number of inputs	Four	Six
Supply voltage	24VDC (20.4~28.8VDC) (-15%~+20%)	
Connector type	Removable terminal block (distance to the terminal is 5 mm)	
Conversion time	200 ms /channel	
Weight	207g	176g

Things to note when connecting the module to a PLC CP:

1. Up to 8 modules can be connected to a PLC CPU.

2. The connected module is numbered automatically from 0 (nearest to the PLC CPU) to 7 (furthest away from the PLC CPU).

3. The connected modules do NOT take up any digital I/O points.

- **Functional specifications**

Digital data format		16-bit two’s complement number
Overall accuracy		25°C/77°F: The error is ±0.3% of the input within the range. 0 to +55°C / 32 to 131°F: The error is ±0.6% of the input within the range.
Applicable sensor	**04PT**	**<u>2-Wire/3-Wire</u>:** **Pt100**：DIN 43760-1980 JIS C1604-1989，100Ω 3850 PPM/°C **Pt1000**：DIN EN60751，1 kΩ 3850 PPM/°C **Ni100/Ni1000**：DIN 43760 **0~300Ω/0~3000Ω**
	06PT	**<u>2-Wire/3-Wire:</u>** **Pt100**：DIN 43760-1980 JIS C1604-1989，100Ω 3850 PPM/°C **Pt1000**：DIN EN60751，1 kΩ 3850 PPM/°C **Ni100/Ni1000**：DIN 43760 **Cu50/Cu100** **JPt100**：JIS C1604-1989 **LG-Ni1000** **0~300Ω/0~3000Ω**
Rated measurement range		Please refer to the table Note*1 below.
Rated analog-to-digital conversion range		Please refer to the table Note*2 below.
Maximum measurable temperature range		Please refer to the table Note*3 below.
Hardware resolution	**Centigrade (°C)**	0.1°C
	Fahrenheit (°F)	0.18°F*4
	Input impedance	0.1Ω
Average function		Setting range:K1~K100
Self-diagnosis function		Detecting if exceeding upper and lower limts or channel disconnection.

Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500VAC Isolation between an analog circuit and a ground: 500VAC Isolation between an analog circuit and a digital circuit: 500VAC Isolation between the 24 VAC and a ground:500VAC

Note*1. Rated measurement range

Sensor	Centigrade（°C）	Fahrenheit（°F）	Input impedance
Pt100	-180°C~800°C	-292°F~1,472°F	0~300Ω 0~3000Ω
Ni100	-80°C~170°C	-112°F~338°F	
Pt1000	-180°C~800°C	-292°F~1,472°F	
Ni1000	-80°C~170°C	-112°F~338°F	
JPt100	-180°C~500°C	-292°F~932°F	
Cu50	-50°C~150°C	-58°F~302°F	
Cu100	-50°C~150°C	-58°F~302°F	
LG-Ni1000	-50°C~180°C	-58°F~356°F	

Note*2. Rated analog-to-digital conversion range

Sensor	Centigrade（°C）	Fahrenheit（°F）	Input impedance
Pt100	K-1,800~K8,000	K-2,920~K14,720	K0~K3,000 K0~K30,000
Ni100	K-800~K1,700	K-1,120~K3,380	
Pt1000	K-1,800~K8,000	K-2,920~K14,720	
Ni1000	K-800~K1,700	K-1,120~K3,380	
JPt100	K-1,800~K5,000	K-2,920~K9,320	
Cu50	K-500~K1,500	K-580~K3,020	
Cu100	K-500~K1,500	K-580~K3,020	
LG-Ni1000	K-500~K1,800	K-580~K3,560	

Note*3. Maximum measurable temperature range

- **DVP04PT-E2**

Sensor	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Pt100	-190°C~810°C	-310°F~1,490°F	0~320Ω 0~3200Ω
Ni100	-90°C~180°C	-130°F~356°F	
Pt1000	-190°C~810°C	-310°F~1,490°F	
Ni1000	-90°C~180°C	-130°F~356°F	

- **DVP06PT-E2**

Sensor	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Pt100	-200°C~850°C	-328°F~1,562°F	0~320Ω 0~3200Ω
Ni100	-100°C~180°C	-148°F~356°F	
Pt1000	-200°C~850°C	-328°F~1,562°F	
Ni1000	-100°C~180°C	-148°F~356°F	
JPt100	-200°C~510°C	-328°F~950°F	
Cu50	-60°C~160°C	-76°F~320°F	
Cu100	-60°C~160°C	-76°F~320°F	
LG-Ni1000	-60°C~200°C	-76°F~392°F	

Note*4. The temperature unit to be displayed is 0.1 °C and 0.1 °F. If the display mode is Fahrenheit, the number in the second decimal place will not be displayed.

4.1.2 DVP04TC-E2 Specifications

- **Electrical specifications**

Number of inputs	Four
Supply voltage	24VDC (20.4VDC~28.8VDC) (-15%~+20%)
Connector type	Removable terminal block (distance to the terminal is 5 mm)
Conversion time	200 ms /channel
Weight	205g

Things to note when connecting the module to a PLC CPU:

1. Up to 8 modules can be connected to a PLC CPU.

2. The connected module is numbered automatically from 0 (nearest to the PLC CPU) to 7 (furthest away from the PLC CPU).

3. The connected modules do NOT take up any digital I/O points.

- **Functional specifications**

Analog input channel		Four
Digital data format		16-bit two's complement number
Overall accuracy		25°C/77°F: The allowed error range is ±0.3% of full scale. 0 to +55°C / 32 to 131°F: The allowed error range is ±0.6% of full scale.
Applicable sensor		J-type · K-type · R-type · S-type · T-type · E-type · N-type thermocouple; input impedance: ±80mV
Rated input range		Please refer to the table Note*1 below.
Analog-to-digital conversion		Please refer to the table Note*2 below.
Hardware resolution	**Centigrade (°C)**	0.1°C
	Fahrenheit (°F)	0.18°F*3
	Input impedance	0.01mV
Average function		Yes, CR#8 ~ CR#11, setting range: K1 ~ K100
Self-diagnosis function		Detecting if exceeding upper and lower limts or channel disconnection.
Isolation		An analog circuit is isolated from a digital circuit by a digital integrated circuit / an optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC Isolation between analog channels: 120 VAC

Note*1. Rated input range

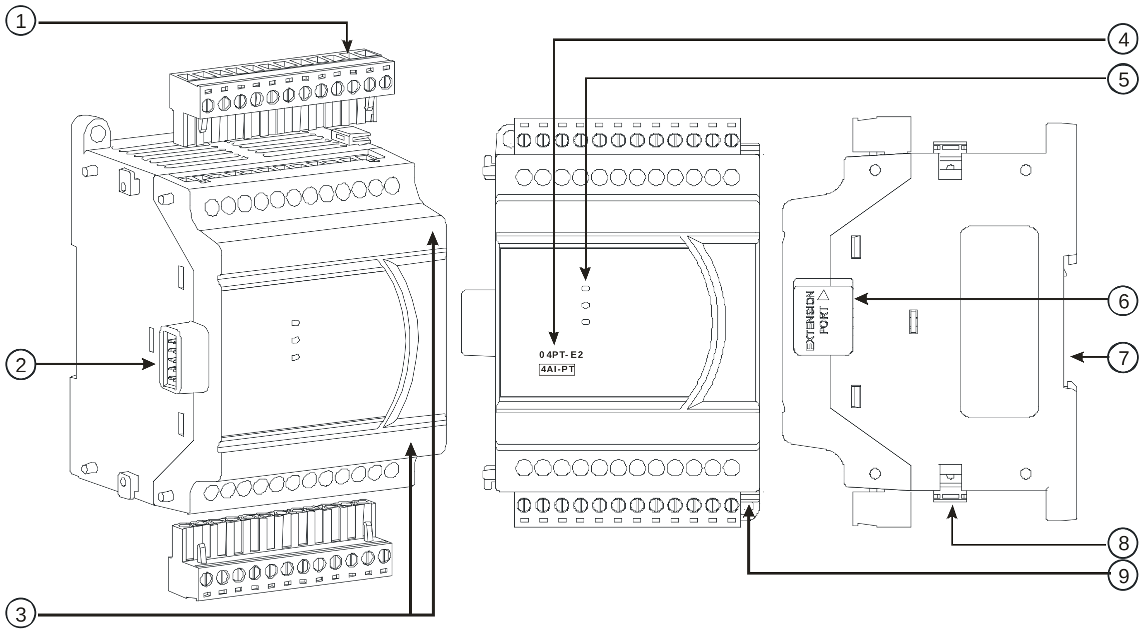
Sensor	Centigrade (°C)	Fahrenheit (°F)	Input impedance
J-type	-100°C~1,150°C	-148°F~2,102°F	±80mV
K-type	-100°C~1,350°C	-148°F~2,462°F	
R-type	0°C~1,750°C	32°F~3,182°F	
S-type	0°C~1,750°C	32°F~3,182°F	
T-type	-150°C~390°C	-238°F~734°F	
E-type	-150°C~980°C	-238°F~1,796°F	
N-type	-150°C~1,280°C	-238°F~2,336°F	

Note*2. Analog-to-digital conversion

Sensor	Centigrade (°C)	Fahrenheit (°F)	Input impedance
J-type	K-1,000~K11,500	K-1,480~K21,020	±8,000
K-type	K-1,000~K13,500	K-1,480~K24,620	
R-type	K0~K17,500	K320~K31,820	
S-type	K0~K17,500	K320~K31,820	
T-type	K-1,500~K3,900	K-2,380~K7,340	
E-type	K-1,500~K9,800	K-2,380~K17,960	
N-type	K-1,500~K12,800	K-2,380~K23,360	

Note*3. The temperature unit to be displayed is 0.1 °C and 0.1 °F. If the display mode is Fahrenheit, the number in the second decimal place will not be displayed.

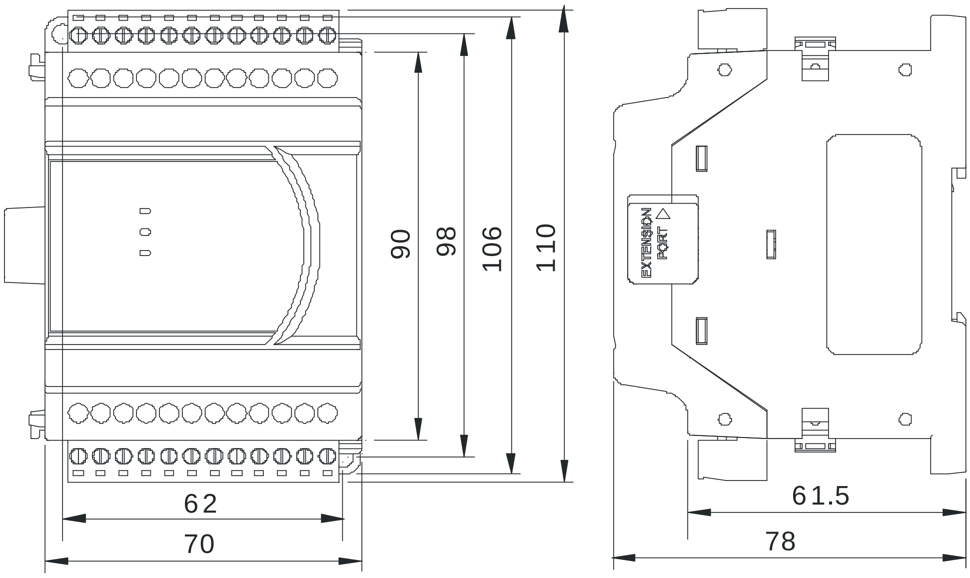
4.2 Module Profiles



No.	Name	Description
1	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads to be driven.
2	External module connection port	Connects the modules
3	Terminal number	Terminal number
4	Model name	Model name of the module
5	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
5	ERROR LED indicator	Error status of the module ON: a serious error occurs in the module. OFF: the module is normal. Blinking: a minor error occurs in the module.
5	Analog to digital conversion indicator	Indicates the analog to digital conversion status Blinking: conversion is taking place OFF: stop conversion
6	External module connection port	Connects the modules
7	DIN rail slot (35 mm)	For the DIN rail
8	I/O module securing clip	Secures the modules
9	Mounting hole	Secures the module on the set

4

4.3 Module Dimensions



Unit: mm

4.4 Module Terminals

- **DVP04PT-E2**

DVP04PT-E2 (4AI)

1	2	3	4	5	6	7	8	9	10	11	12
O1+	I1+	I1-	FE	O2+	I2+	I2-	FE	O3+	I3+	I3-	FE

1	2	3	4	5	6	7	8
24V	0V	⏚	FE	O4+	I4+	I4-	FE

- **DVP06PT-E2**

DVP06PT-E2 (6AI)

1	2	3	4	5	6	7	8	9	10	11	12
O1+	I1+	I1-	O2+	I2+	I2-	O3+	I3+	I3-	O4+	I4+	I4-

1	2	3	4	5	6	7	8	9	10	11	12
24V	0V	⏚	FE	FE	FE	O5+	I5+	I5-	O6+	I6+	I6-

- **DVP04TC-E2**

DVP04TC-E2 (4AI)

1	2	3	4	5	6	7	8	9	10	11	12
I1+	I1-	FE	I2+	I2-	FE	I3+	I3-	FE	I4+	I4-	FE

1	2	3	4	5	6	7	8
24V	0V	⏚	FE	FE	FE	FE	FE

4.5 Control Registers

4.5.1 DVP04PT-E2 / DVP06PT-E2Control Registers

<table>
<tr><th colspan="2">CR#</th><th colspan="2" rowspan="2">Attrib.</th><th rowspan="2">Registers content</th><th rowspan="2">Description</th></tr>
<tr><th>04PT</th><th>06PT</th></tr>
<tr><td>0</td><td>0</td><td>O</td><td>R</td><td>Model name</td><td>DVP04PT-E2 model code = H’0082
DVP06PT-E2 model code = H’00C2</td></tr>
<tr><td>1</td><td>1</td><td>O</td><td>R</td><td>Firmware version</td><td>Display the current firmware version in hex.</td></tr>
<tr><td>2</td><td>2</td><td>O</td><td>R/W</td><td>CH1 Input mode setting</td><td rowspan="6">Input mode: Default = H’0000。
Mode 0（H’0000）: Pt100（-180°C~800°C）
Mode1（H’0001）: Ni100（-80°C~170°C）
Mode2（H’0002）: Pt1000（-180°C~800°C）
Mode3（H’0003）: Ni1000（-80°C~170°C）
Mode4（H’0004）: 0~300Ω
Mode5（H’0005）: 0~3000Ω
Mode6（H’0006）: JPt100（-180°C~500°C）
Mode7（H’0007）: Cu50（-50°C~150°C）
Mode8（H’0008）: Cu100（-50°C~150°C）
Mode9（H’0009）: LG-Ni1000（-50°C~180°C）
Mode-1（H’FFFF）: Channel unavailable
Note1：DVP04PT-E2 do NOT support mode 6-9.
Note2：DVP04PT-E2 mode 5 requires firmware version V1.11 or above</td></tr>
<tr><td>3</td><td>3</td><td>O</td><td>R/W</td><td>CH2 Input mode setting</td></tr>
<tr><td>4</td><td>4</td><td>O</td><td>R/W</td><td>CH3 Input mode setting</td></tr>
<tr><td>5</td><td>5</td><td>O</td><td>R/W</td><td>CH4 Input mode setting</td></tr>
<tr><td></td><td>6</td><td>O</td><td>R/W</td><td>CH5 Input mode setting</td></tr>
<tr><td></td><td>7</td><td>O</td><td>R/W</td><td>CH6 Input mode setting</td></tr>
<tr><td>7</td><td></td><td>O</td><td>R/W</td><td>Temperature unit setting</td><td>Select the temperature unit (Celsius °C / Fahrenheit °F).
Default= H’0（°C）</td></tr>
<tr><td>8</td><td>8</td><td>O</td><td>R/W</td><td>CH1 average times</td><td rowspan="6">Average times setting of channels CH1 ~ CH6
Setting range: K1 ~ K100
Default = K10</td></tr>
<tr><td>9</td><td>9</td><td>O</td><td>R/W</td><td>CH2 average times</td></tr>
<tr><td>10</td><td>10</td><td>O</td><td>R/W</td><td>CH3 average times</td></tr>
<tr><td>11</td><td>11</td><td>O</td><td>R/W</td><td>CH4 average times</td></tr>
<tr><td></td><td>12</td><td>O</td><td>R/W</td><td>CH5 average times</td></tr>
<tr><td></td><td>13</td><td>O</td><td>R/W</td><td>CH6 average times</td></tr>
<tr><td>12</td><td>14</td><td>X</td><td>R</td><td>Average temperature measured at CH1</td><td rowspan="6">Average temperature measured.
Setting Temperature Unit:
● DVP04PT-E2：CR#7
● DVP06PT-E2：CR#27</td></tr>
<tr><td>13</td><td>15</td><td>X</td><td>R</td><td>Average temperature measured at CH2</td></tr>
<tr><td>14</td><td>16</td><td>X</td><td>R</td><td>Average temperature measured at CH3</td></tr>
<tr><td>15</td><td>17</td><td>X</td><td>R</td><td>Average temperature measured at CH4</td></tr>
<tr><td></td><td>18</td><td>X</td><td>R</td><td>Average temperature measured at CH5</td></tr>
<tr><td></td><td>19</td><td>X</td><td>R</td><td>Average temperature measured at CH6</td></tr>
</table>

<table>
<tr><th colspan="2">CR#</th><th colspan="2" rowspan="2">Attrib.</th><th rowspan="2">Registers content</th><th rowspan="2">Description</th></tr>
<tr><th>04PT</th><th>06PT</th></tr>
<tr><td>20</td><td>20</td><td>X</td><td>R</td><td>Present temperature measured at CH1</td><td rowspan="6">Present temperature measured.
Setting Temperature Unit:
● DVP04PT-E2：CR#7
● DVP06PT-E2：CR#27</td></tr>
<tr><td>21</td><td>21</td><td>X</td><td>R</td><td>Present temperature measured at CH2</td></tr>
<tr><td>22</td><td>22</td><td>X</td><td>R</td><td>Present temperature measured at CH3</td></tr>
<tr><td>23</td><td>23</td><td>X</td><td>R</td><td>Present temperature measured at CH4</td></tr>
<tr><td></td><td>24</td><td>X</td><td>R</td><td>Present temperature measured at CH5</td></tr>
<tr><td></td><td>25</td><td>X</td><td>R</td><td>Present temperature measured at CH6</td></tr>
<tr><td></td><td>26</td><td>O</td><td>R/W</td><td>Mode 4: 0~300Ω. Temperature display decimal digit changes</td><td>In mode 4 (0~300Ω), temperature display decimal changes (0: 1 digit after the decimal place/ 1: 2 digits after the decimal place). Default= H0</td></tr>
<tr><td></td><td>27</td><td>O</td><td>R/W</td><td>Temperature unit setting</td><td>Select the temperature unit (Celsius °C / Fahrenheit °F).
Default = H'0 (°C)</td></tr>
<tr><td>28</td><td>28</td><td>O</td><td>R/W</td><td>Adjusted offset value of CH1</td><td rowspan="6">Adjusted offset value, range K-1000 ~ K1000. Default = K0
Measured Value = Original Value – Adjusted offset value
Unit Setup:
● DVP04PT-E2：CR#7
● DVP06PT-E2：CR#27</td></tr>
<tr><td>29</td><td>29</td><td>O</td><td>R/W</td><td>Adjusted offset value of CH2</td></tr>
<tr><td>30</td><td>30</td><td>O</td><td>R/W</td><td>Adjusted offset value of CH3</td></tr>
<tr><td>31</td><td>31</td><td>O</td><td>R/W</td><td>Adjusted offset value of CH4</td></tr>
<tr><td></td><td>32</td><td>O</td><td>R/W</td><td>Adjusted offset value of CH5</td></tr>
<tr><td></td><td>33</td><td>O</td><td>R/W</td><td>Adjusted offset value of CH6</td></tr>
<tr><td>40</td><td>40</td><td>O</td><td>R/W</td><td>Set value changing prohibited</td><td>Prohibit set value changing,
b0~b5 corresponds to CH1 ~ CH6. Default =H'0000</td></tr>
<tr><td>41</td><td>41</td><td>X</td><td>R/W</td><td>Save all the set values</td><td>Save all the set values. Default =H'0000</td></tr>
<tr><td>43</td><td>43</td><td>X</td><td>R</td><td>Error status</td><td>Register for storing all error status. See the table of error status for more information.</td></tr>
<tr><td>100</td><td>100</td><td>O</td><td>R/W</td><td>Enable/Disable limit detection</td><td>Upper and lower bound detection, b0~b5 corresponds to CH1 ~ CH6 (0: Disable/ 1: Enable). Default= H'0000.</td></tr>
<tr><td>101</td><td>101</td><td>X</td><td>R/W</td><td>Upper and lower bound status</td><td>Display the upper and lower bound status (0: Not Exceeding; 1: Exceeding upper and lower bound value), b0~b5 corresponds to CH1 ~ CH6 lower bound, b8~b13 corresponds to CH1 ~ CH6 upper bound.
Default =H'0000</td></tr>
<tr><td>102</td><td>102</td><td>O</td><td>R/W</td><td>Set value of CH1 upper bound</td><td rowspan="6">Set upper bound value. Default = K32000.</td></tr>
<tr><td>103</td><td>103</td><td>O</td><td>R/W</td><td>Set value of CH2 upper bound</td></tr>
<tr><td>104</td><td>104</td><td>O</td><td>R/W</td><td>Set value of CH3 upper bound</td></tr>
<tr><td>105</td><td>105</td><td>O</td><td>R/W</td><td>Set value of CH4 upper bound</td></tr>
<tr><td></td><td>106</td><td>O</td><td>R/W</td><td>Set value of CH5 upper bound</td></tr>
<tr><td></td><td>107</td><td>O</td><td>R/W</td><td>Set value of CH6 upper bound</td></tr>
</table>

CR#		Attrib.		Registers content	Description
04PT	06PT				
108	108	O	R/W	Set value of CH1 lower bound	Set lower bound value. Default = K-32000.
109	109	O	R/W	Set value of CH2 lower bound	
110	110	O	R/W	Set value of CH3 lower bound	
111	111	O	R/W	Set value of CH4 lower bound	
	112	O	R/W	Set value of CH5 lower bound	
	113	O	R/W	Set value of CH6 lower bound	

Symbols:
O: When CR#41 is set to H'5678, the set value of CR will be saved.
X: Set value will not be saved.
R: You can use FROM instruction to read data.
W: You can use TO instruction to write data.

4

※ **CR#0 for module reset**

You can use CR#0 to reset all the settings by simply writing H'4352 in CR#0 and wait for one second before turning the power OFF and then ON again, all the modules connected will be initialized. It is suggested to connect to only one module for module reset.

※ **CR#43 Error status value**. See the table below:

Description					
bit0	K1（H'1）	Power supply error	Bit7	K128（H'80）	CH5 Conversion error
bit1	K2（H'2）	Reserved	Bit8	K256（H'0100）	CH6 Conversion error
bit2	K4（H'4）	Upper/lower bound error	bit9	K512（H'0200）	Mode setting error
bit3	K8（H'8）	CH1 Conversion error	bit10	K1024（H'0400）	Sampling range error
bit4	K16（H'10）	CH2 Conversion error	bit11	K2048（H'0800）	Upper / lower bound setting error
bit5	K32（H'20）	CH3 Conversion error	bit12	K4096（H'1000）	Set value changing prohibited
bit6	K64（H'40）	CH4 Conversion error	bit13	K8192（H'2000）	Communication breakdown on next module

Note: Each error status is determined by the corresponding bit (b0 ~ b13) and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error

※ **PIDControl Registers**

PID control function is not available for CH5 and CH6 of DVP06PT-E2.

CR				Attrib.		Register content	Description
CH1	CH2	CH3	CH4				
120	140	160	180	O	R/W	Set temperature value	Please set the temperature value according to proper range of each sensor type. Default = K0
121	141	161	181	O	R/W	Sampling time (s)	Range: K1 ~ K30 (s). Default = K2
122	142	162	182	O	R/W	K_P	Proportional control constant. Default = K121
123	143	163	183	O	R/W	K_I	Integral constant. Default = K2,098
124	144	164	184	O	R/W	K_D	Derivative constant. Default = K-29
125	145	165	185	O	R/W	Upper limit of I value	Upper limit of I value. Default = K0
126	146	166	186	O	R/W	Lower limit of I value	Lower limit of I value. Default = K0
127	147	167	187	X	R	I value	Current accumulated offset value
128	148	168	188	O	R/W	Heating/cooling	0: Heater, 1: Cooler. Default = H'0000
129	149	169	189	O	R/W	Upper limit of output	Setting range: K-32,760~K32,760. Default = K32,000
130	150	170	190	O	R/W	Lower limit of output	Setting range: K-32,760~K32,760. Default = K0
131	151	171	191	X	R	Output percentage	Range: K0~K1,000. (Unit: 0.1%)
132	152	172	192	X	R	Output width (ms)	Width of control output. Unit: ms
133	153	173	193	X	R	Output cycle (ms)	Cycle of control output. Unit: ms
134	154	174	194	X	R	Output volume	Output volume
135	155	175	195	X	R/W	PID_RUN/STOP	0: STOP, 1: RUN. Default = K0
136	156	176	196	X	R/W	Auto-tuning	0: Disabled, 1: Auto-tuning. Default = K0

Symbols:
O: Set value will be saved.
X: Set value will not be saved.
R: You can use FROM instruction to read data.
W: You can use TO instruction to write data.

※ **Adjust PT Conversion Curve**

You can adjust the conversion curves according to the actual needs by changing the Offset value.

Offset in DVP04/06PT-E2: Deviation digital value from the target value.

(Measured Value= Original Value – Adjust Value Offset)

- **Mode0 ~ Mode3, Mode6 ~ Mode9: output unit 0.1°**

$$Y = \left(\frac{X(^\circ)}{0.1(^\circ)} - Offset \right)$$

Y= Digital output,

X= Measured temperature input

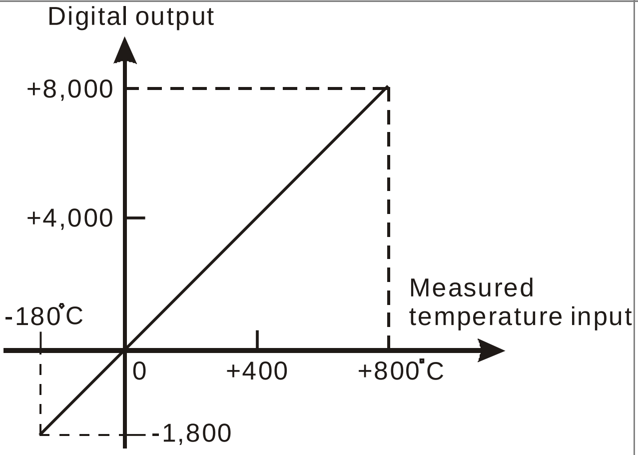
- **Mode4 ~ Mode5: output unit 0.1Ω**

$$Y = \left(\frac{X(\mathrm{Ohm})}{0.1(\mathrm{Ohm})} - Offset \right)$$

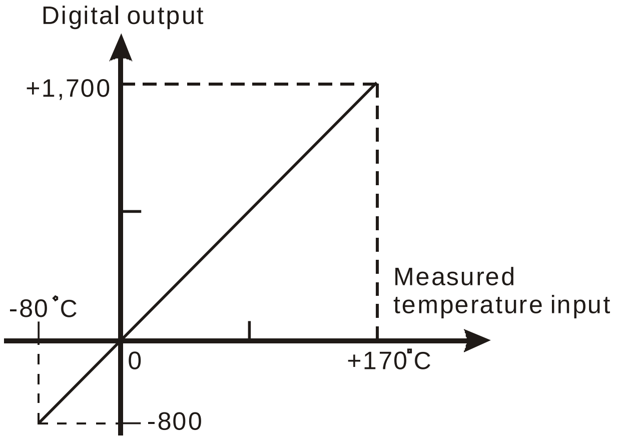
Y= Digital output,

X= Measured temperature input

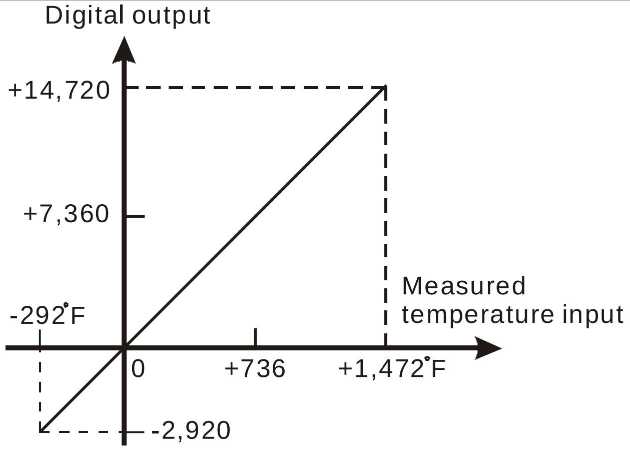
Mode 0



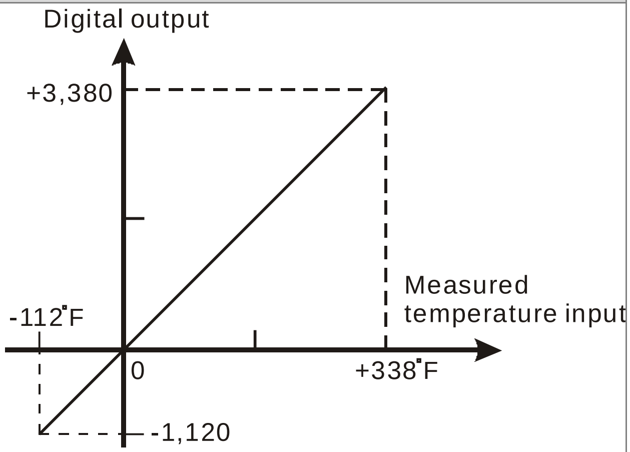
Mode 1



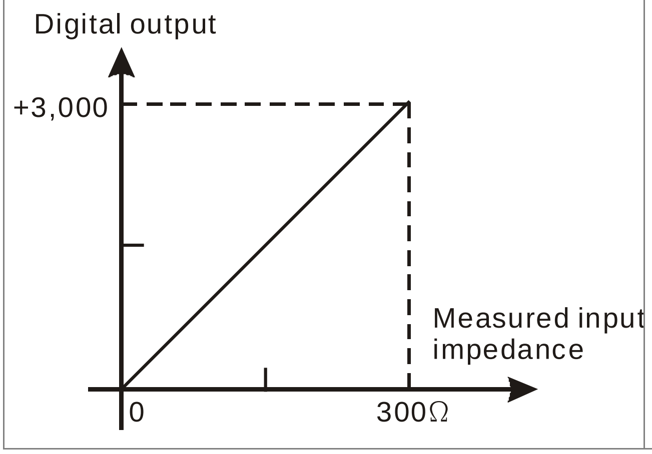
Mode 2



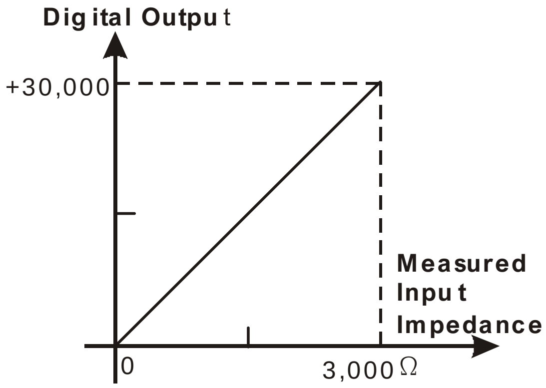
Mode 3



Mode 4



Mode 5



4.5.2 DVP04TC-E2 Control Registers

CR#	Attrib.		Register content	Description
0	O	R	Model name	Set up by the system: DVP04TC-E2 model code = H'0083
1	O	R	Firmware version	Display the current firmware version in hex.
2	O	R/W	CH1 Input mode setting	Input mode: Default = H'0000. Mode 0 (H'0000): J-type (-100°C ~1,150°C) Mode 1 (H'0001): K-type (-100°C ~ 1,350°C) Mode 2 (H'0002): R-type (0°C ~ 1,750°C) Mode 3 (H'0003): S-type (0°C ~ 1,750°C) Mode 4 (H'0004): T-type (-150°C ~ 390°C) Mode 5 (H'0005): E-type (-150°C ~ 980°C) Mode 6 (H'0006): N-type (-150°C ~ 1,280°C) Mode 7 (H'0007): -80mV~+80mV Mode -1(H'FFFF): Close
3	O	R/W	CH2 Input mode setting	
4	O	R/W	CH3 Input mode setting	
5	O	R/W	CH4 Input mode setting	
7	O	R/W	Temperature unit setting	Select the temperature unit (Celsius °C / Fahrenheit °F). Default = H0(°C)
8	O	R/W	CH1 sampling range	Set sampling range at CH1 ~ CH4 Range = K1 ~ K100 Default = K10
9	O	R/W	CH2 sampling range	
10	O	R/W	CH3 sampling range	
11	O	R/W	CH4 sampling range	
12	X	R	Average temperature measured at CH1	Average temperature measured at CH1 ~ Ch4 Temperature unit: set in CR#7
13	X	R	Average temperature measured at CH2	
14	X	R	Average temperature measured at CH3	
15	X	R	Average temperature measured at CH4	
20	X	R	Present temperature measured at CH1	Present temperature measured at CH1 ~ CH4 Temperature unit: set in CR#7
21	X	R	Present temperature measured at CH2	
22	X	R	Present temperature measured at CH3	
23	X	R	Present temperature measured at CH4	
28	O	R/W	Adjusted Offset value of CH1	Set the adjusted Offset value of Ch1 ~ Ch4. Default = K0 Range: K-400 ~ K400 Temperature unit: set in CR#7 (Measured Value= Original Value – Adjust Value Offset)
29	O	R/W	Adjusted Offset value of CH2	
30	O	R/W	Adjusted Offset value of CH3	
31	O	R/W	Adjusted Offset value of CH4	
40	O	R/W	Set value changing prohibited	Prohibit set value changing in CH1 ~ CH4. Default =H'0000
41	X	R/W	Save all the set values	Save all the set values. Default =H'0000
43	X	R	Error status	Register for storing all error status. See the table of error status for more information.
100	O	R/W	Function: Enable / Disable limit detection	Upper and lower bound detection, b0~b3 corresponds to CH1 ~ CH4 (0: Disable/ 1: Enable). Default= H'0000.
101	X	R/W	Upper and lower bound status	Display the upper and lower bound status (0: Not Exceeding; 1: Exceeding upper and lower bound value), b0~b3 corresponds to CH1 ~ CH4 lower bound, b8~b11 corresponds to CH1 ~ CH4 upper bound.

CR#	Attrib.		Register content	Description
102	O	R/W	Set value of CH1 upper bound	Set value of CH1~CH4 upper bound. Default = K32000.
103	O	R/W	Set value of CH2 upper bound	
104	O	R/W	Set value of CH3 upper bound	
105	O	R/W	Set value of CH4 upper bound	
108	O	R/W	Set value of CH1 lower bound	Set value of CH1~CH4 lower bound. Default = K-32000.
109	O	R/W	Set value of CH2 lower bound	
110	O	R/W	Set value of CH3 lower bound	
111	O	R/W	Set value of CH4 lower bound	
Symbols: O: When CR#41 is set to H'5678, the set value of CR will be saved. X: Set value will not be saved. R: You can use FROM instruction to read data. W: You can use TO instruction to write data.				

4

※ **CR#0 for module reset**

You can use CR#0 to reset all the settings by simply writing H'4352 in CR#0 and wait for one second before turning the power OFF and then ON again, all the modules connected will be initialized. It is suggested to connect to only one module for module reset. And this is only available for firmware V1.10 or later.

CR#43Error status value. See the table below.

Description					
bit0	K1 (H'1)	Power supply error	bit6	K64 (H'40)	CH4 Conversion error
bit1	K2 (H'2)	Temperature sensing componet error	bit9	K512 (H'0200)	Mode setting error
bit2	K4 (H'4)	Upper/lower bound error	bit10	K1024 (H'0400)	Sampling range error
bit3	K8 (H'8)	CH1 Conversion error	bit11	K2048 (H'0800)	Upper / lower bound setting error
bit4	K16 (H'10)	CH2 Conversion error	bit12	K4096 (H'1000)	Set value changing prohibited
bit5	K32 (H'20)	CH3 Conversion error	bit13	K8192 (H'2000)	Communication breakdown on next module
Note: Each error status is determined by the corresponding bit (b0 ~ b13) and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error					

※ **PID Control Registers**

CR				Attrib.		Register content	Description
CH1	CH2	CH3	CH4				
120	140	160	180	O	R/W	Set temperature value	Please set the temperature value according to proper range of each sensor type. Default = K0
121	141	161	181	O	R/W	Sampling time (s)	Range: K1 ~ K30 (s). Default = K2
122	142	162	182	O	R/W	K_P	Proportional control constant. Default = K121
123	143	163	183	O	R/W	K_I	Integral constant. Default = K2,098
124	144	164	184	O	R/W	K_D	Derivative constant. Default = K-29
125	145	165	185	O	R/W	Upper limit of I value	Upper limit of I value. Default = K0
126	146	166	186	O	R/W	Lower limit of I value	Lower limit of I value. Default = K0
127	147	167	187	X	R	I value	Current accumulated offset value
128	148	168	188	O	R/W	Heating/cooling	0: Heater, 1: Cooler. Default = H'0000

CR				Attrib.		Register content	Description
CH1	CH2	CH3	CH4				
129	149	169	189	O	R/W	Upper limit of output	Upper limit of output. Setting range: K-32,760 ~ K32,760. Default = K32,000
130	150	170	190	O	R/W	Lower limit of output	Lower limit of output. Setting range: K-32,760 ~ K32,760. Default = K0
131	151	171	191	X	R	Output percentage	Range: K0~K1,000 (Unit: 0.1%)
132	152	172	192	X	R	Output width (ms)	Width of control output. Unit: ms
133	153	173	193	X	R	Output cycle (ms)	Cycle of control output. Unit: ms
134	154	174	194	X	R	Output volume	Output volume
135	155	175	195	X	R/W	PID_RUN/STOP	0: STOP, 1: RUN. Default = K0
136	156	176	196	X	R/W	Auto-tuning	0: Disabled, 1: Auto-tuning. Default = K0
Symbols: O: Set value will be saved. X: Set value will not be saved. R: You can use FROM instruction to read data. W: You can use TO instruction to write data.							

※ **Adjust TC Conversion Curve**

You can adjust the conversion curves according to the actual needs by changing the Offset value (CR#28 ~ CR#31).

Offset: Deviation digital value from the target value. (Measured Value= Original Value – Adjust Value Offset)

- **Mode0 ~ Mode6: output unit 0.1°**

$$Y = \left(\frac{X(°)}{0.1(°)} - Offset \right)$$

Y= Digital output,

X= Measured temperature input

- **Mode7: 0.01 mV = 80 mV/8000**

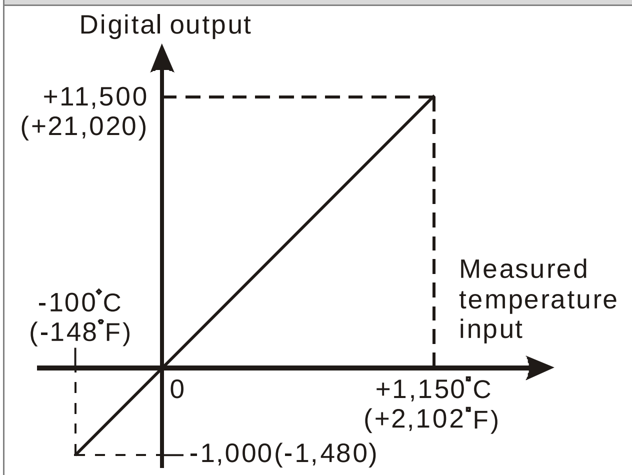
$$Y = \left(\frac{X(mV)}{0.01(mV)} - Offset \right)$$

Y= Digital output,

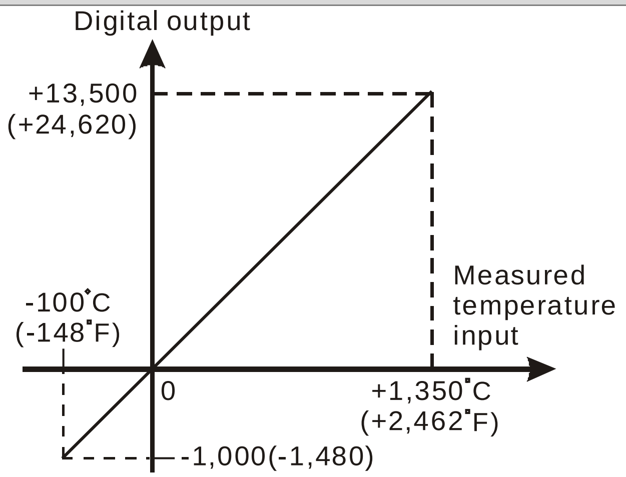
X= Current input

Mode 0 of CR#2~CR#5	-100°C~1150°C (-1000~11500) -148°F~2102°F (-1480~21020)
Mode1 of CR#2~CR#5	-100°C~1350°C (-1000~13500) -148°F~2462°F (-1480~24620)
Mode2、3 of CR#2~CR#5	0°C~1750°C (0~17500) 32°F~3182°F (320~31820)
Mode4 of CR#2~CR#5	-150°C~390°C (-1500~3900) -238°F~734°F (-2380~7340)
Mode5 of CR#2~CR#5	-150°C~980°C (-1500~9800) -238°F~1796°F (-2380~17960)
Mode6 of CR#2~CR#5	-150°C~1280°C (-1500~12800) -238°F~2336°F (-2380~23360)

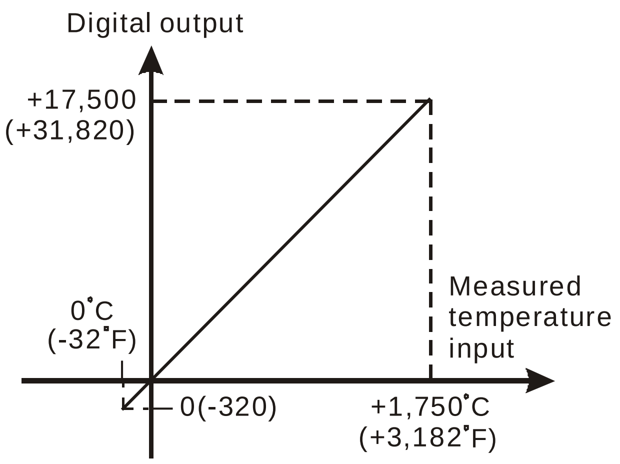
Mode 0: J-type thermocouple



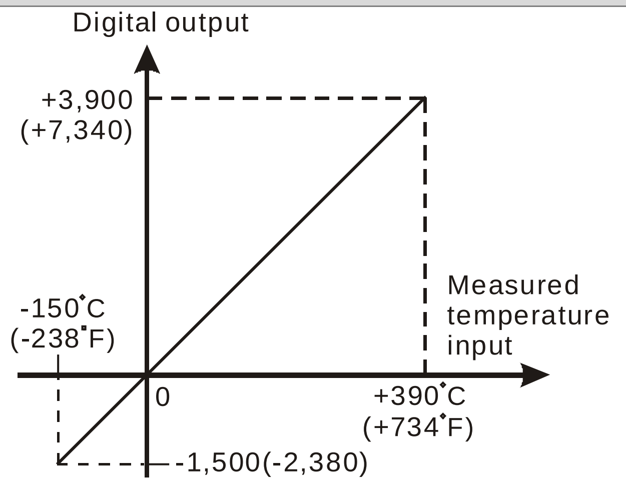
Mode 1: K-type thermocouple

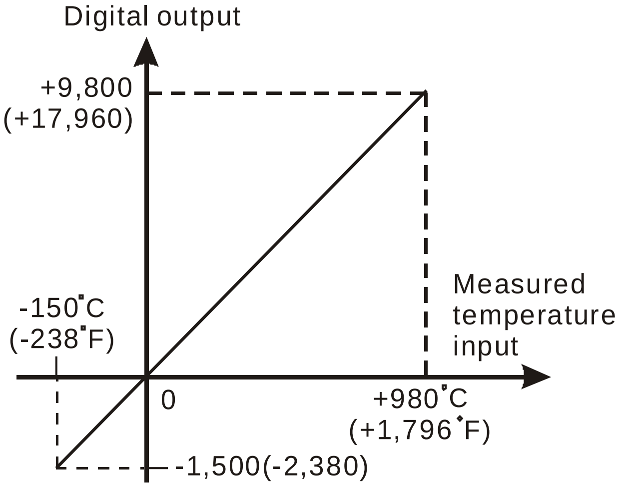
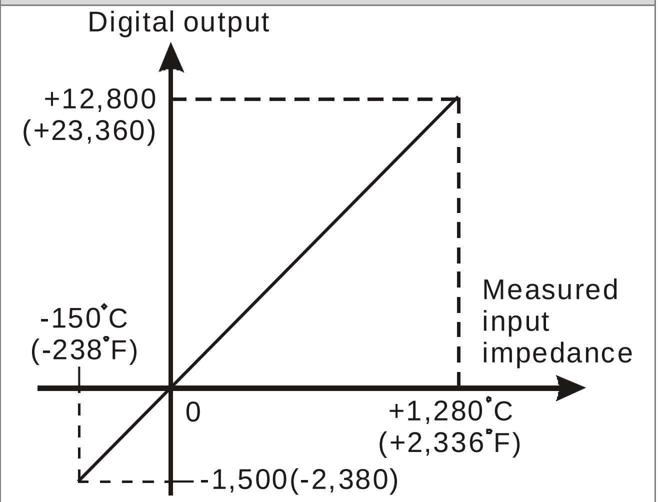


Mode 2: R-type thermocouple
Mode 3: S-type thermocouple

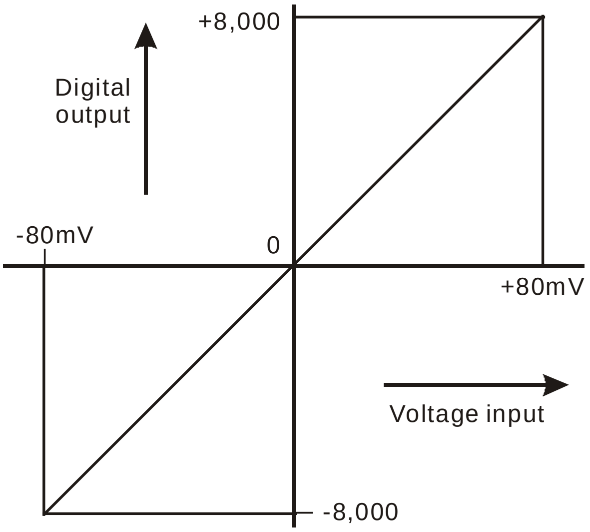


Mode 4: T-type thermocouple



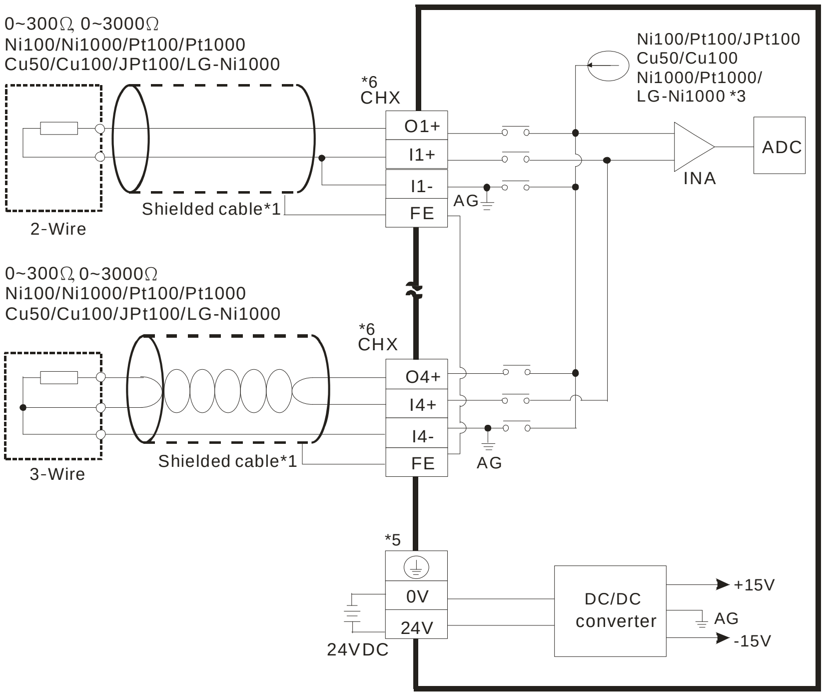
Mode 5: E-type thermocouple	Mode 6: N-type thermocouple
	

Mode 7 of CR#2~CR#5	-80mV~+80mV（-8000~8000）

Mode 7


4.6 Wiring

4.6.1 Wiring DVP04PT-E2 / DVP06PT-E2



*1. Use shielded twisted pair cables for temperature sensors, including Ni100/Ni1000, Pt100/Pt1000, Cu50/Cu100, JPt100, LG-Ni1000 for analog input module wiring and keep them away from power cables and other cables that generate noise. Use 3-wire temperature sensors. But if you use two-wire temperature sensors, In-+and In- must be short-circuited (where n is between 1–6).

*2. When the impedance to be measured is 0~300Ω or 0~3000Ω, it is recommended to use a 2-wire or 3-wire temperature sensor instead of a 4-wire one.

*3. Choose a suitable temperature sensor.

- DVP06PT-E2:

  When using temperature sensors such as Ni100, Pt100, JPt100, Cu50, Cu100 and 0~300 Ω impedance sensor, the internal excitation current is 1.0389 mA.

  When using temperature sensors such as Ni1000, Pt1000, LG-Ni1000 and 0~3000 Ω impedance sensor, the internal excitation current is 208.3μA。

- DVP04PT-E2：

  When using temperature sensors such as Ni100, Pt100 and 0~300 Ω impedance sensor, the internal excitation current is 1.53mA.

  When using temperature sensors such as Ni1000, Pt1000 and 0~3000 Ω impedance sensor, the internal excitation current is 200μA.

*4. Connect FE of the shielded cable to ground when the noise it too loud.

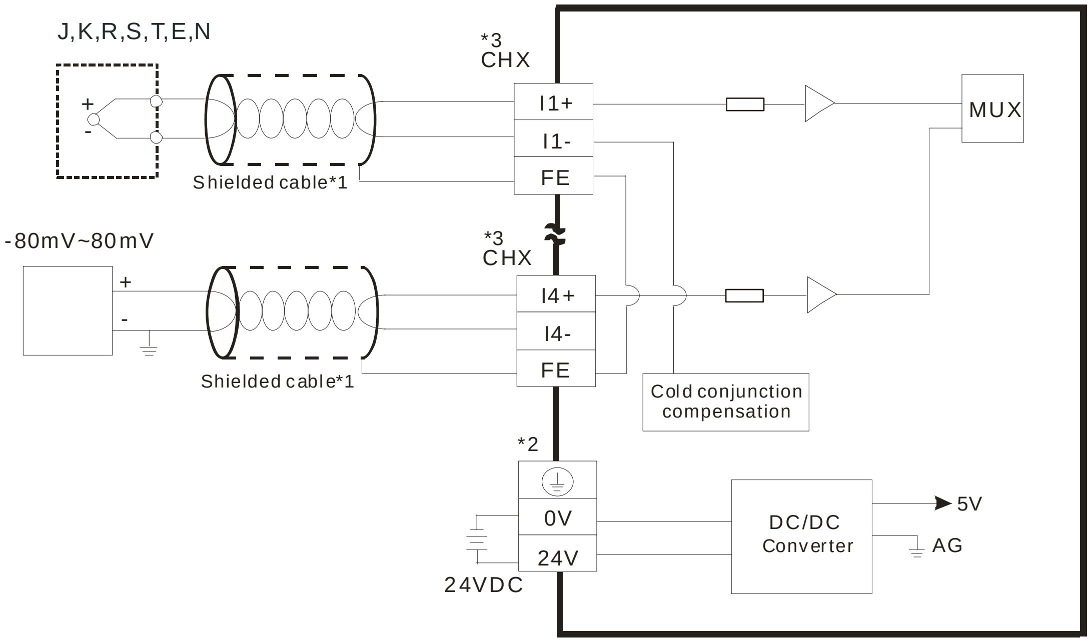
*5. Connect the terminal ⏚ to ground.

*6. CHX: Every channel can work with the input wiring shown above.

Note 1: Use cables with the same length (less than 200 m) and use terminal resistors of less than 200 ohm.

Note 2: Please refer to the functional specifications for the sensor types supported by each model.

4.6.2 Wiring DVP04TC-E2



*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable connected to a type J, K, R, S, T, E, N thermocouple. It should be kept separate from other power cables and cables that generate noise.

*2. Connect the terminal ⏚ to ground.

*3. CHX: Every channel can work with the input wiring shown above.

Note 1: only use copper conducting wires with a temperature rating of 60/75°C and the length must be less than 50 m.

Note2: TC modules must run for 30 minutes before they start to take any temperature measurement.

4.7 Troubleshooting

When an error occurs in PT, TC modules, an error indicator will start blinking. Once you see an error indicator starts blinking, you can use the FROM instruction to read the error codes stored in CR#43. The bit 0 to bit 13 indicates the error codes. It is possible to have two errors at the same time. 0 indicates normal and 1 indicates error. Refer to the following table for more the causes and the solutions for troubleshooting.

Bit No.	RUN LED	ERROR LED	Description	Solution
bit0	OFF	ON	The external voltage is abnormal.	Check the power supply.
bit1	Blinking every 0.2 seconds	Blinking every 0.2 seconds	Temperature sensor is abnormal.	Contact the factory.
bit2			Conversion value exceeds the set upper/lower value	Check the upper and lower value
bit3			The signal received by channel 1 exceeds the range of analog inputs (temperature).	Check the signal received by channel 1
bit4			The signal received by channel 2 exceeds the range of analog inputs (temperature).	Check the signal received by channel 2
bit5			The signal received by channel 3 exceeds the range of analog inputs (temperature).	Check the signal received by channel 3
bit6			The signal received by channel 4 exceeds the range of analog inputs (temperature).	Check the signal received by channel 4
bit7			The signal received by channel 5 exceeds the range of analog inputs (temperature).	Check the signal received by channel 5
bit8			The signal received by channel 6 exceeds the range of analog inputs (temperature).	Check the signal received by channel 6
bit9			Mode setting error	Check the mode setting
bit10			Average time setting error	Check the average time setting
bit11			Upper/lower value setting error	Check the upper/lower value setting
bit12			Set value cannot be changed.	Check the value in CR#40 (set value changing prohibited)
bit13			The later module is disconnected.	Check the wiring of the modules.

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Chapter 5 DVP-E Series Position Control Module

Table of Contens

5.1 General Specifications

5.1.1 DVP02PU-E2 Specifications

- **Electrical specifications**

Model name	DVP02PU-E2
Number of inputs	High-speed input points: 3; normal input points 5; high-speed output: 4 (2-axis)
Supply voltage	24VDC from PLC CPU
Connector type	Removable terminal block (distance to the terminal is 5 mm)
Connect to DVP PLC CPU	Up to 8 modules can be connected and no digital I/O will be taken. Numbering is from 0 to 7 in a consecutive order; the one closes to the PLC CPU is 0.
Weight	180g

- **Functional specifications – Input Points**

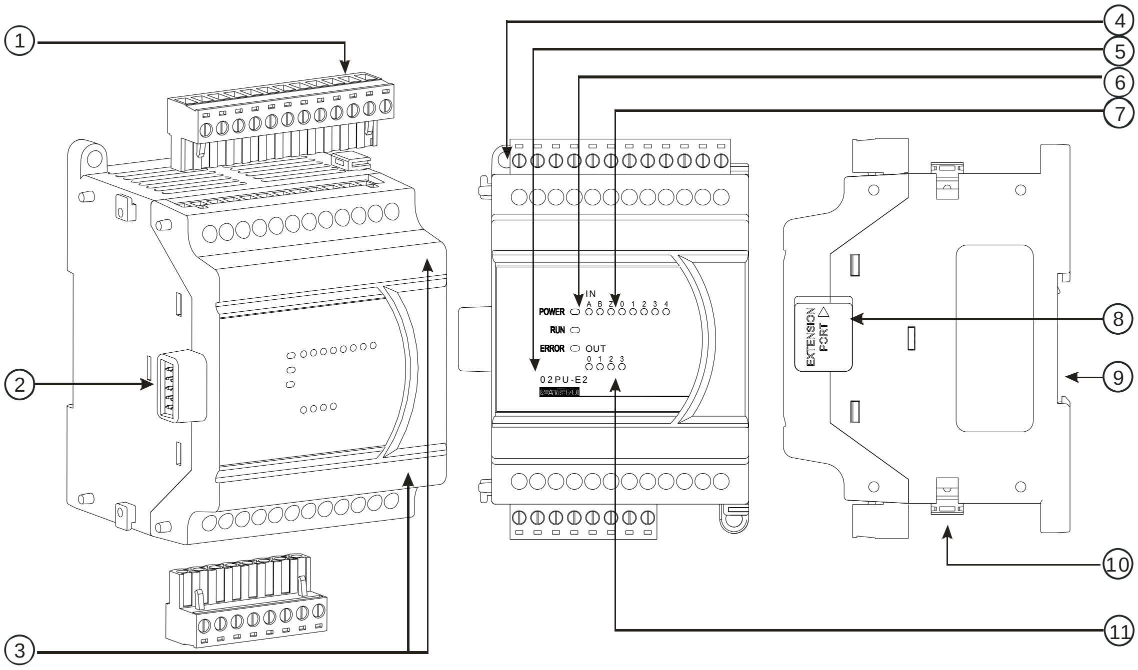
Item \ Model		High-speed Input	Normal Input
Number of inputs		3（A+/A-，B+/B-，Z+/Z-）	5（X0~X4）
Connector type		Removable terminal blocks	
Input form		Differential input	Direct current (sinking or sourcing)
Input current		5~24VDC，5~15mA	24VDC，5mA
Action level	**OFF→ON**	>3VDC	>15VDC
	ON→OFF	<1.5VDC	<5VDC
Response time		<1.5us	<0.1ms
Maximum input frequency		200kHz（A+/A-，B+/B-） 20kHz（Z+/Z-）	1kHz
Input impedance		4.7kΩ	
Input isolation		500VAC	
Input display		When the optocoupler is driven, the input LED indicator is ON.	

- **Functional specifications – Output Points**

Item \ Model		High-speed Output
Number of outputs		Four(2-axis）
Connector type		Removable terminal blocks
Output form		differential output
Output voltage		5VDC *1
Leakage current		< 10uA
Minimum load		1mA / 5VDC
Maximum load	**Resistance**	20mA
	Inductance	N/A
	Bulb	N/A
Maximum output frequency		200kHz
Maximum Response time	**OFF→ON**	0.15us
	ON→OFF	0.15us
Output isolation		500VAC

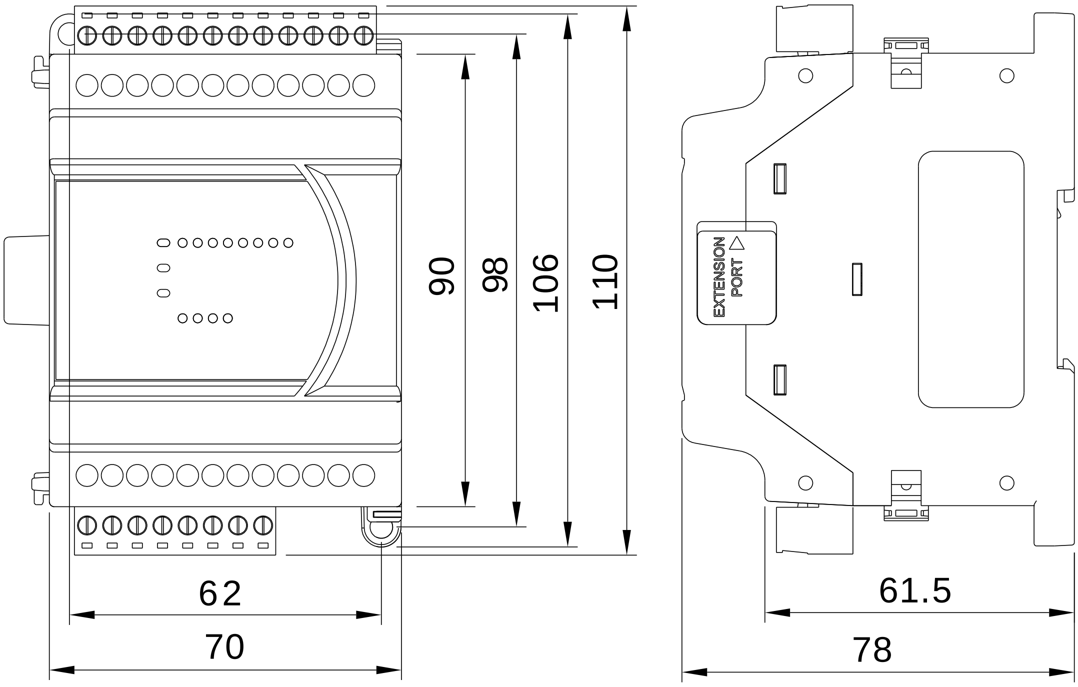
Note*1: Actual output4VDC（No load）~2.66VDC（20mA）

5.2 Module Profiles



No.	Name	Description
1	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads to be driven.
2	External module connection port	Connects the modules
3	Arrangement of the input/output terminals	Arrangement of the terminals
4	Installation hole	For module installation
5	Model serial	Model serial
6	POWER LED indicator (Green)	Indicates the status of the power supply ON: the power is on OFF: no power
	Error LED indicator (Red)	Error status of the module OFF: the module is normal. Blinking (0.2 seconds ON/OFF): hardware error occurs in the module, can NOT operate normally
	Run LED indicator (Green)	Operating status of the module ON: the module is running and ready to accept instructions. OFF: the module is stopped and can NOT accept instrucitons.
7	Input LED indicator (Red)	ON: Receives an input signal OFF: Receives no input signal
8	I/O module connecting port	Connects to the next module
9	DIN rail clip	Secures the module onto the DIN rail
10	I/O module securing clip	Secures the modules
11	Output LED indicator (Red)	ON: Receives an output signal OFF: Receives no output signal

5.3 Module Dimensions



Unit: mm

5.4 Module Terminals

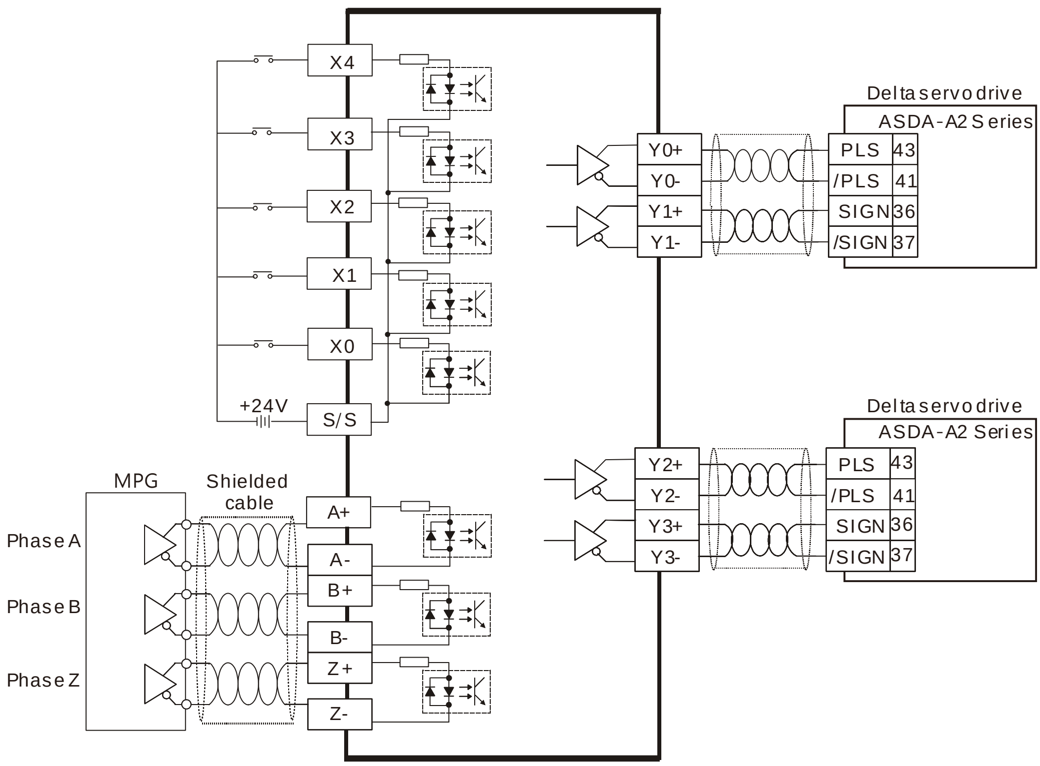
DVP02PU-E2

	1	2	3	4	5	6	7	8	9	10	11	12
Upper	A+	A-	B+	B-	Z+	Z-	S/S	X0	X1	X2	X3	X4
Lower	Y0+	Y0-	Y1+	Y1-	Y2+	Y2-	Y3+	Y3-				

5.5 Control Register

Since this module does NOT use control registers to read/write data, you need to use API to perform data reading and writing. You can use API to execute DVP positioning module features, including setting output control parameters of PU module (API1402 PUCONF), reading PU module output state (API1403 PUSTAT), PU module output pulse without acceleration (API1404 DPUPLS), Relative position output of PU module with acceleration and deceleration (API1405 DPUDRI), Absolute addressing output of PU module with acceleration and deceleration (API1406 DPUDRA), PU module homing (API 1407 DPUZRN), PU module jog output (API1408 DPUJOG), PU module MPG output (API1409 DPUMPG), and High-speed counter function of PU module (API1410 DPUCNT). Refer to API14 Module Instruction form DVP-ES3/EX3/SV3/SX3 Programming Manual for more information on operation.

5.6 Wiring



Note: Refer to Chapter 6 Applied Instruction (Module Instructions API14xx) from DVP-ES3/EX3/SV3/SX3 Series Programming Manual and Delta Servo Drive Manual for more details on output modes.

5.7 Troubleshooting

When an error occurs in PU modules, you can check the state code to identify the causes, error indicator will not display. Please refer to special extension module exchange function (SM228, you can find more detailed information in section 2.2.16 ‘Additional Remarks on SM/SR’ in the DVP-ES3/EX3/SV3/SX3 Series Programming Manual).

For detailed operation and application examples regarding the API instructions, please refter to ‘API14 Module Instructions’ in DVP-ES3/EX3/SV3/SX3 Series Programming Manual.

- **Error indicator and troubleshooting description**

RUN LED	ERROR LED	Description	Solution
OFF	ON	The power supply from PLC CPU to the module is abnormal.	1. Check if the power supply of PLC CPU is normal. 2. Check if the connection between PLC CPU and the module is well-connected. If the above points are ture, change your module.
OFF	Blinking every 0.2 seconds	The previous firmware update is abnormal.	The previous firmware update was failed. Contact your local authorized distributors for another firmware update for the module.
No change	The light is lit for 0.5 seconds and then unlit for 3 seconds.	The postivie limit is reached.	1. Check if the positive and negative is set. 2. Check if the software/hardware positive limit is reached? Leave the positive limit and go towards the negative direction.
No change	The light is blinking every 0.5 seconds for two times and unlit for 3 seconds.	The negative limit is reached.	1. Check if the positive and negative is set. 2. Check if the software/hardware negative limit is reached? Leave the negative limit and go towards the positive direction.
No change	The light is blinking every 0.5 seconds for three times and unlit for 3 seconds.	Current position value overflow	Incorrect position setting may lead to incorrect movement. You can use PUSTAT instruction to clear the current position.

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Chapter 6 DVP-E Series Extension Cable Interface Module

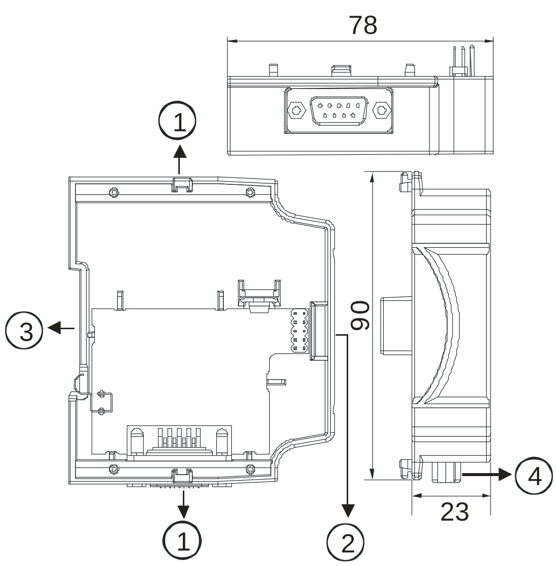
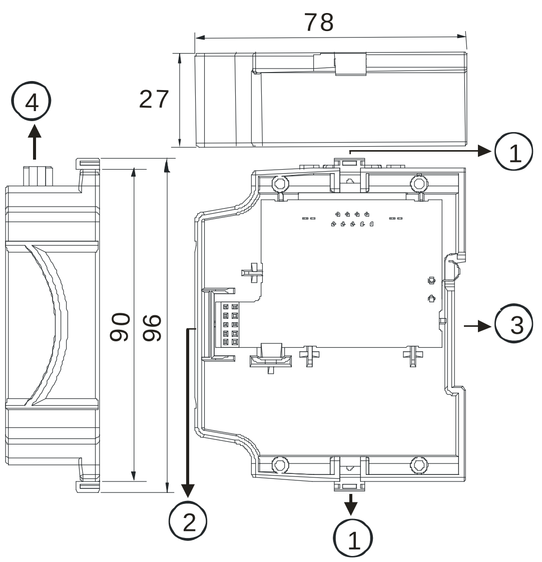
Table of Contens

6.1 General Specifications

DVPAEXT01-E2 (DVPAEXT1R-E2 + DVPAEXT1L-E2) is an extension cable interface module. The extension distance is 0.7 meters. DVPAEXT01-E2 is only applicable to the connection between DVP-ES2/EX2 series CPU and the DI/DO or AI/AO extension modules, and the installation does not count as any digital extension point or analog module.

Model / Item	DVPAEXT01-E2	
	DVPAEXT1R-E2	**DVPAEXT1L-E2**
Weight	50g	55g

6.2 Module Profiles

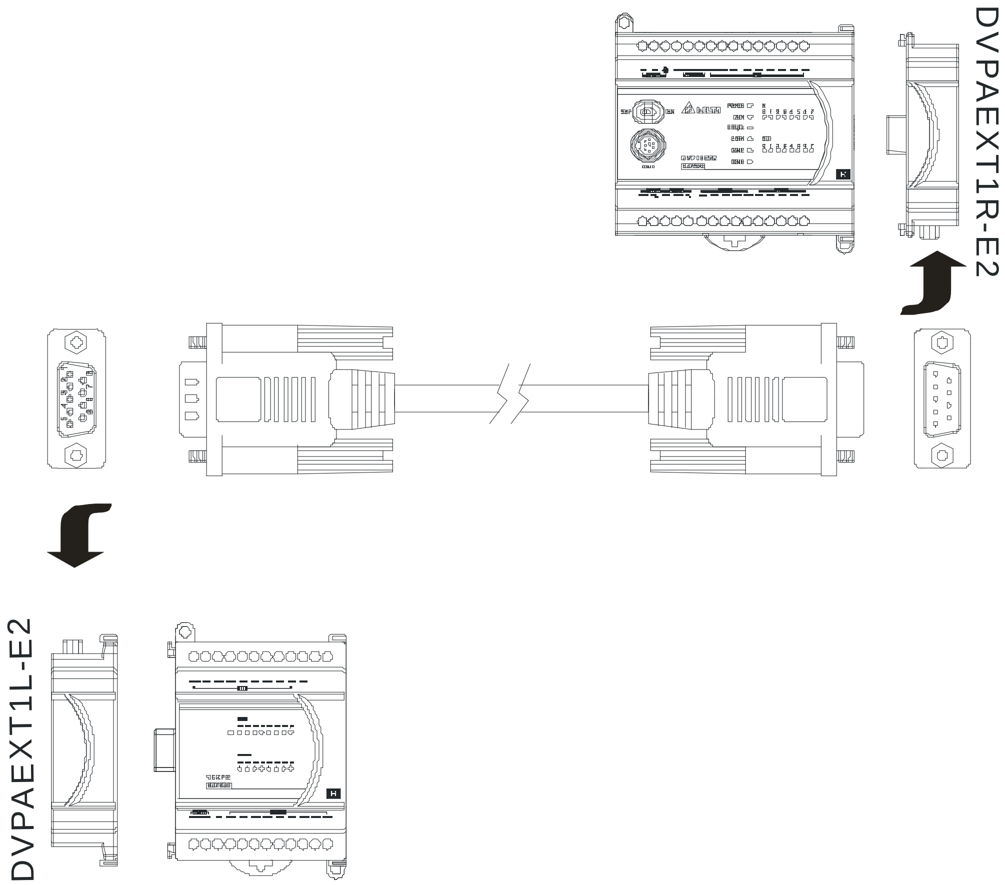
DVPAEXT1R-E2 (right side, previous one)	DVPAEXT1L-E2 (left side, latter one)
	

No.	Name	Description
1	I/O module securing clip	Secures the modules
2	External module connection port	Connects the modules
3	DIN rail slot (35 mm)	For the DIN rail
4	Extension cable port	Connects the extension cable

6.3 Installlation and Wiring

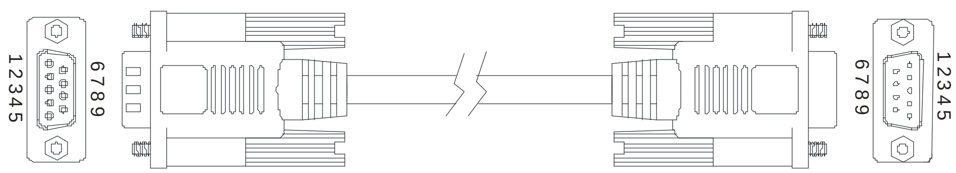
- **Use DVPAEXT01-E2 (DVPAEXT1R-E2 + DVPAEXT1L-E2) to extend the connections**

Since the installation space is limited, you can use DVPAEXT01-E2 (DVPAEXT1R-E2 + DVPAEXT1L-E2) to extend the communication signal and the connection between DVP-ES2/EX2 series CPU and the DI/DO or AI/AO extension modules.



- **Pin Definition**

Use the enclosed cable to connect DVPAEXT1R-E2 and DVPAEXT1L-E2.



7

Chapter 7 DVP-S Series Digital Input/Output Module

Table of Contents

7.1 General Specifications

<table>
<tr><th>Model（DVP）
Item</th><th>06SN11R</th><th>08SM11N</th><th>08SM10N</th><th>08SN11R</th><th>08SN11T</th><th>08SN11TS</th><th>08SP11R</th><th>08SP11T</th><th>08SP11TS</th><th>16SM11N</th></tr>
<tr><td>Power supply voltage</td><td colspan="10">24VDC from PLC CPU</td></tr>
<tr><td>Weight(g)</td><td>200</td><td>162</td><td>141</td><td>154</td><td>146</td><td>146</td><td>141</td><td>136</td><td>136</td><td>146</td></tr>
</table>

<table>
<tr><th>Model（DVP）
Item</th><th>16SP11R</th><th>16SP11T</th><th>16SP11TS</th><th>16SN11T</th><th>16SN11TS</th><th>32SM11N</th><th>32SN11TN</th></tr>
<tr><td>Power supply voltage</td><td colspan="7">24VDC from PLC CPU</td></tr>
<tr><td>Weight(g)</td><td>162</td><td>154</td><td>151</td><td>70</td><td>70</td><td>70</td><td>70</td></tr>
</table>

- **Electrical specifications for the inputs on digital input/output modules**

<table>
<tr><th colspan="2">Model（DVP）
Item</th><th>08SM11N</th><th>16SM11N</th><th>08SP11T</th><th>08SP11R</th><th>08SP11TS</th><th>16SP11T</th><th>16SP11R</th><th>16SP11TS</th><th>32SM11N</th><th>08SM10N</th></tr>
<tr><td colspan="2">Number of inputs</td><td>8</td><td>16</td><td>4</td><td>4</td><td>4</td><td>8</td><td>8</td><td>8</td><td>32</td><td>8</td></tr>
<tr><td colspan="2">Connector type</td><td colspan="10">Removable terminal block</td></tr>
<tr><td colspan="2">Input type</td><td colspan="10">Digital input</td></tr>
<tr><td colspan="2">Input form</td><td colspan="9">DC (sinking or sourcing)</td><td>AC</td></tr>
<tr><td colspan="2">Input voltage</td><td colspan="9">24VDC，5mA</td><td>85~132VAC 50~60Hz
9.2mA 110VAC/60Hz</td></tr>
<tr><td rowspan="2">Action level</td><td>OFF→ON</td><td colspan="9">>16.5VDC</td><td>>79VAC</td></tr>
<tr><td>ON→OFF</td><td colspan="9"><8VDC</td><td><30VAC</td></tr>
<tr><td rowspan="2">Response time</td><td>OFF→ON</td><td colspan="8" rowspan="2">Approximately 10ms</td><td rowspan="2">Approximately 20ms</td><td>< 15ms</td></tr>
<tr><td>ON→OFF</td><td>< 20ms</td></tr>
<tr><td colspan="2">Input impedance</td><td colspan="9">4.7kΩ</td><td>19kΩ/50Hz 16kΩ/60Hz</td></tr>
<tr><td colspan="2">Input isolation</td><td colspan="10">500VAC</td></tr>
<tr><td colspan="2">Input display</td><td colspan="10">When the optocoupler is driven, the input LED indicator is ON.</td></tr>
</table>

- **Electrical specifications for the outputs on digital input/output modules**

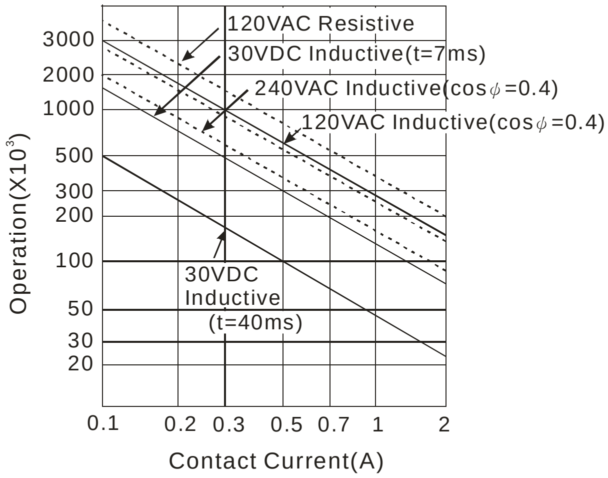
<table>
<tr><th colspan="2">Model（DVP）
Item</th><th>08SP11T</th><th>16SP11T</th><th>08SN11T</th><th>16SN11T</th><th>32SN11TN</th><th>08SP11TS</th><th>16SP11TS</th><th>08SN11TS</th><th>16SN11TS</th><th>08SP11R</th><th>16SP11R</th><th>08SN11R</th><th>06SN11R</th></tr>
<tr><td colspan="2">Number of outputs</td><td>4</td><td>8</td><td>8</td><td>16</td><td>32</td><td>4</td><td>8</td><td>8</td><td>16</td><td>4</td><td>8</td><td>8</td><td>6</td></tr>
<tr><td colspan="2">Connector type</td><td colspan="13">Removable terminal block</td></tr>
<tr><td colspan="2">Output type</td><td colspan="5">Transistor -T（Sinking）</td><td colspan="4">Transistor -T（Sourcing）</td><td colspan="4">Relay-R</td></tr>
<tr><td colspan="2">Voltage</td><td colspan="2">5~30VDC</td><td colspan="3">5~30VDC</td><td colspan="4">5~30VDC</td><td colspan="4">10~250VAC，
5~30VDC</td></tr>
<tr><td colspan="2">Leakage current</td><td colspan="2">< 10uA</td><td colspan="3">< 250uA</td><td colspan="4"><10uA</td><td colspan="4">–</td></tr>
<tr><td>Max. load</td><td>Resistance</td><td colspan="2">0.3A/output[*2]
（1.2A/COM）</td><td colspan="3">0.1A/output[*2]，
（3.2A/COM）</td><td colspan="4">0.3A/output[*2]
（2A/COM）</td><td colspan="3">1.5A/output
（5A/COM）</td><td>6A/output</td></tr>
</table>

Item		Model（DVP） 08SP 11T	16SP 11T	08SN 11T	16SN 11T	32SN 11TN	08SP 11TS	16SP 11TS	08SN 11TS	16SN 11TS	08SP 11R	16SP 11R	08SN 11R	06SN 11R
	Induc-tance	N/A									Life cycle curve*3			Life cycle curve *4
	Bulk	N/A												
Minimum load		1mA/5V												
Output isolation		500VAC									1500VAC			
Switching frequency*1		≦100Hz									≦1Hz			
Response time	OFF→ON	15us		<0.1ms			15us				Approximately 10ms			
	ON→OFF	25us		<0.3ms			25us							

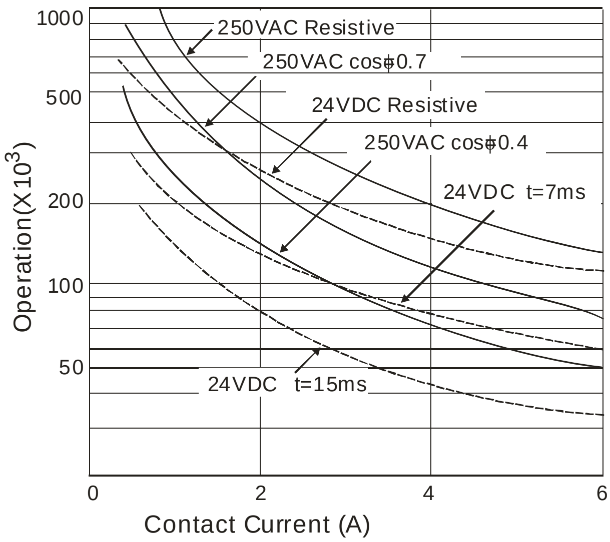
*1. The scan cycle affects the frequency.

*2. UP, ZP should include external aid power 24VDC (-15% ~ +20%) and the rated comsumption is around 1mA/point

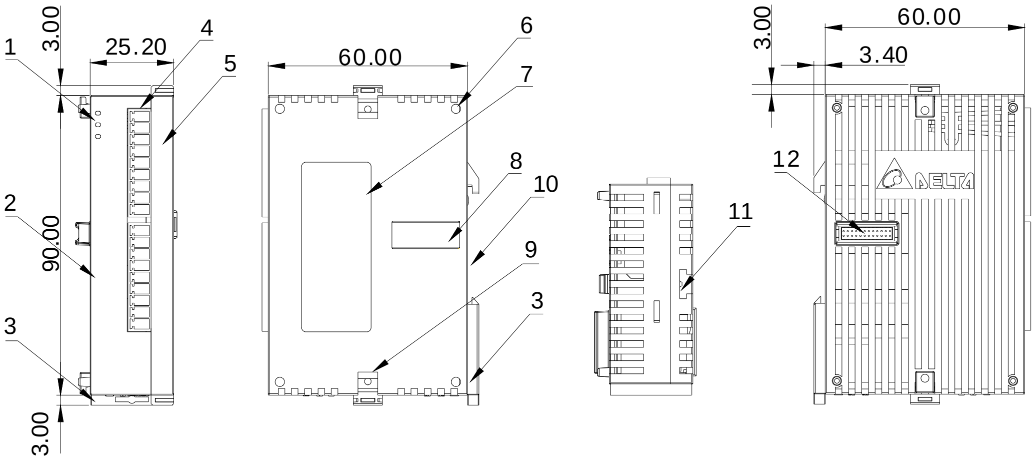
*3. Life cycle curve: The lifetime of a relay terminal varies with the working voltage, the load type (the power factor cosø, the time constant t(L/R)), and the current passing through the terminal. The life cycle curve is shown below.



*4. Life cycle curve: The lifetime of a relay terminal varies with the working voltage, the load type (the power factor cosø, the time constant t(L/R)), and the current passing through the terminal. The life cycle curve is shown below.



7.2 Module Profiles



Unit: mm

No.	Name	Description
1	Power LED	Indicates the power status of the power supply ON: the power is onOFF: no power
	Low Voltage indicator	Indicates the low voltage status of module ON: low voltage occurs OFF: low voltage resolved
2	Model name	Model name of the module
3	DIN rail securing clip	Secure the modules on the set
4	I/O Terminal	The inputs are connected to sensors. The outputs are connected to loads to be driven.
5	Terminal number	Terminal number
6	Extension unit positioning hole	For positioning between modules.
7	Nameplate	Label of the module
8	Extension module connection port	Connect the modules
9	Extension unit fixing clip	For securing the extension module.
10	Din rail slot(35mm)	For the DIN rail.
11	Securing module slot	For securing the extension module.
12	Extension module connection port	Connect the PLC or the module.

7.4 Terminals

08SM11N	08SM10N	16SM11N	06SN11R	08SN11R 08SN11T	16SN11T
S/S, X0, X1, X2, X3, X4, X5, X6, X7	COM, X0, X1, X2, X3, X4, X5, X6, X7	S/S, X0, X1, X2, X3, X4, X5, X6, X7 / S/S, X10, X11, X12, X13, X14, X15, X16, X17	C0, Y0, •, C1, Y1, •, C2, Y2, • / C3, Y3, •, C4, Y4, •, C5, Y5, •	C0, Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7	UP, Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7 / ZP0, Y10, Y11, Y12, Y13, Y14, Y15, Y16, Y17, ZP1

08SN11TS	16SN11TS	08SP11R 08SP11T	16SP11R 16SP11T	08SP11TS	16SP11TS
UP, Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7, ZP	UP0, Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7 / UP1, Y10, Y11, Y12, Y13, Y14, Y15, Y16, Y17, ZP	S/S, X0, X1, X2, X3, •, •, •, • / C0, Y0, C1, Y1, C2, Y2, C3, Y3, •	S/S, X0, X1, X2, X3, X4, X5, X6, X7 / C0, Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7	S/S, X0, X1, X2, X3, •, •, •, • / UP, Y0, Y1, Y2, Y3, •, •, •, •, ZP	S/S, X0, X1, X2, X3, X4, X5, X6, X7 / UP, Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7, ZP

32SM11N				32SN11TN			
X0	1	2	X1	Y0	1	2	Y1
X2	3	4	X3	Y2	3	4	Y3
X4	5	6	X5	Y4	5	6	Y5
X6	7	8	X7	Y6	7	8	Y7
X10	9	10	X11	Y10	9	10	Y11
X12	11	12	X13	Y12	11	12	Y13
X14	13	14	X15	Y14	13	14	Y15
X16	15	16	X17	Y16	15	16	Y17
S/S	17	18	S/S	ZP	17	18	ZP
NC	19	20	NC	UP	19	20	UP
X20	21	22	X21	Y20	21	22	Y21
X22	23	24	X23	Y22	23	24	Y23
X24	25	26	X25	Y24	25	26	Y25
X26	27	28	X27	Y26	27	28	Y27
X30	29	30	X31	Y30	29	30	Y31
X32	31	32	X33	Y32	31	32	Y33
X34	33	34	X35	Y34	33	34	Y35
X36	35	36	X37	Y36	35	36	Y37
S/S	37	38	S/S	ZP	37	38	ZP
NC	39	40	NC	UP	39	40	UP
DVP32SM				DVP32SN			

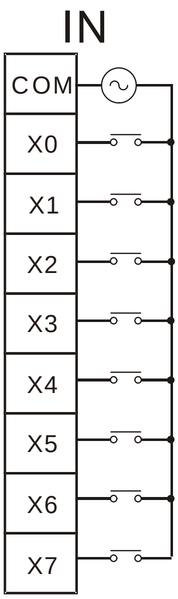
7

7.5 Wiring

This section illustrates how to wire digital input/output modules. The wiring diagrams below also illustrate how the power supplies are connected to S/S, and COM. If you need more information about wiring of digital input/output terminals, refer to Section 7.6 in this manual.

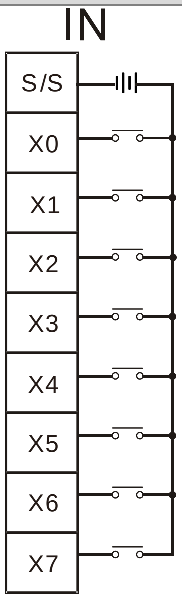
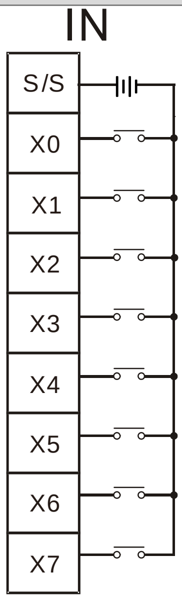
7.5.1 Wiring DVP08SM10N

Input form	AC (Alternating Current)
Voltage specifications	85~132VAC（50~60Hz）, 9.2mA（110VAC/60Hz）



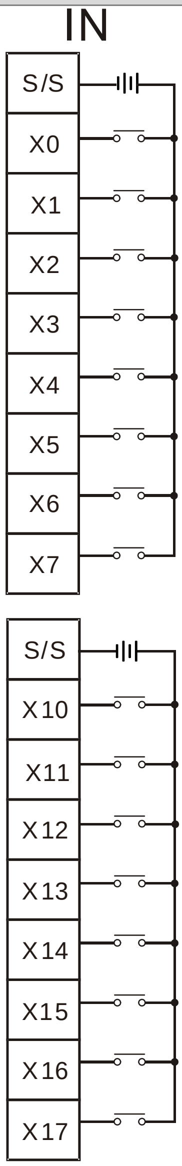
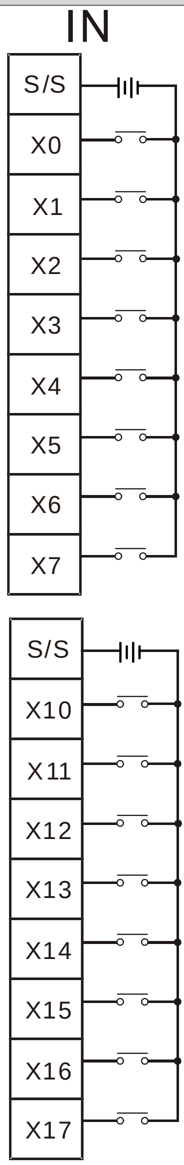
7.5.2 Wiring DVP08SM11N

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA

Sinking	Sourcing
	

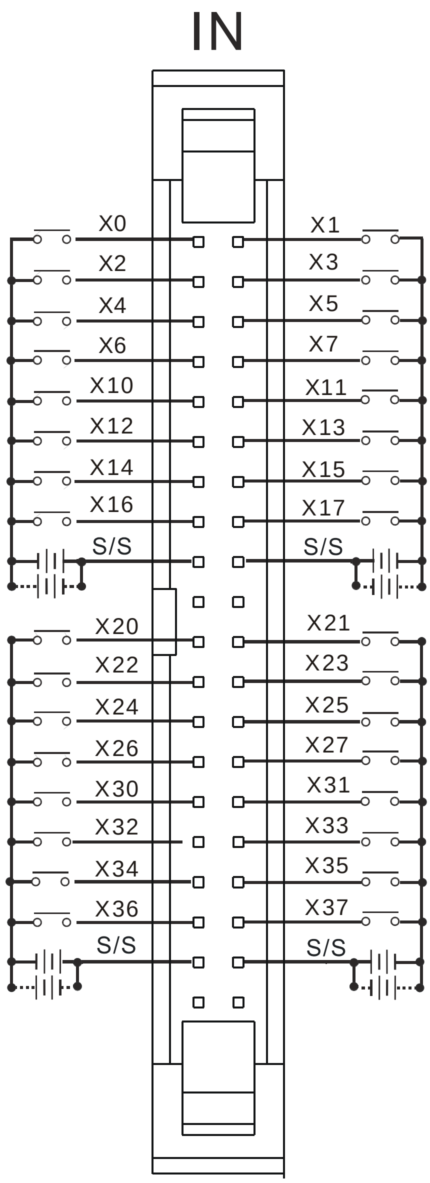
7.5.3 Wiring DVP16SM11N

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA

<table>
<tr><th>Sinking</th><th>Sourcing</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

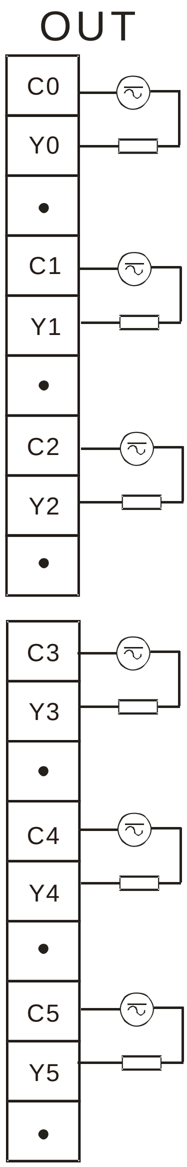
7.5.4 Wiring DVP32SM11N

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA



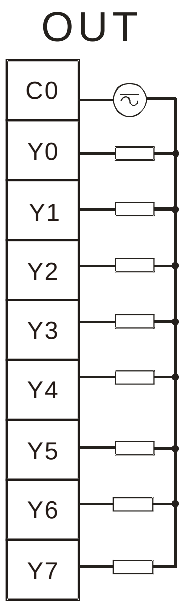
7.5.5 Wiring DVP06SN11R

Output form	Relay
Voltage specifications	10~250VAC，5~30VDC，6A/output



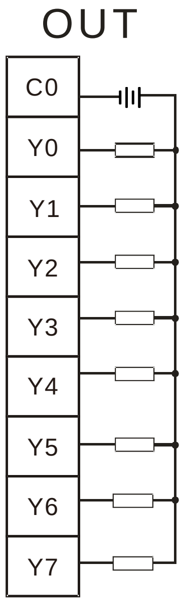
7.5.6 Wiring DVP08SN11R

Output form	Relay
Voltage specifications	10~240VAC，5~30VDC，1.5A/output，5A/COM



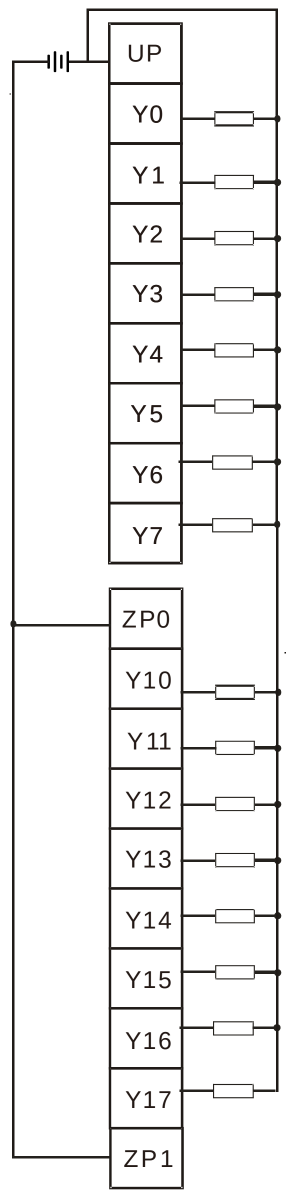
7.5.7 Wiring DVP08SN11T

Output form	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM



7.5.8 Wiring DVP16SN11T

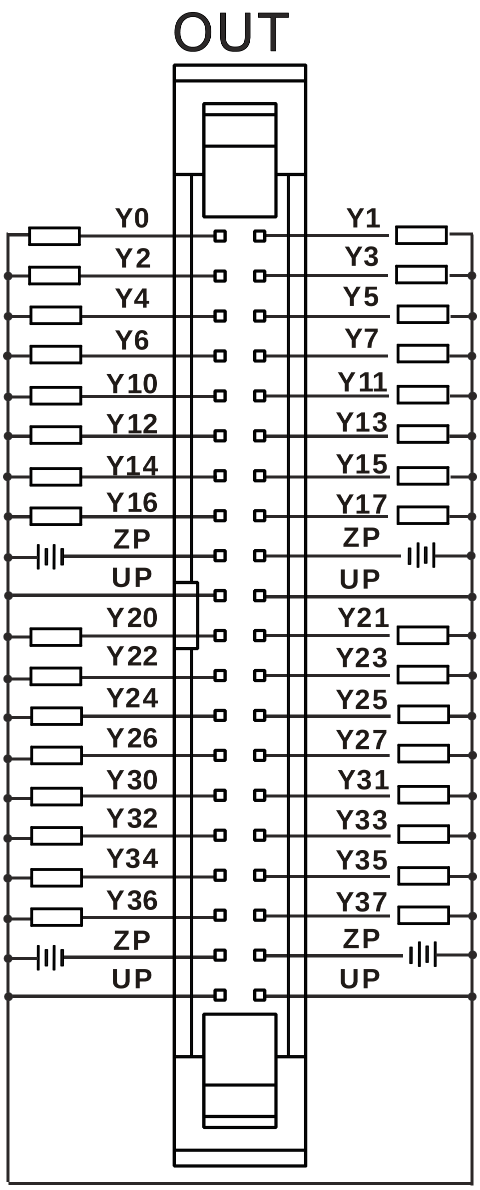
Output form	Transistor-T (sinking)
Voltage specifications	5~30VDC · 0.3A/oupput · 1.2A/COM



Note: You need to add external power supply 24 VDC (-15% ~ +20%) for UP, ZP0, ZP1; power consumption is up to 30 mA.

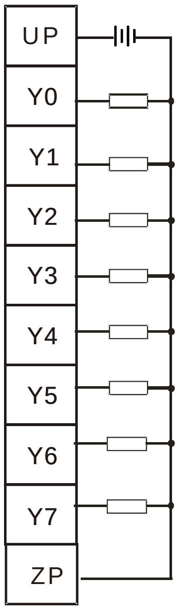
7.5.9 Wiring DVP32SN11TN

Output form	Transistor-T (sinking)
Voltage specifications	5~30VDC · 0.1A/output · 2.2A/COM



7.5.10 Wiring DVP08SN11TS

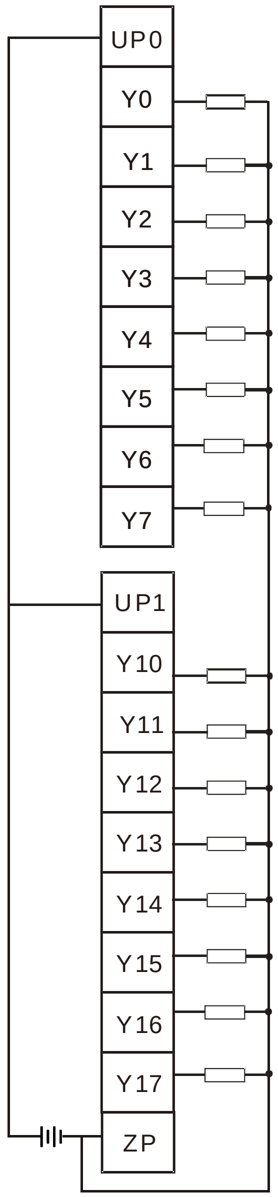
Output form	Transistor-P(sourcing)
Voltage specifications	5~30VDC，0.3A/output，2A/COM



Note: You need to add external power supply 24 VDC (-15% ~ +20%) for UP and ZP; power consumption is up to 15 mA.

7.5.11 Wiring DVP16SN11TS

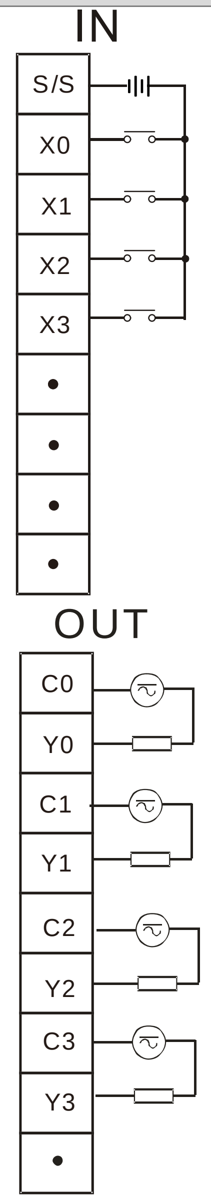
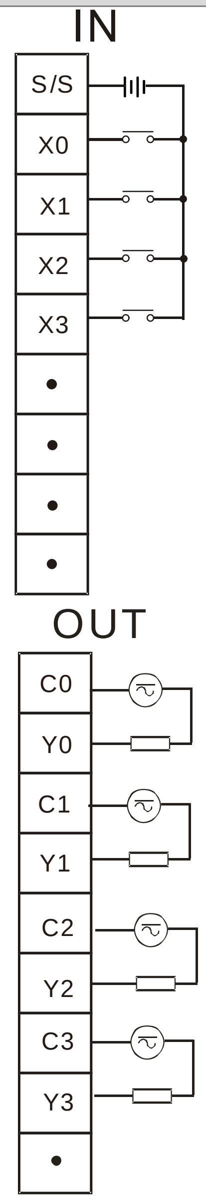
Output form	Transistor-P(sourcing)
Voltage specifications	5~30VDC，0.3A/output，2A/COM



Note: You need to add external power supply 24 VDC (-15% ~ +20%) for UP0, UP1 and ZP; power consumption is up to 25 mA.

7.5.12 Wiring DVP08SP11R

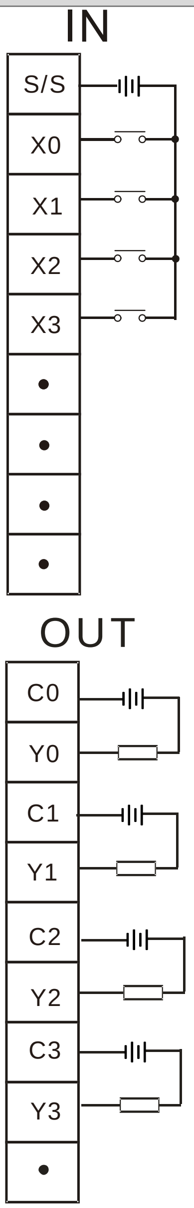
Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output form	Relay
Voltage specifications	10~250VAC，5~30VDC，1.5A/output，5A/COM

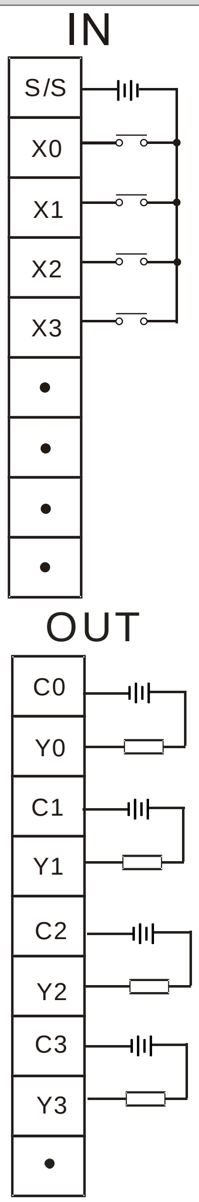
Sinking input and relay output	Sourcing input and relay output
	

7.5.13 Wiring DVP08SP11T

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output form	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM

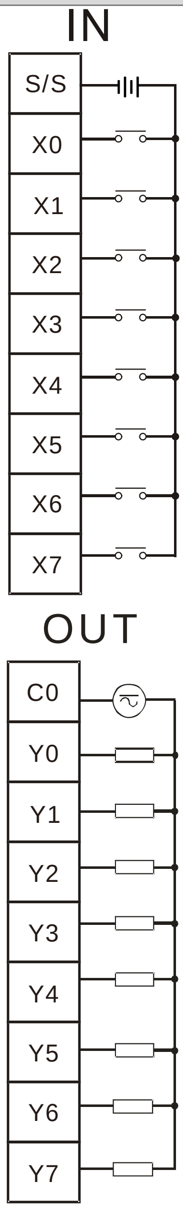
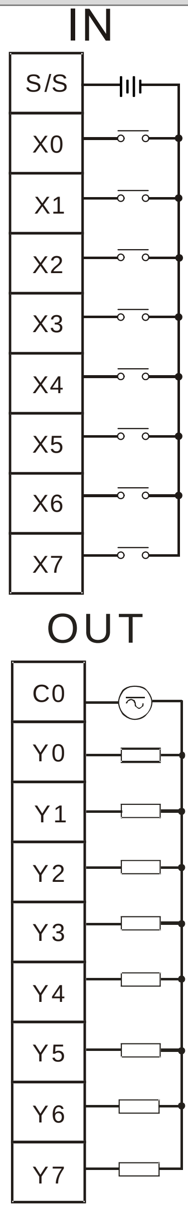
Sinking input and output	Sourcing input and Sinking output





7.5.14 Wiring DVP16SP11R

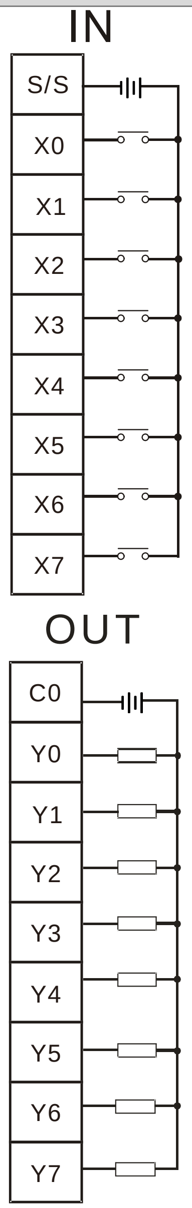
Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output form	Relay
Voltage specifications	10~250VAC，5~30VDC，1.5A/點，5A/共點

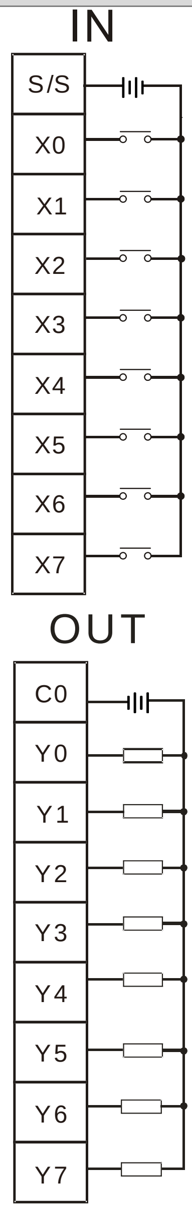
Sinking input and relay output	Sourcing input and relay output
	

7.5.15 Wiring DVP16SP11T

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output form	Transistor-T (sinking)
Voltage specifications	5~30VDC，0.3A/output，1.2A/COM

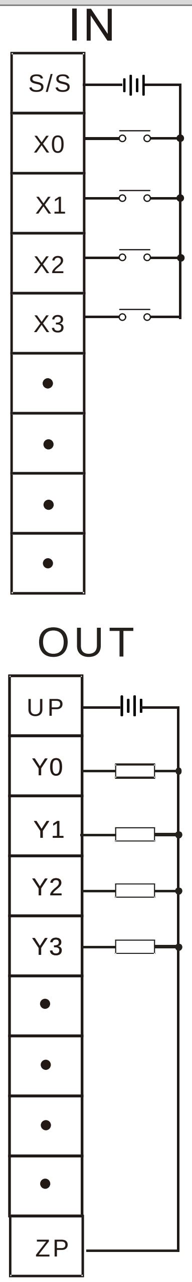
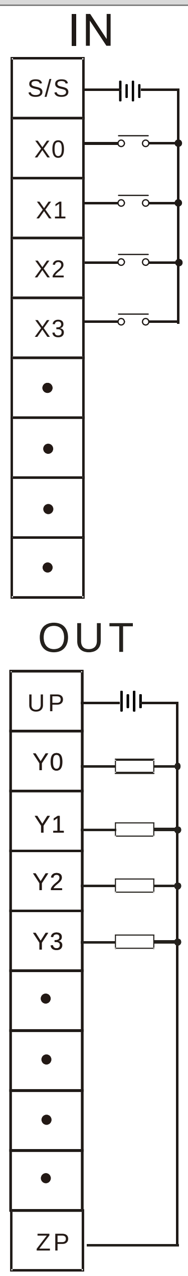
Sinking input and output	Sourcing inputand Sinking output





7.5.16 Wiring DVP08SP11TS

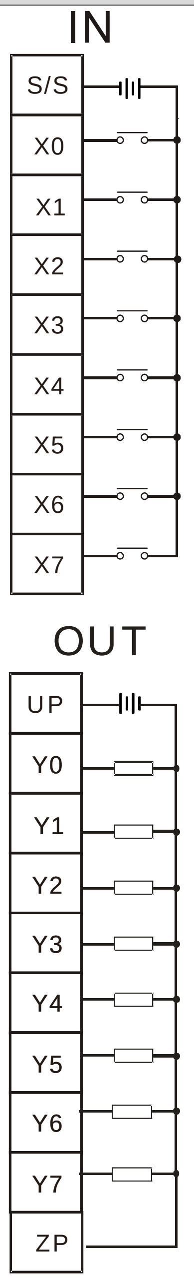
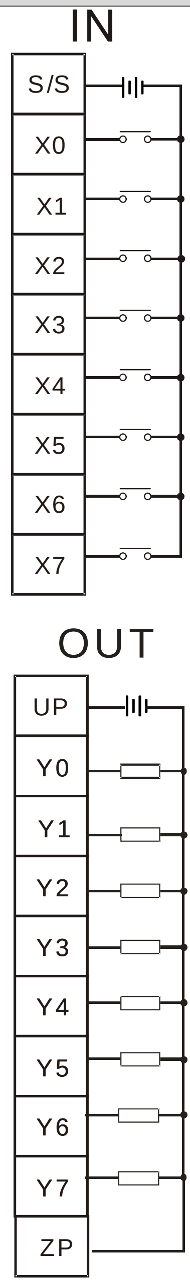
Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC · 5mA
Output form	Transistor-P(sourcing)
Voltage specifications	5~30VDC · 0.3A/output · 2A/COM

Sinking input and Sourcing output	Sourcing input and output
	

Note: You need to add external power supply 24 VDC (-15% ~ +20%) for UP and ZP; power consumption is up to 10 mA.

7.5.17 Wiring DVP16SP11TS

Input form	Direct current (sinking or sourcing)
Voltage specifications	24VDC，5mA
Output form	Transistor-P(sourcing)
Voltage specifications	5~30VDC，0.3A/output，2A/COM

Sinking input and sourcing output	Sourcing input and output
	

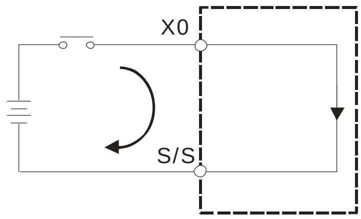
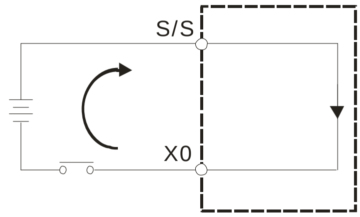
Note: You need to add external power supply 24 VDC (-15% ~ +20%) for UP and ZP; power consumption is up to 15 mA.

7.6 Wiring Digital Input/Output

7.6.1 Wiring Digital Input

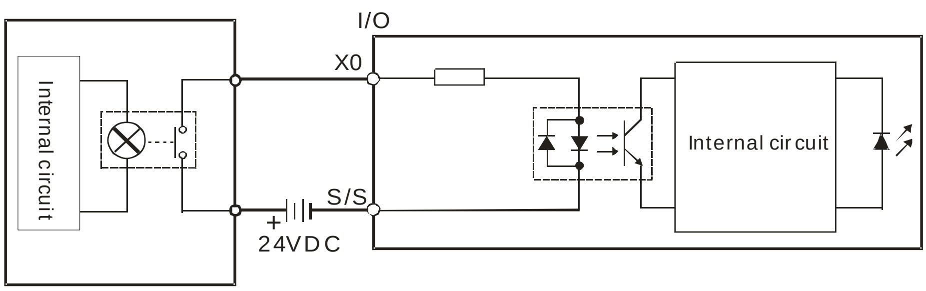
7.6.1.1 Direct Current Power Supply (24 VDC)

When the digital input signal is DC input, there are two DC input types, Sinking and Sourcing. See the definition below.

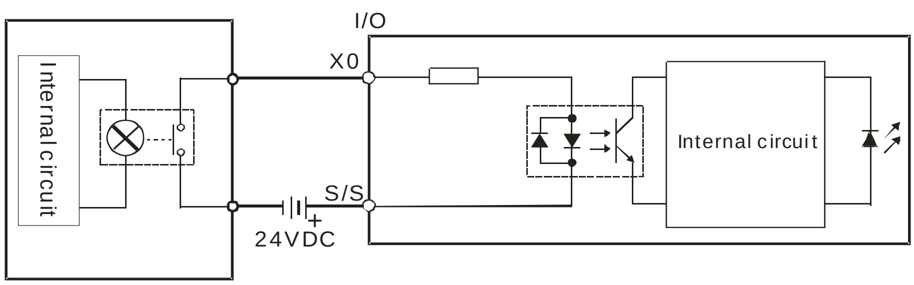
● Sinking Sink=The current flows into the terminal X0.  	● Sourcing Source=The current flows from the terminal X0 

7.6.1.2 Wiring Input V.S. Relay Types

- **Sinking**

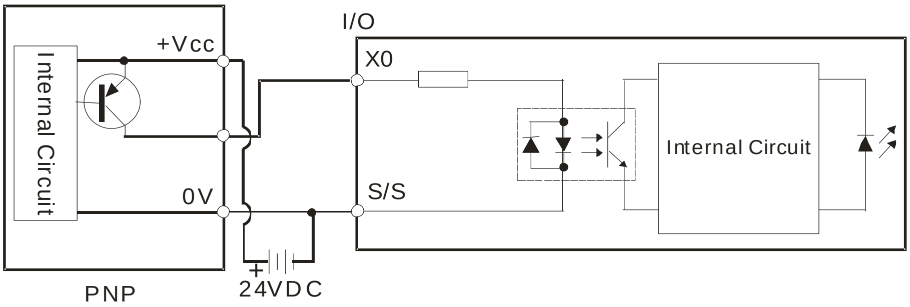


- **Sourcing**

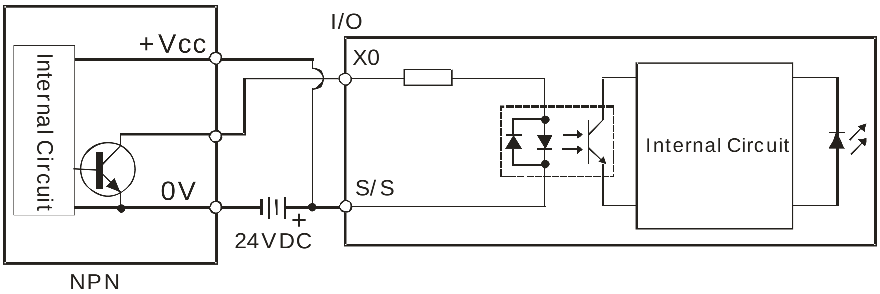


7.6.1.3 Wiring Input V.S. Open-collector Input Types

- **Sinking (PNP input type)**



- **Sourcing (NPN input type)**



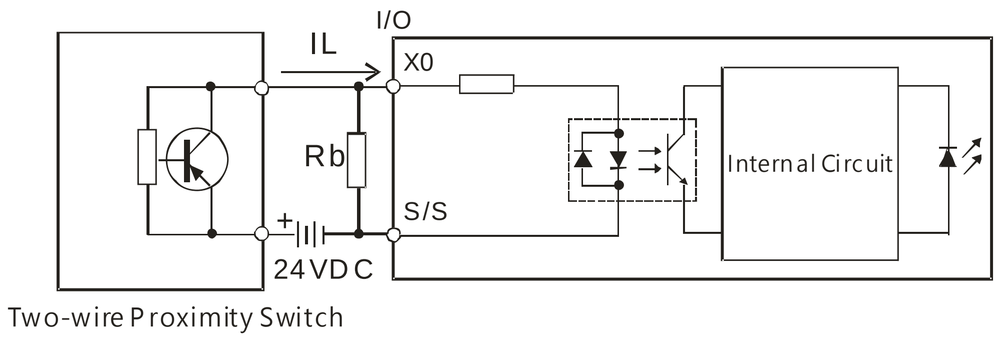
7

7.6.1.4 Wiring Input V.S. Two-Wire Proximity Switch

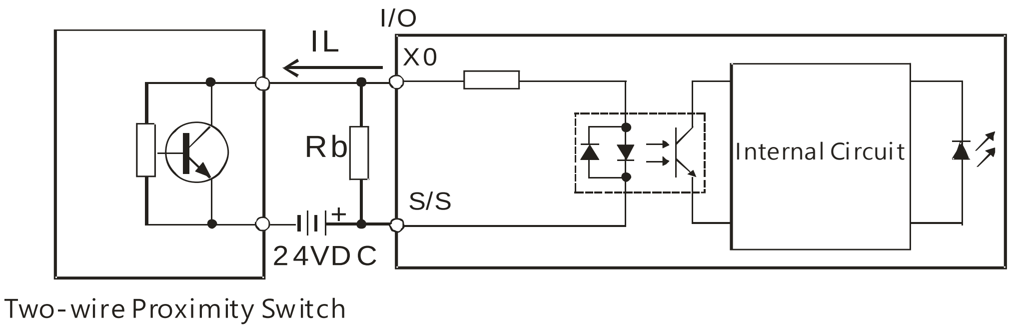
Use the two-wire proximity switch whose leakage current I_L is less than 1.5 mA when the switch is OFF. If the leakage current I_L is larger than 1.5 mA, connect the divider resistance Rb using the formula below.

$$Rb \le \frac{6}{IL - 1.5} \quad (\text{k}\Omega)$$

- **Sinking**

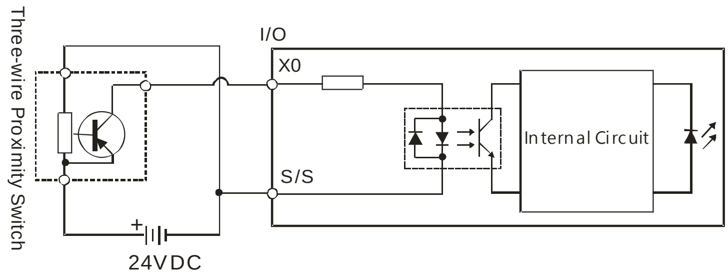


- **Sourcing**

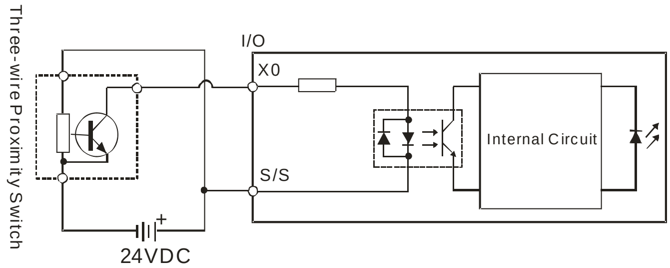


7.6.1.5 Wiring Input V.S. Three-Wire Proximity Switch

- **Sinking**

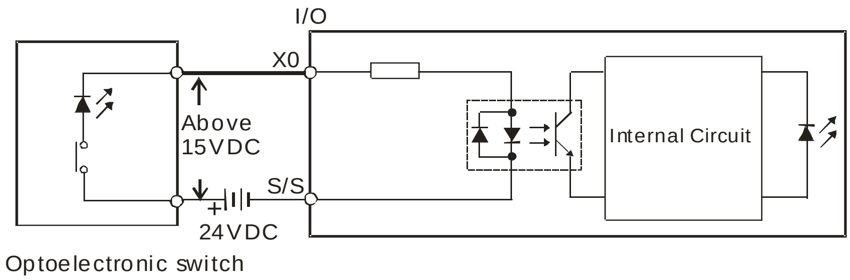


- **Sourcing**

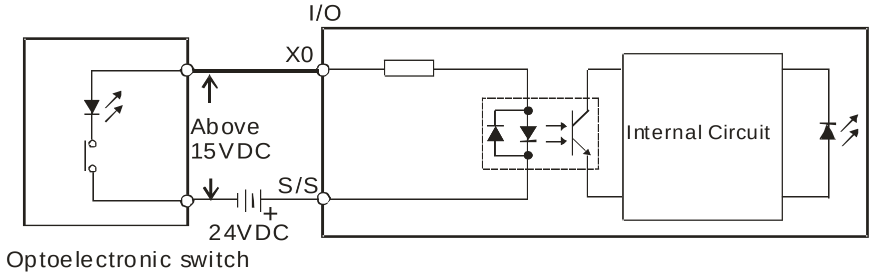


7.6.1.6 Wiring Input V.S. Optoelectronic Switch

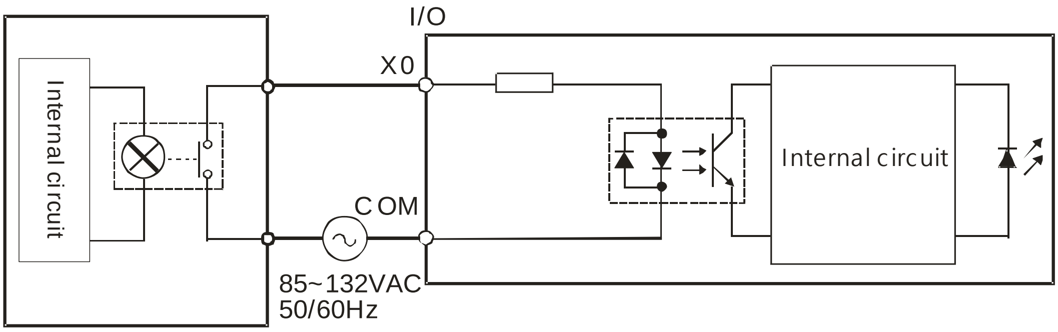
- **Sinking**



- **Sourcing**



7.6.1.7 Alternating Current Power Supply (Applicable to DVP08SM10N)



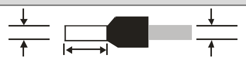
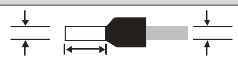
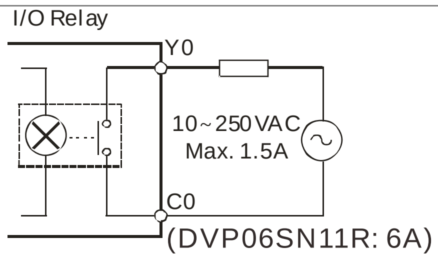
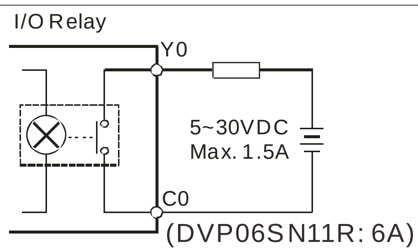
7.6.2 Wiring Digital Output

7.6.2.1 Output Circuits

There are three types of output units: relay outputs and transistor outputs (NPN and PNP).

1. **Relay output**

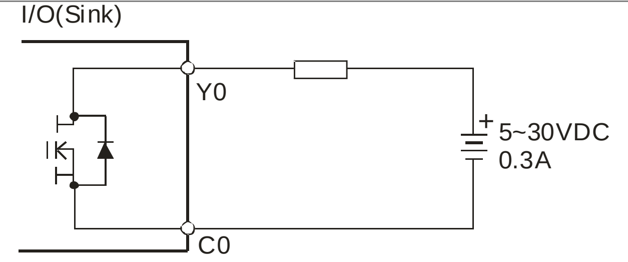
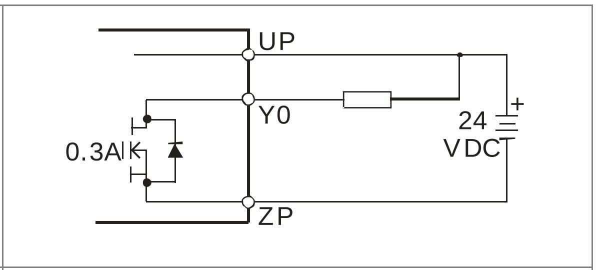
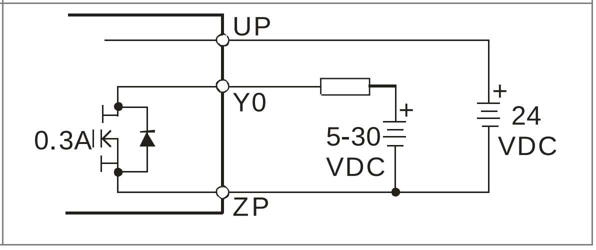
   Relay output wiring requires different wire sizes depending on the provided power type, as specified in the diagram. The terminal screw torque at the PLC is 2.0 kgf-cm (1.77 lbf-in). Only copper wires rated for 60/75°C can be used.

	AC power supply	DC power supply
Terminal Specifications	 **< 2 mm 6-8 mm 18-16 AWG**	 **< 2 mm 6-8 mm 24-16 AWG**
Wiring		

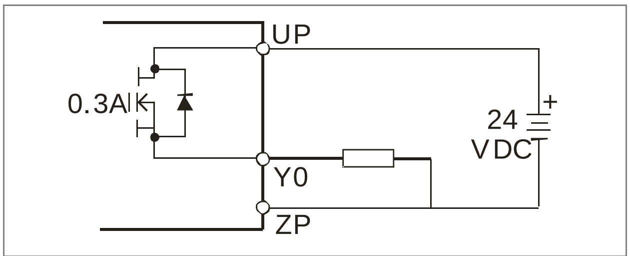
*1. The relay output terminals within the common point COM (those with the same color in the diagram below) should use the same voltage (10~240VAC or 5~24VDC).

C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7

2. **NPN Transistor output**

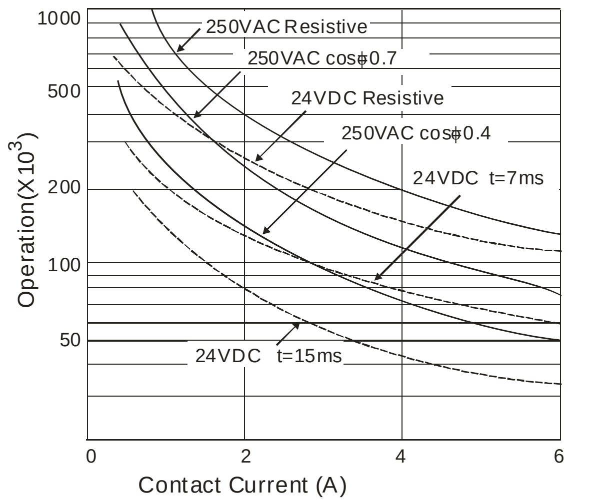
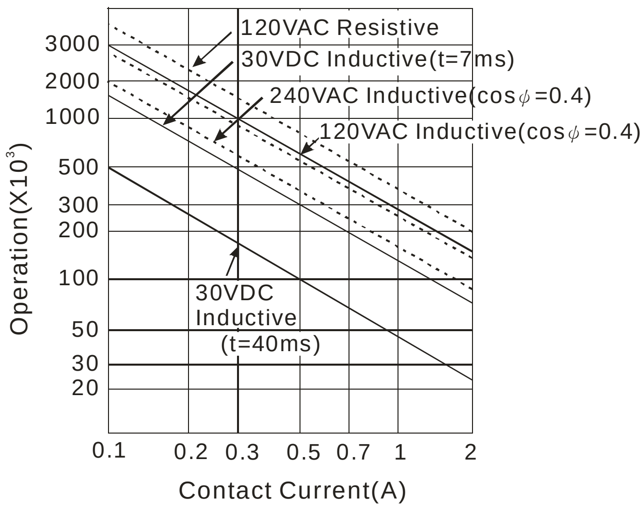
3. **PNP Transistor output**



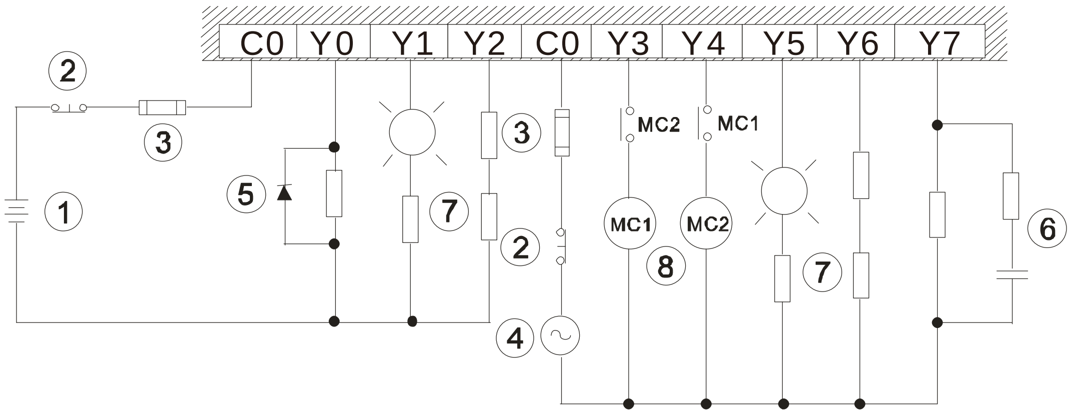
7.6.2.2 Relay Output Circuit

Relay terminals have no polarity. They can be used with alternating current that passes through a load, or with direct current that passes through a load. The maximum current that can pass through every relay terminal of DVP06SN11R is 6 A, same as the maximum current that can pass through common terminal.

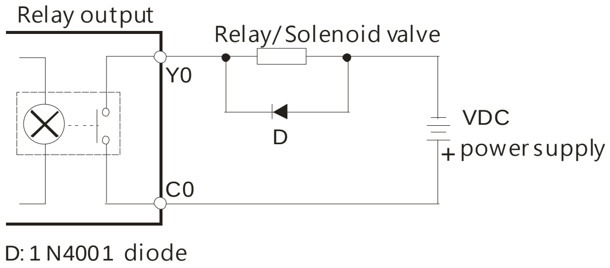
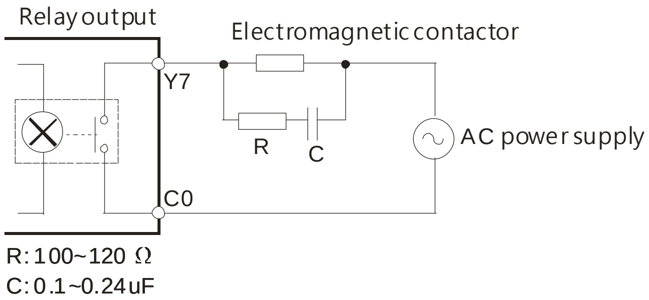
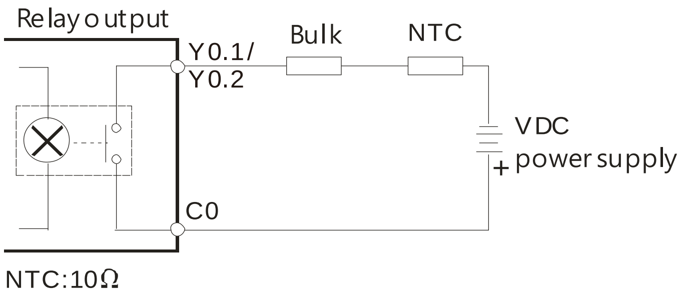
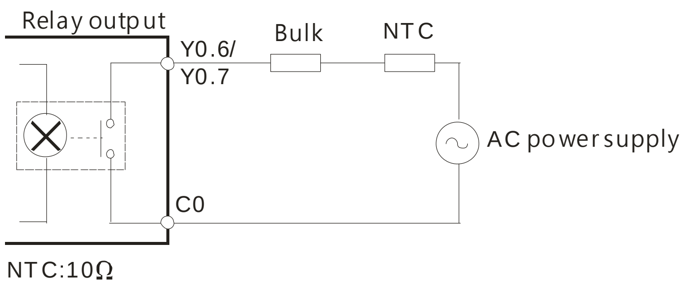
For other models, the maximum current that can pass through every relay terminal is 1.5A, and the maximum current that can pass through common terminal is 5A. The lifetime of a relay terminal varies with the working voltage, the load type (the power factor cosψ), and the current passing through the terminal. The relation is shown in the life cycle curve below.

<table>
<tr><td>1. Only applicable to DVP06SN11R</td><td>2. Applicable to all module models (except DVP06SN11R)</td></tr>
<tr><td>
</td><td>
</td></tr>
</table>

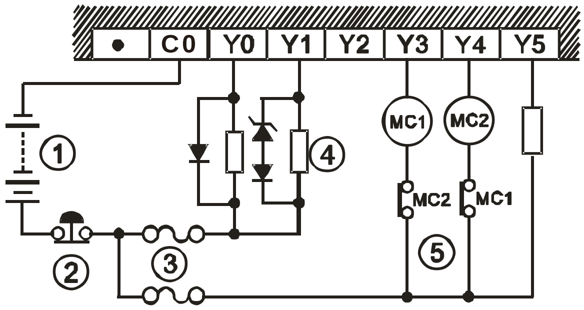
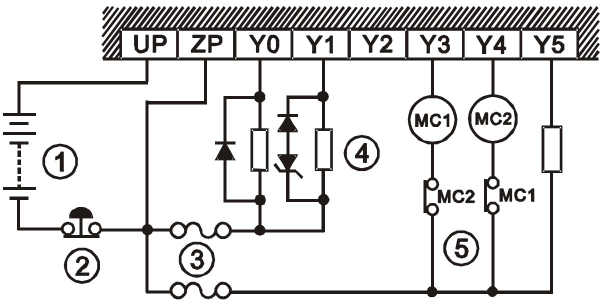
- **Relay output circuit**

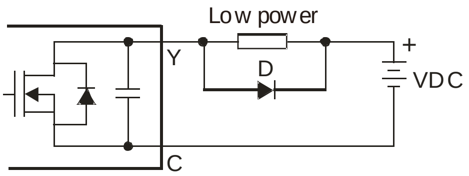
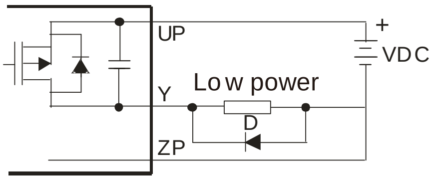
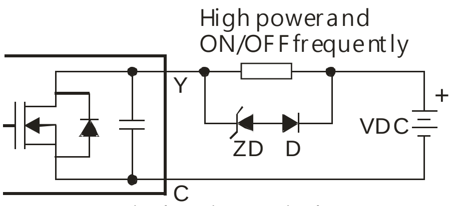
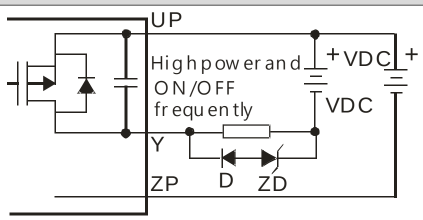


①	Direct-current power supply
②	Emergency stop using an external switch.
③	Fuse: to protect the output circuit, a fuse having a breaking capacity between 5 A to 8 A is connected to the common terminal.(DVP06SN11R utilizes 6~9A)
④	Alternating-current power supply

⑤	A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage that occurs when the load is OFF. 
⑥	An electromagnetic contactor is used as an AC load. A resistor and a capacitor are connected in parallel to absorb the surge voltage that occurs when the load is OFF. 
⑦	A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current that occurs when the load is ON.  A bulb (neon lamp) is used as an AC load. A thermistor is connected in series to absorb the surge current that occurs when the load is ON. 
⑧	Mutually exclusive output: For example, Y0.3 controls the clockwise rotation of the motor, and Y0.4 controls the counterclockwise rotation of the motor. This interlock circuit and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

7.6.2.3 Transistor Output Circuit

NPN	PNP
	

<table>
<tr><td>①</td><td colspan="2">Direct-current power supply</td></tr>
<tr><td>②</td><td colspan="2">Emergency stop</td></tr>
<tr><td>③</td><td colspan="2">Fuse</td></tr>
<tr><td rowspan="6">④</td><td colspan="2">1. A diode is connected in parallel to absorb the surge voltage: used in low-power situations.</td></tr>
<tr><td>NPN</td><td>PNP</td></tr>
<tr><td>D: 1N4001Diode or its equivalent</td><td>D: 1N4001Diode or its equivalent</td></tr>
<tr><td colspan="2">2. A diode and Zener are connected in parallel to absorb the surge voltage: used in high-power and power-on/off frequently situations.</td></tr>
<tr><td>NPN</td><td>PNP</td></tr>
<tr><td>D: 1N4001Diode or its equivalent
ZD: 9V Zener, 5W</td><td>D: 1N4001Diode or its equivalent
ZD: 9V Zener, 5W</td></tr>
<tr><td>⑤</td><td colspan="2">Mutually exclusive output: For example, Y3 controls the clockwise rotation of the motor, and Y4 controls the counterclockwise rotation of the motor. This interlock circuit and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.</td></tr>
</table>

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Chapter 8 DVP-S Series Analog Input/Output Module

Table of Contents

8.1 General Specifications

8.1.1 DVP04AD-S2 / DVP06AD-S Specifications

- **Electrical specifications**

Module name	DVP04AD-S2	DVP06AD-S
Number of inputs	4	6
Analog input channel	4 channel/each module	6 channel/each module
Analog-to-digital conversion	Voltage input / Current input	
Supply voltage	24VDC (20.4VDC~28.8VDC) (-15%~+20%)	
Connector type	Removable terminal block	
Conversion time	3ms/channel	
Connect to DVP PLC CPU	Up to 8 modules can be connected and no digital I/O will be taken. Numbering is from 0 to 7 in a consecutive order; the one closes to the PLC CPU is 0.	
Weight	90g	91g

- **Functional specifications**

Analog/digital module	Voltage input		Current input	
Rated input range	±10V	-6~10V	±20mA	-12~20mA
Digital conversion range	±8,000	±8,000	±4,000	±4,000
Hardware input limit*1	±10.1V	-6.08~10.08V	±20.2mA	-12.16~20.16mA
Digital conversion limit*2	±8,192	±8,192	±4,096	±4,096
Hardware resolution	14 bits	14 bits	13 bits	13 bits
DVP06AD-S Input impedance	200KΩ		250Ω	
DVP04AD-S2 Input impedance	≧1MΩ		250Ω	
Absolute input range*3	±15V		±32mA	
Digital data format	16-bits two's complement number			
Average function	Yes, 04AD-S2:CR#2 ~ CR#5; 06AD-S: CR#2 ~ CR#7, setting range: K1 ~ K20			
Self-diagnosis function	Detecting if exceeding upper and lower limits or channel disconnection.			
Overall Accuracy	25° C / 77° F: The allowed error range is ±0.5% of full scale. 0° C to 55° C / 32° F to 131° F: The allowed error range is ±1% of full scale.			
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500VAC Isolation between an analog circuit and a ground: 500VAC Isolation between an analog circuit and a digital circuit: 500VAC Isolation between the 24 VDC and a ground: 500VAC			

*1. If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value.

*2. If the input signal exceeds the hardware input limit, it also exceeds the digital conversion limit, and a conversion limit error appears. For example, in the voltage input mode (-10 V to +10 V), when the input signal is -10.25 V, exceeding the hardware lower limit, it also exceeds the conversion lower limit. The module uses the lower limit value (-8192) as the input signal and a conversion limit error appears.

*3. If an input signal exceeds the absolute range, it might damage the channel.

8.1.2 DVP02DA-S/ DVP04DA-S2 Specifications

- **Electrical specifications**

Module name	DVP02DA-S	DVP04DA-S2
Number of outputs	2	4
Analog-to-digital conversion	Voltage output / Current output	
Supply voltage	24VDC (20.4~28.8VDC) (-15%~+20%)	
Connector type	Removable terminal block	
Short circuit protection	The module is with short circuit protection, but if the duration of a short circuit is too long, it can cause circuit damage. Current output can be open circuit.	
Connect to DVP-PLC CPU	Up to 8 modules can be connected and no digital I/O will be taken. Numbering is from 0 to 7 in a consecutive order; the one closes to the PLC CPU is 0.	
Weight	89g	94g

- **Functional specifications**

Analog/digital module	Voltage output		Current output	
Rated output range	0~10V	2~10V	0~20mA	4~20mA
Digital conversion range	0~+4,000	0~+4,000	0~+4,000	0~+4,000
Digital conversion limit	0~+4,095	0~+4,095	0~+4,095	0~+4,095
Hardware resolution	12 bits	12 bits	12 bits	12 bits
Maximum output current	10mA		-	
Load impedance	≧1KΩ		≦500Ω	
Output impedance	≦0.5Ω		≧1MΩ	
Overall accuracy	25° C / 77° F: The allowed error range is ±0.5% of full scale. 0° C to 55° C / 32° F to 131° F: The allowed error range is ±1% of full scale.			
Response time	3ms/channel			
Digital data format	16-bits two's complement number			
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VAC. Isolation between an analog circuit and a ground: 500 VAC. Isolation between an analog circuit and a digital circuit: 500 VAC. Isolation between the 24 VDC and a ground: 500 VAC.			

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8.1.3 DVP06XA-S2 specifications

- **Electrical/common specification**

Module name	DVP06XA-S2
Number of inputs/outputs	Input: 4 / output: 2
Analog-to-digital conversion	Voltage input/current input/voltage output/ current output
Supply voltage	24VDC (20.4~28.8VDC) (-15%~+20%)
Digital data format	16-bits two's complement number
Response time	3ms/channel
Overall accuracy	25° C / 77° F: The allowed error range is ±0.5% of full scale. 0° C to 55° C / 32° F to 131° F: The allowed error range is ±1% of full scale.
Connector type	Removable terminal block
Connect to DVP-PLC CPU	Up to 8 modules can be connected and no digital I/O will be taken. Numbering is from 0 to 7 in a consecutive order; the one closes to the PLC CPU is 0
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500VAC Isolation between an analog circuit and a ground: 500VAC Isolation between an analog circuit and a digital circuit: 500VAC Isolation between the 24 VDC and a ground: 500VAC
Weight	91g

- **A/D Functional specifications**

	Voltage input		Current input	
Analog input channel	4 channel/each module			
Rated input range	±10V	-6~10V	±20mA	-12~20mA
Digital conversion range	±2,000	±2,000	±1,000	±1,000
Hardware resolution	12 bits	12 bits	11 bits	11 bits
06XA-S2 input impedance	≧1MΩ		250Ω	
Absolute input range*1	±15V		±32mA	
Average function	Yes, CR#2 ~ CR#5, setting range: K1 ~ K20.			
Self-diagnosis function	Detecting if exceeding upper and lower limits or channel disconnection.			

*1. If an input signal exceeds the absolute range, it might damage the channel.

- **D/A Functional specifications**

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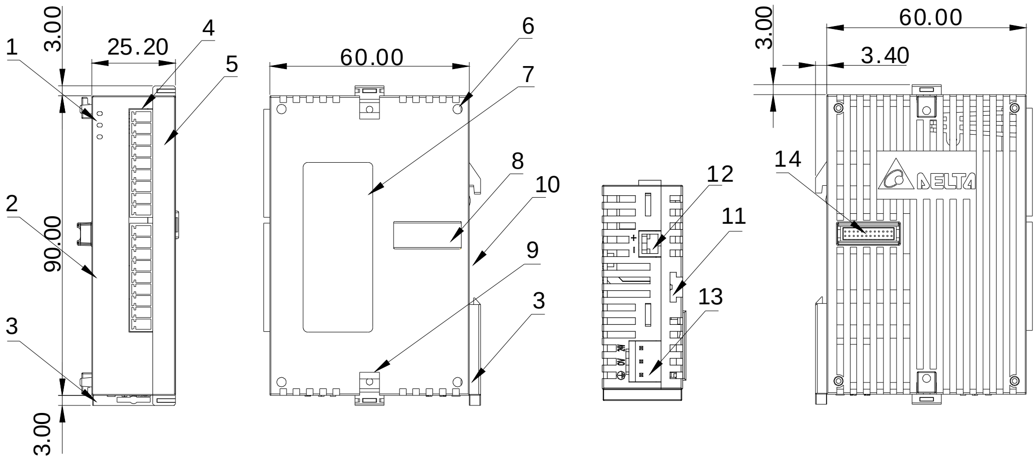
Analog/digital module	Voltage output		Current output	
Analog output channel	2 channel/each module			
Rated output range	0~10V	2~10V	0~20mA	4~20mA
Digital conversion range	0~+4,000	0~+4,000	0~+4,000	0~+4,000
Digital conversion limit	0~+4,095	0~+4,095	0~+4,095	0~+4,095
Hardware resolution	12bits	12bits	12bits	12bits
Maximum output current	10mA		-	
Load impedance	≧1KΩ		≦500Ω	
Output impedance	≦0.5Ω		≧1MΩ	
Short circuit protection	The module is with short circuit protection, but if the duration of a short circuit is too long, it can cause circuit damage. Current output can be open circuit.			

8.2 Module Profiles



Unit: mm

No.	Name	Description
1	Power LED indicator	Indicates the status of the power supply. ON: the power is on OFF: no power
	Run LED indicator	Indicates the operating status of the module
	ERROR LED indicator	Error status of the module. ON: A serious module error has occurred OFF: the module is normal. Blinking (0.2 seconds ON/OFF): A non-serious module error occurs, can NOT operate normally
2	Model name	Model name of the module
3	DIN rail securing clip	Secure the module on the set
4	I/O Terminals	The inputs are connected to sensors. The outputs are connected to loads to be driven.
5	Terminal number	Terminal number
6	Extension unit positioning hole	For positioning between modules
7	Nameplate	Label of the module
8	Extension module connection port	Connect the modules
9	Extension unit fixing clip	For securing the extension module.
10	DIN rail slot(35mm)	For the DIN rail.
11	Securing module slot	for securing the extension module.
12	RS-485communication port	Provide RS-485 communication wiring
13	Power input port	Expansion unit power input.
14	Extension port	Connect the PLC or the modules.

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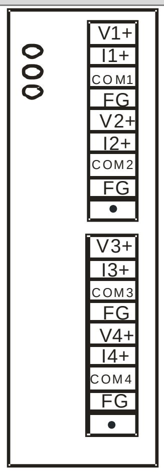
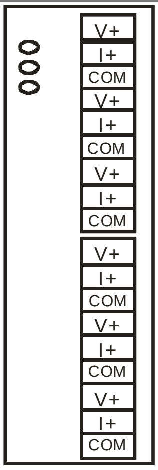
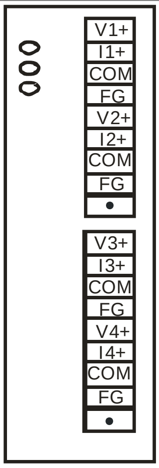
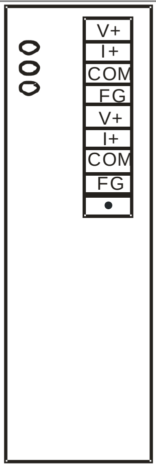
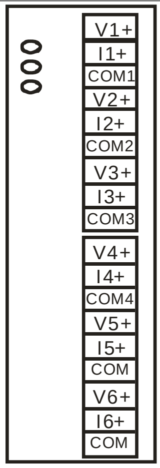
8.3 Terminals

<table>
<tr><th>DVP04AD-S2</th><th>DVP06AD-S</th><th>DVP04DA-S2</th><th>DVP02DA-S</th><th>DVP06XA-S2</th></tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</table>

8.4 Control Register

8.4.1 DVP04AD-S2 Control Register

<table>
<tr><th rowspan="2">CR#</th><th rowspan="2">RS-485 Parameter address</th><th rowspan="2" colspan="2">Latched</th><th rowspan="2">Register name</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><th colspan="4">Reserved</th><th colspan="3">CH4</th><th colspan="3">CH3</th><th colspan="3">CH2</th><th colspan="3">CH1</th></tr>
<tr><td>0</td><td>H’4000</td><td>○</td><td>R</td><td>Model type</td><td colspan="16">For system use. Data length: 8 bits (b7 ~ b0)
Model code of DVP04AD-S2: H’90
Users can read the model type by means of a program to check if the expansion module exists.</td></tr>
<tr><td>1</td><td>H’4001</td><td>○</td><td>R/W</td><td>Input mode setting</td><td colspan="16">Input mode setting: The factory setting is H0000.
Mode0：Voltage input mode（-10~+10V）
Mode1：Voltage input mode（-6~+10V）
Mode2：current input mode（-12~+20mA）
Mode3：current input mode（-20~+20mA）
Mode7：Disabling a channel</td></tr>
<tr><td colspan="21">CR#1: used to set 4 internal channels working mode of analog input module. Every channel has four modes that can be set individually. For example: if set CH1 to mode 0 (b2 ~ b0 = 000), CH2 to mode 1 (b5 ~ b3 = 001), CH3: mode 2 (b8 ~ b6 = 010), CH4: mode 3 (b11 ~ b9 = 011). Then CR#1 is set to H’0688 and the upper bits (b12 ~ b15) will be reserved. The factory setting of CR#1 is H’0000.</td></tr>
<tr><td>2</td><td>H’4002</td><td>○</td><td>R/W</td><td>CH1average times</td><td colspan="16" rowspan="4">Average times setting of channels CH1 ~ CH4.
Setting range is K1 ~ K20 and factory setting is K10.</td></tr>
<tr><td>3</td><td>H’4003</td><td>○</td><td>R/W</td><td>CH2average times</td></tr>
<tr><td>4</td><td>H’4004</td><td>○</td><td>R/W</td><td>CH3average times</td></tr>
<tr><td>5</td><td>H’4005</td><td>○</td><td>R/W</td><td>CH4average times</td></tr>
<tr><td>6</td><td>H’4006</td><td>×</td><td>R</td><td>Average value of CH1 input signal</td><td colspan="16" rowspan="4">Display average value of CH1 ~ CH4 input signal.
The default value is 10, that is, the average value of the CH1/CH2/CH3/CH4 input signal is calculated every 10 times.</td></tr>
<tr><td>7</td><td>H’4007</td><td>×</td><td>R</td><td>Average value of CH2 input signal</td></tr>
<tr><td>8</td><td>H’4008</td><td>×</td><td>R</td><td>Average value of CH3 input signal</td></tr>
<tr><td>9</td><td>H’4009</td><td>×</td><td>R</td><td>Average value of CH4 input signal</td></tr>
<tr><td>12</td><td>H’400C</td><td>×</td><td>R</td><td>present value of CH1 input signal</td><td colspan="16" rowspan="4">Display present value of CH1 ~ CH4 input signal.</td></tr>
<tr><td>13</td><td>H’400D</td><td>×</td><td>R</td><td>present value of CH2 input signal</td></tr>
<tr><td>14</td><td>H’400E</td><td>×</td><td>R</td><td>present value of CH3 input signal</td></tr>
<tr><td>15</td><td>H’400F</td><td>×</td><td>R</td><td>present value of CH4 input signal</td></tr>
<tr><td>18</td><td>H’4012</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH1</td><td colspan="16" rowspan="4">Offset setting of CH1 ~ CH4. Factory setting is K0, and unit is LSB.
Voltage input: setting range is K-4,000 ~ K4,000.
Current input: setting range is K-4,000 ~ K4,000.</td></tr>
<tr><td>19</td><td>H’4013</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH2</td></tr>
<tr><td>20</td><td>H’4014</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH3</td></tr>
<tr><td>21</td><td>H’4015</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH4</td></tr>
<tr><td>24</td><td>H’4018</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH1</td><td colspan="16" rowspan="2">GAIN setting of CH1 ~ CH4. Factory setting is K4,000 and unit is LSB.
Voltage input: setting range is K-3,200 ~ K16,000.</td></tr>
<tr><td>25</td><td>H’4019</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH2</td></tr>
</table>

8

<table>
<tr><th rowspan="2">CR#</th><th rowspan="2">RS-485 Parameter address</th><th rowspan="2" colspan="2">Latched</th><th rowspan="2">Register name</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><th colspan="4">Reserved</th><th colspan="3">CH4</th><th colspan="3">CH3</th><th colspan="3">CH2</th><th colspan="3">CH1</th></tr>
<tr><td>26</td><td>H’401A</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH3</td><td colspan="16" rowspan="2">Current input: setting range is K-3,200 ~ K10,400.</td></tr>
<tr><td>27</td><td>H’401B</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH4</td></tr>
<tr><td colspan="21">CR#18~CR#27: Please notice that GAIN value – OFFSET value=+800 LSB ~ +12,000LSB (voltage) or +800 LSB ~ +6,400 LSB (current). If the value difference comes up small (within range), the output signal resolution is then slim, and the variation is definitely larger. On the contrast, if the value difference exceeds the range, the output signal resolution becomes larger, and the variation is definitely smaller.</td></tr>
<tr><td>30</td><td>H’401E</td><td>╳</td><td>R</td><td>Error status</td><td colspan="16">The data register to save all error status. Please refer to error code chart for detail.</td></tr>
</table>

CR#30： Error status value (see the table below)

Error description	Value	b15~b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Abnormal power	K1（H’1）	Reserved	0	0	0	0	0	0	0	0	0	0	0	1
Mode error	K4（H’4）		0	0	0	0	0	0	0	0	0	1	0	0
Offset/gain error	K8（H’8）		0	0	0	0	0	0	0	0	1	0	0	0
Abnormal digital value	K32（H’20）		0	0	0	0	0	0	1	0	0	0	0	0
Incorrect number of values averaged	K64（H’40）		0	0	0	0	0	1	0	0	0	0	0	0
Instruction error	K128（H’80）		0	0	0	0	1	0	0	0	0	0	0	0
The input received by CH1 out of the range	K256（H’100）		0	0	0	1	0	0	0	0	0	0	0	0
The input received by CH2 out of the range	K512（H’200）		0	0	1	0	0	0	0	0	0	0	0	0
The input received by CH3 out of the range	K1024（H’400）		0	1	0	0	0	0	0	0	0	0	0	0
The input received by CH4 out of the range	K2048（H’800）		1	0	0	0	0	0	0	0	0	0	0	0

Note: Each error code corresponds to a bit (b0 ~ b11). Two or more errors may happen at the same time. 0 means normal, and 1 means there is an error.

<table>
<tr><td>31</td><td>H’401F</td><td>○</td><td>R/W</td><td>Communication address setting</td><td>Setting RS-485 communication address. Setting range is 01 ~ 254 and factory setting is K1.</td></tr>
<tr><td>32</td><td>H’4020</td><td>○</td><td>R/W</td><td>Communication format setting</td><td>Set the communication format.
For baud rate, the settings are 4,800/9,600/19,200/38,400/57,600/115,200 bps.
Communication format:<u>DVP04AD-S2</u>
ASCII：7 E 1、7 O 1、7 N 1、8 E 1、8 O 1、8 N 1、
7 E 2、7 O 2、7 N 2、8 E 2、8 O 2、8 N 2
RTU：8 E 1、8 O 1、8 N 1、8 E 2、8 O 2、8 N 2
Factory default: ASCII,9600,7,E,1 (CR#32=H’0002)
Refer to ※CR#32 communication format settings at the end of this table for more information.</td></tr>
<tr><td>33</td><td>H’4021</td><td>○</td><td>R/W</td><td>Reset to factory setting and set characteristics adjustable priority</td><td>Factory setting is H’0000. Take CH1 setting for example:
1. When b0=0, user can set OFFSET and GAIN value of CH1 (CR#18, CR#24). When b0=1, inhibits user to adjust OFFSET and GAIN value of CH1 (CR#18, CR#24).
2. b1 means if characteristic register is latched. b1=0 (factory setting, latched), b1=1 (not latched).
3. When b2 is set to 1, all settings will be reset to factory setting.</td></tr>
<tr><td colspan="6">CR#33 is used to set the internal function priority. For example: characteristic register. Output latched function will save output setting in the internal memory before power loss.</td></tr>
</table>

8

<table>
<tr><th rowspan="2">CR#</th><th rowspan="2">RS-485 Parameter address</th><th rowspan="2" colspan="2">Latched</th><th rowspan="2">Register name</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><th colspan="4">Reserved</th><th colspan="3">CH4</th><th colspan="3">CH3</th><th colspan="3">CH2</th><th colspan="3">CH1</th></tr>
<tr><td>34</td><td>H’4022</td><td>○</td><td>R</td><td>Firmware version</td><td colspan="16">In hexadecimal to display software version. For example: H’010A means 1.0A.</td></tr>
<tr><td colspan="4">35~48</td><td colspan="17">System used.</td></tr>
<tr><td colspan="21">Symbols:
○ means latched.
╳ means not latched.
R means can read data by using FROM instruction or RS-485.
W means can write data by using TO instruction or RS-485.LSB（Least Significant Bits）:
1. Voltage input:1_{LSB}=10V/8,000=1.25mV
2. Current input:1_{LSB}=20mA/4,000=5μA</td></tr>
</table>

※Added the RESET function for 04AD-S2 with firmware V4.16 or later. Connect the module power input to 24 VDC and write H’4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.

※ The corresponding parameters address H’4000 ~ H’4022 of CR#0 ~ CR#34 are provided for users to read/ write data via RS-485 communication.

※ Function codes: 03’H is for reading data from registers. 06’H is for writing a word data into registers. 10’H is for writing multiple word data into registers.

※ If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example, transferring the address “H’4000” of CR#0 in hexadecimal format to decimal format, to have the result 16384 and then adding one to it, you have 16385, the Modbus address in decimal format.

※ DVP04AD-S2 CR#32communication format settings: for modules with firmware V4.14 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H’00XX) and for RTU mode, the format is fixed to 8, E, 1 (H’C0xx/H’80xx). For modules with firmware V4.15 or later, refer to the following table for setups. Note that the original code H’C0XX/H’80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.15 or later.

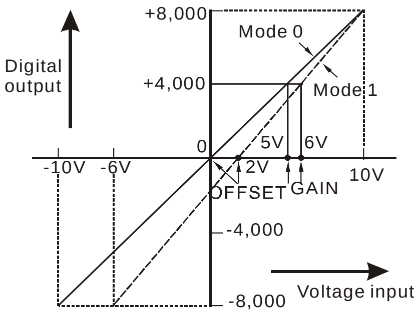
b15~b12		b11~b8		b7~b0	
ASCII/RTU exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7 · E · 1*1	H'01	4800bps
H'8	RTU · do NOT exchange low and high byte of CRC check code	H'1	8 · E · 1	H'02	9600bps
		H'2	7 · N · 1*1	H'04	19200bps
H'C	RTU · do NOT exchange low and high byte of CRC check code	H'3	8 · N · 1	H'08	38400bps
		H'4	7 · O · 1*1	H'10	57600bps
		H'5	8 · O · 1	H'20	115200bps
		H'6	7 · E · 2*1		
		H'7	8 · E · 2		
		H'8	7 · N · 2*1		
		H'9	8 · N · 2		
		H'A	7 · O · 2*1		
		H'B	8 · O · 2		

Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

*1. This is only available for ASCII format.

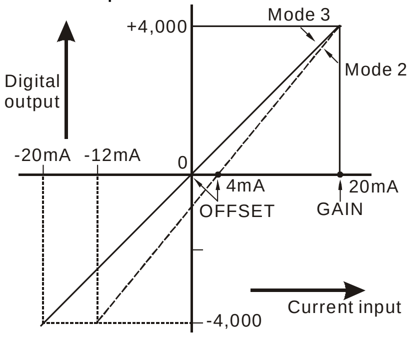
- **Adjust A/D Conversion Characteristic Curves**

Voltage input mode:



Mode 0 of CR#1:	GAIN=5V (4,000LSB), OFFSET=0V (0LSB).
Mode 1 of CR#1:	GAIN=6V (4,800LSB), OFFSET=2V (1,600LSB).
GAIN:	Voltage input value when digital output is 4,000 Setting range is -3,200LSB ~ +16,000LSB.
OFFSET:	Voltage input value when digital output is 0 Setting range: -4,000LSB ~ +4,000LSB.
GAIN－OFFSET:	Setting range is +800LSB ~ +12,000LSB.

Current input mode:



Mode 2 of CR#1:	GAIN=20mA (4,000LSB), OFFSET=4mA (800LSB).
Mode 3 of CR#1:	GAIN=20mA (4,000LSB), OFFSET=0mA (0LSB).
GAIN:	Current input value when digital output is +4,000. Setting range is -3,200LSB ~ +10,400LSB.
OFFSET:	Current input value when digital output value is 0. Setting range is -4,000LSB ~ +4,000LSB.
GAIN－OFFSET:	Setting range is +800LSB ~ +6,400LSB.

The chart above is to adjust A/D conversion characteristic curve of voltage input mode and current input mode. Users can adjust conversion characteristic curve by changing OFFSET values (CR#18 ~ CR#21) and GAIN values (CR#24 ~ CR#27) depend on application.

8.4.2 DVP04DA-S2 Control Register

<table>
<tr><th>CR#</th><th>RS-485 Parameter address</th><th colspan="2">Latched</th><th>Register name</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><td>0</td><td>H’4032</td><td>○</td><td>R</td><td>Model type</td><td colspan="16">For system use.Data length: 8 bits (b7 ~ b0)
Model code of DVP04DA-S2: H’91
Users can read the model type by means of a program to check if the expansion module exists.</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">H’4033</td><td rowspan="2">○</td><td rowspan="2">R/W</td><td rowspan="2">Output mode setting</td><td colspan="4">Reserved</td><td colspan="3">CH4</td><td colspan="3">CH3</td><td colspan="3">CH2</td><td colspan="3">CH1</td></tr>
<tr><td colspan="16">Input mode setting: The factory setting is H’0000.
Mode 0: Voltage output mode (0V ~ +10V)
Mode 1: Voltage output mode (2V ~ +10V)
Mode 2: Current output mode (4mA ~ +20mA)
Mode 3: Current output mode (0mA ~ +20mA)</td></tr>
<tr><td colspan="21">CR#1: used to set 2 internal channels working mode of analog output module. Every channel has four modes that can be set individually. For example: if set CH1 to mode 2 (b2 ~ b0 = 010), CH2 to mode 1 (b5 ~ b3 = 001), CH3: mode 0 (b8 ~ b6 = 000), CH4: mode 0 (b11 ~ b9 = 000). Then CR#1 is set to H’000A and the upper bits (b12 ~ b15) will be reserved. The factory setting of CR#1 is H’0000.</td></tr>
<tr><td>6</td><td>H’4038</td><td>×</td><td>R/W</td><td>CH1output value</td><td colspan="16" rowspan="4">The output value of CH1~CH4, setting range: K0~K4,000.
The factory setting is K0, unit is LSB.</td></tr>
<tr><td>7</td><td>H’4039</td><td>×</td><td>R/W</td><td>CH2output value</td></tr>
<tr><td>8</td><td>H’403A</td><td>×</td><td>R/W</td><td>CH3output value</td></tr>
<tr><td>9</td><td>H’403B</td><td>×</td><td>R/W</td><td>CH4output value</td></tr>
<tr><td>18</td><td>H’4044</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH1</td><td colspan="16" rowspan="4">Offset setting of CH1 ~ CH4. Setting range: K-2,000~K2,000.
Factory setting is K0 and unit is LSB.
Voltage setting range is -2,000 ~ +2,000.
Current setting range is -2,000 ~ +2,000.(LSB)</td></tr>
<tr><td>19</td><td>H’4045</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH2</td></tr>
<tr><td>20</td><td>H’4046</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH3</td></tr>
<tr><td>21</td><td>H’4047</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH4</td></tr>
<tr><td>24</td><td>H’404A</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH1</td><td colspan="16" rowspan="4">GAIN setting of CH1 ~ CH4. Setting range: K0~K4,000.
Factory setting is K2,000 and unit is LSB.
Voltage setting range is 0 ~ +4,000.
Current setting range is 0 ~ +4,000.(LSB)</td></tr>
<tr><td>25</td><td>H’404B</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH2</td></tr>
<tr><td>26</td><td>H’404C</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH3</td></tr>
<tr><td>27</td><td>H’404D</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH4</td></tr>
<tr><td colspan="21">CR#18~CR#27: Please notice that GAIN value – OFFSET value=+400 LSB ~ +6,000LSB (voltage or current). If the value difference comes up small (within range), the output signal resolution is then slim and the variation is definitely larger. On the contrast, if the value difference exceeds the range, the output signal resolution becomes larger, and the variation is definitely smaller.</td></tr>
<tr><td>30</td><td>H’4050</td><td>×</td><td>R</td><td>Error status</td><td colspan="16">Data register to save all error status. Please refer to error code chart for detail.</td></tr>
</table>

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CR#	RS-485 Parameter address	Latched		Register name	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

CR#30：Error status value (see the table below)

Error description	Value	b15~b8	b7	b6	b5	b4	b3	b2	b1	b0
Abnormal power	K1（H'1）	Reserved	0	0	0	0	0	0	0	1
Scale over error	K2（H'2）		0	0	0	0	0	0	1	0
Mode error	K4（H'4）		0	0	0	0	0	1	0	0
Offset/gain error	K8（H'8）		0	0	0	0	1	0	0	0
Abnormal digital value	K32（H'20）		0	0	1	0	0	0	0	0
Incorrect number of values averaged	K64（H'40）		0	1	0	0	0	0	0	0
Instruction error	K128（H'80）		1	0	0	0	0	0	0	0

Note: Each error code corresponds to a bits(b0 ~ b7). Two or more errors may happen at the same time. 0 means normal, and 1 means there is an error.

Ex: When the digital input exceeds 4000, the scale over (K2) error will be displayed; when the analog output exceeds 10V, Abnormal digital value (K32) and scale over (K2) error states will be displayed at the same time.

CR#	RS-485 Parameter address	Latched		Register name	b15~b0
31	H'4051	○	R/W	Communication address setting	Setting RS-485 communication address. Setting range is 01 ~ 254 and factory setting is K1.
32	H'4052	○	R/W	Communication format setting	Used to set communication format. For baud rate, the settings are 4,800/9,600/19,200/38,400/57,600/115,200 bps. Communication format: <u>DVP04DA-S2</u> ASCII：7 E 1 · 7 O 1 · 7 N 1 · 8 E 1 · 8 O 1 · 8 N 1 · 7 E 2 · 7 O 2 · 7 N 2 · 8 E 2 · 8 O 2 · 8 N 2 RTU：8 E 1 · 8 O 1 · 8 N 1 · 8 E 2 · 8 O 2 · 8 N 2 Factory default: ASCII,9600,7,E,1 (CR#32=H'0002) Refer to ※CR#32 communication format settings at the end of this table for more information.
33	H'4053	○	R/W	Reset to factory setting and set characteristics adjustable priority	Reserved | CH4 | CH3 | CH2 | CH1 Factory setting is H'0000.Take CH1 setting for example: 1. When b0=0, user can set OFFSET and GAIN value of CH1 (CR#18, CR#24). When b0=1, inhibits user to adjust OFFSET and GAIN value of CH1 (CR#18, CR#24). 2. b1 means if characteristic register is latched. b1=0 (factory setting, latched), b1=1 (not latched). 3. When b2 is set to 1, all settings will be reset to factory setting.

CR#33 is used to set the internal function priority. For example: characteristic register. Output latched function will save output setting in the internal memory before power loss.

CR#	RS-485 Parameter address	Latched		Register name	b15~b0
34	H'4054	○	R	Firmware version	In hexadecimal to display software version. For example: H'010A means 1.0A.
35~48				System used	

Symbols:

○ Means latched.

╳ Means not latched.

R means can read data by using FROM instruction or RS-485.

W means can write data by using TO instruction or RS-485.

LSB(Least Significant Bits):

1. Voltage output: 1_{LSB} =10V/4,000=2.5mV
2. Current output:1_{LSB} =20mA/4,000=5μA

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※ Added the RESET function for 04AD-S2 with firmware V4.16 or later. Connect the module power input to 24 VDC and write H’4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.

※ The corresponding parameters address H’4032 ~ H’4054 of CR#0 ~ CR#34 are provided for users to read/ write data via RS-485 communication.

※ Function codes: 03’H is for reading data from registers. 06’H is for writing a word data into registers. 10’H is for writing multiple word data into registers

※ If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example, transferring the address “H’4032” of CR#0 in hexadecimal format to decimal format, to have the result 16434 and then adding one to it, you have 16435, the Modbus address in decimal format.

※ DVP04DA-S2 CR#32 communication format settings: for modules with firmware V4.14 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H’00XX) and for RTU mode, the format is fixed to 8, E, 1 (H’C0xx/H’80xx). For modules with firmware V4.15 or later, refer to the following table for setups. Note that the original code H’C0XX/H’80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.15 or later.

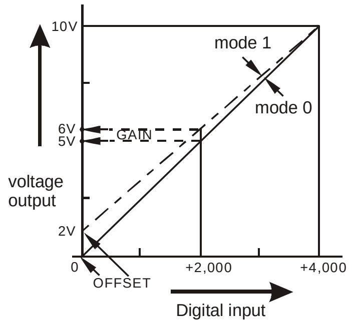
<table>
<tr><th colspan="2">b15~b12</th><th colspan="2">b11~b8</th><th colspan="2">b7~b0</th></tr>
<tr><td colspan="2">ASCII/RTU
exchange low and high byte of CRC check code</td><td colspan="2">Data format</td><td colspan="2">Baud rate</td></tr>
<tr><th colspan="6">Description</th></tr>
<tr><td>H'0</td><td>ASCII</td><td>H'0</td><td>7, E, 1*1</td><td>H'01</td><td>4800 bps</td></tr>
<tr><td rowspan="2">H'8</td><td rowspan="2">RTU,
do NOT exchange low and high byte of CRC check code</td><td>H'1</td><td>8, E, 1</td><td>H'02</td><td>9600 bps</td></tr>
<tr><td>H'2</td><td>7, N, 1*1</td><td>H'04</td><td>19200 bps</td></tr>
<tr><td rowspan="2">H'C</td><td rowspan="2">RTU,
do NOT exchange low and high byte of CRC check code</td><td>H'3</td><td>8, N, 1</td><td>H'08</td><td>38400 bps</td></tr>
<tr><td>H'4</td><td>7, O, 1*1</td><td>H'10</td><td>57600 bps</td></tr>
<tr><td rowspan="7"></td><td rowspan="7"></td><td>H'5</td><td>8, O, 1</td><td>H'20</td><td>115200 bps</td></tr>
<tr><td>H'6</td><td>7, E, 2*1</td><td rowspan="6"></td><td rowspan="6"></td></tr>
<tr><td>H'7</td><td>8, E, 2</td></tr>
<tr><td>H'8</td><td>7, N, 2*1</td></tr>
<tr><td>H'9</td><td>8, N, 2</td></tr>
<tr><td>H'A</td><td>7, O, 2*1</td></tr>
<tr><td>H'B</td><td>8, O, 2</td></tr>
</table>

Ex: Write H’C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

Note *1: This is only available for ASCII format.

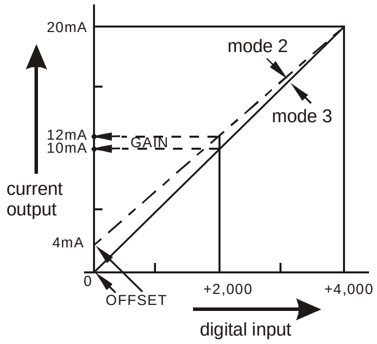
- **Adjusting D/A Conversion Characteristic Curves**

Voltage output mode:



Mode 0 of CR#1:	GAIN=5V (2,000LSB), OFFSET=0V (0LSB) .
Mode 1 of CR#1:	GAIN=6V (2,400LSB), OFFSET=2V (800LSB) .
GAIN：	The setting range of voltage output value when digital input value is K2,000 should be 0LSB ~ +4,000LSB.
OFFSET：	The setting range of voltage output value when digital input value is K0 should be -2,000LSB ~ +2,000LSB.
GAIN - OFFSET：	Setting range: +400LSB ~ +6,000LSB.

Current output mode:



Mode 2 of CR#1:	GAIN=12mA (2,400LSB), OFFSET=4mA (800LSB) .
Mode 3 of CR#1:	GAIN=10mA (2,000LSB), OFFSET=0mA (0LSB) .
GAIN：	The setting range of current output when digital input value is K2,000 should be 0LSB ~ +4,000LSB.
OFFSET：	The setting range of current output when digital input value is K0 should be -2,000LSB ~ +2,000LSB.
GAIN - OFFSET：	Setting range: +400LSB ~ +6,000LSB.

The charts above are D/A conversion characteristic curve of voltage output mode and current output mode. Users can adjust conversion characteristic curve by changing OFFSET values (CR#18 ~ CR#21) and GAIN values (CR#24 ~ CR#27) depend on application.

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8.4.3 DVP06XA-S2 Control Register

<table>
<tr><th rowspan="2">CR#</th><th rowspan="2">RS-485 parameter address</th><th rowspan="2" colspan="2">Latched</th><th rowspan="2">Register name</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><th colspan="2">CH6</th><th colspan="2">CH5</th><th colspan="3">CH4</th><th colspan="3">CH3</th><th colspan="3">CH2</th><th colspan="3">CH1</th></tr>
<tr><td>#0</td><td>H’40C8</td><td>○</td><td>R</td><td>Model type</td><td colspan="16">For system use. Data length: 8 bits (b7 ~ b0)
Model code of DVP06XA-S2: H’D4
Users can read the model type by means of a program to check if the extension module exists.</td></tr>
<tr><td>#1</td><td>H’40C9</td><td>○</td><td>R/W</td><td>Input mode setting</td><td colspan="16">Input mode setting: (CH1 ~ CH4)
Mode 0: Voltage input mode (-10V ~ +10V)
Mode 1: Voltage input mode (-6V ~ +10V)
Mode 2: Current input mode (-12mA ~ +20mA)
Mode 3: Current input mode (-20mA ~ +20mA)
Output mode setting: (CH5 ~ CH6)
Mode 0: Voltage output mode (0V ~ 10V)
Mode 1: Voltage output mode (2V ~ 10V)
Mode 2: Current output mode (4mA ~ 20mA)
Mode 3: Current output mode (0mA ~ 20mA)</td></tr>
<tr><td colspan="21">CR#1: b11~b0 are used to set 4 internal channels working mode of analog input module (AD). b12~b15 are used to set 2 channels working mode of analog output module (DA). Every channel has four modes that can be set individually. For example: if setting CH1 to mode 0 (b2~b0=000), CH2 to mode 1 (b5~b3=001), CH3: mode 2 (b8~b6=010), CH4: mode 3 (b11~b9=011), b0~b11 need be set to H’688. If setting CH5: mode 2 (b13~b12=10), CH6: mode 1 (b15~b14=01), b12~b15 need be set to H’6. Factory Setting is H’0000.</td></tr>
<tr><td>#2</td><td>H’40CA</td><td>○</td><td>R/W</td><td>CH1 average number</td><td colspan="16" rowspan="4">The number of readings used for “average” on channels CH1 ~ CH4. Setting range is K1 ~ K20 and factory setting is K10. Please note that the average number of writes to CR#2~CR#5 only needs to be written once. If written continuously, the average value cannot be obtained.</td></tr>
<tr><td>#3</td><td>H’40CB</td><td>○</td><td>R/W</td><td>CH2 average number</td></tr>
<tr><td>#4</td><td>H’40CC</td><td>○</td><td>R/W</td><td>CH3 average number</td></tr>
<tr><td>#5</td><td>H’40CD</td><td>○</td><td>R/W</td><td>CH4 average number</td></tr>
<tr><td>#6</td><td>H’40CE</td><td>╳</td><td>R</td><td>Average value of CH1 input signal</td><td colspan="16" rowspan="4">Display average value of CH1 ~ CH4 input signal.
Assume that the average number of times is set to 10, that is, an average is taken every 10 accumulated input signals from channels CH1~CH4.</td></tr>
<tr><td>#7</td><td>H’40CF</td><td>╳</td><td>R</td><td>Average value of CH2 input signal</td></tr>
<tr><td>#8</td><td>H’40D0</td><td>╳</td><td>R</td><td>Average value of CH3 input signal</td></tr>
<tr><td>#9</td><td>H’40D1</td><td>╳</td><td>R</td><td>Average value of CH4 input signal</td></tr>
<tr><td>#10</td><td>H’40D2</td><td>╳</td><td>R/W</td><td>CH5 output signal value</td><td colspan="16" rowspan="2">Output value of CH5 ~ CH6, the setting range is K0 ~ K4,000. The factory setting is K0 and the unit is LSB.</td></tr>
<tr><td>#11</td><td>H’40D3</td><td>╳</td><td>R/W</td><td>CH6 output signal value</td></tr>
<tr><td>#12</td><td>H’40D4</td><td>╳</td><td>R</td><td>Present value of CH1 input signal</td><td colspan="16" rowspan="4">Display present value of CH1 ~ CH4 input signal</td></tr>
<tr><td>#13</td><td>H’40D5</td><td>╳</td><td>R</td><td>Present value of CH2 input signal</td></tr>
<tr><td>#14</td><td>H’40D6</td><td>╳</td><td>R</td><td>Present value of CH3 input signal</td></tr>
<tr><td>#15</td><td>H’40D7</td><td>╳</td><td>R</td><td>Present value of CH4 input signal</td></tr>
<tr><td>#18</td><td>H’40DA</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH1</td><td colspan="16" rowspan="4">Offset setting of CH1 ~ CH4. Factory setting is K0 and unit is LSB.
Voltage input: setting range is K-1,000$_{LSB}$ ~ K1,000$_{LSB}$.
Current input: setting range is K-1,000$_{LSB}$ ~ K1,000$_{LSB}$.</td></tr>
<tr><td>#19</td><td>H’40DB</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH2</td></tr>
<tr><td>#20</td><td>H’40DC</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH3</td></tr>
<tr><td>#21</td><td>H’40DD</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH4</td></tr>
</table>

CR#	RS-485 parameter address	Latched		Register name	b15 b14 (CH6) / b13 b12 (CH5) / b11 b10 b9 (CH4) / b8 b7 b6 (CH3) / b5 b4 b3 (CH2) / b2 b1 b0 (CH1)
#22	H'40DE	○	R/W	To adjust OFFSET value of CH5	Offset setting of CH5 ~ CH6. Factory setting is K0 and unit is LSB. The setting range is K-2,000$_{LSB}$ ~ K2,000$_{LSB}$.
#23	H'40DF	○	R/W	To adjust OFFSET value of CH6	
#24	H'40E0	○	R/W	To adjust GAIN value of CH1	GAIN setting of CH1~CH4. Factory setting is K1,000 and unit is LSB. Voltage input: setting range is K-800$_{LSB}$ ~ K4,000$_{LSB}$. Current input: setting range is K-800$_{LSB}$ ~ K2,600$_{LSB}$. Please notice that GAIN VALUE - OFFSET VALUE=+200$_{LSB}$ ~ +3,000$_{LSB}$ (voltage) or +200$_{LSB}$ ~ +1,600$_{LSB}$ (current)
#25	H'40E1	○	R/W	To adjust GAIN value of CH2	
#26	H'40E2	○	R/W	To adjust GAIN value of CH3	
#27	H'40E3	○	R/W	To adjust GAIN value of CH4	
#28	H'40E4	○	R/W	To adjust GAIN value of CH5	GAIN setting of CH5 ~ CH6. Factory setting is K2,000 and unit is LSB. The setting range is K0 ~ K4,000. Please notice that GAIN value – OFFSET value= +400$_{LSB}$ ~ +6,000$_{LSB}$ (voltage or current).
#29	H'40E5	○	R/W	To adjust GAIN value of CH6	
CR#24~CR#29: If the value difference comes up small (within range), the output signal resolution is then slim and the variation is definitely larger. On the contrast, if the value difference exceeds the range, the output signal resolution becomes larger and the variation is definitely smaller.					
#30	H'40E6	×	R	Error status	Data register stores the error status, see error code chart for details.
#31	H'40E7	○	R/W	Communication address setting	RS-485 communication address. Setting range is K1 ~ K254 and factory setting is K1.
#32	H'40E8	○	R/W	Communication format setting	For baud rate, the settings are 4,800 / 9,600 / 19,200 / 38,400 / 57,600 / 115,200 bps. Communication format: For DVP06XA-S2 ASCII：7,E,1 / 7,O,1 / 7,N,1 / 8,E,1 / 8,O,1 / 8,N,1 / 7,E,2 / 7,O,2 / 7,N,2 / 8,E,2 / 8,O,2 / 8,N,2 RTU ：8,E,1 / 8,O,1 / 8,N,1 / 8,E,2 / 8,O,2 / 8,N,2 Factory default: ASCII,9600,7,E,1 (CR#32=H'0002) Refer to ※CR#32 communication format settings at the end of this table for more information.
#33	H'40E9	○	R/W	Reset to factory setting and set characteristics adjustable priority	Example: Setting of CH1 1. When b0=0, user can set OFFSET and GAIN value of CH1 (CR#18, CR#24). When b0=1, inhibits user to adjust OFFSET and GAIN value of CH1 (CR#18, CR#24). 2. b1 means if characteristic register is latched. b1=0 (factory setting, latched), b1=1 (not latched). 3. b2: Set to 1 and PLC will be reset to factory settings. The setting of CH5 ~ CH6, give CH5 setting for example (b13, b12): 00: can be adjusted, latched. 01: can be adjusted, non-latched.(DVP06XA-S2 do NOT support this function, always remain latched.) 10: inhibits adjust. 11: reset to factory settings and clear b12, b13 to 0.
CR#33 is used to set the internal function priority. For example: characteristic register. Output latched function will save output setting in the internal memory before power loss.					
#34	H'40EA	○	R	Software version	Display software version in hexadecimal. Example: H'010A=version 1.0A.
#35 ~ #48					System used
Symbols: ○ means latched. R means can read data by using FROM instruction or RS-485. × means non-latched. W means can write data by using TO instruction or RS-485. LSB (Least Significant Bits): 1. Voltage input: 1$_{LSB}$=10V/2,000=5mV. 2. Current input: 1$_{LSB}$=20mA/1,000=20µA. 1. Voltage output: 1$_{LSB}$=10V/4,000=2.5mV. 2. Current output: 1$_{LSB}$=20mA/4,000=5µA.					

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※ Added the RESET function for 06XA-S2 with firmware V4.16 or later. Connect the module power input to 24 VDC and write H’4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.

※ The corresponding parameters address H’40C8 ~ H’40EA of CR#0 ~ CR#34 will allow user to read/write data via RS-485 communication.

※ Function codes: 03’H is for reading data from registers. 06’H is for writing a word data into registers. 10’H is for writing multiple word data into registers.

CR#30 is the error code. Please refer to the chart below.

Error Description	Value	b15~ b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Abnormal power	K1 (H’1)	Reserved	0	0	0	0	0	0	0	0	0	0	0	1
The D/A output exceeds the range.	K2 (H’2)		0	0	0	0	0	0	0	0	0	0	1	0
Mode error	K4 (H’4)		0	0	0	0	0	0	0	0	0	1	0	0
Offset/gain error	K8 (H’8)		0	0	0	0	0	0	0	0	1	0	0	0
Hardware malfunction	K16 (H’10)		0	0	0	0	0	0	0	1	0	0	0	0
Abnormal digital value	K32 (H’20)		0	0	0	0	0	0	1	0	0	0	0	0
Incorrect number of values averaged	K64 (H’40)		0	0	0	0	0	1	0	0	0	0	0	0
Instruction error	K128 (H’80)		0	0	0	0	1	0	0	0	0	0	0	0
The input received by CH1 is out of the range.	K256 (H’100)		0	0	0	1	0	0	0	0	0	0	0	0
The input received by CH2 is out of the range.	K512 (H’200)		0	0	1	0	0	0	0	0	0	0	0	0
The input received by CH3 is out of the range.	K1024 (H’400)		0	1	0	0	0	0	0	0	0	0	0	0
The input received by CH4 is out of the range.	K2048 (H’800)		1	0	0	0	0	0	0	0	0	0	0	0

Note: Each error code corresponds to a bits(b0 ~ b11).

Two or more errors may happen at the same time. 0 means there normal, and 1 means there is an error.

Example: If the digital input exceeds 4,000, the error K2 will occur.

If the analog output exceeds 10V, the errors K2 and K32 will occur. (A/D does not support displaying the error K2.)

※ If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example, transferring the address “H’40C8” of CR#0 in hexadecimal format to decimal format, to have the result 16584 and then adding one to it, you have 16585, the Modbus address in decimal format.

※ DVP06XA-S2 CR#32 communication format settings: for modules with firmware V4.14 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H’00XX) and for RTU mode, the format is fixed to 8, E, 1 (H’C0xx/H’80xx). For modules with firmware V4.15 or later, refer to the following table for setups. Note that the original code H’C0XX/H’80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.15 or later.

b15 ~ b12		b11 ~ b8		b7 ~ b0	
ASCII/RTU exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7,E,1*1	H'01	4800 bps
H'8	RTU, do not exchange low and high byte of CRC check code	H'1	8,E,1	H'02	9600 bps
		H'2	7,N,1*1	H'04	19200 bps
H'C	RTU, exchange low and high byte of CRC check code	H'3	8,N,1	H'08	38400 bps
		H'4	7,O,1*1	H'10	57600 bps
		H'5	8.O,1	H'20	115200 bps
		H'6	7,E,2*1		
		H'7	8,E,2		
		H'8	7,N,2*1		
		H'9	8,N,2		
		H'A	7,O,2*1		
		H'B	8.O,2		

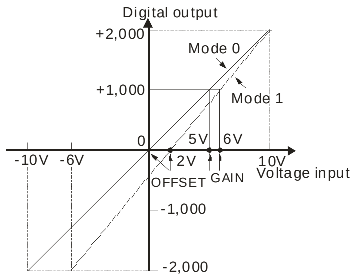
Note *1: This is only available for ASCII format.

Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

- **Analog/Digital Curves**

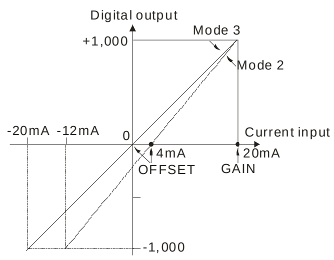
▪ **Adjusting the A/D Conversion Curves of CH1~Ch4**

Voltage input mode:



Mode 0 of CR#1:	GAIN=5V ($1,000_{LSB}$) · OFFSET=0V (0_{LSB}) .
Mode 1 of CR#1:	GAIN=6V ($1,200_{LSB}$) · OFFSET=2V (400_{LSB}) .
GAIN :	Voltage input value when digital output is 1,000. Setting range is -800_{LSB} ~ $+4,000_{LSB}$.
OFFSET :	Voltage input value when digital output is 0. Setting range is $-1,000_{LSB}$ ~ $+1,000_{LSB}$
GAIN - OFFSET :	Setting range is $+200_{LSB}$~$+3,000_{LSB}$

Current input mode:

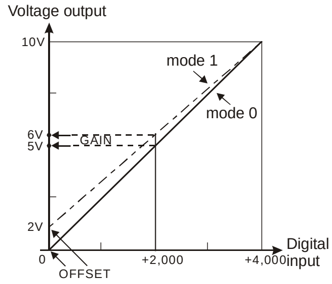


Mode 2 of CR#1:	GAIN=20mA ($1,000_{LSB}$) · OFFSET=4mA (200_{LSB}) .
Mode 3 of CR#1:	GAIN=20mA ($1,000_{LSB}$) · OFFSET=0mA (0_{LSB}) .
GAIN :	Current input value when digital output is +1,000. Setting range is -800_{LSB} ~ $+2,600_{LSB}$
OFFSET :	Current input value when digital output value is 0. Setting range is $-1,000_{LSB}$ ~ $+1,000_{LSB}$
GAIN-OFFSET :	Setting range is $+200_{LSB}$~$+1,600_{LSB}$

Use the chart above to adjust A/D conversion characteristic curve of voltage input mode and current input mode. Users can adjust conversion characteristic curve by changing OFFSET values (CR#18~CR#21) and GAIN values (CR#24~CR#27) according to application.

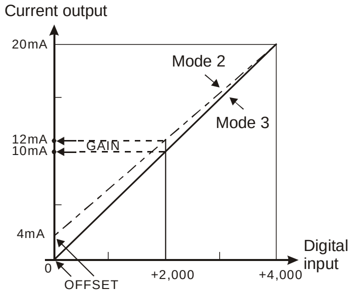
■ **Adjust the D/A Conversion Curves of CH5~CH6**

Voltage output mode:



Mode 0 of CR#1:	GAIN=5V (2,000LSB) · OFFSET=0V (0LSB) .
Mode 1 of CR#1:	GAIN=6V (2,400LSB) · OFFSET=2V (800LSB) .
GAIN：	Voltage output value when digital input value is K2,000. Setting range is 0LSB ~ +4,000LSB.
OFFSET：	Voltage output value when digital input is K0. Setting range is -2,000LSB ~ +2,000LSB.
GAIN-OFFSET：	Setting range is +400LSB~+6,000LSB

Current output mode:



Mode 2 of CR#1:	GAIN=12mA (2,400LSB) · OFFSET=4mA (800LSB) .
Mode 3 of CR#1:	GAIN=10mA (2,000LSB) · OFFSET=0mA (0LSB) .
GAIN：	Current output value when digital input value is K2,000. Setting range is 0LSB ~ +4,000LSB.
OFFSET：	Current output value when digital input is K0. Setting range is -2,000LSB ~ +2,000LSB.
GAIN-OFFSET：	Setting range is +400LSB~+6,000LSB

Use the chart above to adjust D/A conversion characteristic curve of voltage output mode and current output mode. Users can adjust conversion characteristic curve by changing OFFSET values (CR#14~CR#15) and GAIN values (CR#18~CR#19) according to application.

8.4.4 DVP02DA-S Control Register

<table>
<tr><th>CR#</th><th>RS-485 parameters address</th><th colspan="2">Latched</th><th>Register name</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><td>#0</td><td>H’4032</td><td>○</td><td>R</td><td>Model type</td><td colspan="16">System used, data length is 8 bits (b7 ~ b0).
DVP-02DA model code=H’49.
User can read the data from program to check if there is extension module.</td></tr>
<tr><td rowspan="2">#1</td><td rowspan="2">H’4033</td><td rowspan="2">○</td><td rowspan="2">R/W</td><td rowspan="2">Output mode setting</td><td colspan="10">Reserved</td><td colspan="3">CH2</td><td colspan="3">CH1</td></tr>
<tr><td colspan="16">Output mode setting: default setting is H’0000.
Mode 0: voltage output mode (0V ~ 10V).
Mode 1: voltage output mode (2V ~ 10V).
Mode 2: current output mode (4mA ~ 20mA).
Mode 3: current output mode (0mA ~ 20mA).
Mode 4: none use.</td></tr>
<tr><td colspan="21">CR#1: used to set two internal channels working mode of analog output module. Every channel has four modes that can be set individually. For example: if set CH1 to mode 2 (b2 ~ b0 = 010), CH2 to mode 1 (b5 ~ b3 = 001). It needs to set CR#1 to H’000A and the upper bits (b6 ~ b15) will be reserved.</td></tr>
<tr><td>#10</td><td>H’403C</td><td>×</td><td>R/W</td><td>CH1 output value</td><td colspan="16" rowspan="2">The output value of CH1~CH2, setting range is K0 ~ K4,000. Default setting is K0 and unit is LSB.</td></tr>
<tr><td>#11</td><td>H’403D</td><td>×</td><td>R/W</td><td>CH2 output value</td></tr>
<tr><td>#22</td><td>H’4048</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH1</td><td colspan="16" rowspan="2">It is used to set the OFFSET value of CH1 ~ CH2.
The setting range is K-2,000 ~ K2,000.
The default setting is K0 and unit is LSB.</td></tr>
<tr><td>#23</td><td>H’4049</td><td>○</td><td>R/W</td><td>To adjust OFFSET value of CH2</td></tr>
<tr><td>#28</td><td>H’404E</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH1</td><td colspan="16" rowspan="2">It is used to set the GAIN value of CH1 ~ CH2.
The setting range is K0 ~ K4,000.
The default setting is K2,000 and unit is LSB.</td></tr>
<tr><td>#29</td><td>H’404F</td><td>○</td><td>R/W</td><td>To adjust GAIN value of CH2</td></tr>
<tr><td colspan="21">CR#22~CR#29: Please be noticed that GAIN value – OFFSET value=+400$_{LSB}$ ~+6,000$_{LSB}$ (voltage or current). When this value within this range, the resolution of the output signal will be thin and the value variation will be larger. When this value exceeds this range, the resolution of output signal will be thick and the variation of value will be smaller.</td></tr>
<tr><td>#30</td><td>H’4050</td><td>×</td><td>R</td><td>Error status</td><td colspan="16">The data register to save all error status. Please refer to error code chart for detail.</td></tr>
<tr><td colspan="21">CR#30 is the error code. Please refer to the following chart.</td></tr>
</table>

Error description	Content	b15 ~ b8	b7	b6	b5	b4	b3	b2	b1	b0
Power source abnormal	K1 (H’1)	Reserved	0	0	0	0	0	0	0	1
Analog input value error	K2 (H’2)		0	0	0	0	0	0	1	0
Setting mode error	K4 (H’4)		0	0	0	0	0	1	0	0
Offset/gain error	K8 (H’8)		0	0	0	0	1	0	0	0
Digital range error	K32 (H’20)		0	0	1	0	0	0	0	0
Average times setting error	K64 (H’40)		0	1	0	0	0	0	0	0
Instruction error	K128 (H’80)		1	0	0	0	0	0	0	0

Note: Each error code will have corresponding bits (b0 ~ b7). Two or more errors may happen at the same time. 0 means normal and 1 means error happened.

EX: if the digital input exceeds 4,000, error (K2) will occur. If the analog output exceeds 10V, both analog input value error K2 and K32 will occur.

CR#	RS-485 parameters address	Latched		Register name	
#31	H’4051	○	R/W	Communication address setting	It is used to set RS-485 communication address. The setting range is from 01 to 254 and the default setting is K1.

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<table>
<tr><th>CR#</th><th>RS-485 parameters address</th><th colspan="2">Latched</th><th>Register name</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><td>#32</td><td>H’4052</td><td>○</td><td>R/W</td><td>Communication format setting</td><td colspan="16">It is used to set communication format.
For baud rate, the settings are 4,800/9,600/19,200/38,400/57,600/115,200 bps.
Communication format:
ASCII：7,E,1 / 7,O,1 / 8,E,1 / 8,O,1 / 8,N,1
RTU ：8,E,1 / 8,O,1 / 8,N,1
Factory default: ASCII,9600,7,E,1 (CR#32=H’0002)
Refer to ※CR#32 communication format settings at the end of this table for more information.</td></tr>
<tr><td rowspan="2">#33</td><td rowspan="2">H’4053</td><td rowspan="2">○</td><td rowspan="2">R/W</td><td rowspan="2">Reset to default setting and set characteristics adjustable priority</td><td colspan="12">Reserved</td><td colspan="2">CH2</td><td colspan="2">CH1</td></tr>
<tr><td colspan="16">Output latched setting, default setting H’0000.
Give CH1 setting for example:
1. When b0=0, user can set OFFSET and GAIN value of CH1 (CR#22, CR#28). When b1=1, inhibits user to adjust OFFSET and GAIN value of CH1 (CR#22, CR#28).
2. b1 means if characteristic register is latched. b1=0 (default setting, latched), b1=1 (not latched).
3. When b2 is set to 1, all settings will be reset to default setting.</td></tr>
<tr><td colspan="21">CR#33 is used to set the internal function priority. For example: characteristic register. Output latched function will save output setting to the internal memory before power loss.</td></tr>
<tr><td>#34</td><td>H’4054</td><td>○</td><td>R</td><td>Firmware version.</td><td colspan="16">In hexadecimal to display software version. For example: H’010A means 1.0A.</td></tr>
<tr><td colspan="4">#35 ~ #48</td><td colspan="17">System used</td></tr>
<tr><td colspan="21">Symbols: ○ means latched.
╳ means not latched.
R means can read data by using FROM instruction via RS-485.
W means can write data by using TO instruction via RS-485.
LSB (Least Significant Bits): 1. Voltage output: 1_{LSB}=10V/4,000=2.5mV.
2. Current output: 1_{LSB}=20mA/4,000=5μA.</td></tr>
</table>

※ Added the RESET function for modules with firmware V4.06 or later. Connect the module power input to 24 VDC and write H’4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.

※ The corresponding parameters address H’4032 ~ H’4054 of CR#0 ~ CR#34 are provided for users to read/ write data via RS-485 communication.

※ If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example, transferring the address “H’4032” of CR#0 in hexadecimal format to decimal format, to have the result 16434 and then adding one to it, you have 16435, the Modbus address in decimal format.

※ Function codes: 03’H is for reading data from registers. 06’H is for writing a word data into registers. 10’H is for writing multiple word data into registers.

※ CR#32 communication format settings: for modules with firmware V4.04 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H’00XX) and for RTU mode, the format is fixed to 8, E, 1 (H’C0xx/H’80xx). For modules with firmware V4.05 or later, refer to the following table for setups. Note that the original code H’C0XX/H’80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.05 or later.

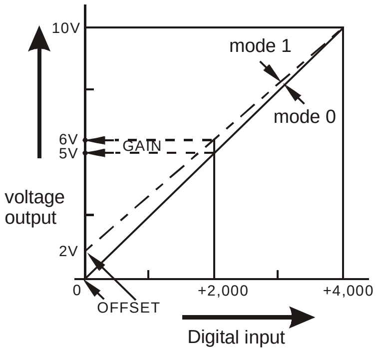
b15 ~ b12		b11 ~ b8		b7 ~ b0	
ASCII/RTU, exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7,E,1*1	H'01	4800 bps
H'8	RTU, do not exchange low and high byte of CRC check code	H'1	8,E,1	H'02	9600 bps
		H'2	reserved	H'04	19200 bps
H'C	RTU, exchange low and high byte of CRC check code	H'3	8,N,1	H'08	38400 bps
		H'4	7,O,1*1	H'10	57600 bps
		H'5	8.O,1	H'20	115200 bps

Note *1: This is only available for ASCII format.

Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

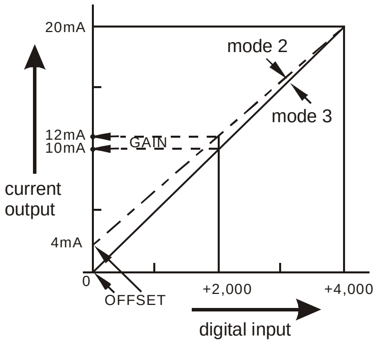
- **Adjust D/A Conversion Curve**

Voltage output mode:



Mode 0 of CR#1:	GAIN=5V (2,000 LSB)، OFFSET=0V (0 LSB)
Mode 1 of CR#1:	GAIN=6V (2,400 LSB)، OFFSET=2V (800 LSB)
GAIN：	The setting range of voltage output value when digital input value is K2,000 should be 0LSB ~ +4,000LSB.
OFFSET：	The setting range of voltage output value when digital input value is K0 should be -2,000LSB ~ +2,000LSB.
GAIN - OFFSET：	Setting range: +400 LSB~+6,000 LSB

Current output mode:



Mode 2 of CR#1:	GAIN=12mA (2,400 LSB)، OFFSET=4mA (800 LSB)
Mode 3 pf CR#1:	GAIN=10mA (2,000 LSB)، OFFSET=0mA (0 LSB)
GAIN：	The setting range of current output when digital input value is K2,000 should be 0LSB ~ +4,000LSB.
OFFSET：	The setting range of current output when digital input value is K0 should be -2,000LSB ~ +2,000LSB.
GAIN - OFFSET：	Setting range: +400 LSB~+6,000 LSB

The charts above are D/A conversion characteristic curve of voltage output mode and current output mode. Users can adjust conversion characteristic curve by changing OFFSET values (CR#14 ~ CR#15) and GAIN values (CR#18 ~ CR#19) depend on application.

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8.4.5 DVP06AD-S Control Register

<table>
<tr><th>CR #</th><th>RS-485 parameter address</th><th colspan="2">Latched</th><th>Register content</th><th>b15</th><th>b14</th><th>b13</th><th>b12</th><th>b11</th><th>b10</th><th>b9</th><th>b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><td>#0</td><td>H’4000</td><td>○</td><td>R</td><td>Model name</td><td colspan="16">Set by the system. Data length: 8 bits (b7 ~ b0).
DVP06AD-S model code=H’C8.</td></tr>
<tr><td rowspan="2">#1</td><td rowspan="2">H’4001</td><td rowspan="2">○</td><td rowspan="2">R/W</td><td rowspan="2">Input mode setting</td><td colspan="4">Reserved</td><td colspan="2">CH6</td><td colspan="2">CH5</td><td colspan="2">CH4</td><td colspan="2">CH3</td><td colspan="2">CH2</td><td colspan="2">CH1</td></tr>
<tr><td colspan="16">Input mode: Default=H’0000.
Mode 0: Voltage input (-10V ~ +10V)
Mode 1: Voltage input (-6V ~ +10V)
Mode 2: Current input (-12mA ~ +20mA)
Mode 3: Current input (-20mA ~ +20mA)</td></tr>
<tr><td colspan="21">CR#1: The working mode of the 6 channels in the analog input module. There are 4 modes for each channel which can be set up separately. For example, if the user needs to set up CH1: mode 0 (b1 ~ b0=00) and CH2: mode 1 (b3 ~ b2=01), CH3: mode 2 (b5 ~ b4=10), CH4: mode 3 (b7 ~ b6=11), CH5: mode 0 (b9 ~ b8=00), CH6: mode 1 (b11 ~ b10=01), CR#1 has to be set as H’04E4 and the higher bits (b12 ~ b15) have to be reserved. Default value=H’0000.</td></tr>
<tr><td>#2</td><td>H’4002</td><td>○</td><td>R/W</td><td rowspan="3">CH1 ~ CH6 Average times setting</td><td colspan="8">CH2</td><td colspan="8">CH1</td></tr>
<tr><td>#3</td><td>H’4003</td><td>○</td><td>R/W</td><td colspan="8">CH4</td><td colspan="8">CH3</td></tr>
<tr><td>#4</td><td>H’4004</td><td>○</td><td>R/W</td><td colspan="8">CH6</td><td colspan="8">CH5</td></tr>
<tr><td colspan="21">CR#2 ~ CR#4: The settings of average times of the signals at CH1 ~ CH6. Range of settings in CH1 ~ CH6: K1 ~ K20. For example, if the average time at CH1 is to be set as K10 and CH2 as K18, CR#2 must be set as H’120A. CR#3 ~ 4 apply the same rule. The default setting of each channel=K10. Default settings of CR#2 ~ CR#4 are all H’0A0A.</td></tr>
<tr><td>#6</td><td>H’4006</td><td>×</td><td>R</td><td>CH1 input average</td><td colspan="16" rowspan="6">Average of input signals at CH1 ~ CH6</td></tr>
<tr><td>#7</td><td>H’4007</td><td>×</td><td>R</td><td>CH2 input average</td></tr>
<tr><td>#8</td><td>H’4008</td><td>×</td><td>R</td><td>CH3 input average</td></tr>
<tr><td>#9</td><td>H’4009</td><td>×</td><td>R</td><td>CH4 input average</td></tr>
<tr><td>#10</td><td>H’400A</td><td>×</td><td>R</td><td>CH5 input average</td></tr>
<tr><td>#11</td><td>H’400B</td><td>×</td><td>R</td><td>CH6 input average</td></tr>
<tr><td colspan="21">CR#6 ~ CR#11: The average of the signals at CH1~CH6 obtained from the settings in CR#2~CR#4. For example, if the settings in CR#2~CR#4 is 10, the content in CR#6~CR#11 will be the average of the most recent 10 signals at CH1~CH6.</td></tr>
<tr><td>#12</td><td>H’400C</td><td>×</td><td>R</td><td>CH1 input present value</td><td colspan="16" rowspan="6">Present value of input signals at CH1 ~ CH6</td></tr>
<tr><td>#13</td><td>H’400D</td><td>×</td><td>R</td><td>CH2 input present value</td></tr>
<tr><td>#14</td><td>H’400E</td><td>×</td><td>R</td><td>CH3 input present value</td></tr>
<tr><td>#15</td><td>H’400F</td><td>×</td><td>R</td><td>CH4 input present value</td></tr>
<tr><td>#16</td><td>H’4010</td><td>×</td><td>R</td><td>CH5 input present value</td></tr>
<tr><td>#17</td><td>H’4011</td><td>×</td><td>R</td><td>CH6 input present value</td></tr>
<tr><td>#18</td><td>H’4012</td><td>○</td><td>R/W</td><td>Adjusted OFFSET value of CH1</td><td colspan="16" rowspan="6">OFFSET settings at CH1 ~ CH6. Default=K0; Unit: LSB.
When voltage input, range: K-4,000$_{LSB}$ ~ K4,000$_{LSB}$.
When current input, range: K-4,000$_{LSB}$ ~ K4,000$_{LSB}$.
Please refer to this instruction sheet when setting OFFSET and GAIN.</td></tr>
<tr><td>#19</td><td>H’4013</td><td>○</td><td>R/W</td><td>Adjusted OFFSET value of CH2</td></tr>
<tr><td>#20</td><td>H’4014</td><td>○</td><td>R/W</td><td>Adjusted OFFSET value of CH3</td></tr>
<tr><td>#21</td><td>H’4015</td><td>○</td><td>R/W</td><td>Adjusted OFFSET value of CH4</td></tr>
<tr><td>#22</td><td>H’4016</td><td>○</td><td>R/W</td><td>Adjusted OFFSET value of CH5</td></tr>
<tr><td>#23</td><td>H’4017</td><td>○</td><td>R/W</td><td>Adjusted OFFSET</td></tr>
</table>

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CR #	RS-485 parameter address	Latched		Register content	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
				value of CH6																
#24	H'4018	○	R/W	Adjusted GAIN value of CH1																
#25	H'4019	○	R/W	Adjusted GAIN value of CH2																
#26	H'401A	○	R/W	Adjusted GAIN value of CH3	GAIN settings at CH1 ~ CH6. Default=K4,000; Unit: LSB. When voltage input, range: K-3,200LSB ~ K16,000LSB. When current input, range: K-3,200LSB ~ K10,400LSB. Please refer to this instruction sheet when setting OFFSET and GAIN.															
#27	H'401B	○	R/W	Adjusted GAIN value of CH4																
#28	H'401C	○	R/W	Adjusted GAIN value of CH5																
#29	H'401D	○	R/W	Adjusted GAIN value of CH6																
CR#18 ~ CR#29: Please note that: GAIN value – OFFSET value=+800LSB ~ +12,000LSB (voltage) or +800LSB ~ +6,400LSB (current) When GAIN – OFFSET is small (steep oblique), the resolution of input signal will be finer and variation on the digital value will be greater. When GAIN – OFFSET is big (gradual oblique), the resolution of input signal will be rougher and variation on the digital value will be smaller.																				
#30	H'401E	╳	R	Error status	Register for storing all error status. See the table of error status for more information.															

CR #30: Error status value (see the table below):

Error status	Content	b15 ~ b8	b7	b6	b5	b4	b3	b2	b1	b0
Abnormal power supply	K1 (H'1)	Reserved	0	0	0	0	0	0	0	1
Incorrect mode setting	K4 (H'4)		0	0	0	0	0	1	0	0
Offset/Gain error	K8 (H'8)		0	0	0	0	1	0	0	0
Abnormal digital range	K32 (H'20)		0	0	1	0	0	0	0	0
Incorrect average times setting	K64 (H'40)		0	1	0	0	0	0	0	0
Instruction error	K128 (H'80)		1	0	0	0	0	0	0	0

Note: Each error status is determined by the corresponding bits (b0 ~ b7) and there may be more than 2 errors occurring at the same time. 0=normal; 1=error

CR #	RS-485 parameter address	Latched		Register content	Description
#31	H'401F	○	R/W	Communication address setting	For setting RS-485 communication address. Range: 01 ~ 254. Default=K1.
#32	H'4020	○	R/W	Communication format setting	For baud rate, the settings are 4,800/9,600/19,200/38,400/57,600/115,200 bps. Communication format: ASCII：7,E,1 / 7,O,1 / 8,E,1 / 8,O,1 / 8,N,1 RTU ：8,E,1 / 8,O,1 / 8,N,1 Factory default: ASCII, 9600, 7, E,1 (CR#32=H'0002) Refer to ※CR#32 communication format settings at the end of this table for more information.
#33	H'4021	○	R/W	Return to default setting; OFFSET/GAIN tuning authorization	Return to default | CH6 | CH5 | CH4 | CH3 | CH2 | CH1 Take the setting of CH1 for example: 1. b0: Switch for upper/lower bound alarm on the input value for the channel. 0=disabled; 1=enabled (default). 2. b1: OFFSET/GAIN tuning. 0=forbidden; 1=allowed (default). 3. When b12 ~ b15=1, all values in CH1 ~ CH6 will return to default settings. b12 ~ b15 will return to 0 automatically after the setting is completed.
CR#33 for input mode, setting of average times, OFFSET value and GAIN value will be reset after returning to default settings.					

CR #	RS-485 parameter address	Latched		Register content	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
#34	H'4022	○	R	Firmware version	Displaying the current firmware version in hex, e.g. version 1.00 is indicated as H'0100.															
#35 ~ #48				For system use																

Symbols: ○: Latched (when written in through RS-485 communication).
╳: Non-latched.
R: Able to read data by FROM instruction or RS-485 communication.
W: Able to write data by TO instruction or RS-485 communication.
LSB (Least Significant Bits): 1. For voltage input: 1_{LSB}=10V/8,000=1.25mV.
2. For current input: 1_{LSB}=20mA/4,000=5μA.

※ Added the RESET function for modules with firmware V4.12 or later. Connect the module power input to 24 VDC and write H'4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.

※ The corresponding parameters address H'4000 ~ H'4022 of CR#0 ~ CR#34 are provided for users to read/ write data via RS-485 communication.

※ If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example, transferring the address "H'4000" of CR#0 in hexadecimal format to decimal format, to have the result 16384 and then adding one to it, you have 16385, the Modbus address in decimal format.

※ Function codes: 03'H is for reading data from registers. 06'H is for writing a word data into registers. 10'H is for writing multiple word data into registers.

※The latched CR must be written through RS-485 communication to have the power-off latching function. If it is written by the host using the TO/DTO command, it will not have the power-off latching function.

※ CR#32 communication format settings: for modules with firmware V4.10 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H'00XX) and for RTU mode, the format is fixed to 8, E, 1 (H'C0xx/H'80xx). For modules with firmware V4.11 or later, refer to the following table for setups. Note that the original code H'C0XX/H'80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.11 or later.

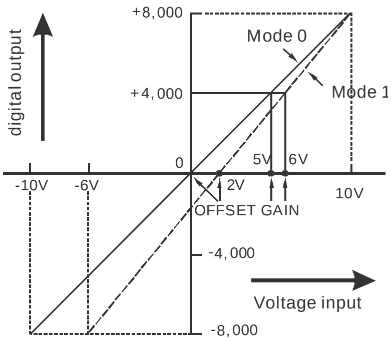
b15 ~ b12		b11 ~ b8		b7 ~ b0	
ASCII/RTU, exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7,E,1*1	H'01	4800 bps
H'8	RTU, do not exchange low and high byte of CRC check code	H'1	8,E,1	H'02	9600 bps
		H'2	reserved	H'04	19200 bps
H'C	RTU, exchange low and high byte of CRC check code	H'3	8,N,1	H'08	38400 bps
		H'4	7,O,1*1	H'10	57600 bps
		H'5	8.O,1	H'20	115200 bps

Note *1: This is only available for ASCII format.

Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

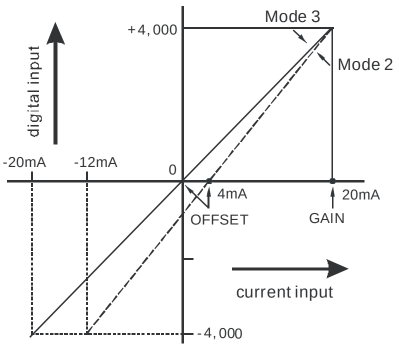
- **Adjusting A/D Conversion Curve**

Voltage input mode:



CR#1 mode 0:	GAIN=5V (4,000LSB), OFFSET=0V (0LSB) .
CR#1 mode 1:	GAIN=6V (4,800LSB), OFFSET=2V (1,600LSB) .
GAIN：	The voltage input value when the digital input value=4,000. Range: -3,200LSB ~ +16,000LSB.
OFFSET：	The voltage input value when the digital output value=0. Range: -4,000LSB ~ +4,000LSB.
GAIN - OFFSET：	Range: +800LSB~+12,000LSB

Current input mode:



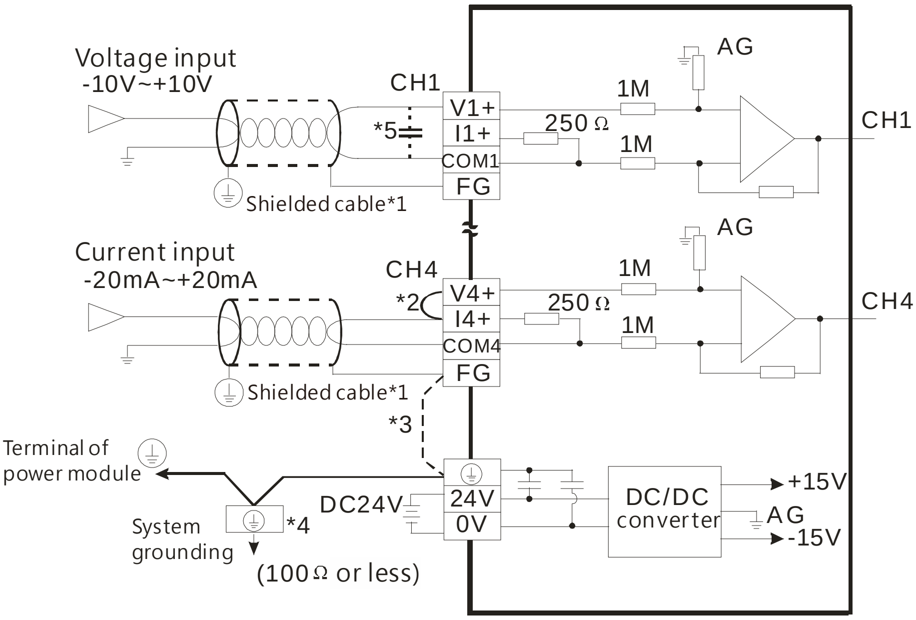
CR#1 mode 2:	GAIN=20mA (4,000LSB), OFFSET=4mA (800LSB) .
CR#1 mode 3:	GAIN=20mA (4,000LSB), OFFSET=0mA (0LSB) .
GAIN：	The current input value when the digital output value=+4,000. Range: -3,200LSB ~ +10,400LSB.
OFFSET：	The current input value when the digital output value=0. Range: -4,000LSB ~ +4,000LSB.
GAIN - OFFSET：	Range:+800LSB~+6,400LSB

The user can adjust the OFFSET/GAIN curves according to the actual needs by changing the OFFSET value (CR#18 ~ CR#23) and GAIN value (CR#24 ~ CR#29).

8

8.5 Wiring

8.5.1 Wiring DVP04AD-S2



*1: When performing analog input, please isolate other power wirings.

*2: When connecting to current signals, please make sure to short-circuit “V+” and “I+” (V4+ and I4+) terminals.

*3: If the noise is too loud, please connect the FG and ground terminals.

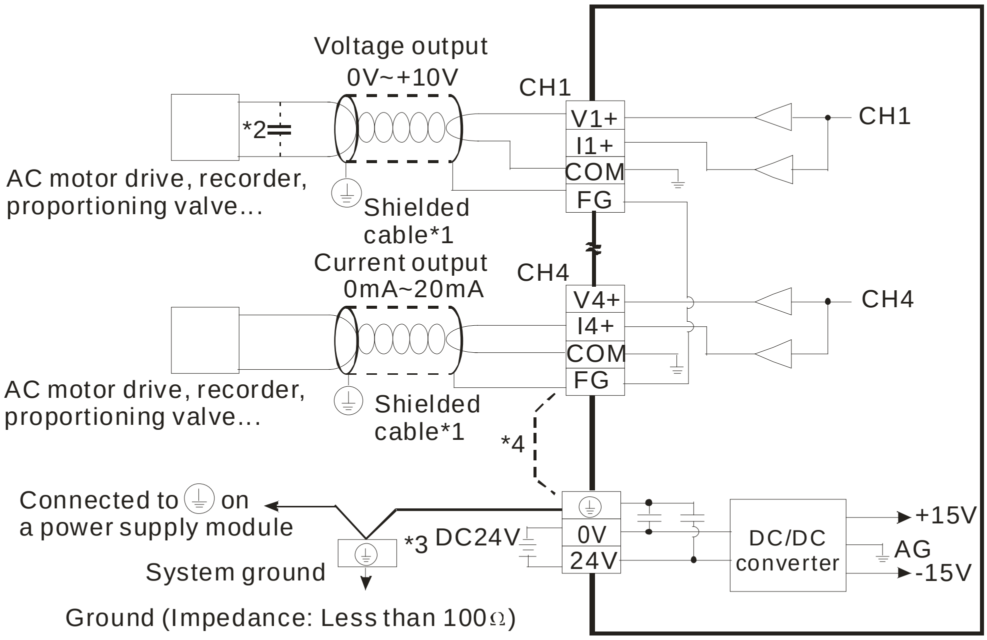
*4: Please connect the ⏚ terminal on both the power module and DVP04AD-S2 to the system earth point and ground the system contact or connect it to the cover of power distribution cabinet.

*5: If the ripple voltage of the input terminal of the load connected is large, and results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

※ DO NOT wire empty terminals (●).

※ Use cables with the same length (less than 200 m) and wire resistance of less than 100 ohm.

8.5.2 Wiring DVP04DA-S2



Note 1: Please isolate the analog output cable from other power cables.

Note 2: If noise interferes with the wiring and makes the ripple voltage of the input terminal of the load connected high, please connect a 0.1~0.47 μF and 25 V capacitor.

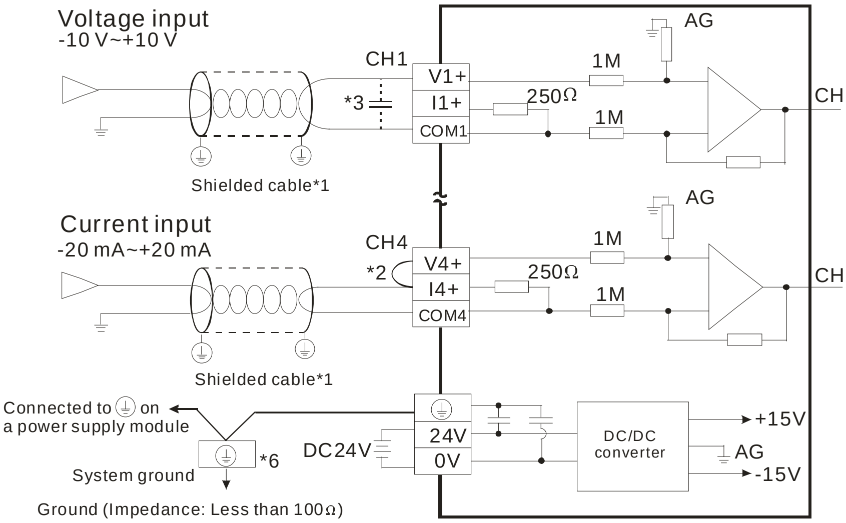
Note 3: Please connect ⏚ on a power supply module and ⏚ on the analog output module to the system ground, and then ground the system ground or connect the system ground to a distribution box.

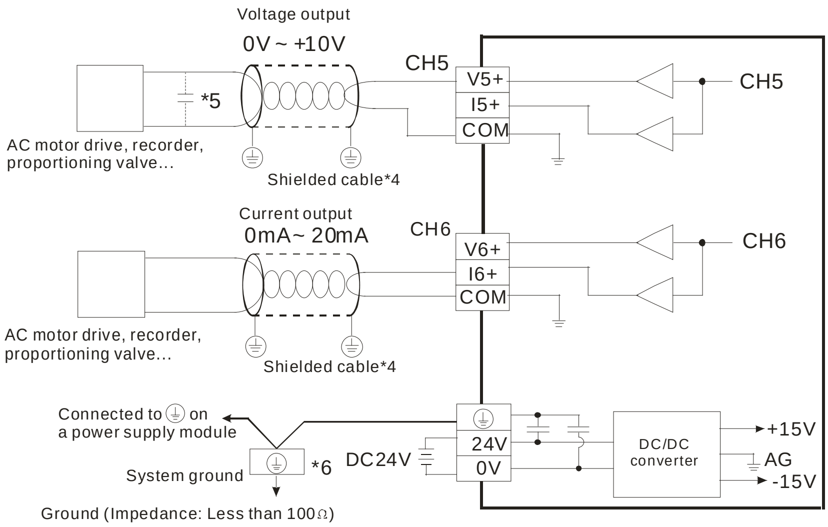
Note 4: If there is much noise, please connect the terminal FG to the ground terminal.

※ DO NOT wire to the empty terminal (●).

※ Use cables with the same length (less than 200 m) and wire resistance of less than 100 ohm.

8.5.3 Wiring DVP06XA-S2





Note 1: Please isolate the analog input cable from other power cables.

Note 2: If current is connected, the connection between V+ and I+ (the connection between V4+ and I4+) needs to be a short circuit.

Note 3: If ripple voltage results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

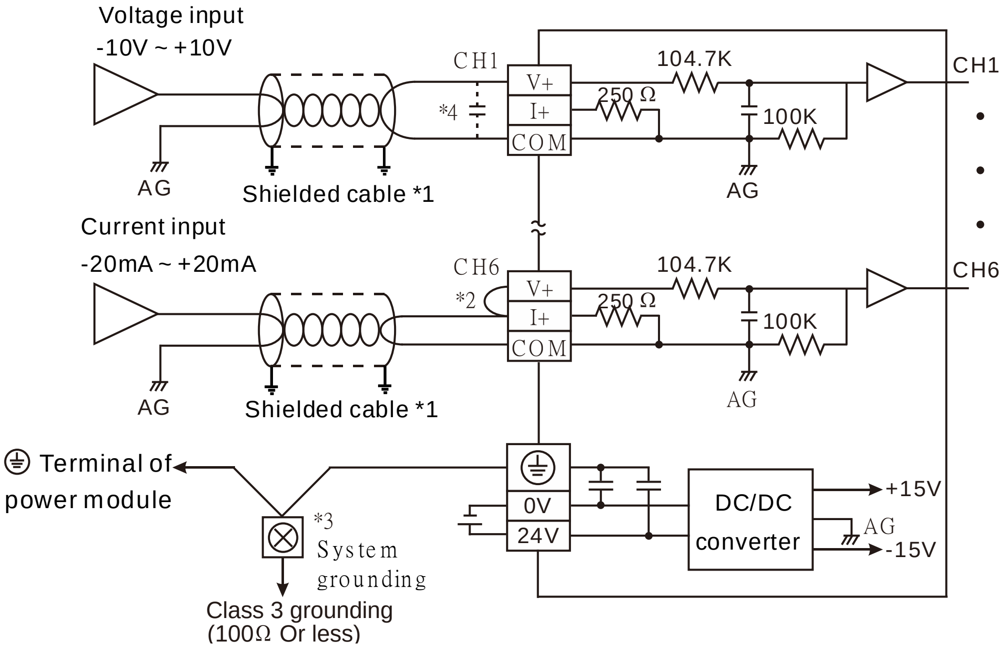
Note 4: Please isolate the analog output cable from other power cables.

Note 5: If noise interferes with the wiring and makes the ripple voltage of the output terminal of the load connected high, please connect a 0.1~0.47 μF and 25 V capacitor.

Note 6: Please connect ⏚ on a power supply module and ⏚ on the analog output module to the system ground, and then ground the system ground or connect the system ground to a distribution box.

※ Use cables with the same length (less than 200 m) and wire resistance of less than 100 ohm.

8.5.4 Wiring DVP06AD-S



*1: When performing analog input, please isolate other power wirings.

*2: When connecting to current signals, please make sure to short-circuit “V+” and “I+” terminals.

*3: Please connect the ⏚ terminal on both the power module and DVP06AD-S to the system earth point and ground the system contact or connect it to the cover of power distribution cabinet.

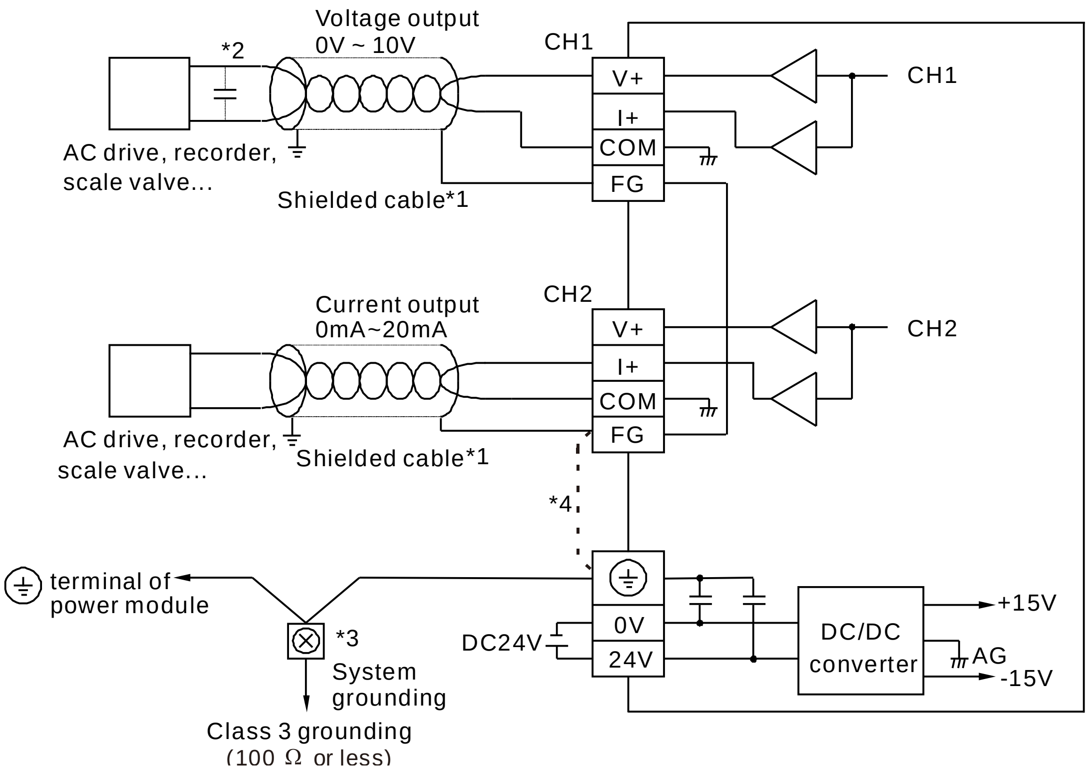
*4: If the ripple voltage of the input terminal of the load connected is large, and results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.

※ DO NOT wire empty terminals (●).

※ Use cables with the same length (less than 200 m) and wire resistance of less than 100 ohm.

8

8.5.5 Wiring DVP02DA-S



Note 1: Please isolate analog output and other power wiring.

Note 2: If noise interferes from loaded input wiring terminal is significant, please connect a capacitor with 0.1 ~ 0.47μF 25V for noise filtering.

Note 3: Please connect ⏚ power module terminal and ⏚ analog output module terminal to system earth point and make system earth point be grounded or connects to machine cover.

Note 4: If there is much noise, please connect the terminal FG to the ground terminal.

※ Use cables with the same length (less than 200 m) and wire resistance of less than 100 ohm.

※ DO NOT wire empty terminals.

8

8.6 Troubleshooting

When an error occurs in AD, DA, XA modules, an error indicator will start blinking. Once you see an error indicator starts blinking, you can use the FROM instruction to read the error codes stored in CR#30. The bits 0 to bits 15 indicates the corresponding error codes. It is possible to have two errors at the same time. 0 indicates normal and 1 indicates error. Refer to the following table for more the causes and the solutions for troubleshooting

Bits No.	RUN LED	ERROR LED	Description	Solution
bits0	OFF	ON	The external voltage is abnormal.	Check the power supply.
bits1	Blinking	Blinking	Input value exceeds the set upper/lower bound	Check the input signal
bits2	Blinking	OFF	Communication address setting error	Check whether the value written in the communication address is correct and rewrite it
bits3			OFFSET/GAIN error	Check if the written value of OFFSET and GAIN are correct and rewrite them.
bits4			Analog measuring sensor is abnormal	Contact the factory
bits5	Blinking	Blinking	Input value exceeds the set upper/lower bound	Check the input signal
bits6	Blinking	OFF	Average time setting error	Check the average time setting
bits7			FROM/TO instruction error	Check whether the instruction reads or writes from incorrect CR. Check whether the module is properly connected.
bits8	Blinking	Blinking	The signal received by channel 1 exceeds the range of analog inputs	Check the signal received by channel 1
bits9			The signal received by channel 2 exceeds the range of analog inputs	Check the signal received by channel 2
bits10			The signal received by channel 3 exceeds the range of analog inputs	Check the signal received by channel 3
bits11			The signal received by channel 4 exceeds the range of analog inputs	Check the signal received by channel 4

9

Chapter 9 DVP-S Series Temperature Measurement Module

Table of Contents

9.1 General Specification

9.1.1 DVP04PT-S / DVP06PT-S Specification

- **Electrical Specifications**

Model name	DVP04PT-S	DVP06PT-S
Number of inputs	4	6
Supply voltage	24VDC（20.4~28.8VDC）(-15%~+20%)	
Connector type	Removable terminal block	
Connect to DVP-PLC CPU	Up to 8 modules can be connected and no digital I/O will be taken. Numbering is from 0 to 7 in a consecutive order; the one closes to the PLC CPU is 0.	
Weight	91.5g	84.5g

- **Functional Specifications**

Digital data format		16-bits two's complement number
Response time		DVP04PT-S：200ms/channels; DVP06PT-S：160ms/channels
Overall accuracy		0° C to 55° C / 32° F to 131° F: The allowed error range is ±6% of full scale.
Applicable sensors		**2-wire/3-wire:** **Pt100**：DIN 43760-1980 JIS C1604-1989，100Ω 3850 PPM/°C **Pt1000**：DIN EN60751，1 kΩ 3850 PPM/°C **Ni100/Ni1000**：DIN 43760 **Cu50/Cu100** **LG-Ni1000** **0~300Ω/0~3000Ω**
Rated measurement range		Please refer to the table Note*1 below.
Digital analog-to-digital conversion range		Please refer to the table Note*2 below.
Maximum measurable temperature range		Please refer to the table Note*3 below.
Resolution	**Centigrade(°C)**	0.1°C
	Fahrenheit(°F)	0.18°F*4
	Input impedance	0~300Ω：0.01Ω 0~3000Ω：0.1Ω
Average function		Yes（DVP04PT-S：CR#2~CR#5/DVP06PT-S：CR#2）, Setting range:K1~K20
Self-diagnosis function		Detecting if exceeding upper and lower limits or channel disconnection.
Isolation		An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500VAC Isolation between an analog circuit and a ground: 500VAC Isolation between an analog circuit and a digital circuit: 500VAC Isolation between the 24 VDC and a ground: 500VAC

Note*1. Rated measurement range

Sensor	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Pt100	-180°C~800°C	-292°F~1,472°F	
Ni100	-80°C~170°C	-112°F~338°F	
Pt1000	-180°C~800°C	-292°F~1,472°F	
Ni1000	-80°C~170°C	-112°F~338°F	
Cu50	-50°C~150°C	-58°F~302°F	
Cu100	-50°C~150°C	-58°F~302°F	
LG-Ni1000	-60°C~200°C	-76°F~392°F	
0~300Ω	-	-	0~300Ω
0~3000Ω	-	-	0~3000Ω

Note*2. Rated analog-to-digital conversion range

Sensor	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Pt100	K-1,800~K8,000	K-2,920~K14,720	
Ni100	K-800~K1,700	K-1,120~K3,380	
Pt1000	K-1,800~K8,000	K-2,920~K14,720	
Ni1000	K-800~K1,700	K-1,120~K3,380	
Cu50	K-500~K1,500	K-580~K3,020	
Cu100	K-500~K1,500	K-580~K3,020	
LG-Ni1000	K-600~K2,000	K-760~K3,920	
0~300Ω	-	-	K0~K30,000
0~3000Ω	-	-	K0~K30,000

Note*3. Maximum measurable temperature range

Sensor	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Pt100	-200°C~800°C	-328°F~1,472°F	
Ni100	-90°C~180°C	-130°F~356°F	
Pt1000	-200°C~800°C	-328°F~1,472°F	
Ni1000	-90°C~180°C	-130°F~356°F	
Cu50	-50°C~150°C	-58°F~302°F	
Cu100	-50°C~150°C	-58°F~302°F	
LG-Ni1000	-60°C~250°C	-76°F~482°F	
0~300Ω	-	-	0~320Ω
0~3000Ω	-	-	0~3200Ω

Note*4. The temperature unit to be displayed is 0.1 °C and 0.1 °F. If the display mode is Fahrenheit, the number in the second decimal place will not be displayed.

9.1.2 DVP04TC-S Specifications

- **Electrical Specifications**

Number of inputs	4
Supply voltage	24VDC（20.4~28.8VDC）(-15%~+20%)
Connector type	Removable terminal block
Connect to DVP-PLC CPU	Up to 8 modules can be connected and no digital I/O will be taken. Numbering is from 0 to 7 in a consecutive order; the one closes to the PLC CPU is 0.
Weight	78.7g

- **Functional specifications**

Analog input channel		4 channel/each module
Digital conversion range		16 bits two's complement number
Response time		200ms/channel
Overall accuracy		25°C/77°F: The allowed error range is ±0.5% of full scale. 0 to +55°C / 32 to 131°F: The allowed error range is ±1% of full scale.
Applicable sensors		J-type · K-type · R-type · S-type · T-type thermocouple
Rated input range		Please refer to the table Note*1 below.
Analog-to-digital conversion		Please refer to the table Note*2 below.
Hardware resolution	**Centigrade（°C）**	0.1°C
	Fahrenheit（°F）	0.18°F*3
Average function		Yes, CR#2~CR#5, setting range:K1~K20
Self-diagnosis function		Detecting if exceeding upper and lower limts or channel disconnection.
Isolation		An analog circuit is isolated from a digital circuit by a digital integrated circuit / an optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC Isolation between analog channels: 120 VAC

Note*1. Rated input range

Sensor	Centigrade（°C）	Fahrenheit（°F）
J-type	-100°C~700°C	-148°F~1,292°F
K-type	-100°C~1,000°C	-148°F~1,832°F
R-type	-10°C~1,700°C	-14°F~3,092°F
S-type	-10°C~1,700°C	-14°F~3,092°F
T-type	-100°C~350°C	-148°F~662°F

Note*2. Analog-to-digital conversion

Sensor	Centigrade (°C)	Fahrenheit (°F)
J-type	K-1,000~K7,000	K-3,280~K12,920
K-type	K-1,000~K10,000	K-1,480~K18,320
R-type	K-100~K17,000	K-140~K30,920
S-type	K-100~K17,000	K-140~K30,920
T-type	K-1,000~K3,500	K-1,480~K6,620

Note*3. The temperature unit to be displayed is 0.1 °C and 0.1 °F. If the display mode is Fahrenheit, the number in the second decimal place will not be displayed

9.1.3 DVP08NTC-S Specifications

- **Electrical specifications**

Number of inputs	8
Supply voltage	24VDC (20.4~28.8VDC) (-15%~+20%)
Connector type	Removable terminal block
Connect to DVP-PLC CPU	Up to 8 modules can be connected and no digital I/O will be taken. Numbering is from 0 to 7 in a consecutive order; the one closes to the PLC CPU is 0.
Weight	70g

- **Functional specifications**

Analog input channel	8 channel/each module
Digital data format	16 bits two's complement number
Response time	200ms/channel
Overall accuracy	25°C/77°F: The allowed error range is ±0.5% of full scale. 0 to +55°C / 32 to 131°F: The allowed error range is ±1% of full scale.
Applicable sensors	Pt1000: DIN 43760 Ni1000: DIN EN60751 LG-Ni1000 NTC 10K B25 B85 3977K NTC 100K B25 B85 4260K NTC 20K B25 B85 4200 NTC 30K B25 B50 4200 PT-42H 10K B25 B85 3435K PT-43 10.74K B25 B85 3480K PT-51F 49.12K B25 B85 3992K PT-25E2 98..63K B25 B85 4066K PT-312 231.4K B25 B85 4240K KTY81 110 120 KTY81 121 KTY81 122 KTY81 210 220 KTY81 221 KTY81 222
Drive current	213.33uA (RTD) /109.17uA (NTC) /1.009mA (KTY81 Series)
Rated input range	Please refer to the table Note*1 below.
Analog-to-digital conversion	Please refer to the table Note*2 below.

Hardware resolution	**Centigrade (°C)**	0.1°C
	Fahrenheit (°F)	0.1°F
Average function		Yes, CR#6, setting range:K1~K100
Self-diagnosis function		Detecting if exceeding upper and lower limts or channel disconnection.
Isolation		There is no isolation between channels. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC

Note*1. **Rated input range**

Sensor	Centigrade (°C)	Fahrenheit (°F)
Pt1000	-180°C~800°C	-292~1,472°F
Ni1000	-100°C~180°C	-148~356°F
LG-Ni1000	-60°C~200°C	-76~392°F
NTC 10K B25 B85 3977K	-40~110°C	-40~230°F
NTC 100K B25 B85 4260K	-20°C~150°C	-4~302°F
NTC 20K B25 B85 4200	-40°C~125°C	-40~257°F
NTC 30K B25 B50 4200	-30°C~130°C	-22~266°F
PT-42H 10K B25 B85 3435K	-50°C~130°C	-58~266°F
PT-43 10.74K B25 B85 3480K	-50°C~130°C	-58~266°F
PT-51F 49.12K B25 B85 3992K	-25°C~180°C	-13~356°F
PT-25E2 98..63K B25 B85 4066K	-25°C~210°C	-13~410°F
PT-312 231.4K B25 B85 4240K	0°C~240°C	32~464°F
KTY81 110 120	-55°C~150°C	-67~302°F
KTY81 121	-55°C~150°C	-67~302°F
KTY81 122	-55°C~150°C	-67~302°F
KTY81 210 220	-55°C~150°C	-67~302°F
KTY81 221	-55°C~150°C	-67~302°F
KTY81 222	-55°C~150°C	-67~302°F

Note*2. **Analog-to-digital conversion**

Sensor	Centigrade（°C）	Fahrenheit（°F）
Pt1000	K-1,800~K8,000	K-2,920~K14,720
Ni1000	K-1,000~K1,800	K-1,480~K3,560
LG-Ni1000	K-600~K2,000	K-760~K3,920
NTC 10K B25 B85 3977K	K-400~K1,100	K-400~K2,300
NTC 100K B25 B85 4260K	K-200~K1,500	K-40~K3,020
NTC 20K B25 B85 4200	K-400~K1,250	K-400~K2,570
NTC 30K B25 B50 4200	K-300~K1,300	K-220~K2,660
PT-42H 10K B25 B85 3435K	K-500~K1,300	K-580~K2,660
PT-43 10.74K B25 B85 3480K	K-500~K1,300	K-580~K2,660
PT-51F 49.12K B25 B85 3992K	K-250~K1,800	K-130~K3,560
PT-25E2 98..63K B25 B85 4066K	K-250~K2,100	K-130~K4,100
PT-312 231.4K B25 B85 4240K	K 0~K2,400	K-320~K4,640
KTY81 110 120	K-550~K1,500	K-670~K3,020
KTY81 121	K-550~K1,500	K-670~K3,020
KTY81 122	K-550~K1,500	K-670~K3,020
KTY81 210 220	K-550~K1,500	K-670~K3,020
KTY81 221	K-550~K1,500	K-670~K3,020
KTY81 222	K-550~K1,500	K-670~K3,020

9.1.4 DVP02TUN-S / DVP02TUR-S / DVP02TUL-S / DVP02TKN-S / DVP02TKR-S / DVP02TKL-S Specifications

- **Electrical specifications**

Supply voltage	24VDC（20.4~28.8VDC）(-15%~+20%）
Connector type	Removable terminal block
Hardware resolution	16 bits
Distance	100 meters
Input disconnection detection	Temperature input supports disconnection detection
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit. There is no isolation between channels. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC
Connect to DVP-PLC CPU	The modules are numbered from 0 to 7 automatically by their distance from DVP-PLC. Max. 8 modules are allowed to connect to DVP-PLC and will not occupy any digital I/O points.
Weight	70g

- **Analog input function specification**

Models	DVP02TUN-S/DVP02TUR-S/DVP02TUL-S DVP02TKN-S/DVP02TKR-S/DVP02TKL-S		
Analog	**Voltage input**	**Current input**	**Temperature input**
Rated input range	0~10V 0~5V 0~+50mV -100~+100mV	0~20mA 4~20mA	Thermocouple*1 Thermistor*2
Overall accuracy (normal temperature)	±0.5%		±0.4%
Overall accuracy (full temperature range)	±1%		±0.8%
Hardware resolution	16 bits		24 bits
Input impedance	650KΩ	2MΩ	2MΩ

*1. Thermocouple: J、K、R、S、T、E、N、B、U、L、TXK (L)、C、PL II

*2. Thermistor: Pt100、JPt100、Pt1000、Ni100、Ni120、Ni1000、Cu50、Cu100、LG-Ni1000

- **Analog sampling time (by channel)**

Model	DVP02TUN-S/DVP02TUR-S/DVP02TUL-S DVP02TKN-S/DVP02TKR-S/DVP02TKL-S				
Analog input type	**AI**	**Thermocouple**	**Thermistor**	**Quick AI (0~10V) *2**	**Quick AI (4~20mA) *2**
Setting time (ms)	80	80	160	3	3
Conversion time (ms)	50	50	100	2	2
Response time (ms)	130	130	260	5	5

Response time = setting time + conversion time

*1. Compared to the response time of the thermocouple temperature, it needs two times of time for the thermistor temperature to respond, since the thermistor channels require a temperature compensation.

*2. Since there is only one channel used, the time to stabilize the circuit is not required.

- **Analog output function specification**

Model	DVP02TUL-S/DVP02TKL-S	
Analog	**Voltage output**	**Current output**
Rated output range	0~10V	0~20mA 4~20mA
Overall accuracy (normal temperature)	±0.5%	
Overall accuracy (full temperature range)	±1%	
Hardware resolution	12 bits	
Allowable load impedance	1kΩ~2MΩ at0V~10V	≦550Ω
Setting time (μs)	100	250
Conversion time (μs)	500	500
Response time (μs)	600	750

Response time = setting time + conversion time

- **Digital output Function Specification**

Item \ Model		DVP02TUR-S DVP02TKR-S	DVP02TUN-S DVP02TKN-S
Number of outputs		4	4
Connector type		Removable terminal block	
Output point type		Relay-R	Transistor-T (NPN)
Voltage specification		Below 250VAC，30VDC	12~30VDC
Maximum load	**Resistive**	2A/1 point （3A/COM）*1	0.3A/1 point （0.6A/COM）*1
	Inductive	Life curves *2, *4	7.2W（24VDC）*3
	Bulk	20W（24VDC） 100W（230VAC）	2W（24VDC）
Maximum output frequency	**Resistive**	1Hz	100Hz
	Inductive	0.5Hz	0.5Hz
	Bulk	1Hz	10Hz
Maximum response time	**OFF→ON** **ON→OFF**	10ms	0.5ms

*1. Complied with UL61010-2-201 & IEC61131-2 (AC or DC resistance)

*2. Complied with UL61010-2-201 & IEC61131-2 (AC/DC general-use)

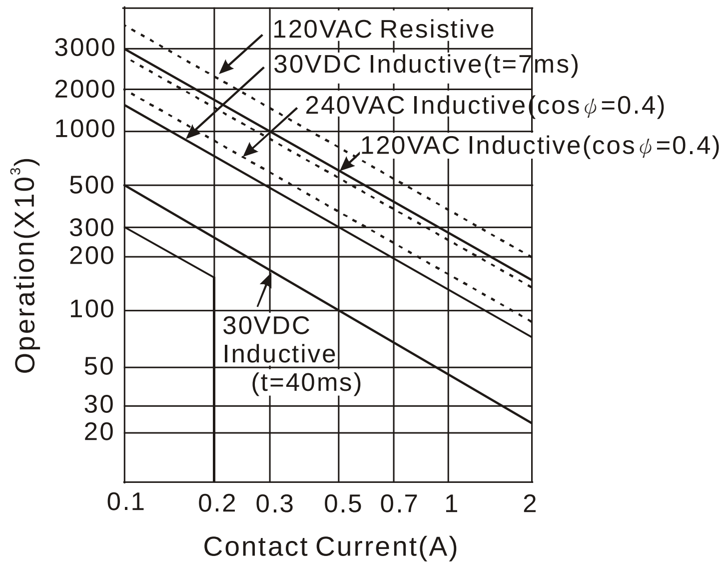
AC pilot duty: Rated making capacity: 7.5A; rated breaking capacity: 0.75A; 2.5A thermal continuous at 240VAC

DC pilot duty: rated making capacity: 0.22A; rated breaking capacity: 0.22A; 1A thermal continuous at 30VDC

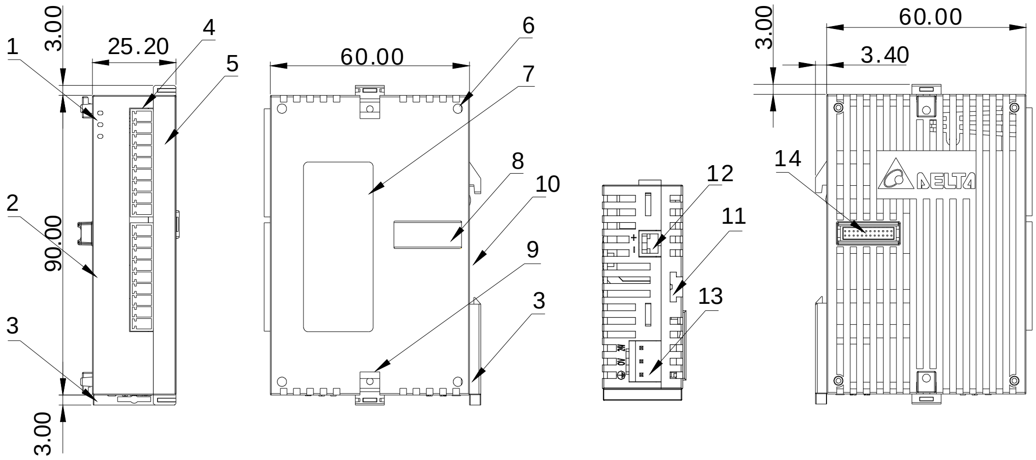
*3. Complied with IEC/UL61010-2-201 (DC general-use)

Disconnect power before servicing to avoid the risk of electric shock.

*4. Life curves



9.2 Module Profiles and Dimensions



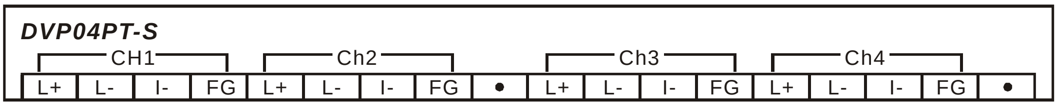
Unit:mm

No.	Name	Description
1	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	Run LED indicator	Indicates the operating status of the module
	ERROR LED indicator	Error status of the module. ON: A serious module error has occurred OFF: the module is normal. Blinking (0.2 seconds ON/OFF): A non-serious module error occurs, can NOT operate normally
2	Model name	Model name of the module
3	DIN rail securing clip	Secure the module on the set
4	I/O Terminals	The inputs are connected to sensors. The outputs are connected to loads to be driven.
5	Terminal number	Terminal number
6	Extension unit positioning hole	For positioning between modules
7	Nameplate	Lable of the module
8	Extension module connection port	Connect the modules.
9	Extension unit fixing clip	For securing the extension module.
10	DIN rail slot（35mm）	For the DIN rail.
11	Securing module slot	For securing the extension module
12	RS-485communication port	Provide RS-485 communication wiring
13	Power input port	Expansion unit power input.
14	Extension port	Connect the PLC or the modules.

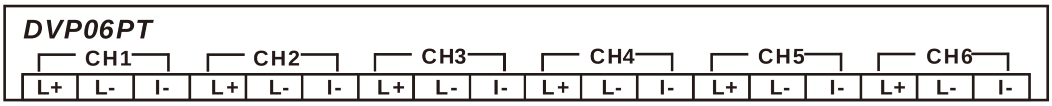
9

9.3 Terminals

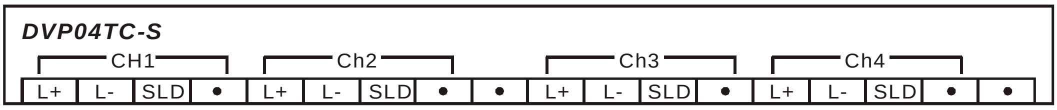
DVP04PT-S



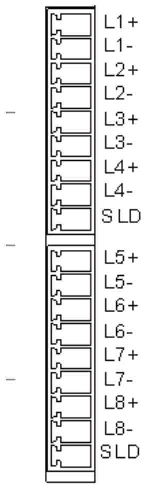
DVP06PT-S



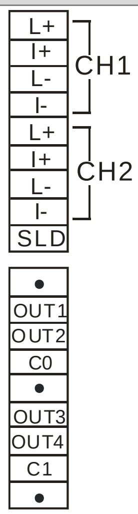
DVP04TC-S



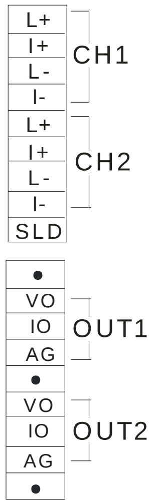
DVP08NTC-S



DVP02TUR-S/DVP02TUN-S
DVP02TKR-S/DVP02TKN-S



DVP02TUL-S
DVP02TKL-S



9.4 DVP04PT-S / DVP06PT-S / DVP04TC-S / DVP08NTC-S Control Register

9.4.1 DVP04PT-S / DVP06PT-S Control Register

<table>
<tr><th>CR#</th><th>Address</th><th>Latched</th><th>Attribute</th><th>Register content</th><th>Description</th></tr>
<tr><td>#0</td><td>H’4064</td><td>O</td><td>R</td><td>Model name
(Set up by the system)</td><td>DVP04PT-S model code= H’8A
DVP06PT-S model code = H’CA</td></tr>
<tr><td>#1</td><td>H’4065</td><td>X</td><td>R/W</td><td>CH1~CH4 Mode setting</td><td><table><tr><td>b15~12</td><td>b11~8</td><td>b7~4</td><td>b3~0</td></tr><tr><td>CH4</td><td>CH3</td><td>CH2</td><td>CH1</td></tr></table>Take CH1 mode (b3,b2,b1,b0) for example.
1. (0,0,0,0): Pt100 (default)
2. (0,0,0,1): Ni100
3. (0,0,1,0): Pt1000
4. (0,0,1,1): Ni1000
5. (0,1,0,0): LG-Ni1000
6. (0,1,0,1): Cu100
7. (0,1,1,0): Cu50
8. (0,1,1,1): 0~300 Ω
9. (1,0,0,0): 0~3000 Ω
10. (1,1,1,1)The channel is disabled.
Mode 8 and 9 are only available for DVP04PT-S V4.16 or later and DVP06PT-S V4.12 or later.</td></tr>
<tr><td rowspan="2">#2</td><td>H’4066</td><td rowspan="2">O</td><td rowspan="2">R/W</td><td>DVP04PT-S:
CH1 average number</td><td>Number piece of readings used for the calculation of “average” temperature on CH1.
Setting range: K1~K20.
Default setting is K10.</td></tr>
<tr><td>--</td><td>DVP06PT-S:
CH1~CH6 average number</td><td>Number piece of readings used for the calculation of “average” temperature on CH1 ~ 6.
Setting range: K1~K20.
Default setting is K10.</td></tr>
<tr><td>#3</td><td>H’4067</td><td>O</td><td>R/W</td><td>DVP04PT-S:
CH2 average number</td><td>Number piece of readings used for the calculation of “average” temperature on CH2.
Setting range: K1~K20.
Default setting is K10.</td></tr>
<tr><td>#4</td><td>H’4068</td><td>O</td><td>R/W</td><td>DVP04PT-S:
CH3 average number</td><td>Number piece of readings used for the calculation of “average” temperature on CH3.
Setting range: K1~K20.
Default setting is K10.</td></tr>
<tr><td>#5</td><td>H’4069</td><td>O</td><td>R/W</td><td>DVP04PT-S:
CH4 average number</td><td>Number piece of readings used for the calculation of “average” temperature on CH4.
Setting range: K1~K20.
Default setting is K10.</td></tr>
<tr><td>#6</td><td>H’406A</td><td>X</td><td>R</td><td>CH1 average degrees</td><td rowspan="6">DVP04PT-S:
Average Celsius degrees for CH1 ~ 4
DVP06PT-S:
Average Celsius degrees for CH1 ~ 6
Unit: 0.1°C/ 0.01 Ω (0~300 Ω)/ 0.1 Ω (0~3000 Ω)</td></tr>
<tr><td>#7</td><td>H’406B</td><td>X</td><td>R</td><td>CH2 average degrees</td></tr>
<tr><td>#8</td><td>H’406C</td><td>X</td><td>R</td><td>CH3 average degrees</td></tr>
<tr><td>#9</td><td>H’406D</td><td>X</td><td>R</td><td>CH4 average degrees</td></tr>
<tr><td>#10</td><td>--</td><td>X</td><td>R</td><td>CH5 average degrees</td></tr>
<tr><td>#11</td><td>--</td><td>X</td><td>R</td><td>CH6 average degrees</td></tr>
</table>

<table>
<tr><th>CR#</th><th>Address</th><th>Latched</th><th>Attribute</th><th>Register content</th><th>Description</th></tr>
<tr><td>#12</td><td>H'4070</td><td>X</td><td>R</td><td>CH1 average degrees</td><td rowspan="6">DVP04PT-S:
Average Fahrenheit degrees for CH1 ~ 4 DVP06PT-S:
Average Fahrenheit degrees for CH1 ~ 6
Unit: 0.1°F/ 0.01 Ω (0~300 Ω)/ 0.1 Ω (0~3000 Ω)</td></tr>
<tr><td>#13</td><td>H'4071</td><td>X</td><td>R</td><td>CH2 average degrees</td></tr>
<tr><td>#14</td><td>H'4072</td><td>X</td><td>R</td><td>CH3 average degrees</td></tr>
<tr><td>#15</td><td>H'4073</td><td>X</td><td>R</td><td>CH4 average degrees</td></tr>
<tr><td>#16</td><td>--</td><td>X</td><td>R</td><td>CH5 average degrees</td></tr>
<tr><td>#17</td><td>--</td><td>X</td><td>R</td><td>CH6 average degrees</td></tr>
<tr><td>#18</td><td>H'4076</td><td>X</td><td>R</td><td>Present temp. of CH1</td><td rowspan="6">DVP04PT-S:
Present Celsius temperature of CH 1~4
DVP06PT-S:
Present Celsius temperature of CH1~6
Unit: 0.1°C/ 0.01 Ω (0~300 Ω)/ 0.1 Ω (0~3000 Ω)</td></tr>
<tr><td>#19</td><td>H'4077</td><td>X</td><td>R</td><td>Present temp. of CH2</td></tr>
<tr><td>#20</td><td>H'4078</td><td>X</td><td>R</td><td>Present temp. of CH3</td></tr>
<tr><td>#21</td><td>H'4079</td><td>X</td><td>R</td><td>Present temp. of CH4</td></tr>
<tr><td>#22</td><td>--</td><td>X</td><td>R</td><td>Present temp. of CH5</td></tr>
<tr><td>#23</td><td>--</td><td>X</td><td>R</td><td>Present temp. of CH6</td></tr>
<tr><td>#24</td><td>H'407C</td><td>X</td><td>R</td><td>Present temp. of CH1</td><td rowspan="6">DVP04PT-S:
Present Fahrenheit temperature of CH 1~4 DVP06PT-S:
Present Fahrenheit temperature of CH 1~6
Unit: 0.1°F/ 0.01 Ω (0~300 Ω)/ 0.1 Ω (0~3000 Ω)</td></tr>
<tr><td>#25</td><td>H'407D</td><td>X</td><td>R</td><td>Present temp. of CH2</td></tr>
<tr><td>#26</td><td>H'407E</td><td>X</td><td>R</td><td>Present temp. of CH3</td></tr>
<tr><td>#27</td><td>H'407F</td><td>X</td><td>R</td><td>Present temp. of CH4</td></tr>
<tr><td>#28</td><td>--</td><td>X</td><td>R</td><td>Present temp. of CH5</td></tr>
<tr><td>#29</td><td>--</td><td>X</td><td>R</td><td>Present temp. of CH6</td></tr>
<tr><td>#29</td><td>H'4081</td><td>X</td><td>R/W</td><td>DVP04PT-S:
PID mode setup</td><td>Set H'5678 as PID mode and other values as normal mode
Default value is H'0000.</td></tr>
<tr><td>#30</td><td>H'4082</td><td>X</td><td>R</td><td>Error status</td><td>Data register stores the error status. Refer to the error code chart for details.</td></tr>
<tr><td rowspan="2">#31</td><td>H'4083</td><td>O</td><td>R/W</td><td>DVP04PT-S:
Communication address setup</td><td>Set up the RS-485 communication address; setting range: 01~254. Default: K1</td></tr>
<tr><td>--</td><td>X</td><td>R/W</td><td>DVP06PT-S:
CH5~CH6 Mode setting</td><td>CH5 mode: b0 ~ b3
CH6 mode: b4 ~ b7
See CR#1 for reference</td></tr>
<tr><td rowspan="2">32</td><td>H'4084</td><td>O</td><td>R/W</td><td>DVP04PT-S:
Communication format setting</td><td>For baud rate, the settings are 4,800/9,600/19,200/38,400/57,600/115,200 bps.
Communication format:
ASCII: 7,E,1 / 7,O,1 / 8,E,1 / 8,O,1 / 8,N,1
RTU: 8,E,1 / 8,O,1 / 8,N,1
Factory default : ASCII,9600,7,E,1 (CR#32=H'0002)
Refer to ※CR#32 communication format settings at the end of this table for more information.</td></tr>
<tr><td>--</td><td>X</td><td>R/W</td><td>DVP06PT-S:
CH5~CH6
Error LED indicator setting</td><td><table><tr><td>b15~12</td><td>b11~9</td><td>b8~6</td><td>b5~3</td><td>b2~0</td></tr><tr><td>ERR LED</td><td colspan="2">reserved</td><td>CH6</td><td>CH5</td></tr></table>b12~13 respectively correspond to CH5~6 error display enable/disable,
when bit is ON, the scale exceeds the range, and the Error LED indicator flashes. OFF: disabled.</td></tr>
<tr><td>#33</td><td>H'4085</td><td>O</td><td>R/W</td><td>DVP04PT-S:
CH1~CH4
Reset to default setting
And Error LED indicator setting</td><td><table><tr><td>b15~12</td><td>b11~9</td><td>b8~6</td><td>b5~3</td><td>b2~0</td></tr><tr><td>ERR LED</td><td>CH4</td><td>CH3</td><td>CH2</td><td>CH1</td></tr></table></td></tr>
</table>

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CR#	Address	Latched	Attribute	Register content	Description
	--	X	R/W	DVP06PT-S: All channels reset to default setting And CH1~CH4 Error LED indicator setting	If b2~b0 are set to 100, all the setting values of CH1 will be reset to the defaults. To reset all channels to defaults, set b11~0 to H'924 (DVP04PT-S supports single and all channels reset; DVP06PT-S supports all channels reset only). b12~15 respectively correspond to CH1~4 error display enable/disable, when bit is ON, the scale exceeds the range, and the Error LED indicator flashes. OFF: disabled.
#34	H'4086	O	R	Firmware version	Display version in hexadecimal. ex: H'010A = version 1.0A
#35 ~ #48 For system use					
Symbols: O means latched. (Supported with RS485, but does not support when connecting to MPUs.) X means not latched. R means can read data by using FROM instruction or RS-485. W means can write data by using TO instruction or RS-485.					

1. Added the RESET function is only for 04PT-S modules with firmware V4.16 or later and not available for 06PT-S. Connect the module power input to 24 VDC and write H'4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.

2. If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example transferring the address "H'4064" of CR#0 in hexadecimal format to decimal format, to have the result 16484 and then adding one to it, you have 16485, the Modbus address in decimal format.

3. CR#32 communication format settings: for DVP04PT-S modules with firmware V4.14 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H'00XX) and for RTU mode, the format is fixed to 8, E, 1 (H'C0xx/H'80xx). For modules with firmware V4.15 or later, refer to the following table for setups. Note that the original code H'C0XX/H'80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.15 or later.

b15 ~ b12		b11 ~ b8		b7 ~ b0	
ASCII/RTU, exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7,E,1*1	H'01	4800 bps
H'8	RTU, do not exchange low and high byte of CRC check code	H'1	8,E,1	H'02	9600 bps
		H'2	reserved	H'04	19200 bps
H'C	RTU, exchange low and high byte of CRC check code	H'3	8,N,1	H'08	38400 bps
		H'4	7,O,1*1	H'10	57600 bps
		H'5	8.O,1	H'20	115200 bps

Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

Note *1: This is only available for ASCII format.

4. RS-485 function codes: 03'H is for reading data from registers. 06'H is for writing a data word to registers. 10'H is for writing multiple data words to registers.

5. CR#30 is the error code register.
   Note: Each error code will have a corresponding bit and should be converted to 16-bit binary numbers (Bit0~15). When each bit is ON, it means that an error state has occurred. Therefore, when an error occurs, there may be more than 2 bits showed ON. For example: bit1=ON, bit8=ON, which means that there is an open connection on the channel contact, and it is CH1. Refer to the chart below:

Bit number	0	1	2	3
Description	Power source abnormal	The contact is not connected to anything.	Reserved	Reserved
Bit number	4	5	6	7
Description	Reserved	Reserved	Average number error	Instruction error
Bit number	8	9	10	11
Description	CH1 Abnormal conversion	CH2 Abnormal conversion	CH3 Abnormal conversion	CH4 Abnormal conversion
Bit number	12	13	14	15
Description	CH5 Abnormal conversion	CH6 Abnormal conversion	Reserved	Reserved

6. When CR#29 is set to H’5678, CR#0 ~ CR#34 can be used for PID settings with DVP04PT-S version V3.08 and above.

<table>
<tr><th colspan="8">PID Mode description</th></tr>
<tr><td>CR#</td><td>Keep</td><td>R/W</td><td></td><td>CR#</td><td>Keep</td><td>R/W</td><td></td></tr>
<tr><td>#0</td><td>O</td><td>R</td><td>Model name</td><td>#24</td><td>O</td><td>R/W</td><td>CH1 K_D</td></tr>
<tr><td>#1</td><td>X</td><td>R/W</td><td>CH1~CH4 Mode setting</td><td>#25</td><td>O</td><td>R/W</td><td>CH2 K_D</td></tr>
<tr><td>#2</td><td>X</td><td>R</td><td>PID Output % at CH1</td><td>#26</td><td>O</td><td>R/W</td><td>CH3 K_D</td></tr>
<tr><td>#3</td><td>X</td><td>R</td><td>PID Output % at CH2</td><td>#27</td><td>O</td><td>R/W</td><td>CH4 K_D</td></tr>
<tr><td>#4</td><td>X</td><td>R</td><td>PID Output % at CH3</td><td rowspan="13">#28</td><td rowspan="13">X</td><td rowspan="13">R/W</td><td rowspan="13">Run/Stop & Auto tuning

Bit0：CH1 PID Run/Stop
Bit1：CH2 PID Run/Stop
Bit2：CH3 PID Run/Stop
Bit3：CH4 PID Run/Stop
0=PID Stop，1=PID Run

Bit4：CH1 Auto tuning
Bit5：CH2 Auto tuning
Bit6：CH3 Auto tuning
Bit7：CH4 Auto tuning
1: The auto tuning function is enabled. After the auto tuning action completed, the value becomes 0.</td></tr>
<tr><td>#5</td><td>X</td><td>R</td><td>PID Output % at CH4</td></tr>
<tr><td colspan="4">CR#2~CR#5: 0~1000; Unit: 0.1%</td></tr>
<tr><td>#6</td><td>X</td><td>R</td><td>Average temperature (^{0}C) at CH1</td></tr>
<tr><td>#7</td><td>X</td><td>R</td><td>Average temperature (^{0}C) at CH2</td></tr>
<tr><td>#8</td><td>X</td><td>R</td><td>Average temperature (^{0}C) at CH3</td></tr>
<tr><td>#9</td><td>X</td><td>R</td><td>Average temperature (^{0}C) at CH4</td></tr>
<tr><td colspan="4">CR#6~CR#9：Unit: 0.1%</td></tr>
<tr><td>#10</td><td>O</td><td>R/W</td><td>Set temperature at CH1</td></tr>
<tr><td>#11</td><td>O</td><td>R/W</td><td>Set temperature at CH2</td></tr>
<tr><td>#12</td><td>O</td><td>R/W</td><td>Set temperature at CH3</td></tr>
<tr><td>#13</td><td>O</td><td>R/W</td><td>Set temperature at CH4</td></tr>
<tr><td colspan="4">CR#10~CR#13: Set the PID target value (SV)</td></tr>
<tr><td>#14</td><td>O</td><td>R/W</td><td>CH1 K_P</td><td rowspan="2">#29</td><td rowspan="2">X</td><td rowspan="2">R/W</td><td rowspan="2">Enter PID mode(H’5678)
K0: Exit the PID mode</td></tr>
<tr><td>#15</td><td>O</td><td>R/W</td><td>CH2 K_P</td></tr>
<tr><td>#16</td><td>O</td><td>R/W</td><td>CH3 K_P</td><td>#30</td><td>X</td><td>R</td><td>Error code</td></tr>
<tr><td>#17</td><td>O</td><td>R/W</td><td>CH4 K_P</td><td>#31</td><td>O</td><td>R/W</td><td>CH1 Sampling time</td></tr>
<tr><td>#19</td><td>O</td><td>R/W</td><td>CH1 K_I</td><td>#32</td><td>O</td><td>R/W</td><td>CH2 Sampling time</td></tr>
<tr><td>#20</td><td>O</td><td>R/W</td><td>CH2 K_I</td><td>#33</td><td>O</td><td>R/W</td><td>CH3 Sampling time</td></tr>
<tr><td>#21</td><td>O</td><td>R/W</td><td>CH3 K_I</td><td>#34</td><td>O</td><td>R/W</td><td>CH4 Sampling time</td></tr>
<tr><td>#22</td><td>O</td><td>R/W</td><td>CH4 K_I</td><td colspan="4">CR#31~CR#34: 1~30; Unit: 1s</td></tr>
<tr><td colspan="8">Note: CR#29 must be set to H’5678 to enter the PID mode before configuring settings on other control registers.</td></tr>
</table>

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9.4.2 DVP04TC-S Control Register

CR#	Address	Save		Register content	Description
#0	H'4096	O	R	Model name	Set up by the system: DVP04TC-S model code=H'8B
#1	H'4097	O	R/W	Thermocouple type	b15~b12: Reserved; b11~b9: CH4; b8~b6: CH3; b5~b3: CH2; b2~b0: CH1 Example: Setting of CH1 1. (b2, b1, b0) set to (0, 0, 0), use J-type. 2. (b2, b1, b0) set to (0, 0, 1), use K-type. 3. (b2, b1, b0) set to (0, 1, 0), use R-type. 4. (b2, b1, b0) set to (0, 1, 1), use S-type. 5. (b2, b1, b0) set to (1, 0, 0), use T-type. Note: With version V4.20 and above, you can close a certain channel. For example, set (b2, b1, b0) to (1, 1, 0) and CH1 would be closed.

CR#1: Used to set the working mode of four channels. There are 5 modes (J-type, K-type, R-type, S-type, and T-type) for each channel and can be set individually. For example, if you want to set CH1~CH4 as following: CH1: J-type (b2 ~ b0=000), CH2: K-type (b5 ~ b3=001), CH3: J-type (b8 ~ b6=000) and CH4: K-type (b11 ~ b9=001), you should set CR#1 to H'0208. The higher bits (b12 ~ b15) will be reserved, and the default setting is H'0000.

CR#	Address	Save		Register content	Description
#2	H'4098	O	R/W	CH1 average number	Average times setting of channels CH1 ~ CH4. Setting range: For versions prior to V3.04: K1 ~ K4,095. For versions after V3.05: K1 ~ K20. Default setting is K10.
#3	H'4099	O	R/W	CH2 average number	
#4	H'409A	O	R/W	CH3 average number	
#5	H'409B	O	R/W	CH4 average number	

CR#2 ~ CR#5: Please notice that when setting average times via TO/DTO instructions, please use rising-edge/falling-edge detection instruction (such as LDP and LDF) to get correct average times.

CR#	Address	Save		Register content	Description
#6	H'409C	X	R	CH1 average degrees	Average Celsius degrees for channels CH1 ~ CH4. (Unit: 0.1°C).
#7	H'409D	X	R	CH2 average degrees	
#8	H'409E	X	R	CH3 average degrees	
#9	H'409F	X	R	CH4 average degrees	
#10	H'40A0	X	R	CH1 average degrees	Average Fahrenheit degrees for channels CH1 ~ CH4. (Unit: 0.1°F).
#11	H'40A1	X	R	CH2 average degrees	
#12	H'40A2	X	R	CH3 average degrees	
#13	H'40A3	X	R	CH4 average degrees	
#14	H'40A4	X	R	Present temp. of CH1	Present Celsius temperature of channels CH1 ~ CH4. (Unit: 0.1°C).
#15	H'40A5	X	R	Present temp. of CH2	
#16	H'40A6	X	R	Present temp. of CH3	
#17	H'40A7	X	R	Present temp. of CH4	
#19	H'40A9	X	R	Present temp. of CH1	Present Fahrenheit temperature of channels CH1 ~ CH2. (Unit: 0.1°F).
#20	H'40AA	X	R	Present temp. of CH2	
#21	H'40AB	X	R	Present temp. of CH3	Present Fahrenheit temperature of channels CH3 ~ CH4. (Unit: 0.1°F).
#22	H'40AC	X	R	Present temp. of CH4	
#24	H'40AE	O	R/W	CH1 OFFSET Value	Adjust offset value of channels CH1 ~ CH4. The range is -1,000 ~ +1,000 and default setting is K0.(Unit: 0.1°C). OFFSET = module measured temperature - OFFSET value = actual displayed temperature
#25	H'40AF	O	R/W	CH2 OFFSET Value	
#26	H'40B0	O	R/W	CH3 OFFSET Value	
#27	H'40B1	O	R/W	CH4 OFFSET Value	
#29	H'40B3	X	R/W	PID mode setting	Set H'5678 to enable PID mode, all other settings are normal mode. Default: H'0000.
#30	H'40B4	X	R	Error status	Data register stores the error status. Refer to the error code chart for details.
#31	H'40B5	O	R/W	Communication address setting	RS-485 communication address. Setting range is 1 ~ 254 and default setting is K1.

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#32	H’40B6	O	R/W	Communication format setting	It is used to set communication format. For baud rate, the settings are 4,800/9,600/19,200/38,400/57,600/115,200 bps. Communication format: ASCII：7,E,1 / 7,O,1 / 8,E,1 / 8,O,1 / 8,N,1 RTU ：8,E,1 / 8,O,1 / 8,N,1 Factory default: ASCII,9600,7,E,1 (CR#32=H’0002) Refer to ※CR#32 communication format settings at the end of this table for more information.
#33	H’40B7	O	R/W	Reset to default setting	b15~b12: ERR LED; b11~b9: CH4; b8~b6: CH3; b5~b3: CH2; b2~b0: CH1 Example: Setting of CH1 1. b0 ~ b1: Reserved. 2. b2: Set to 1 and PLC will be reset to default settings. Definition of ERR LED: b12~b15=1111 (default settings) 1. b12 corresponds to CH1: when b12=1, scale exceeds the range, ERR LED flashes. 2. b13 corresponds to CH2: when b13=1, scale exceeds the range, ERR LED flashes. 3. b14 corresponds to CH3: when b14=1, scale exceeds the range, ERR LED flashes. 4. b15 corresponds to CH4: when b15=1, scale exceeds the range, ERR LED flashes
#34	H’40B8	O	R	Software version	Display the software version in hexadecimal. Example: H’010A = version 1.0A
#35 ~ #48				System used	
Symbols: O: means latched. (Support when using RS-485 communication, not support when connecting with MPU) X: means not latched. R: able to read data by using FROM instruction or RS-485. W: able to write data by using TO instruction or RS-485.					

1. Added the RESET function for modules with firmware V4.14 or later. Connect the module power input to 24 VDC and write H’4352 into CR#0 and then turn the power off and on again; all parameters in modules, including communication parameters are restored to factory defaults.

2. If you want to use Modbus address in decimal format, you can transfer a hexadecimal register to decimal format and then add one to have it become a decimal Modbus register address. For example, transferring the address “H’4096” of CR#0 in hexadecimal format to decimal format, to have the result 16534 and then adding one to it, you have 16535, the Modbus address in decimal format.

3. CR#32 communication format settings: for modules with firmware V4.12 or previous versions, b11~b8 data format selection is not available. For ASCII mode, the format is fixed to 7, E, 1 (H’00XX) and for RTU mode, the format is fixed to 8, E, 1 (H’C0xx/H’80xx). For modules with firmware V4.13 or later, refer to the following table for setups. Note that the original code H’C0XX/H’80XX will be seen as RTU, 8, E, 1 for modules with firmware V4.13 or later.

b15 ~ b12		b11 ~ b8		b7 ~ b0	
ASCII/RTU, exchange low and high byte of CRC check code		Data format		Baud rate	
Description					
H'0	ASCII	H'0	7,E,1*1	H'01	4800 bps
H'8	RTU, do not exchange low and high byte of CRC check code	H'1	8,E,1	H'02	9600 bps
		H'2	reserved	H'04	19200 bps
H'C	RTU, exchange low and high byte of CRC check code	H'3	8,N,1	H'08	38400 bps
		H'4	7,O,1*1	H'10	57600 bps
		H'5	8.O,1	H'20	115200 bps

Note *1: This is only available for ASCII format.

Ex: Write H'C310 into CR#32 for a result of RTU, exchange low and high byte of CRC check code, 8,N,1 and baud rate at 57600 bps.

4. Function codes: 03'H is for reading data from registers. 06'H is for writing a word data into registers. 10'H is for writing multiple word data into registers.

5. CR#30 is the error code register. Refer to the chart below:

<table>
<tr><th>Error description</th><th>Content</th><th>b15 ~ b8</th><th>b7</th><th>b6</th><th>b5</th><th>b4</th><th>b3</th><th>b2</th><th>b1</th><th>b0</th></tr>
<tr><td>Power source abnormal</td><td>K1 (H'1)</td><td rowspan="8">Reserved</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Wiring to empty external contact</td><td>K2 (H'2)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>Setting mode error</td><td>K4 (H'4)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>Offset/Gain error</td><td>K8 (H'8)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Temperature sensor error</td><td>K16 (H'10)</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Digital range error</td><td>K32 (H'20)</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Average times setting error</td><td>K64 (H'40)</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Instruction error</td><td>K128 (H'80)</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="11">Note: Each error code will have corresponding bit (b0 ~ b7). Two or more errors may happen at the same time. 0 means normal and 1 means having error.</td></tr>
</table>

6. When CR#29 is set to H'5678, CR#0 ~ CR#34 can be used for PID settings in DVP04TC-S V3.08 and versions above.

<table>
<tr><th colspan="8">PID Mode description</th></tr>
<tr><td>CR#</td><td>Keep</td><td>R/W</td><td></td><td>CR#</td><td>Keep</td><td>R/W</td><td></td></tr>
<tr><td>#0</td><td>O</td><td>R</td><td>Model name</td><td>#24</td><td>O</td><td>R/W</td><td>CH1 K_D</td></tr>
<tr><td>#1</td><td>X</td><td>R/W</td><td>Thermocouple type</td><td>#25</td><td>O</td><td>R/W</td><td>CH2 K_D</td></tr>
<tr><td>#2</td><td>X</td><td>R</td><td>PID Output % at CH1</td><td>#26</td><td>O</td><td>R/W</td><td>CH3 K_D</td></tr>
<tr><td>#3</td><td>X</td><td>R</td><td>PID Output % at CH2</td><td>#27</td><td>O</td><td>R/W</td><td>CH4 K_D</td></tr>
<tr><td>#4</td><td>X</td><td>R</td><td>PID Output % at CH3</td><td rowspan="14">#28</td><td rowspan="14">X</td><td rowspan="14">R/W</td><td rowspan="14">Run/Stop & Auto tuning

Bit0：CH1 PID Run/Stop
Bit1：CH2 PID Run/Stop
Bit2：CH3 PID Run/Stop
Bit3：CH4 PID Run/Stop
0=PID Stop，1=PID Run

Bit4：CH1 Auto tuning
Bit5：CH2 Auto tuning
Bit6：CH3 Auto tuning
Bit7：CH4 Auto tuning
1: The auto tuning function is enabled. After the auto tuning completed, the value becomes 0.</td></tr>
<tr><td>#5</td><td>X</td><td>R</td><td>PID Output % at CH4</td></tr>
<tr><td colspan="4">CR#2~CR#5: 0~1000; Unit: 0.1%</td></tr>
<tr><td>#6</td><td>X</td><td>R</td><td>Average temperature (^{0}C) at CH1</td></tr>
<tr><td>#7</td><td>X</td><td>R</td><td>Average temperature (^{0}C) at CH2</td></tr>
<tr><td>#8</td><td>X</td><td>R</td><td>Average temperature (^{0}C) at CH3</td></tr>
<tr><td>#9</td><td>X</td><td>R</td><td>Average temperature (^{0}C) at CH4</td></tr>
<tr><td colspan="4">CR#6~CR#9：Unit: 0.1%</td></tr>
<tr><td>#10</td><td>O</td><td>R/W</td><td>Set temperature at CH1</td></tr>
<tr><td>#11</td><td>O</td><td>R/W</td><td>Set temperature at CH2</td></tr>
<tr><td>#12</td><td>O</td><td>R/W</td><td>Set temperature at CH3</td></tr>
<tr><td>#13</td><td>O</td><td>R/W</td><td>Set temperature at CH4</td></tr>
<tr><td colspan="4">CR#10~CR#13: Set the PID target value (SV)</td></tr>
<tr><td>#14</td><td>O</td><td>R/W</td><td>CH1 K_P</td><td rowspan="2">#29</td><td rowspan="2">X</td><td rowspan="2">R/W</td><td rowspan="2">Enter PID mode(H'5678)
K0: Exit the PID mode</td></tr>
<tr><td>#15</td><td>O</td><td>R/W</td><td>CH2 K_P</td></tr>
<tr><td>#16</td><td>O</td><td>R/W</td><td>CH3 K_P</td><td>#30</td><td>X</td><td>R</td><td>Error code</td></tr>
<tr><td>#17</td><td>O</td><td>R/W</td><td>CH4 K_P</td><td>#31</td><td>O</td><td>R/W</td><td>CH1 Sampling time</td></tr>
<tr><td>#19</td><td>O</td><td>R/W</td><td>CH1 K_I</td><td>#32</td><td>O</td><td>R/W</td><td>CH2 Sampling time</td></tr>
<tr><td>#20</td><td>O</td><td>R/W</td><td>CH2 K_I</td><td>#33</td><td>O</td><td>R/W</td><td>CH3 Sampling time</td></tr>
<tr><td>#21</td><td>O</td><td>R/W</td><td>CH3 K_I</td><td>#34</td><td>O</td><td>R/W</td><td>CH4 Sampling time</td></tr>
<tr><td>#22</td><td>O</td><td>R/W</td><td>CH4 K_I</td><td colspan="4">CR#31~CR#34: 1~30; Unit: 1s</td></tr>
<tr><td colspan="8">Note: Users must enter the PID mode (CR#29=H'5678) before setting other control registers.</td></tr>
</table>

9.4.3 DVP08NTC-S Control Register

CR#	MODBUS Address	Latched	Attribute	Register content	Description	
#0	H4000	O	R	Model name	H010D	
#1	H4001	O	R/W	CH1 & CH2 Mode setting	Please refer to the content description - Sensor Settings (CR#1~CR#4)	
#2	H4002	O	R/W	CH3 & CH4 Mode setting		
#3	H4003	O	R/W	CH5 & CH6 Mode setting		
#4	H4004	O	R/W	CH7 & CH8 Mode setting		
#5	H4005	O	R/W	Temperature scales setting	K0: Celsius(°C) (Default) K1: Fahrenheit(°F)	
#6	H4006	O	R/W	Moving average	Setting range: 1~100. Default: 3	
#7	H4007	X	R	CH1 average degrees	Average degrees, unit: 0.1°C.	
#8	H4008	X	R	CH2 average degrees		
#9	H4009	X	R	CH3 average degrees		
#10	H400A	X	R	CH4 average degrees		
#11	H400B	X	R	CH5 average degrees		
#12	H400C	X	R	CH6 average degrees		
#13	H400D	X	R	CH7 average degrees		
#14	H400E	X	R	CH8 average degrees		
#15	H400F	X	R	Error code register	Please refer to the content description – Error code register	
#16	H4010	O	R/W	RS-485 station setting	Setting range:1~254. Default: 1	
#17	H4011	O	R/W	Communication format Setting	Please refer to the content description – communication format setting	
#18	H4012	X	R	CH1 ADC Raw Data	Low word	Raw conversion data
#19	H4013				High word	
#20	H4014	X	R	CH2 ADC Raw Data	Low word	
#21	H4015				High word	
#22	H4016	X	R	CH3 ADC Raw Data	Low word	Raw conversion data
#23	H4017				High word	
#24	H4018	X	R	CH4 ADC Raw Data	Low word	
#25	H4019				High word	
#26	H401A	X	R	CH5 ADC Raw Data	Low word	
#27	H401B				High word	
#28	H401C	X	R	CH6 ADC Raw Data	Low word	
#29	H401D				High word	
#30	H401E	X	R	CH7 ADC Raw Data	Low word	
#31	H401F				High word	
#32	H4020	X	R	CH8 ADC Raw Data	Low word	
#33	H4021				High word	
#34	H4022	O	R	Firmware version	Example:H0123 represents V1.23	
#35	H4023	X	R/W	Instruction	Please refer to the content description - Instruction	
#36~ #49	For system use					
Symbols:						

CR#	MODBUS Address	Latched	Attribute	Register content	Description
O means latched. X means not latched (Power-off latching command must be issued to maintain power-off state.) R means can read data by using FROM instruction or RS-485. W means can write data by using TO instruction or RS-485.					

◆Sensors setting (CR#1~CR#4)

The content and allocations of registers are shown below:

CR#	MODBUS Address	Register Name	Register Allocations	
			High byte（b15~b8）	Low byte（b7~b0）
#1	H4001	CH1 & CH2 Sensors setting	CH2 Setting value	CH1 Setting value
#2	H4002	CH3 & CH4 Sensors setting	CH4 Setting value	CH3 Setting value
#3	H4003	CH5 & CH6 Sensors setting	CH6 Setting value	CH5 Setting value
#4	H4004	CH7 & CH8 Sensors setting	CH8 Setting value	CH7 Setting value

The corresponding sensor types are as follows:

Value		Sensor Type
Demical	Hexademical	
K0	H00	Pt1000
K1	H01	Ni1000
K2	H02	LG-Ni1000
K3	H03	NTC 10K B25 B85 3977K
K4	H04	NTC 100K B25 B85 4260K
K5	H05	NTC 20K B25 B85 4200
K6	H06	NTC 30K B25 B50 4200
K7	H07	PT-42H 10K B25 B85 3435K
K8	H08	PT-43 10.74K B25 B85 3480K
K9	H09	PT-51F 49.12K B25 B85 3992K
K10	H0A	PT-25E2 98..63K B25 B85 4066K
K11	H0B	PT-312 231.4K B25 B85 4240K
K12	H0C	KTY81-110/120
K13	H0D	KTY81-121
K14	H0E	KTY81-122
K15	H0F	KTY81-210/220
K16	H10	KTY81-221
K17	H11	KTY81-222
K18	H12	Self-defined temperature/resistance table 1
K19	H13	Self-defined temperature/resistance table 2
K20	H14	Self-defined temperature/resistance table 3
K21	H15	Self-defined temperature/resistance table 4
K22	H16	Self-defined temperature/resistance table 5
K23	H17	Self-defined temperature/resistance table 6
K24	H18	Self-defined temperature/resistance table 7
K25	H19	Self-defined temperature/resistance table 8
K255	HFF	Channel disabled (Default)

Example:

1. To set CH1 to use Pt1000 (H00) and CH2 to use NTC 30K (H06), write H0600 to CR#1.
2. To set CH5 to use self-defined table 8 (H19) and close CH6 channel (HFF), write HFF19 to CR#3.

◆**Error Code Register (CR#15)**

Error Status	Value	b15 ~ b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
CH1 Invalid measured value or sensor connection failure	K1（H1）	Reserved	0	0	0	0	0	0	0	0	0	1
CH2 Invalid measured value or sensor connection failure	K2（H2）		0	0	0	0	0	0	0	0	1	0
CH3 Invalid measured value or sensor connection failure	K4（H4）		0	0	0	0	0	0	0	1	0	0
CH4 Invalid measured value or sensor connection failure	K8（H8）		0	0	0	0	0	0	1	0	0	0
CH5 Invalid measured value or sensor connection failure	K16（H10）		0	0	0	0	0	1	0	0	0	0
CH6 Invalid measured value or sensor connection failure	K32（H20）		0	0	0	0	1	0	0	0	0	0
CH7 Invalid measured value or sensor connection failure	K64（H40）		0	0	0	1	0	0	0	0	0	0
CH8 Invalid measured value or sensor connection failure	K128（H’80）		0	0	1	0	0	0	0	0	0	0
Power source abnormal	K256（H100）		0	1	0	0	0	0	0	0	0	0
Hardware malfunction	K512（H200）		1	0	0	0	0	0	0	0	0	0
Note: Each error status is determined by the corresponding bit (b0~b9). Two or more errors may occur at the same time. 0 means normal, 1 mans an error has occurred.												

- **Communication format setting (CR#17)**

b15~b12		b11~b8		b7~b0	
ASCII/RTU		Data format		Baud rate	
H0	ASCII (Default)	H'0	7,E,1(Only for ASCII) (Default)	H02	9600(Default)
HC	RTU	H1	8 · E · 1	H04	19200
		H2	7 · N · 1(Only for ASCII)	H08	38400
		H3	8 · N · 1	H10	57600
		H4	7 · O · 1(Only for ASCII)	H20	115200
		H5	8 · O · 1		
		H6	7 · E · 2(Only for ASCII)		
		H7	8 · E · 2		
		H8	7 · N · 2(Only for ASCII)		
		H9	8 · N · 2		
		HA	7 · O · 2(Only for ASCII)		
		HB	8 · O · 2		

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- **Instruction (CR#35)**

Instruction	Description
H6001	Retain values after power loss.
H5AA5	Restore to factory settings. Self-defined table will not be reset.
H5AA6	Clear all self-defined tables.

After writing, CR#35 can be read once, where a reading of 1 indicates a successful write command, and a reading of 0 indicates a failed write command. After reading, the value will reset to 0.

9.5 DVP02TUN-S / DVP02TUR-S / DVP02TUL-S / DVP02TKN-S / DVP02TKR-S / DVP02TKL-S Control Registers

9.5.1 Control Registers

9.5.1.1 MODBUS Address List for DVP02TK-S Series

TK MODBUS Address	Description
H0000	TK CR#0: starting address
H1000	The 1st module on the right side of TK series, CR#0: starting address
H2000	The 2nd module on the right side of TK series, CR#0: starting address
H3000	The 3rd module on the right side of TK series, CR#0: starting address
H4000	The 4th module on the right side of TK series, CR#0: starting address
H5000	The 5th module on the right side of TK series, CR#0: starting address
H6000	The 6th module on the right side of TK series, CR#0: starting address
H7000	The 7th module on the right side of TK series, CR#0: starting address
H8000	The 8th module on the right side of TK series, CR#0: starting address

Note: Modbus address is required while using Modbus-tk to read-write registers over a RS-485 network.

9.5.1.2 MODBUS Hex Address List for DVP02TK-S Series

Address (Hex)	Attribute		Name	Description	Default
0F00	R	X	Number of connected extension modules	Detecting number of the extension modules connected to the right side of the TK series	--
0F01	R	X	Code of the 1st module	Code of the 1st module on the right side of TK series	--
0F02	R	X	Code of the 2nd module	Code of the 2nd module on the right side of TK series	--
0F03	R	X	Code of the 3rd module	Code of the 3rd module on the right side of TK series	--
0F04	R	X	Code of the 4th module	Code of the 4th module on the right side of TK series	--
0F05	R	X	Code of the 5th module	Code of the 5th module on the right side of TK series	--
0F06	R	X	Code of the 6th module	Code of the 6th module on the right side of TK series	--

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Address (Hex)	Attribute		Name	Description	Default
0F07	R	X	Code of the 7^{th} module	Code of the 7^{th} module on the right side of TK series	--
0F08	R	X	Code of the 8^{th} module	Code of the 8^{th} module on the right side of TK series	--
0F09	R/W	O	RS-485 communication setup	Refer to sections for setting up the RS-485 communication mode	K0
0F0A	R/W	X	Reserved		
0F0B	R/W	O	RS-485 communication format	0：ASCII / 1：RTU	K0
0F0C	R/W	O	TK station number	TK station number setup	K1
0F0D	R/W	X	TK operation	0：Stop / 1：Run	--

9.5.1.3 List of the Control Registers

TU CR#	TK Add. (Hex)	Attribute		Name	Description	Default
#0	000	R	O	Model	By default, you can see the model's name in the program and determine whether there is any extension module. DVP02TUL-S: H014F DVP02TUN-S: H024F DVP02TUR-S: H034F DVP02TKL-S: H044F DVP02TKN-S: H054F DVP02TKR-S: H064F	--
#1	001	R	O	Firmware version	Hexadecimal, displaying the current firmware version, for example the current firmware is 1.02 and it will display H'0102.	--
#2	002	R	O	CH1 PV	Channel current value	--
#3	003	R	O	CH2 PV		
#4	004	R/W	O	CH1 SV setups	Channel target value	K0
#5	005	R/W	O	CH2 SV setups		
#6	006	R/W	X	CH1 setups to run/stop an operation	K0: stop K1: run K2: pause (programmable)	K0
#7	007	R/W	X	CH2 setups to run/stop an operation		
#8	008	R/W	X	CH1 Auto tuning	K0: Auto control mode K1: Auto adjust mode, after adjusting it will switch to the auto control mode and input the most suitable parameters, e.g., Kc_Kp, Ti_Ki, Td_Kd and Tf. K2: Auto adjust mode (enhanced), recommended when the change in temperature reaches 2 degrees /second. Another channel would be turned off automatically while adjusting, then revert to the original channel setting once completed.	K0
#9	009	R/W	X	CH2 Auto tuning		
#10	00A	R/W	X	Setups to switch pages	CR#11~CR#42: Definitions may vary according to different setups on the specific page. K0: Basic setup page for CH1 K1: PID setup page for CH1	K0

TU CR#	TK Add. (Hex)	Attribute		Name	Description	Default
					K2: Program control setup page for CH1 K3: Pattern 0, 1 setup page for CH1 K4: Pattern 2, 3 setup page for CH1 K5: Pattern 4, 5 setup page for CH1 K6: Pattern 6, 7 setup page for CH1 K7: Automatic PID calculation setup page for CH1 K10: Basic setup page for CH2 K11: PID setup page for CH2 K12: Program control setup page for CH2 K13: Pattern 0, 1 setup page for CH2 K14: Pattern 2, 3 setup page for CH2 K15: Pattern 4, 5 setup page for CH2 K16: Pattern 6, 7 setup page for CH2 K17: Automatic PID calculation setup page for CH2	
#11 ~ #42	--	R/W	X	According to each setup page	Please refer to each setup page.	K0
--	00B	R/W	--	Page0	Basic setup page for CH1	--
--	02B	R/W	--	Page1	PID setup page for CH1	--
--	04B	R/W	--	Page2	Program control setup page for CH1	--
--	06B	R/W	O	Page3	Pattern 0, 1 setup page for CH1	--
--	08B	R/W	O	Page4	Pattern 2, 3 setup page for CH1	--
--	0AB	R/W	O	Page5	Pattern 4, 5 setup page for CH1	--
--	0CB	R/W	O	Page6	Pattern 6, 7 setup page for CH1	--
--	291	R/W	O	Page7	Automatic PID calculation setup page for CH1	--
--	0EB	R/W	O	Page10	Basic setup page for CH2	--
--	10B	R/W	O	Page11	PID setup page for CH2	--
--	12B	R/W	O	Page12	Program control setup page for CH2	--
--	14B	R/W	O	Page13	Pattern 0, 1 setup page for CH2	--
--	16B	R/W	O	Page14	Pattern 2, 3 setup page for CH2	--
--	18B	R/W	O	Page15	Pattern 4, 5 setup page for CH2	--
--	1AB	R/W	O	Page16	Pattern 6, 7 setup page for CH2	--
--	2B1	R/W	O	Page17	Automatic PID calculation setup page for CH2	--
#43	24B		X	Error code	Please refer to error code descriptions.	K0
#45	24D	R/W	X	User-defined	0x0501: Restore to defaults 0x0502: Settings written on flash 0x0504: RS-485 mode and latched (parameter/mode/station number) 0x51CC: Manually output 0x51DD：Auto output (the PID will be invalid after switching to manually output mode.) CR control can be set up by the analog output of	K0

TU CR#	TK Add. (Hex)	Attribute		Name	Description	Default
					DVP02TUL-S/DVP02TKL-S and the digital output of /DVP02TUN-S/DVP02TKR-S/DVP02TKN-S. DVP02TUL-S/DVP02TKL-S： CR#4: CH1 analog output value range K0~K4000 CR#5: CH2 analog output value range K0~K4000 DVP02TUR-S/DVP02TUN-S/DVP02TKR-S/DVP02TKN-S： CR#4 (bit0/bit1): CH1 digital output Y0/Y1 CR#5 (bit0/bit1): CH2 digital output Y2/Y3	
#46	24E	R	O	CH1 display value	The display value is the measured value after being rounded off or the value set to be displayed for the channels.	
#47	24F	R	O	CH2 display value		
Symbols: O: Latched. X: Non-latched. R: Able to read data by FROM instruction. W: Able to write data by TO instruction.						

- CR#43 Error code descriptions

Error Code		1	0
Bit0	Power Supply abnormal	Abnormal	Normal
Bit1	Hardware abnormal	Abnormal	Normal
Bit2	CH1 conversion error	Abnormal	Normal
Bit3	CH2 conversion error	Abnormal	Normal
Bit4	CH1 circuit control abnormal	Abnormal	Normal
Bit5	CH2 circuit control abnormal	Abnormal	Normal
Bit6	Manually / Auto Output	Manually Output	Auto Output
Bit7-15	Reserved		

9.5.1.4 Basic Setup Page

TU CR#	TK CH1 Page0 Add. (Hex)	TK CH2 Page10 Add. (Hex)	Attribute		Name	Description	Default
#11	00B	0EB	R/W	O	Sensor type	K-255: Channel closed K0: 0 ~ 5V K1: 0~10V K2: 0 ~ 20mA K3: 4 ~ 20mA K4: 0 ~ 50mV K5: Pt100 K6: JPt100 K7: Pt1000 K8: J K9: K	K0

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TU CR#	TK CH1 Page0 Add. (Hex)	TK CH2 Page10 Add. (Hex)	Attribute		Name	Description	Default
						K10: R K11: S K12: T K13: E K14: N K15: B K16: L K17: U K18: TXK K19: C K20: PL II K21: Cu50 K22: Cu100 K23: Ni100 K24: Ni1000 K25: LGNi1000 K26: 0~10V (Quick AI) K27: Ni120 K28：-100mV ~ 100mV K29：4 ~ 20mA (Quick AI)	
#12	00C	0EC	R/W	O	Unit of temperature	K0: $^{\circ}$C K1: $^{\circ}$F	K0
#13	00D	0ED	R/W	O	Offset temperature error	K-999 ~ K999	K0
#14	00E	0EE	R/W	O	Temperature filter range	Temperature filter ranges from K10 to K10000. When the value inputted is in the range of ±10 of the last inputted value, the system will run the filtering measurement. Hence, when the noise interference is bigger, the filter range setting should be bigger too.	K10
#15	00F	0EF	R/W	O	Filtering factor	Ranging K0~K50. Operational formula: value = (last value*n + this measurement) / (n+1) When the set value is less, the PV will be closer to this measurement. When the set value is bigger, the filtering factor will be bigger and the PV will be similar.	K1
#16	010	0F0	R/W	O	Control type	K0: PID Auto K1: PID Manual K2: PID program control	K0

TU CR#	TK CH1 Page0 Add. (Hex)	TK CH2 Page10 Add. (Hex)	Attribute		Name	Description	Default
						K3: ON/OFF (for DVP02TUR-S/DVP02TUN-S/ DVP02TKR-S/DVP02TKN-S)	
#17	011	0F1	R/W	O	Output 1 control	K0: Heating K1: Cooling K2: Alarm (for DVP02TUR-S /DVP02TUN-S/ DVP02TKR-S /DVP02TKN-S) K3: Proportion (for DVP02TUL-S/ DVP02TKL-S)	K0
#18	012	0F2	R/W	O	Output 2 control	K0: Heating K1: Cooling K2: Alarm Note: not for DVP02TUL-S/ DVP02TKL-S	K0
#21	015	0F5	R/W	O	Output setup	K0: cyclic output K1: immediately output DVP02TUN-S/ DVP02TKN-S: K0 (default) DVP02TUR-S/ DVP02TKR-S: K0 (default) Note: not available for DVP02TUL-S/DVP02TKL-S	K0
#23	017	0F7	R/W	O	Output 1: heating/cooling control cycle setup	DVP02TUN-S/ DVP02TKN-S: K1~K990 at 0.1 per second, default: K10. DVP02TUR-S/ DVP02TKR-S: K30~K990 at 0.1 per second (default), default: K200. Note: not available for DVP02TUL-S/DVP02TKL-S.	K10 /K200
#24	018	0F8	R/W	O	Output 2: heating/cooling control cycle setup		
#25	019	0F9	R/W	O	Alarm 1 output	K0~K12, please refer to chapter 9.5.4.2 Alarm Features. Note: not available for DVP02TUL-S/DVP02TKL-S.	K0
#26	01A	0FA	R/W	O	Alarm 2 output		
#27	01B	0FB	R/W	O	Alarm output 1 upper-limit setup		
#28	01C	0FC	R/W	O	Alarm output 1 lower-limit setup		
#29	01D	0FD	R/W	O	Alarm output 2 upper-limit setup		
#30	01E	0FE	R/W	O	Alarm output 2 lower-limit setup		

TU CR#	TK CH1 Page0 Add. (Hex)	TK CH2 Page10 Add. (Hex)	Attribute		Name	Description	Default
#32	020	100	R/W	O	PV upper-limit setup for a corresponding output	For DVP02TUL-S series, when the input value varies, the corresponding output will vary accordingly. Take 4~20mA as an example, and set the upper-limit to K1000, lower-limit to K0; when the reading is K0, the output will be 4mA and when the reading is K1000, the output will be 20mA. When set it to a negative slope, and set the range to K0~K1000; when the reading is K0, the output will be 20mA and when the reading is K1000, the output will be 4mA.	K4000
#33	021	101	R/W	O	PV lower-limit setup for a corresponding output		K0
#34	Reserved for system use						
#35	023	103	R/W	O	Heating hysteresis setup	ON-OFF (For DVP02TUN-S / DVP02TUR-S / DVP02TKN-S / DVP02TKR-S)	K10
#36	024	104	R/W	O	Cooling hysteresis setup		K10
#37	025	105	R/W	O	Analog output mode	For DVP02TUL-S / DVP02TKL-S K0: 0~10V K1: 0~20mA K2: 4~20mA	K0
#38	026	106	R/W	O	Out of the LED setting range	K0=LED blinking K1=LED not blinking	K0
#39	027	107	R/W	O	Dead band setup for dual outputs	Setting range: K-32768~K32767 Note: not for DVP02TUL-S / DVP02TKL-S	K10
#40	028	108	R	X	Outputting	DVP02TUL-S / DVP02TKL-S: analog output value K0~K4000 DVP02TUN-S/DVP02TUR-S/DVP02TKN-S/DVP02TKR-S： Bit0: Digital output point, OUT1 Bit1: Digital output point OUT2	--
#41	029	109	R	O	Set up the display value for the channel.	If the preset value (PV) is bigger than the display value, set the PV to be the same as the display value, ranging from K0~K100.	K2
Symbols: O: Latched. X: Non-latched. R: Able to read data by FROM instruction. W: Able to write data by TO instruction.							

9.5.1.5 PID Setup Page

TU CR#	TK CH1 Page1 Add. (Hex)	TK CH2 Page11 Add. (Hex)	Attribute		Name	Description	Default
#11	02B	10B	R/W	O	MOUT_AUTO	K0：Normal, the value of MOUT won't be changed with the value of MV. K1：Auto, the value of MOUT will be changed with the value of MV.	K0
#12	02C	10C	R/W	O	MOUT	When set to PID Manual, the MV value will be outputted as the manually set MOUNT value, between MV_MAX and MV_MIN.	K0
#13	02D	10D	R/W	O	α value	The smaller the value of integral delay parameter the slower the accumulation of integral coefficients would start. Setup range is from K0 to K100.	K65
#14-#17	Reserved						
#18	032	112	R/W	O	PID_EQ	PID formula types K0: Independent Formula K1: Dependent Formula	K1
#19	033	113	R/W	O	PID_DE	The calculation of the PID derivative error K0: Using the variations in the error (E) to calculate the control value of the derivative (Derivative of the error). K1: Using the variations in the PV to calculate the control value of the derivative (Derivative of the PV).	K0
#20	034	114	R/W	O	ERR_DBW	Error dead bandwidth: Range within which an error (E) is 0. An error (E) is equal to SV−PV or PV-SV. If the setting value is 0, the function will not be enabled; otherwise, the CPU module will check whether the present error is less than the absolute value of ERR_DBW, and check whether the present error meets the cross-status condition. If the present error is less than the absolute value of ERR_DBW, and meets the cross-status condition, the present error will be count as 0,	K0

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TU CR#	TK CH1 Page1 Add. (Hex)	TK CH2 Page11 Add. (Hex)	Attribute		Name	Description	Default
						and the PID algorithm will be implemented, otherwise the present error will be brought into the PID algorithm according to the normal processing.	
#21	035	115	R/W	O	BIAS	Feedforward output value, used for the PID feedforward.	K0
#22	036	116	R/W	X	MV	The MV output value is K0~K1000 and the unit is 0.1.	--
#23	037	117	R/W	X	I_MV(Low word)	Accumulated integral value temporarily stored. This value is usually used for reference only. Users can clear or modify it according to their needs. When the MV is greater than the MV_MAX, or less than the MV_MIN, the accumulated integral value in I_MV will no longer be altered.	--
#24	038	118	R/W	X	I_MV (High word)		--
#25	039	119	R/W	O	AUTO Tuning (PID hysteresis)	PID working: SV - PID Range < PV < SV + PID Range	K1
#26	03A	11A	R/W	O	β value	K0 ~ K100 and the unit is 0.01.	K65
#27	03B	11B	R/W	O	Kc_Kp floating point format (Lo word)	Calculated proportional coefficient (Kc or Kp) If the P coefficient is less than 0, the Kc_Kp will be 0. Independently, if Kc_Kp is 0, it will not be controlled by P.	1.0
#28	03C	11C	R/W	O	Kc_Kp floating point format (Hi word)		
#29	03D	11D	R/W	O	Ti_Ki floating point format (Lo word)	Integral coefficient (Ti or Ki) If the calculated coefficient I is less than 0, Ti_Ki will be 0. If Ti_Ki is 0, it will not be controlled by I.	1.0
#30	03E	11E	R/W	O	Ti_Ki floating point format (Hi word)		
#31	03F	11F	R/W	O	Td_Kd floating point format (Lo word)	Derivative coefficient (Td or Kd) If the calculated coefficient D is less than 0, Td_Kd will be 0. If Ti_Ki is 0, it will not be controlled by D.	0.1
#32	040	120	R/W	O	Td_Kd floating point format (Hi word)		
#33	041	121	R/W	O	Tf floating point format (Lo word)	Derivate parameter for suppressing variations can filter derivatives, which would be more effective with greater parameter values. Generally, it is suggested to use the result of auto tuning.	0.0
#34	042	122	R/W	O	Tf floating point format (Hi word)		

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TU CR#	TK CH1 Page1 Add. (Hex)	TK CH2 Page11 Add. (Hex)	Attribute		Name	Description	Default
#35	043	123	R/W	O	Default integral coefficient	K0~K10000 (The unit is 0.01)	K0
#36	044	124	R/W	O	Max. value of MV	K0~K1000 (The unit is 0.1%)	K1000
#37	045	125	R/W	O	Min value of. MV	K0~K1000 (The unit is 0.1%)	K0
Symbols: O: Latched. X: Non-latched. R: Able to read data by FROM instruction. W: Able to write data by TO instruction.							

9.5.1.6 Program Control Setup Page

TU CR#	TK CH1 Page2 Address (Hex)	TK CH2 Page12 Address (Hex)	Attribute		Name	Description	Default
#11	04B	12B	R/W	O	Pattern number to start running	K0~K7	K0
#12	04C	12C	R/W	O	Step number to start running	K0~K7	K0
#13	04D	12D	R/W	O	The Cycle index of the Pattern number 0~7 to repeat running	K0~K99 indicates the running times of the Pattern has reached 100 K9999: running continuously	K0
#14	04E	12E	R	X	Read the current running pattern number	K0~K8 (8 indicates ending)	K0
#15	04F	12F	R	X	Read the current running step number	K0~K7	K0
#16	050	130	R	X	Read the step running time left	Unit (seconds)	K0
#17	051	131	R/W	O	Pattern0_set up for the max. step number to run	K0~K7	K0
#18	052	132	R/W	O	Pattern1_ set up for the max. step number to run		
#19	053	133	R/W	O	Pattern2_ set up for the max. step number to run		
#20	054	134	R/W	O	Pattern3_ set up for the max. step number to run		
#21	055	135	R/W	O	Pattern4_ set up for the max. step number to run		
#22	056	136	R/W	O	Pattern5_ set up for the max. step number to run		
#23	057	137	R/W	O	Pattern6_ set up for the max. step number to run		
#24	058	138	R/W	O	Pattern7_ set up for the		

TU CR#	TK CH1 Page2 Address (Hex)	TK CH2 Page12 Address (Hex)	Attribute		Name	Description	Default
					max. step number to run		
#25	059	139	R	X	The current cycle index number of the Pattern number 0~7 to repeat running		
#26	05A	13A	R/W	O	Temperature wait function setup	K0~K999 (unit: 0.1) K9999: disable	K0
#27	05B	13B	R/W	O	Go back to the pattern number that is currently running	K0~K7	K0
#28	05C	13C	R/W	O	Go back to the step number that is currently running		
#29	05D	13D	R/W	O	Time unit of program control	K0: The unit is 1 min. K1: The unit is 0.1 sec.	K0

9.5.1.7 Pattern0, 1 Setup Page

TU CR#	TK CH1 Page3 Address (Hex)	TK CH2 Page13 Address (Hex)	Attribute		Name	Description	Default
#11	06B	14B	R/W	O	Pattern 0-0 Target temperature	Range: K -32768~K32767	K0
#12	06C	14C	R/W	O	Pattern 0-1 Target temperature		
#13	06D	14D	R/W	O	Pattern 0-2 Target temperature		
#14	06E	14E	R/W	O	Pattern 0-3 Target temperature		
#15	06F	14F	R/W	O	Pattern 0-4 Target temperature		
#16	070	150	R/W	O	Pattern 0-5 Target temperature		
#17	071	151	R/W	O	Pattern 0-6 Target temperature		
#18	072	152	R/W	O	Pattern 0-7 Target temperature		
#19	073	153	R/W	O	Pattern 0-0 Running time	Range: K0~K900 Unit (minutes)	K0
#20	074	154	R/W	O	Pattern 0-1 Running time		
#21	075	155	R/W	O	Pattern 0-2 Running time		
#22	076	156	R/W	O	Pattern 0-3 Running time		
#23	077	157	R/W	O	Pattern 0-4 Running time		
#24	078	158	R/W	O	Pattern 0-5 Running time		
#25	079	159	R/W	O	Pattern 0-6 Running time		
#26	07A	15A	R/W	O	Pattern 0-7 Running time		
#27	07B	15B	R/W	O	Pattern 1-0 Target temperature	Range: K-32768~K32767	K0

TU CR#	TK CH1 Page3 Address (Hex)	TK CH2 Page13 Address (Hex)	Attribute		Name	Description	Default
#28	07C	15C	R/W	O	Pattern 1-1 Target temperature		
#29	07D	15D	R/W	O	Pattern 1-2 Target temperature		
#30	07E	15E	R/W	O	Pattern 1-3 Target temperature		
#31	07F	15F	R/W	O	Pattern 1-4 Target temperature		
#32	080	160	R/W	O	Pattern 1-5 Target temperature		
#33	081	161	R/W	O	Pattern 1-6 Target temperature		
#34	082	162	R/W	O	Pattern 1-7 Target temperature		
#35	083	163	R/W	O	Pattern 1-0 Running time	Range: K0~K900 (Unit minutes)	K0
#36	084	164	R/W	O	Pattern 1-1 Running time		
#37	085	165	R/W	O	Pattern 1-2 Running time		
#38	086	166	R/W	O	Pattern 1-3 Running time		
#39	087	167	R/W	O	Pattern 1-4 Running time		
#40	088	168	R/W	O	Pattern 1-5 Running time		
#41	089	169	R/W	O	Pattern 1-6 Running time		
#42	08A	16A	R/W	O	Pattern 1-7 Running time		

9.5.1.8 Pattern 2, 3 Setup Page

TU CR#	TK CH1 Page4 Address (Hex)	TK CH2 Page14 Address (Hex)	Attribute		Name	Description	Default
#11	08B	16B	R/W	O	Pattern 2-0 Target temperature	Range: K-32768~K32767	K0
#12	08C	16C	R/W	O	Pattern 2-1 Target temperature		
#13	08D	16D	R/W	O	Pattern 2-2 Target temperature		
#14	08E	16E	R/W	O	Pattern 2-3 Target temperature		
#15	08F	16F	R/W	O	Pattern 2-4 Target temperature		
#16	090	170	R/W	O	Pattern 2-5 Target temperature		
#17	091	171	R/W	O	Pattern 2-6 Target temperature		
#18	092	172	R/W	O	Pattern 2-7 Target temperature		
#19	093	173	R/W	O	Pattern 2-0 Running time	Range: K0~K900 (Unit minutes)	K0
#20	094	174	R/W	O	Pattern 2-1 Running time		
#21	095	175	R/W	O	Pattern 2-2 Running time		
#22	096	176	R/W	O	Pattern 2-3 Running time		
#23	097	177	R/W	O	Pattern 2-4 Running time		
#24	098	178	R/W	O	Pattern 2-5 Running time		
#25	099	179	R/W	O	Pattern 2-6 Running time		
#26	09A	17A	R/W	O	Pattern 2-7 Running time		

TU CR#	TK CH1 Page4 Address (Hex)	TK CH2 Page14 Address (Hex)	Attribute		Name	Description	Default
#27	09B	17B	R/W	O	Pattern 3-0 Target temperature	Range: -32768~32767	K0
#28	09C	17C	R/W	O	Pattern 3-1 Target temperature		
#29	09D	17D	R/W	O	Pattern 3-2 Target temperature		
#30	09E	17E	R/W	O	Pattern 3-3 Target temperature		
#31	09F	17F	R/W	O	Pattern 3-4 Target temperature		
#32	0A0	180	R/W	O	Pattern 3-5 Target temperature		
#33	0A1	181	R/W	O	Pattern 3-6 Target temperature		
#34	0A2	182	R/W	O	Pattern 3-7 Target temperature		
#35	0A3	183	R/W	O	Pattern 3-0 Running time	Range: K0~K900 Unit (minutes)	K0
#36	0A4	184	R/W	O	Pattern 3-1 Running time		
#37	0A5	185	R/W	O	Pattern 3-2 Running time		
#38	0A6	186	R/W	O	Pattern 3-3 Running time		
#39	0A7	187	R/W	O	Pattern 3-4 Running time		
#40	0A8	188	R/W	O	Pattern 3-5 Running time		
#41	0A9	189	R/W	O	Pattern 3-6 Running time		
#42	0AA	18A	R/W	O	Pattern 3-7 Running time		

9.5.1.9 Pattern 4, 5 Setup Page

TU CR#	TK CH1 Page5 Address (Hex)	TK CH2 Page15 Address (Hex)	Attribute		Name	Description	Default
#11	0AB	18B	R/W	O	Pattern 4-0 Target temperature	Range: K-32768~K32767	K0
#12	0AC	18C	R/W	O	Pattern 4-1 Target temperature		
#13	0AD	18D	R/W	O	Pattern 4-2 Target temperature		
#14	0AE	18E	R/W	O	Pattern 4-3 Target temperature		
#15	0AF	18F	R/W	O	Pattern 4-4 Target temperature		
#16	0B0	190	R/W	O	Pattern 4-5 Target temperature		
#17	0B1	191	R/W	O	Pattern 4-6 Target temperature		
#18	0B2	192	R/W	O	Pattern 4-7 Target temperature		
#19	0B3	193	R/W	O	Pattern 4-0 Running time	Range: K0~K900 (Unit: minutes)	K0
#20	0B4	194	R/W	O	Pattern 4-1 Running time		
#21	0B5	195	R/W	O	Pattern 4-2 Running time		
#22	0B6	196	R/W	O	Pattern 4-3 Running time		
#23	0B7	197	R/W	O	Pattern 4-4 Running time		
#24	0B8	198	R/W	O	Pattern 4-5 Running time		
#25	0B9	199	R/W	O	Pattern 4-6 Running time		
#26	0BA	19A	R/W	O	Pattern 4-7 Running time		
#27	0BB	19B	R/W	O	Pattern 5-0 Target temperature	Range: K-32768~K32767	K0
#28	0BC	19C	R/W	O	Pattern 5-1 Target temperature		
#29	0BD	19D	R/W	O	Pattern 5-2 Target temperature		
#30	0BE	19E	R/W	O	Pattern 5-3 Target temperature		
#31	0BF	19F	R/W	O	Pattern 5-4 Target temperature		
#32	0C0	1A0	R/W	O	Pattern 5-5 Target temperature		
#33	0C1	1A1	R/W	O	Pattern 5-6 Target temperature		
#34	0C2	1A2	R/W	O	Pattern 5-7 Target temperature		
#35	0C3	1A3	R/W	O	Pattern 5-0 Running time	Range: K0~K900 (Unit: minutes)	K0
#36	0C4	1A4	R/W	O	Pattern 5-1 Running time		
#37	0C5	1A5	R/W	O	Pattern 5-2 Running time		
#38	0C6	1A6	R/W	O	Pattern 5-3 Running time		
#39	0C7	1A7	R/W	O	Pattern 5-4 Running time		
#40	0C8	1A8	R/W	O	Pattern 5-5 Running time		
#41	0C9	1A9	R/W	O	Pattern 5-6 Running time		
#42	0CA	1AA	R/W	O	Pattern 5-7 Running time		

9.5.1.10 Pattern 6, 7 Setup Page

TU CR#	TK CH1 Page6 Address (Hex)	TK CH2 Page16 Address (Hex)	Attribute		Name	Description	Default
#11	0CB	1AB	R/W	O	Pattern 6-0 Target temperature	Range: K-32768~K32767	K0
#12	0CC	1AC	R/W	O	Pattern 6-1 Target temperature		
#13	0CD	1AD	R/W	O	Pattern 6-2 Target temperature		
#14	0CE	1AE	R/W	O	Pattern 6-3 Target temperature		
#15	0CF	1AF	R/W	O	Pattern 6-4 Target temperature		
#16	0D0	1B0	R/W	O	Pattern 6-5 Target temperature		
#17	0D1	1B1	R/W	O	Pattern 6-6 Target temperature		
#18	0D2	1B2	R/W	O	Pattern 6-7 Target temperature		
#19	0D3	1B3	R/W	O	Pattern 6-0 Running time	Range: K0~K900 (Unit: minutes)	K0
#20	0D4	1B4	R/W	O	Pattern 6-1 Running time		
#21	0D5	1B5	R/W	O	Pattern 6-2 Running time		
#22	0D6	1B6	R/W	O	Pattern 6-3 Running time		
#23	0D7	1B7	R/W	O	Pattern 6-4 Running time		
#24	0D8	1B8	R/W	O	Pattern 6-5 Running time		
#25	0D9	1B9	R/W	O	Pattern 6-6 Running time		
#26	0DA	1BA	R/W	O	Pattern 6-7 Running time		
#27	0DB	1BB	R/W	O	Pattern 7-0 Target temperature	Range: K-32768~K32767	K0
#28	0DC	1BC	R/W	O	Pattern 7-1 Target temperature		
#29	0DD	1BD	R/W	O	Pattern 7-2 Target temperature		
#30	0DE	1BE	R/W	O	Pattern 7-3 Target temperature		
#31	0DF	1BF	R/W	O	Pattern 7-4 Target temperature		
#32	0E0	1C0	R/W	O	Pattern 7-5 Target temperature		
#33	0E1	1C1	R/W	O	Pattern 7-6 Target temperature		
#34	0E2	1C2	R/W	O	Pattern 7-7 Target temperature		
#35	0E3	1C3	R/W	O	Pattern 7-0 Running time	Range: K0~K900 (Unit: minutes)	K0
#36	0E4	1C4	R/W	O	Pattern 7-1 Running time		
#37	0E5	1C5	R/W	O	Pattern 7-2 Running time		
#38	0E6	1C6	R/W	O	Pattern 7-3 Running time		
#39	0E7	1C7	R/W	O	Pattern 7-4 Running time		
#40	0E8	1C8	R/W	O	Pattern 7-5 Running time		
#41	0E9	1C9	R/W	O	Pattern 7-6 Running time		
#42	0EA	1CA	R/W	O	Pattern 7-7 Running time		

Symbols: O: Latched. X: Non-latched.
R: Able to read data by FROM instruction. W: Able to write data by TO instruction.

9.5.1.11 Automatic PID Calculation Setup Page

TU CR#	TK CH1 Page7 Address (Hex)	TK CH2 Page17 Address (Hex)	Attribute		Name	Description	Default
#11	291	2B1	R/W	X	The set point currently being adjusted	Set the point that you intend to adjust with the setting value K1 and K2. When the adjustment finished, the value would change to another set point automatically.	K0
#12	292	2B2	R/W	O	Switch for auto-calculation	K1: Turn ON K0: Turn OFF After successfully adjusting both points, the auto-calculation feature would be switch ON.	K0
#13~ #19	293~ 299	2B3~ 2B9	R/W	O	For internal calculation.		
#20	29A	2BA	R/W	O	The first set point SV	Value of the first set point SV	K0
#21~ #26	29B~ 2A0	2BB~ 2C0	R/W	O	For internal calculation.		
#27	2A1	2C1	R/W	O	The second set point SV	Value of the second set point SV	K0
#28~ #33	2A2~ 2A7	2C2~ 2C7	R/W	O	For internal calculation.		

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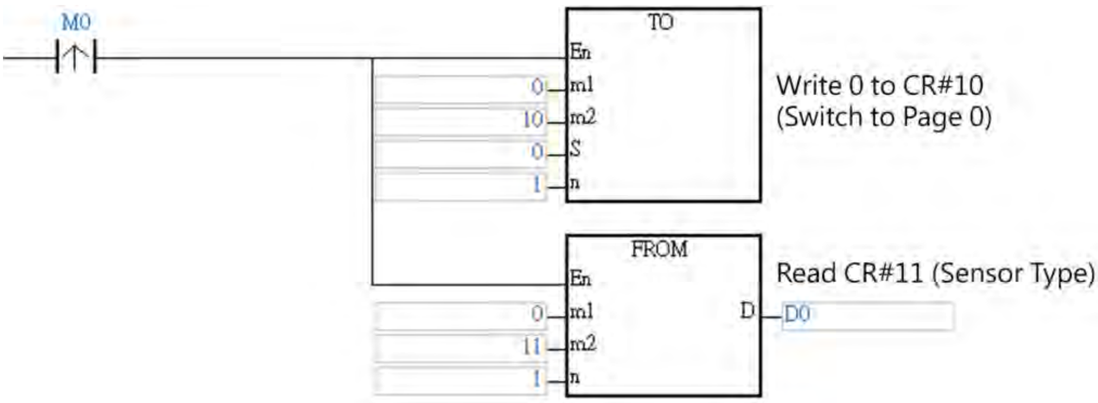
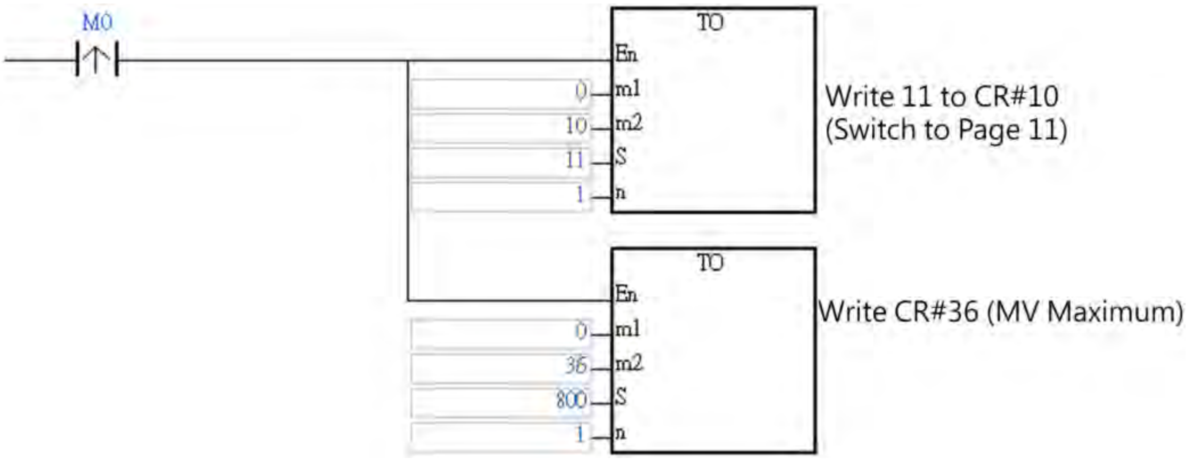
9.5.2 Examples of Setting a Control Register

Since CR#11~CR#42 are defined differently from page to page, the register module features switching pages on the screen. CR#10 is the register for page control, which should be written with the value of the corresponding page before you read-write CR#11~CR#42. The programming example is shown as follows:

1. Read the sensor type of channel1.（Page0，CR#11）



2. Set the maximum MV value of channel2.（Page11，CR#36）



9.5.3 Analog Input Description

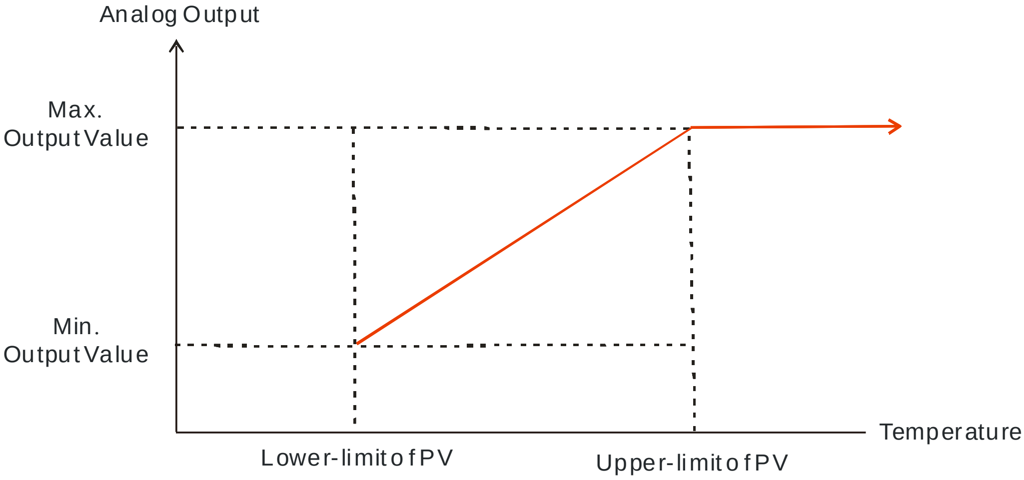
The analog input value of the CH1 is shown at CR#2, and CH2 at CR#3. Please refer to the following table to set the input sensor type register. The temperature of the platinum and thermocouple can be set in Celsius or Fahrenheit, unit 0.1 degree. Users can use offset to edit the settings.

Mode			Analog Range	Digital Range
Current / Voltage	-1	Channel Closed	X	X
	0	0~5V	0 ~ 5V	K0 ~ K32000
	1	0 ~ 10V	0 ~ 10V	
	2	0 ~ 20mA	0 ~ 20mA	
	3	4 ~ 20mA	4 ~ 20mA	
	4	0 ~ 50mV	0 ~ 50mV	
	26	0~10V (Quick AI)	0 ~ 10V	
	28	-100mV~100mV	-100mV~100mV	K-32000~K32000
	29	4 ~ 20mA (Quick AI)	4 ~ 20mA	K0 ~ K32000
Platinum	5	Pt100	-200 ~ 600°C	K-2000 ~K6000
	6	JPt100	-20 ~ 400°C	K-200 ~ K4000
	7	Pt1000	-200 ~ 600°C	K-2000 ~K6000
Thermocouple	8	J	-100 ~ 1200°C	K-1000~K12000
	9	K	-200 ~ 1300°C	K-2000~K13000
	10	R	0 ~ 1700°C	K0 ~K17000
	11	S	0 ~ 1700°C	K0 ~K17000
	12	T	-200 ~ 400°C	K-2000~K4000
	13	E	0 ~ 600°C	K0 ~K6000
	14	N	-200 ~ 1300°C	K-2000~K13000
	15	B	100 ~ 1800°C	K1000~K18000
	16	L	-200 ~ 850°C	K-2000~K8500
	17	U	-200 ~ 500°C	K-2000~K5000
	18	TXK	-200 ~ 800°C	K-2000~K8000
	19	C	0~1800°C	K0~K18000
	20	PL II	-100~1370°C	K-1000~K13700
Copper thermal resistance	21	Cu50	-50~150°C	K-500~K1500
	22	Cu100	-50~150°C	K-500~K1500
Nickel thermal resistance	23	Ni100	-100~180°C	K-1000~K1800
	24	Ni1000	-100~180°C	K-1000~K1800
	25	LGNi1000	-60~200°C	K-600~K2000
	27	Ni120	-80~260°C	K-800~K2600

9.5.4 Outputs

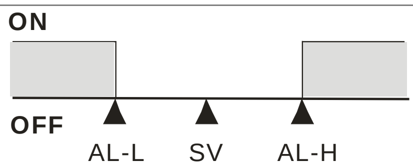
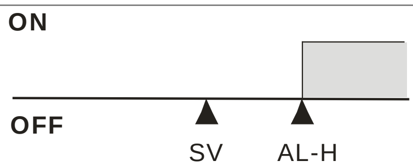
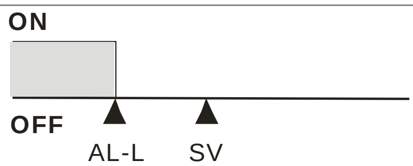
9.5.4.1 The output value varies with the PV value

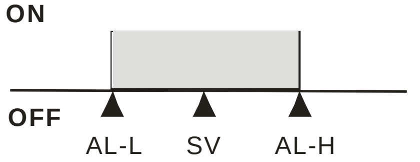
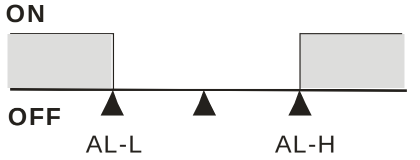
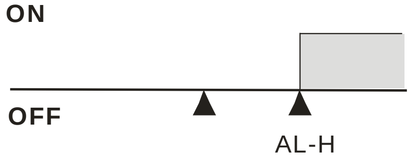
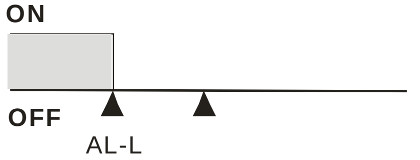
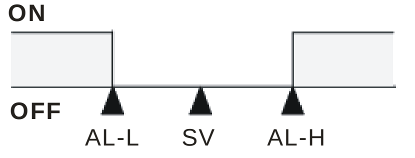
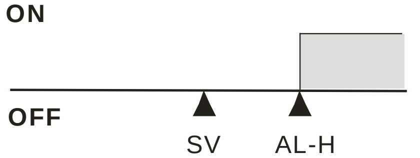
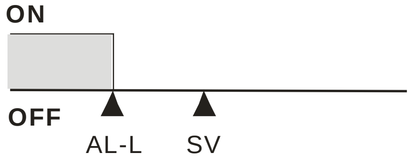
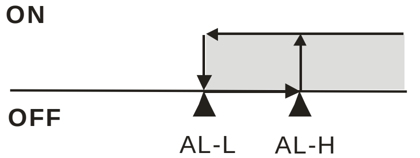
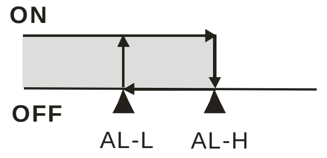
This functionality is only available for DVP02TUL-S/DVP02TKL-S series. When the PV varies, the corresponding output will vary accordingly. Take 4~20mA as an example, and set the upper-limit to 1000, lower-limit to 0; when PV is 0, the output will be 4mA and when PV is 1000, the output will be 20mA. When set it to a negative slope and set the range to 0~1000; when the PV is 0, the output will be 20mA and when the PV is 1000, the output will be 4mA. As the linear graph shown below, the analog output will vary according to the PV value.



9.5.4.2 Alarm Outputs

The alarm output is only available for DVP02TUN-S, DVP02TUR-S, DVP02TKN-S and DVP02TKR-S series, not for DVP02TUL-S and DVP02TKL-S series. Alarm function is to set the input value to trigger the outputs to do corresponding actions. There are 12 modes available for setups. The alarm output operations are shown below.

Setting Value	Alarm Type	Alarm Output Operation
0	Alarm function disabled.	None
1	Deviation upper- and lower-limit: This alarm output operates when the PV is higher than the setting value SV+AL-H or lower than the setting value SV-AL-L.	
2	Deviation upper-limit: This alarm output operates when the PV is higher than the setting value SV+AL-H.	
3	Deviation lower-limit: This alarm output operates when the PV is lower than the setting value SV-AL-L.	

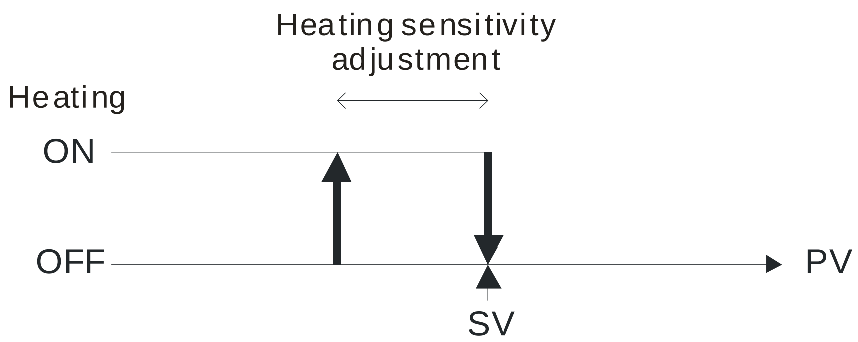
Setting Value	Alarm Type	Alarm Output Operation
4	Upper and lower alarm reverse action: This alarm output operates when the PV is between SV+AL-H and SV- AL_L.	
5	Absolute value upper- and lower-limit: This alarm output operates when the PV is higher than the setting value AL-H or lower than the setting value AL-L.	
6	Absolute value upper-limit: This alarm output operates when the PV is higher than the setting value AL-H.	
7	Absolute value lower-limit: This alarm output operates when the PV is lower than the setting value AL-L.	
8	Standby alarm value upper- and lower-limit: This alarm output operates when the PV is at the set value and the temperature is higher than the setting value SV+AL-H or lower than the setting value SV- AL_L.	
9	Standby alarm value upper-limit: This alarm output operates when the PV is at the set value and the temperature is higher than the setting value SV+AL-H.	
10	Standby alarm value lower-limit: This alarm output operates when the PV is at the set value and the temperature is lower than the setting value SV- AL_L.	
11	Hysteresis upper-limit alarm output: This alarm output operates if PV value is higher than the setting value SV+AL-H. This alarm output is OFF when the PV is lower than the setting value SV+AL-L.	
12	Hysteresis lower-limit alarm output: This alarm output operates if PV value is lower than the setting value SV-AL-H. This alarm output is OFF when the PV is higher than the setting value SV-AL-L.	

9.5.5 ON / OFF Control Mode

For DVP02TUR/DVP02TUN-S/DVP02TKR/DVP02TKN-S series, every channel has 2 digital outputs. Outputs control the ON/OFF mode.

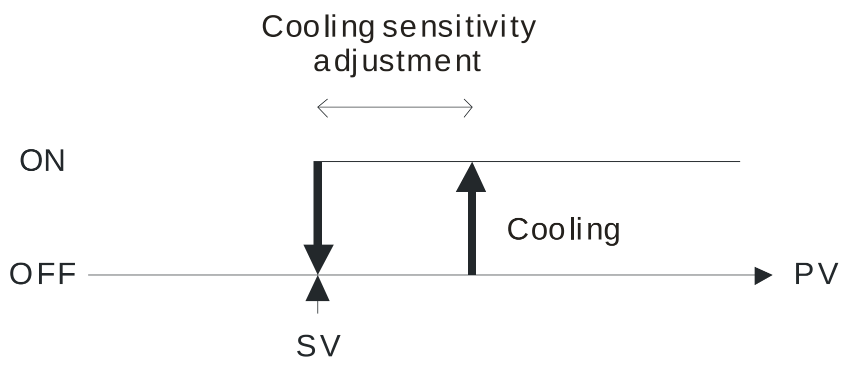
- **Actions for the heating output:**

The output is OFF, when the input is greater than the setting value. Output is ON, when the input is smaller than the total value of the setting value + adjustment sensitivity setting value. For example, set the setting value to 100 degree and the heating sensitivity adjustment to 10 degrees; when the temperature reached 100 degree, the digital output switches to OFF. When the temperature is 90 degrees, it will heat up to 100 degrees, and then the digital output will switch to OFF.

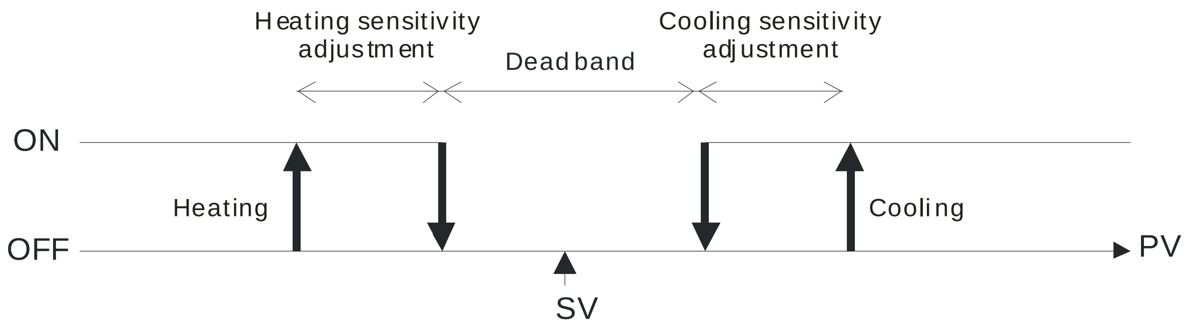


- **Actions for the cooling output:**

The output is ON, when the input is greater than the total value of the setting value + adjustment sensitivity setting value. Output is OFF, when the input is smaller than the setting value. For example, set the setting value to 10 degrees and the cooling sensitivity adjustment to 5 degrees; when the temperature reached 10 degrees, the digital output switches to OFF. When the temperature is 15, it will cool down to 10 degrees, and then the digital output will switch to OFF.



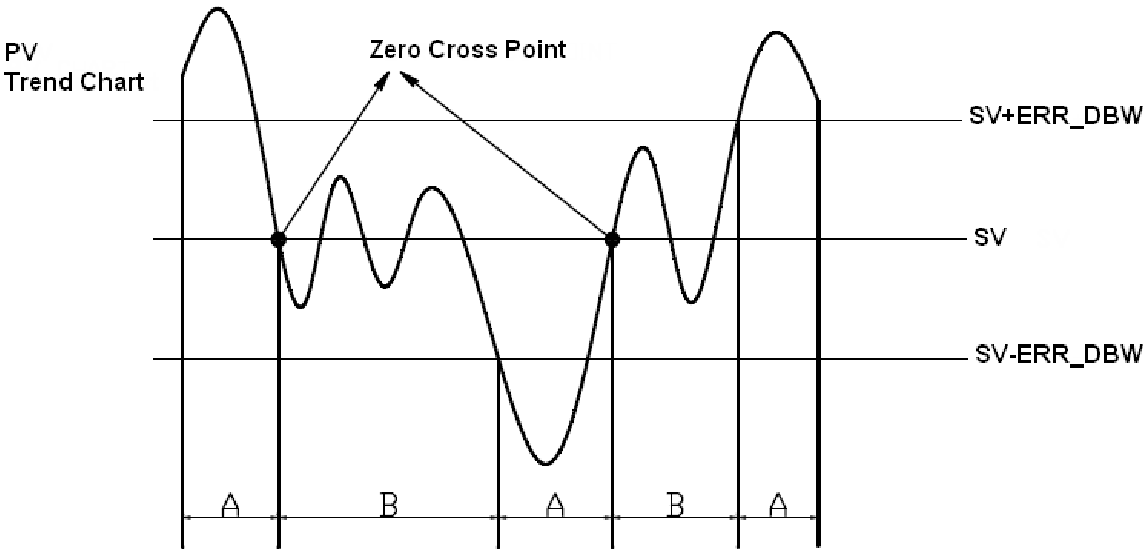
- **Actions for dual outputs:**



When setting one output for heating and the other for cooling, a non-action zone (dead band) can be set as the figure above. For example, set the setting value to 100 degrees, heating sensitivity adjustment to 10 degrees, cooling sensitivity adjustment to 5 degree and dead band to 20 degrees; when the temperature is 90~110 degree, the outputs will be OFF. Heating up the temperature to 90 degrees, the output will switch to OFF. When the temperature is below 80 degrees, the heating up will be started. Cooling down the temperature to 110 degrees, the output will switch to OFF. When the temperature is over 115 degrees, the cooling will be started.

9.5.6 Control Mode

When the PV is in the range of ERR_DBW, the PLC will run the PID operation according to the E value. When the PV is over the SV, the cross status will be established, and the E value will be seen as 0 while running the PID operation until the PV goes over the range of ERR_DBW. If PID_DE is True, the PLC will run the derivative of PV. When the cross status is established, the Delta PV will be seen as 0 while running the derivative of PID operation. As the example shown below, the PLC will run the PID operation in the section A and will see the values of E and Delta PV as 0 while running the PID operation.



PID Formula:

- **Independent Formula & Derivative of E** (**PID_EQ**=False & **PID_DE**=False)

$$CV = K_p E + K_i \int_0^t E dt + K_d \frac{dE}{dt} + BIAS$$

$$E = SV - PV \quad or \quad E = PV - SV$$

- **Independent Formula & Derivative of PV** (**PID_EQ**=False & **PID_DE**=True)

$$CV = K_p E + K_i \int_0^t E dt - K_d \frac{dPV}{dt} + BIAS$$

$$E = SV - PV$$

$$or$$

$$CV = K_p E + K_i \int_0^t E dt + K_d \frac{dPV}{dt} + BIAS$$

$$E = PV - SV$$

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- **Dependent Formula & Derivative of E**（**PID_EQ**=True & **PID_DE**=False）

$$CV = K_c \left[E + \frac{1}{T_i} \int_0^t E dt + T_d \frac{dE}{dt} \right] + BIAS$$

$$E = SV - PV \quad or \quad E = PV - SV$$

- **Dependent Formula & Derivative of PV**（**PID_EQ**=True & **PID_DE**=True）

$$CV = K_c \left[E + \frac{1}{T_i} \int_0^t E dt - T_d \frac{dPV}{dt} \right] + BIAS$$

$$E = SV - PV$$

$$or$$

$$CV = K_c \left[E + \frac{1}{T_i} \int_0^t E dt + T_d \frac{dPV}{dt} \right] + BIAS$$

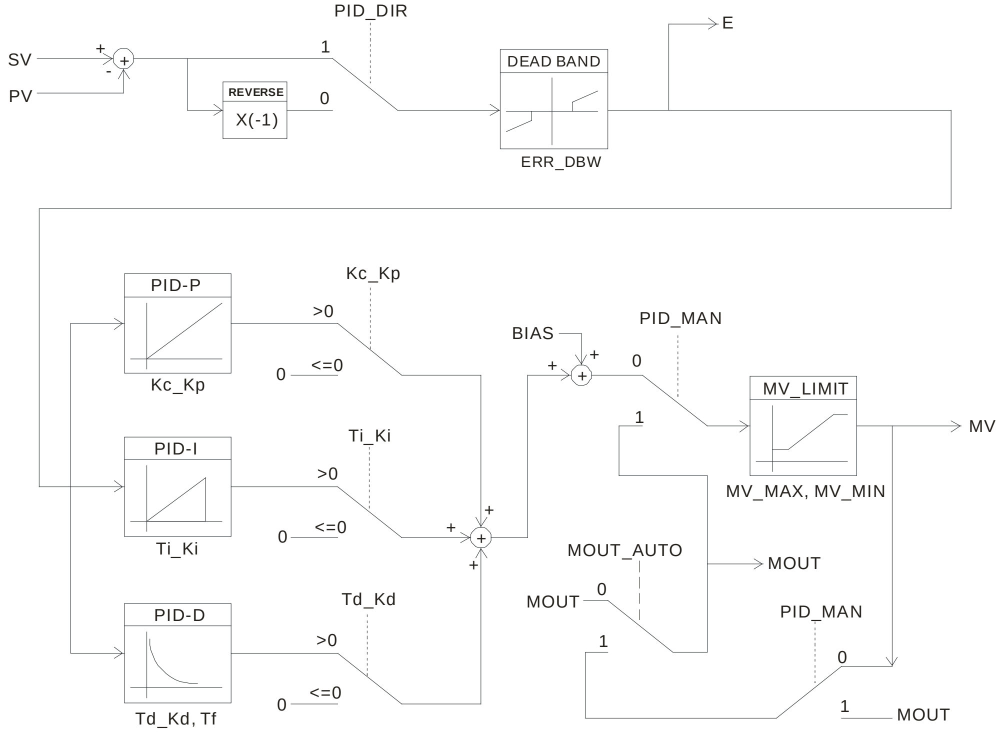
$$E = PV - SV$$

※All the **CVs** stated above are the **MVs** in the formula.

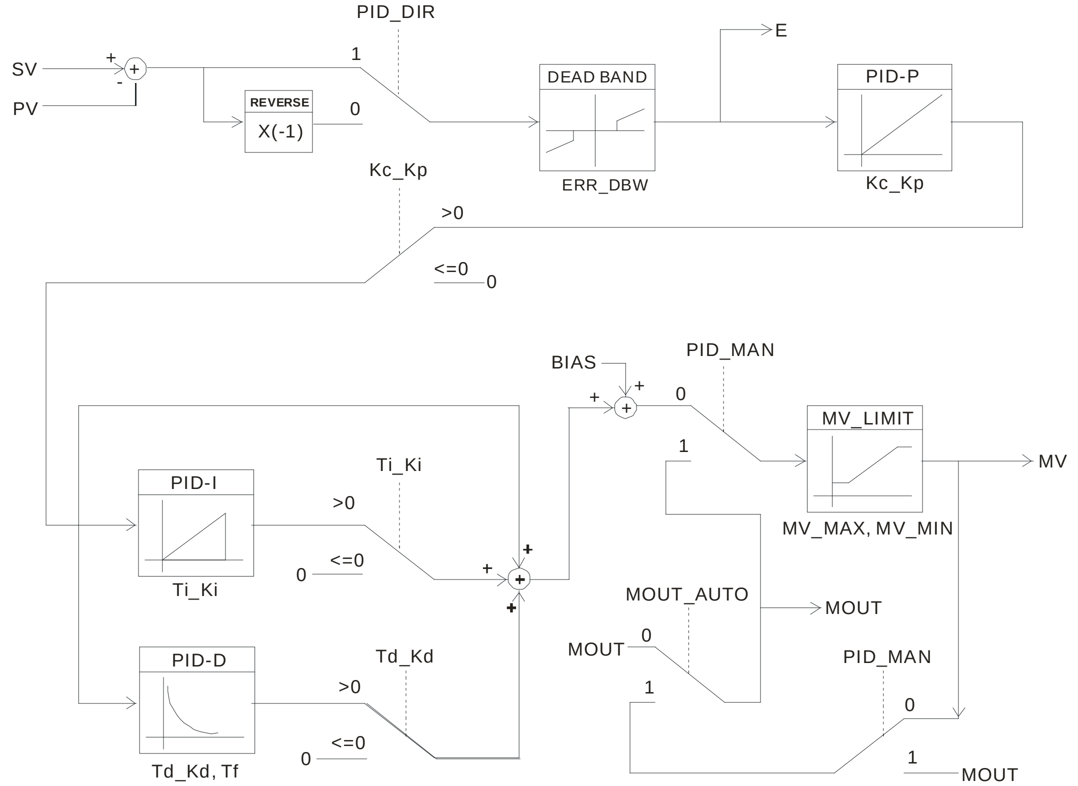
Auto tuning mode: When auto tuning is done, the value will become 0 and switch to the auto tuning mode automatically.

PID Control Block Diagram:

PID Block Diagram (Independent)



PID Block Diagram (Dependent)



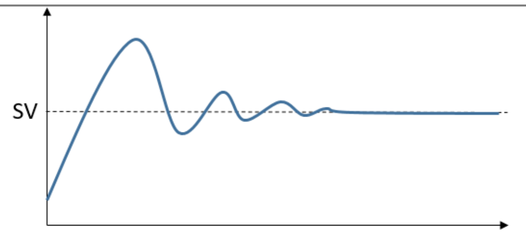
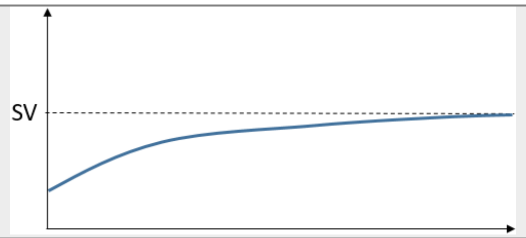
Note:

1. When tuning these 3 parameters, Kc_Kp, Ti_Ki and Td_Kd, set the Kc_Kp value first (according to their experiences), and set the Ti_Ki and Td_Kd value to 0. When it can be controlled, users can increase the values of Ti_Ki and Td_Kd. When the value of Kc_Kp is 1, it means that the proportional gain is 100%. That is, the error is increased by a factor of one. When the proportional gain is less than 100%, the error is decreased. When th proportional gain is greater than 100%, the error is increased.

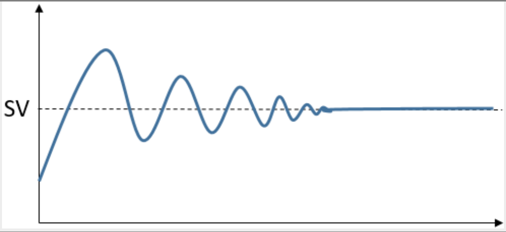
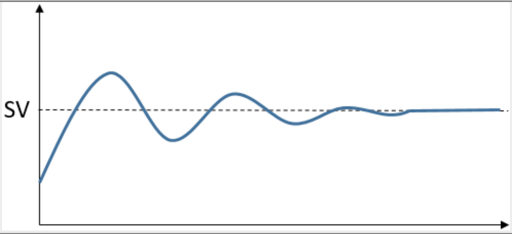
   The parameters which have been tuned automatically are not necessarily suitable for every controlled environment. Therefore, users can further modify the automatically tuned parameters. However, it is suggested to modify the values of Ti_Ki or Td_Kd only.

PID Tuning Guide:

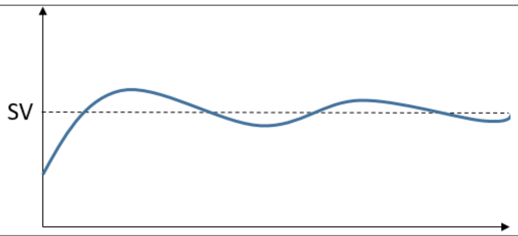
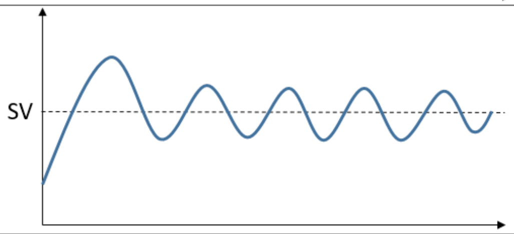
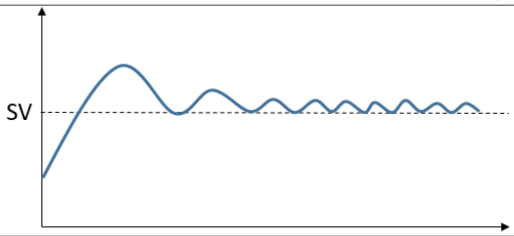
P gain

Increase P gain		Achieve the target temperature more quickly with a faster convergence speed, while Overshoot being increased.
Reduce P gain		Prevent overshooting, which would cause longer time to achieve the target temperature with a slower convergence speed.

I gain

Increase I gain (Decreasing integral time Ti)		As increasing Overshoot, oscillation amplitude would be increased as well, to reach the target temperature with a faster convergence speed.
Decrease I gain (Increasing integral time Ti)		The convergence speed would be slower to minimize overshoot and oscillations.

D gain

Increase D gain		Changes in temperature would be eased.
Decrease D gain		Changes in temperature would become rapid.
Special case		To improve the situation that temperature constantly oscillates over the SV, decrease D gains or simply control with PI.

9.5.7 Programmable SV Control Mode

The temperature setting value is not fixed but a setting curve defined by users according to their requirements. By PID control, the temperature input rises along with the defined temperature curve. The device provides 8 patterns and each pattern with 8 steps, a linking parameter, a loop parameter, and a number of execution steps respectively. Each step has 2 parameters (temperature setting value and time). After setting these parameters up, each temperature controller will have its own set of initial pattern and step for creating its own temperature setting curve. Some of the terms are explained as follows:

1. Initial pattern: set the program to start running at a sequential number of patterns.
2. Initial Step: set the program to start running at a sequential number of steps.
3. Running time: set the temperature duration time, if not necessary, it can be set to 0.
4. Step: includes 2 parameter settings: a setting point X and a Running time T, indicating the setting value (SV) to rise to X degree after the time T. If the setting point X is identical to the previous setting, this process is called a Soak, otherwise it is called a Ramp; therefore this control procedure is also called a Ramp Soak control. The first running procedure is preset as a Soak control, to set the temperature control to setting point X degree in advanced and keep the temperature at X degree, at a duration time of T.
5. Number of loops: Extra loops to be carried out for the pattern. If set to 1, the pattern will be carried out 2 times.
6. Executing step: Number of steps executed for each pattern
7. Execution: Before execution, users need to set up all the parameters. If the setting control is in the running mode, the program will start running from the initial pattern and initial step, carrying out commands one by one by their set orders. When the setting control is in the ending mode, the SV will stop at the final setting. When the setting control is in the stop mode and the temperature will be at the value before the stop, by re-selecting to run, the program will start running from the initial pattern and initial step. When the setting control is in the pause mode and the temperature is at the value before the pause, by re-selecting to run, the program will start running from the step where the program was paused, carrying out the remaining parts. During execution, the SV cannot be set up.

9.5.8 ERROR LED Indicator

When the channel detects the analog input is out of range, the error code will show up and the error LED will also be blinking to notify. Users can disable this functionality to inactivate the error LED blinking, but the error code will still show up.

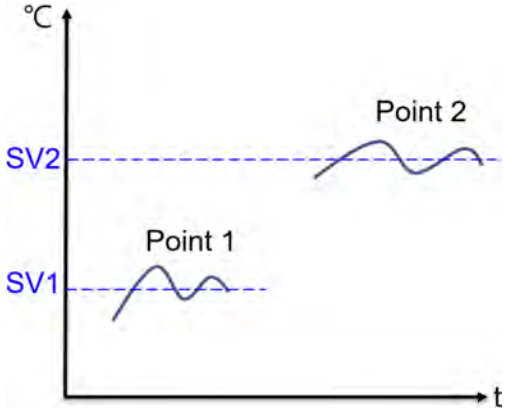
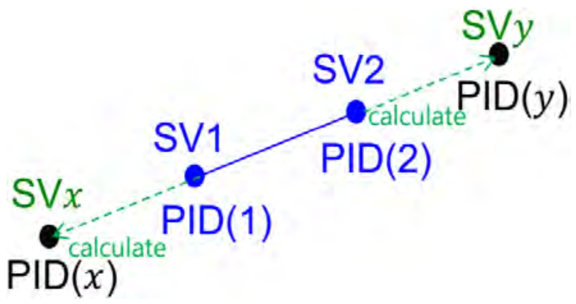
Parameter:

Page	CR	Description	Setting Value
Basic Setup Page	38	Output out of range	K0=LED blinking (default) K1=LED not blinking

9.5.9 Automatic PID Calculation Feature (Support TK V1.06/TU V4.18 and above)

9.5.9.1 Feature Description

As the set value (SV) being changed, the PID parameters would be calculated automatically based on the relation between two set points after performed auto-tuning twice.

<table>
<tr><td>1. After auto-tuning two set points, the SV slope of a linear function would be calculated based on the changes of the waveform parameters between two points.</td><td>2. When the SVs being changed, the corresponding PID parameters would be calculated according to the calculated slope.</td></tr>
<tr><td>
</td><td>
</td></tr>
</table>

9.5.9.2 Setup Instructions

Follow the below steps to set up (take channel 1 for example):

Step 1: Set the first set value (SV) to adjust.

CR Page	CR#	Description	Setting Value
All pages	4	The target value	User-defined

Step 2: Set the current point for auto-tuning.

CR Page	CR#	Description	Setting Value
Automatic PID Calculation Setup Page (Page7)	11	The current set point for auto-tuning.	K1

Step 3: Start auto-tuning.

CR Page	CR#	Description	Setting Value
All pages	8	Auto-tuning	K1 or K2
	6	Setups to run/stop an operation	K1

After finished auto-tuning, the current set point (Step2 CR) would be changed to the second point (K2) automatically.

Step 4: After both set points being tuned (notice if CR#8 changes back to 0), set the second set value (SV) to adjust (same as step1).

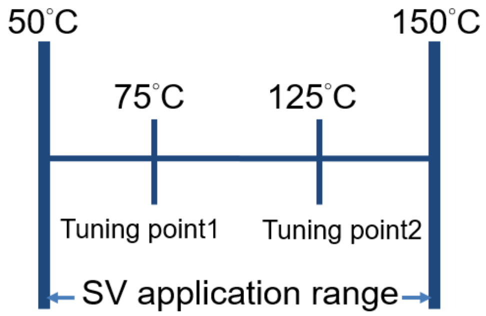
Step 5: Start auto-tuning (same as step3).

Step 6: When the setting is completed, the auto-calculation feature would be switched to ON automatically. And the PID parameters would be output differently according to each SV

9.5.9.3 Additional Instructions

1. Choosing tuning point

   It's suggested that set the tuning points at 25% and 75% of the SV application range



2. Copying parameters

   Under the same environment, CR#12~CR#33 on automatic PID calculation page can be copied to the same position of other modules (including internal calculation parameters) so as to achieve the same calculation result.

3. Adjusting tuning point

   In case that you want to reset a specific tuning point, simply reset the SV and the current tuning point, then perform auto-tuning again.

9.5.10 RS-485 Communication Setup for DVP02TK-S

9.5.10.1 MODBUS Communication Protocol

For DVP02TK-S series, MODBUS supports formats: RTU and ASCII. When RTU is selected, the data length is 8 and the following function codes are supported.

Function code03：read multiple words, up to 32 words can be read.

Function code06：write a single word.

Function code10：write multiple words, up to 32 words can be written.

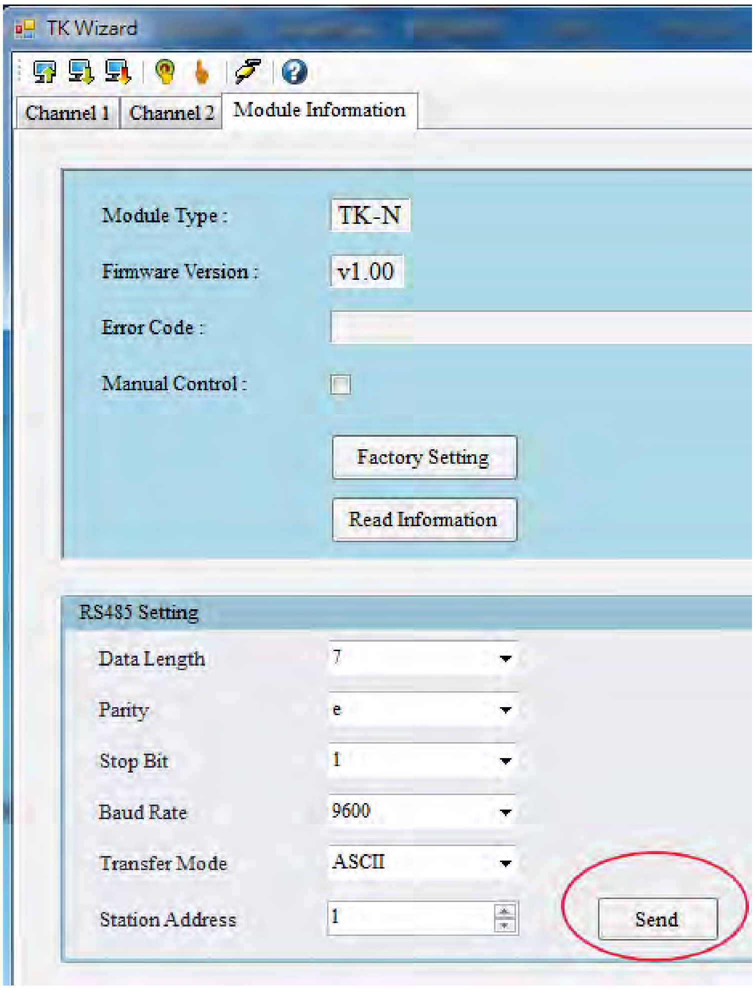
9.5.10.2 Restore to Factory Settings

Users can restore the RS-485 communication settings back to defaults (9600/7/1/E, station number 1) by switching RUN to STOP and then STOP to RUN after turning on the device within 5 seconds.

9.5.10.3 RS-485 Communication Setup

There are 2 methods to setup RS-485 communication, via TK Wizard or setting the MODBUS address.

- TK Wizard (TKSoft): click the Module Information and set up baud rate, transfer mode and then click "Send" to save the settings



- MODBUS address setup:

  Write the value 0x00XY (refer to the following list for X and Y setups) in MODBUS address (0x0F09).

  Example: the value 0x0000 (X=0/Y=0) indicates the baud rate is 9600, data length is 7, stop bits is 1 and the parity is Even.

RS-485 Communication Setting Address = 0x0F09, written value is（0x00XY）				
X	Bit7~Bit4	Baud Rate (bps)	Value	Description
			0	9600(default)
			1	19200
			2	38400
			3	57600
			4	115200

9

<table>
<tr><th colspan="5">RS-485 Communication Setting Address = 0x0F09, written value is（0x00XY）</th></tr>
<tr><td></td><td></td><td></td><td>5~16</td><td>reserved</td></tr>
<tr><td rowspan="8">Y</td><td rowspan="2">Bit3</td><td rowspan="2">Data Length</td><td>0</td><td>7（default）</td></tr>
<tr><td>1</td><td>8</td></tr>
<tr><td rowspan="2">Bit2</td><td rowspan="2">Stop Bits</td><td>0</td><td>1-bit（default）</td></tr>
<tr><td>1</td><td>2-bit</td></tr>
<tr><td rowspan="4">Bit1~Bit0</td><td rowspan="4">Parity</td><td>0</td><td>Even（default）</td></tr>
<tr><td>1</td><td>Odd</td></tr>
<tr><td>2</td><td>None</td></tr>
<tr><td>3</td><td>reserved</td></tr>
</table>

<table>
<tr><th></th><th>Data Length</th><th>Stop Bits</th><th colspan="2">Parity</th><th colspan="3"></th></tr>
<tr><th rowspan="2">Y Value</th><th>bit3</th><th>bit2</th><th>bit1</th><th>bit0</th><th rowspan="2">Data Bits</th><th rowspan="2">Stop Bits</th><th rowspan="2">Parity</th></tr>
<tr><th>(0 : 7 ; 1 : 8)</th><th>(0 : 1-bit ;
1 : 2-bit)</th><th colspan="2">(0 : Even ; 1 : Odd ;
2 : None ; 3 : reserved)</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>7</td><td>1</td><td>even</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>7</td><td>1</td><td>odd</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>1</td><td>0</td><td>7</td><td>1</td><td>none</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>1</td><td>1</td><td>7</td><td>1</td><td>even</td></tr>
<tr><td>4</td><td>0</td><td>1</td><td>0</td><td>0</td><td>7</td><td>2</td><td>even</td></tr>
<tr><td>5</td><td>0</td><td>1</td><td>0</td><td>1</td><td>7</td><td>2</td><td>odd</td></tr>
<tr><td>6</td><td>0</td><td>1</td><td>1</td><td>0</td><td>7</td><td>2</td><td>none</td></tr>
<tr><td>7</td><td>0</td><td>1</td><td>1</td><td>1</td><td>7</td><td>2</td><td>even</td></tr>
<tr><td>8</td><td>1</td><td>0</td><td>0</td><td>0</td><td>8</td><td>1</td><td>even</td></tr>
<tr><td>9</td><td>1</td><td>0</td><td>0</td><td>1</td><td>8</td><td>1</td><td>odd</td></tr>
<tr><td>A</td><td>1</td><td>0</td><td>1</td><td>0</td><td>8</td><td>1</td><td>none</td></tr>
<tr><td>B</td><td>1</td><td>0</td><td>1</td><td>1</td><td>8</td><td>1</td><td>even</td></tr>
<tr><td>C</td><td>1</td><td>1</td><td>0</td><td>0</td><td>8</td><td>2</td><td>even</td></tr>
<tr><td>D</td><td>1</td><td>1</td><td>0</td><td>1</td><td>8</td><td>2</td><td>odd</td></tr>
<tr><td>E</td><td>1</td><td>1</td><td>1</td><td>0</td><td>8</td><td>2</td><td>none</td></tr>
<tr><td>F</td><td>1</td><td>1</td><td>1</td><td>1</td><td>8</td><td>2</td><td>even</td></tr>
</table>

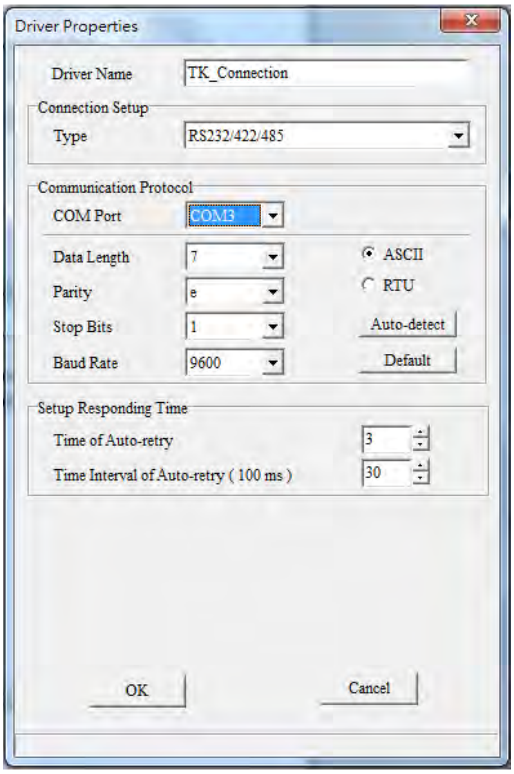
9.5.11 TK Wizard-Connection Setup

9.5.11.1 Restore to Factory Settings for DVP02TK-S

Refer to section 9.5.9.2 for more information on restoring the RS-485 communication settings back to defaults (9600/7/1/E, station number 1).

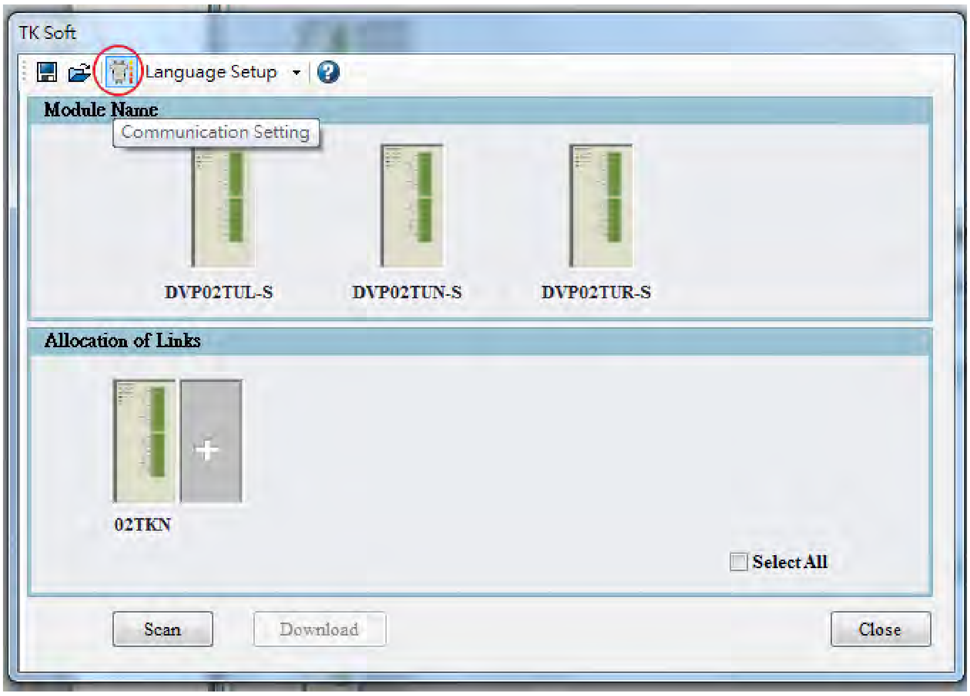
9.5.11.2 COMMGR Setup

Input the communication setting values to create a TK connection in COMMGR. After setting the values, click the auto-detect button to check if the connection is successfully established. Click OK to confirm the settings.

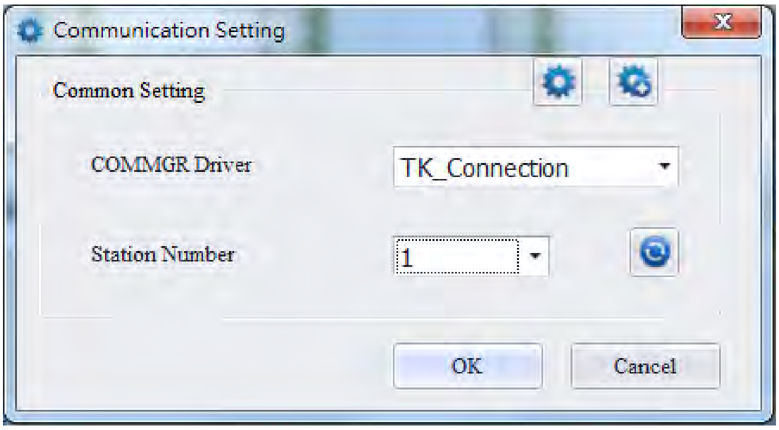


9.5.11.3 Settings in TKSoft

Click the icon Communication Setting in TKSoft to set up the communication.

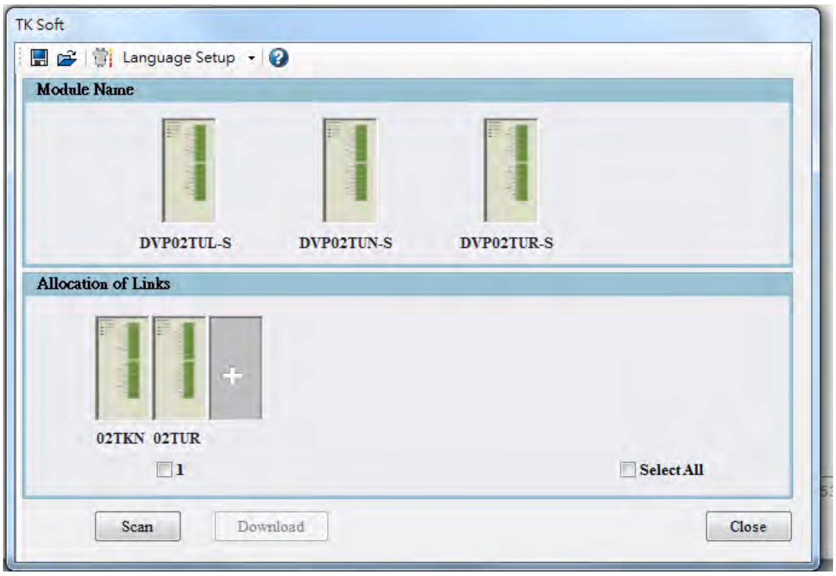


Select the COMMGR driver and the station number.

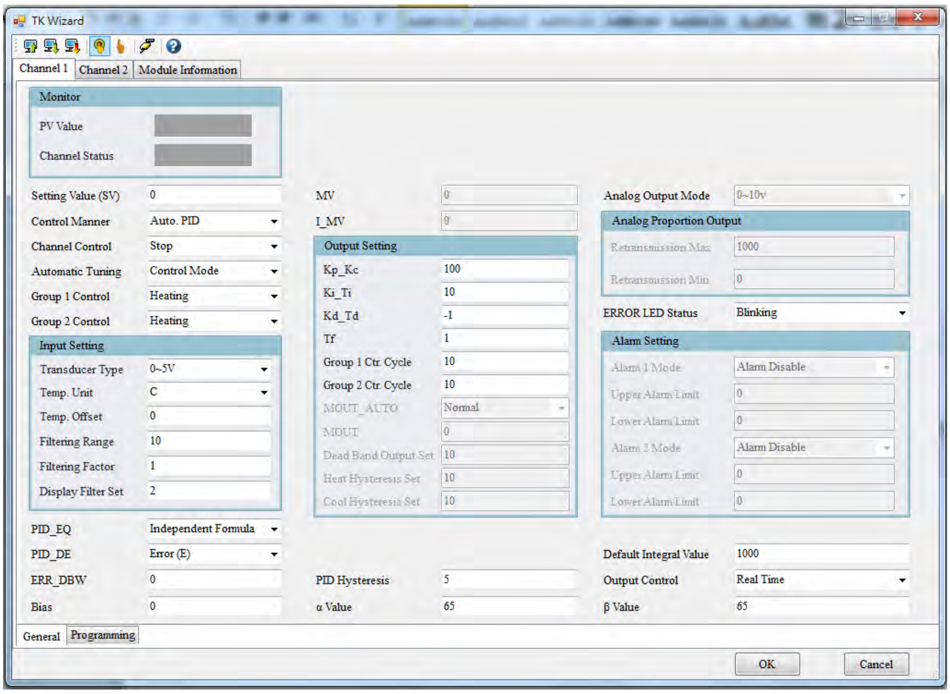


9.5.11.4 TKSoft-Scan the Connected Device

Once the setup completed, users can click the Scan button to have the system to detect the connected DVP02TK-S series and the extension modules from the right side of DVP02TU-S.

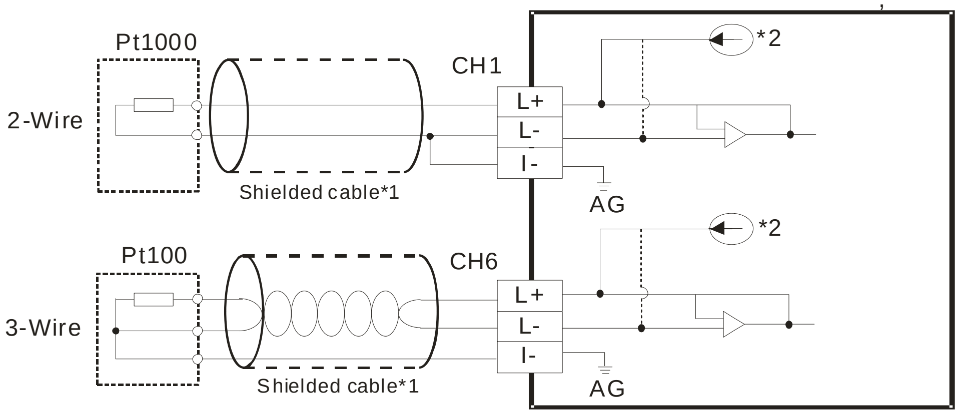


Double click the DVP02TK-S / DVP02TU-S icon to open the setting page.



9.6 Wiring

9.6.1 Wiring DVP04PT-S/DVP06PT-S



Note1: Use only the wires that are packed with the temperature sensor for analog input and separate from other power line or any wire that may cause noise.

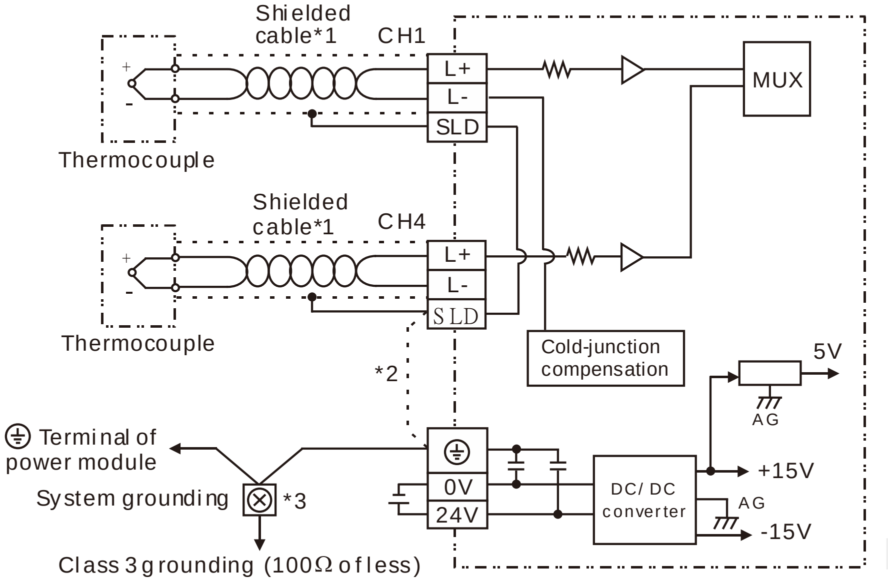
Note2: 3-wire RTD sensor provides a compensation loop that can be used to subtract the wire resistance while 2-wire RTD sensor has no mechanism to compensate. Use cables (3-wired) with the same length (less than 200 m) and wire resistance of less than 20 ohm.

Note3: If there is noise, please connect the shielded cables to the system earth point, and then ground the system earth point or connect it to the distribution box.

Note4: Please keep wires as short as possible when connecting the module to a device whose temperature is going to be measured, and keep the power cable used as far away from the cable connected to a load as possible to prevent noise interference.

Note5: Please connect ⏚ on a power supply module and ⏚ on the temperature module to a system ground, and then ground the system ground or connect the system ground to a distribution box.

9.6.2 Wiring DVP04TC-S



Note1: Use only the wires that are supplied with J, K, R, S, T thermocouple sensor. Tighten PLC terminal screws to a torque of 1.95 kg-cm (1.7 in-lbs).

Note2: Terminal SLD is a grounding location for noise suppression.

Note3: Please connect ⏚ power supply module terminal and ⏚ DVP04TC-S temperature measurement module terminal to system earth ground.

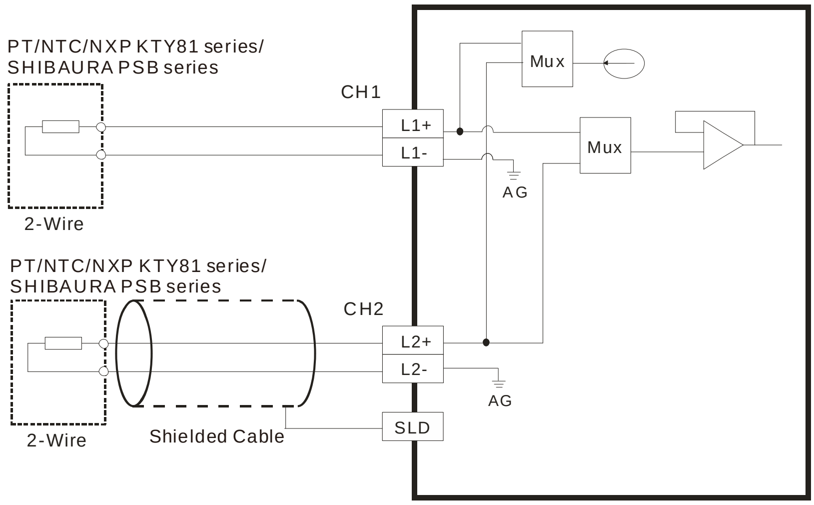
Warning1: Do NOT wire empty terminals.

Warning2: Only use copper conducting wires with a temperature rating of 60/75°C and the length must be less than 50 m.

Warning3: TC modules must run for 30 minutes before they start to take any temperature measurement.

9

9.6.3 Wiring DVP08NTC-S



Note1: Use only the wires that are packed with the temperature sensor for analog input and separate from other power line or any wire that may cause noise.

Note2: DVP08NTC-S only supports 2-wire RTD sensor, which has no mechanism to compensate.

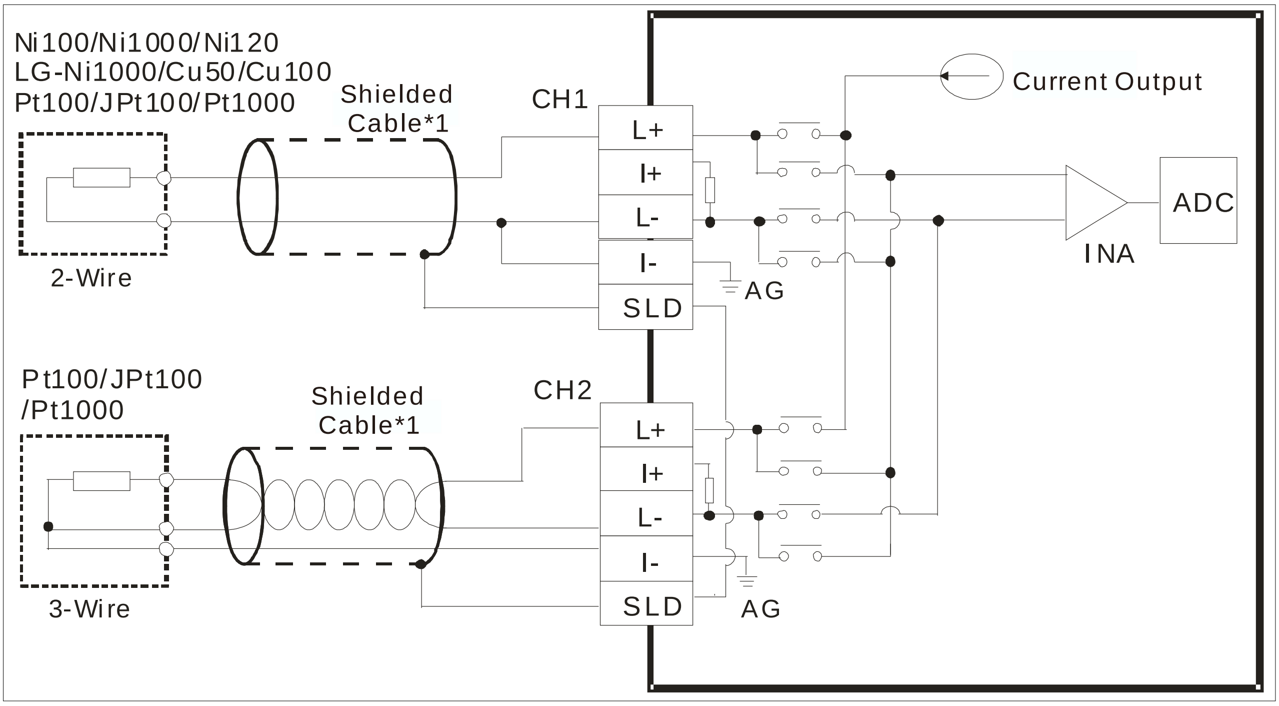
Note3: If there is noise, please connect the shielded cables to the system earth point, and then ground the system earth point or connect it to the distribution box.

Note4: Please keep wires as short as possible when connecting the module to a device whose temperature is going to be measured, and keep the power cable used as far away from the cable connected to a load as possible to prevent noise interference.

Note5: Please connect ⏚ on a power supply module and ⏚ on the temperature module to a system ground, and then ground the system ground or connect the system ground to a distribution box.

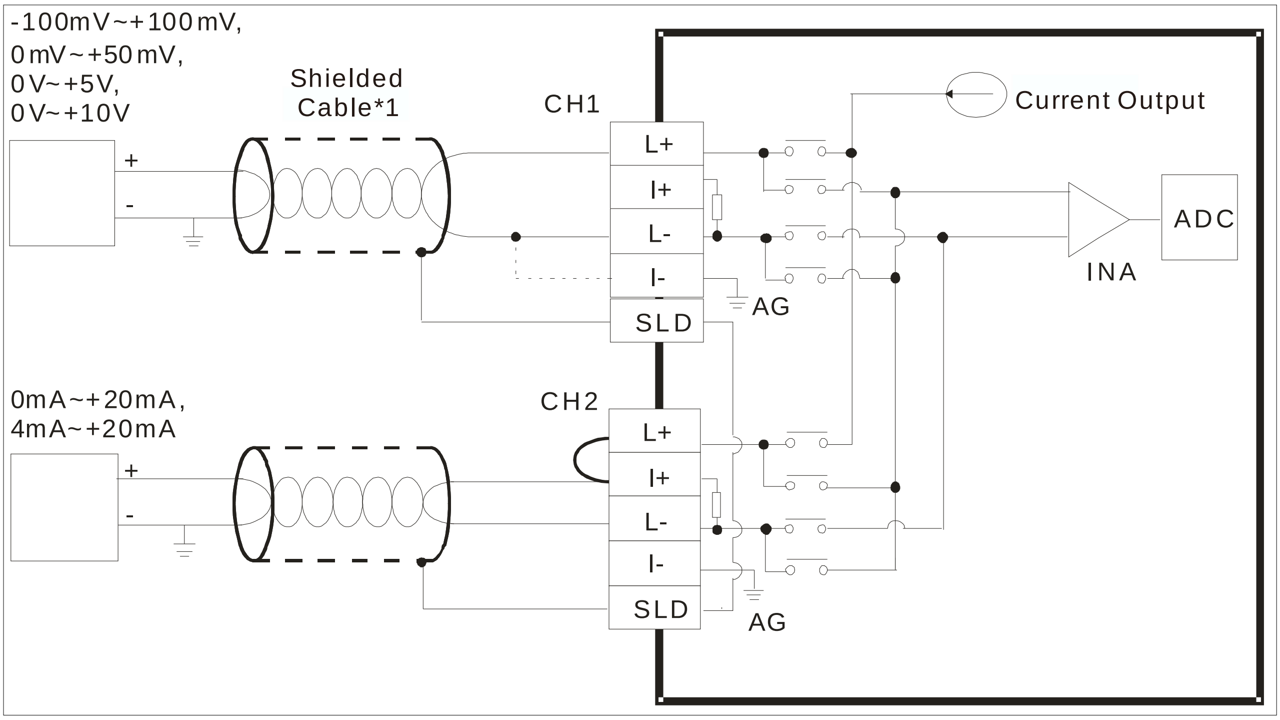
9.6.4 Wiring DVP02TUN-S / DVP02TUR-S / DVP02TUL-S / DVP02TKN-S / DVP02TKR-S / DVP02TKL-S

- **Sensor input wiring**



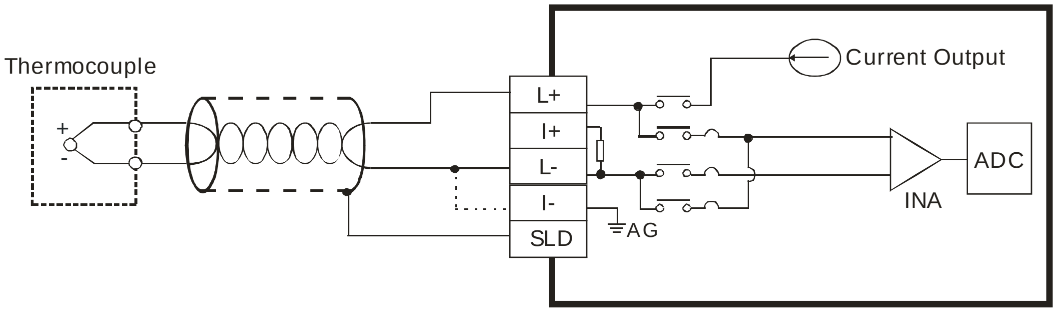
*1. Please isolate it from other power cable.

- **Voltage/Current input wiring**

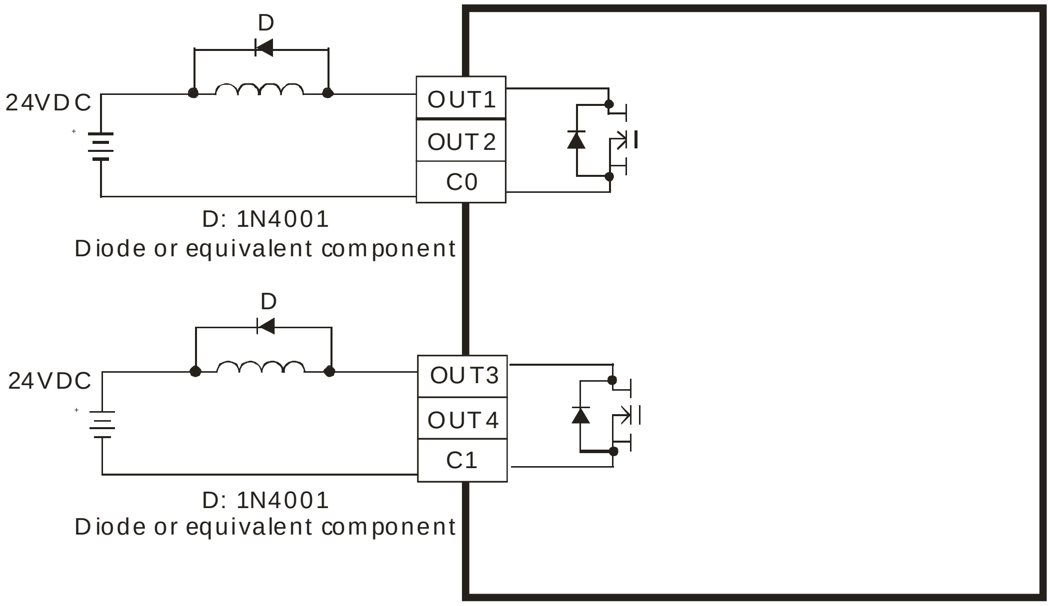


*1. Please isolate it from other power cable.

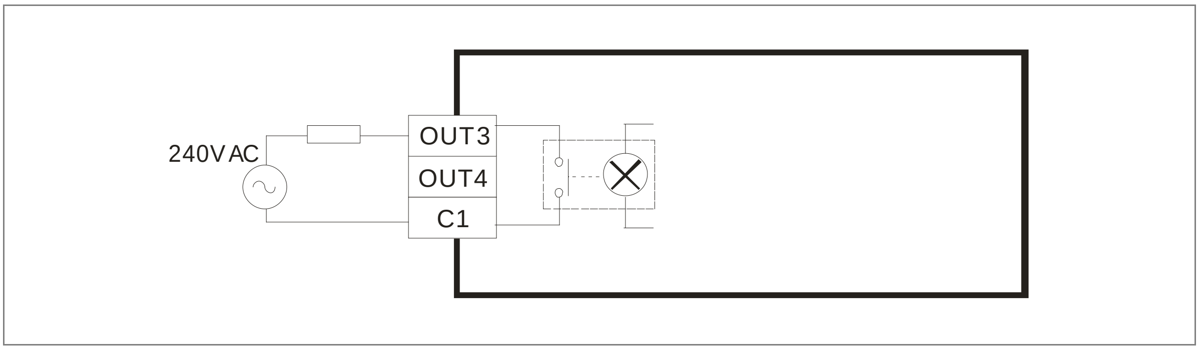
- **Thermocouple input wiring**

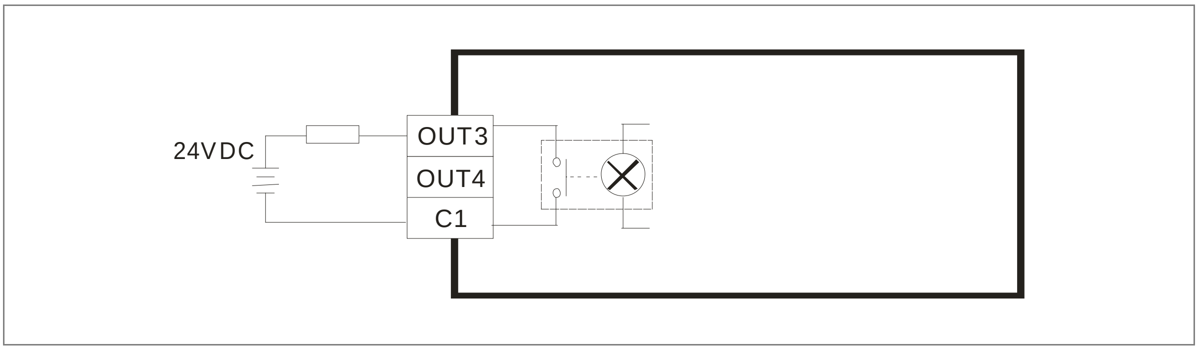


- **DVP02TUN-S/DVP02TKN-S Output point wiring**



- **DVP02TUR-S/DVP02TKR-S Output point wiring**

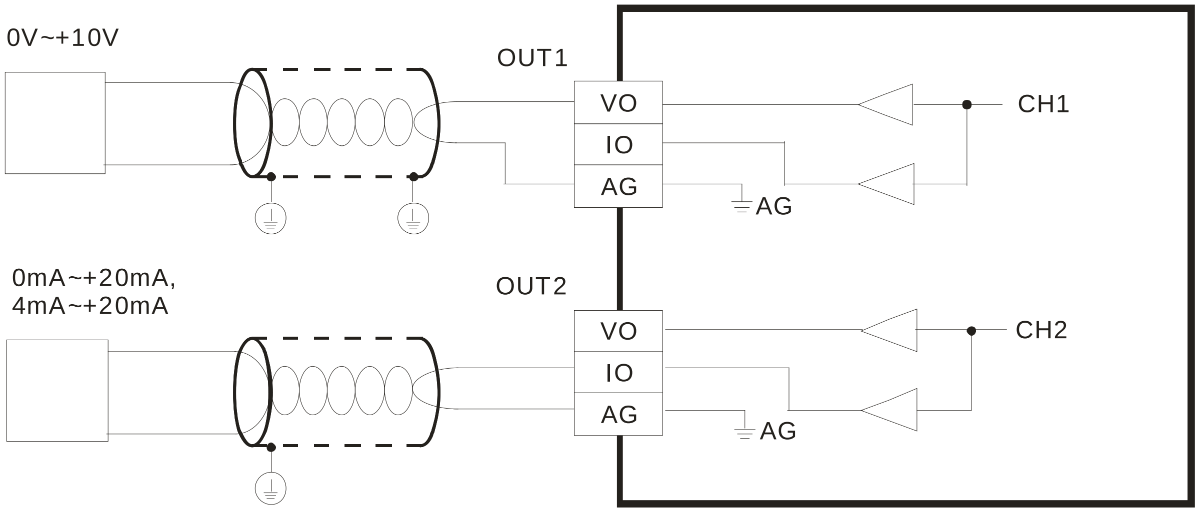




Warning: Electric shock!

Digital relay output points are connected to hazardous locations.

- **DVP02TUL-S/DVP02TKL-S Output point wiring**



9.7 Troubleshooting

When an error occurs in PT, TC modules, an error indicator will start blinking. Once you see an error indicator starts blinking, you can use the FROM instruction to read the error codes stored in CR#30. The bit 0 to bit 15 indicates the error codes. It is possible to have two errors at the same time. 0 indicates normal and 1 indicates error. Refer to the following table for more the causes and the solutions for troubleshooting.

Bit No.	RUN LED	ERROR LED	Description	Solution
bit0	OFF	ON	The external voltage is abnormal.	Check the power supply.
bit1	Blinking	Blinking	Input value exceeds the set upper/lower bound.	Check the input signal.
bit2	Blinking	OFF	Communication address setting error	Check whether the value written in the communication address is correct and rewrite it
bit3			OFFSET/GAIN error	Check if the written value of OFFSET and GAIN are correct and rewrite them.
bit4			Temperature sensor is abnormal.	Contact the factory.
bit5	Blinking	Blinking	The input value is out of range.	Check the input signal.
bit6	Blinking	OFF	Average time setting error	Check the average time setting.
bit7			FROM/TO instruction error	Check whether the instruction reads or writes from incorrect CR. Check whether the module is properly connected.
bit8	Blinking	Blinking	The signal received by channel 1 exceeds the range of analog inputs	Check the signal received by channel 1
bit9			The signal received by channel 2 exceeds the range of analog inputs	Check the signal received by channel 2
bit10			The signal received by channel 3 exceeds the range of analog inputs	Check the signal received by channel 3
bit11			The signal received by channel 4 exceeds the range of analog inputs	Check the signal received by channel 4

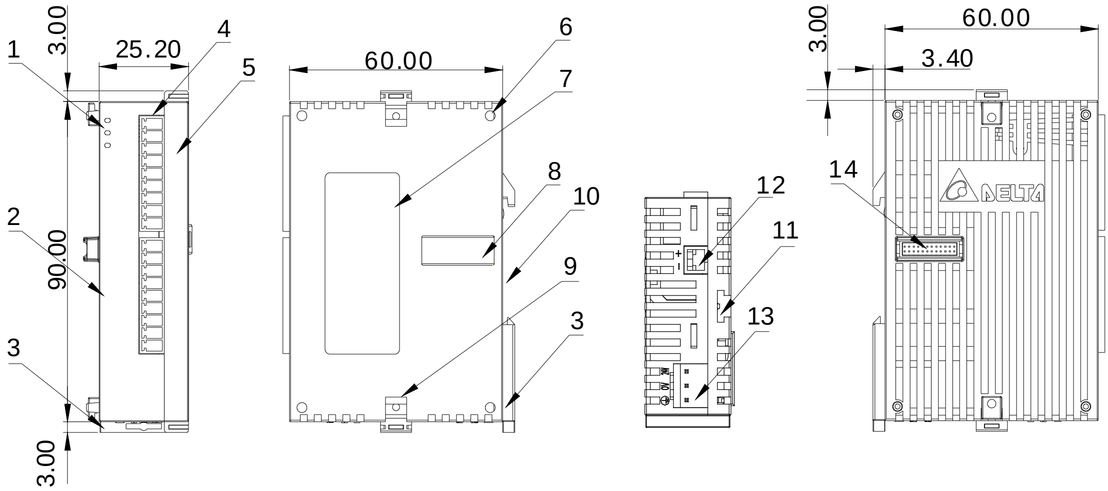
Chapter 10 DVP-S Series Position Control Module

Table of Contents

10.1 DVP01PU-S Specification

Item	Description
Power supply	24VDC（20.4~28.8VDC）(-15%~+20%）
Distance instruction	Distance value is set by CR 1. Setting range: -2,147,483,648 ~ +2,147,483,647 2. Selectable unit: um, mdeg, 10^{-4} inch, Pulse 3. Selectable rate: 100, 101, 102, 103 4. Selectable position: absolute and relative position instruction.
Speed instruction	Speed value is set by CR 1. Setting range: -2,147,483,648 ~ +2,147,483,647 (conversion value of 10 ~ 200 kPPS pulse) 2. Selectable unit: pulse/s, cm/min, 10deg/min, inch/min
External output	Photo coupler is for insulation and there are LED indications for all output/input signals. Outputs: FP and RP (line driver output 5V) Output: CLR is the type of NPN open collector transistor output (5 ~ 24V DC, less than 20mA)
External input	Photo coupler is for insulation and there are LED indications for all output/input signals. Input point: START, STOP, LSP, LSN, DOG (contact or open collector transistor, 24V DC±10%, 5±1mA) Inputs: ΦA, ΦB (line driver or open collector transistor, 5 ~ 24V DC, 6 ~15mA) Input: PG0 (line driver or open collector transistor, 5 ~ 24V DC, 6 ~ 15mA)
Pulse output format	Three selectable modes: Pulse/Dir, FP (CW)/RP (CCW), A/B (all modes are line driver output).
Position program & data transmission	CR data can be read/write via FROM/TO intruction of PLC MPU. The 32-bit data is composed of 2 continuous CR number. The range of 16-bit CR is CR#0 ~ CR#48.
Connect to DVP-PLC series	Modules are numbered from 0 ~ 7 with 0 closet and 7 farthest to the MPU. Up to 8 modules can be connected without occupying any digital I/O.

10.2 Module Profiles and Dimensions



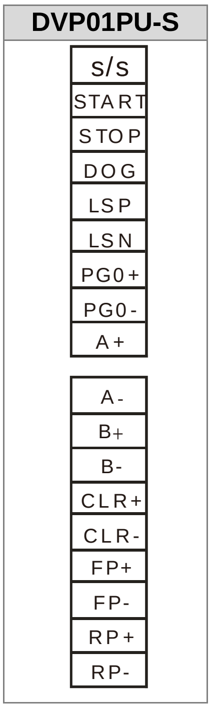
Unit: mm

No.	Name	Description
1	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	Low Voltage indicator	Indicates the low voltage status of the module. ON: the external input power is lower than 19.5V. OFF: the power supply is normal.
	ERROR indicator	Error status of the module OFF: the module operates normally Blink: CR#39 is not 0.
2	Model name	Model name of the module
3	DINrail clip	Secure the module on the set
4	Terminals	The inputs are connected to sensors. The outputs are connected to loads to be driven.
5	Terminal indicator	Terminal number.
6	Mounting hole	For positioning between modules.
7	Nameplate	Lable of the module.
8	Extension module connection port	Connect the modules.
9	Extension unit fixing clip	For securing the extension module.
10	DIN rail slot（35mm）	For the DIN rail.
11	Securing module slot	For securing the extension module.
12	communication port	Provide RS-485 communication wiring.
13	Power input port	Expansion unit power input.
14	Extension port	Connect the PLC or the modules.

10.2.1 LED Display

POWER	: Power indicator, +5V internal power
LV	: Low voltage indicator, lit when external input power is lower than 19.5V
ERROR	: Error indicator (ON/OFF blinking). It will blink when CR#39 is not 0.
LSP	: Right limit input indicator
LSN	: Left limit input indicator
PG0	: Zero signal input indicator
START	: Start input
STOP	: Stop input
DOG	: DOG (near point signal) input
FP	: CW pulse output
RP	: CCW pulse output
ΦA	: A-phase input of manual pulse generator
ΦB	: B-phase input of manual pulse generator
CLR	: Output clear signal

10.3 Terminals



10.3.1 Input/Output Terminal

Description	Terminal	Content	Response
Power supply	+24V/ 0V	Power input/24V DC (-15 ~ +20%) Current consumption 70±10mA; Startup peak current 1.3 A	-
Input	START	Start input terminal	4ms/12ms
	STOP	Stop input terminal	4ms
	LSP/LSN	Limit Stroke of right/left limit	1ms
	ΦA+/ΦA-	A-phase terminal (+, -) of manual pulse generator input (line driver input)	200kHz
	ΦB+/ΦB-	B-phase terminal (+, -) of manual pulse generator input (line driver input)	200kHz
	PG0+/ PG0-	Zero signal input terminal +, - (line driver input)	4ms
	DOG	Offers two different functions depending on operation mode. (1) It is near-point signal in zero return mode. (2) It is start signal on interrupt 1st or interrupt 2nd speed mode.	1ms
	S/S	Signal common terminal of Inputs (START, STOP, DOG, LSP, LSN)	-
Output	CLR+/ CLR-	Clear signal (clear signal of internal error counter for Servo drive)	4ms
	FP+/FP-	FP/RP mode: CW pulse output I/O mode: Output pulse AB-phase mode: A-phase output	200kHz
	RP+/RP-	FP/RP mode: CCW pulse output I/O mode: direction output AB-phase mode: B-phase output	200kHz

10.4 Control Register

CR No. HM	LW	Address	Latched	Attribute	Content	Setting Range
	#0	H'4190	○	R	Model No.	System setting, Read-only (For the model code, please refer to the model list H'0110..)
#2	#1	H'4191	○	R/W	Pulse rate (A)	Range: 1 ~ +2,147,483,647 PPS/REV, factory setting: 2,000 Pulse/Revolution (PLS/REV)
#4	#3	H'4193	○	R/W	Feed rate (B)	Range: 1 ~ +2,147,483,647 unit/REV, factory setting: 1,000 (unit*1/REV)
	#5	H'4195	○	R/W	Parameter setting Factory setting: H'0000	b15: STOP input polarity b14: START input polarity b13: START response time b12: Acceleration curve options b11: DOG polarity b10: DOG trigger time b9: Pulse direction b8: Zero return direction b7: LSN input polarity b6: LSP input polarity b5: Pulse output format b4: Position rate setting b3 b2 b1 b0: Unit setting
#7	#6	H'4196	○	R/W	Maximum speed V_{max}	Range: 0 ~ +2,147,483,647 unit*1 (10 ~ 200 kPPS) *2 Factory setting: 200,000 unit*1
#9	#8	H'4198	○	R/W	Bias speed V_{bias}	Range: 0 ~ +2,147,483,647 unit*1 (0 ~ 200 kPPS pulse transfer value) *2 Factory setting: 0 unit*1
#11	#10	H'419A	○	R/W	JOG speed V_{JOG}	Range: 0 ~ +2,147,483,647 unit*1 (10 ~ 200 kPPS pulse transfer value) *2 Factory setting: 5,000 unit*1
#13	#12	H'419C	○	R/W	Zero return speed V_{RT}	Range: 0 ~ +2,147,483,647 unit*1 (10 ~ 200 kPPS pulse transfer value) *2 Factory setting: 50,000 unit*1
#15	#14	H'419E	○	R/W	Zero return deceleration speed V_{CR}	Range: 0 ~ +2,147,483,647 unit*1 (10 ~ 200 kPPS pulse transfer value) *2 Factory setting: 1,000 unit*1
	#16	H'41A0	○	R/W	The number of PG0 in zero return mode N	Range: 0 ~ +32,767 PLS Factory setting: 0 PLS
	#17	H'41A1	○	R/W	The number of pulse in zero return mode P	Range: -32,768 ~ +32,767 PLS Factory setting: 0 PLS
	#18	H'41A2	○	R/W	Zero return mode H Mode	b0: zero return mode, b1: detect DOG falling-edge in zero return mode
#20	#19	H'41A3	○	R/W	Zero point setting (HP)	Range: 0 ~ ±999,999 unit*1 Factory setting: 0 unit*1
	#21	H'41A5	○	R/W	Acceleration time T_{acc}	Range: 10 ~ +32,767 ms Factory setting: 100 ms
	#22	H'41A6	○	R/W	Deceleration time T_{dec}	Range: 10 ~ +32,767 ms；factory setting: 100 ms
#24	#23	H'41A7	×	R/W	Target position (I) P(I)	Range: -2,147,483,648 ~ +2,147,483,647 unit*1 (-2,147,483,648 ~ +2,147,483,647 pulse transfer value) *2; factory setting: 0 unit*1
#26	#25	H'41A9	×	R/W	Running speed (I) V(I)	Range: -2,147,483,648 ~ +2,147,483,647 unit*1 (10 ~ 200 kPPS pulse transfer value) *2; factory setting: 1,000 unit*1
#28	#27	H'41AB	×	R/W	Target position (II) P(II)	Range: -2,147,483,648 ~ +2,147,483,647 unit*1 (-2,147,483,648 ~ +2,147,483,647 pulse transfer value) *2, factory setting: 0 unit*1
#30	#29	H'41AD	×	R/W	Running speed (II) V(II)	Range: 0 ~ +2,147,483,647 unit*1 (10 ~ 200 kPPS pulse transfer value) *2 Factory setting: 2,000 unit*1

CR No. HM	LW	Address	Latched	Attribute	Content	Setting Range
	#31	H'41AF	×	R/W	Running instruction factory setting: H'0000	b15: - b14: - b13: CLR output (On/Off) b12: CLR signal output mode b11: - b10: Current position = 0 b9: - b8: Software START b7: ABS/REL Coordinate b6: Zero return start b5: JOG- b4: JOG+ b3: CCW pulse STOP b2: CW pulse STOP b1: Software STOP b0: Error reset
	#32	H'41B0	×	R/W	Work mode Factory setting: H'0001	b15: - b14: - b13: Current position: CR34, 33; current speed: CR36, 35; display unit: 0 → pulse, 1 → unit b12: Return to factory setting b11~b9: MASK setting b8: LSP/LSN stop mode b7: Manual pulse generator range limitation b6: STOP mode b5: Manual pulse generator input operation b4: Variable speed operation mode start b3: Interrupt 2nd-speed position mode start b2: 2nd-speed position mode start b1: Interrupt 1st-speed position mode start b0: 1st-speed position mode start
#34	#33	H'41B1	×	R/W	Current position CP (PLS)	Range display: -2,147,483,648 ~ +2,147,483,647 PLS Factory setting: 0 PLS
#36	#35	H'41B3	×	R	Current speed CS (PPS)	Range display: 0 ~ +2,147,483,647 PPS Factory setting: 0 PPS
	#37	H'41B5	×	R/W	Communication address and Baud rate setting	RS-485 communication address setting: setting range 01 ~ 254 Factory setting: K1. Baud rate setting: 4,800, 9,600, 19,200, 38,400, 57,600, and 115,200 bps. ASCII mode data format is 7Bit, even bit and 1 stop bit (7 E 1). RTU mode data format is 8Bit, even bit and 1 stop bit (8 E 1) b0: 4,800 bps (bit/sec.), b1: 9,600 bps (bit/sec.) (factory setting) b2: 19,200 bps (bit/sec.), b3: 38,400 bps (bit/sec.) b4: 57,600 bps (bit/sec.), b5: 115,200 bps (bit/sec.) b6: reserved, b7: 0 for RTU, 1 for ASCII mode, b8 ~ b15: communication address
	#38	H'41B6	○	R/W	Execution status factory setting: H'XXXX	b15: - b14: - b13: - b12: - b11: - b10: MPG input downward b9: MPG input upward b8: - b7: Route paused indication b6: Position completed indication b5: Error occurred flag b4: CP value overflow b3: Zero return is done b2: CCW pulse is outputting b1: CW pulse is outputting b0: Status indication

<table>
<tr><th colspan="5">CR No.</th><th rowspan="2">Content</th><th colspan="3" rowspan="2">Setting Range</th></tr>
<tr><th>HM</th><th>LW</th><th>Address</th><th>Latched</th><th>Attribute</th></tr>
<tr><td></td><td>#39</td><td>H’41B7</td><td>×</td><td>R</td><td>Error code</td><td colspan="3">Please refer to the following note*3 explanation.
Factory setting: H’0000</td></tr>
<tr><td></td><td>#40</td><td>H’41B8</td><td>×</td><td>R/W</td><td>Electronic gearing number of MPG input</td><td colspan="3">Please refer to the following note*4 explanation.
Factory setting: H’1</td></tr>
<tr><td></td><td>#41</td><td>H’41B9</td><td>×</td><td>R/W</td><td>Electronic gearing denominator of MPG input</td><td colspan="3">Please refer to the following note*4 explanation.
Factory setting: H’1</td></tr>
<tr><td>#43</td><td>#42</td><td>H’41BA</td><td>×</td><td>R/W</td><td>Input frequency of manual pulse generator</td><td colspan="3">The input frequency of manual pulse generator
Factory setting: 0</td></tr>
<tr><td>#45</td><td>#44</td><td>H’41BC</td><td>×</td><td>R/W</td><td>Accumulated pulse input no. of manual pulse generator</td><td colspan="3">The count value of CW manual pulse input is “ +” symbol, on the contrary, the CCW manual pulse input is “-“symbol. And the count value is nothing to do with the ratio setting of manual electronic gearing (CR#40, #41). Factory setting: 0.</td></tr>
<tr><td rowspan="6"></td><td rowspan="6">#46</td><td rowspan="6">H’41BE</td><td rowspan="6">×</td><td rowspan="6">R/W</td><td rowspan="6">Response speed of manual pulse generator</td><th>Value</th><th>Response speed</th><td rowspan="6">When response speed setting is faster, the instructions of pulse output and manual pulse generator input will be more synchronous.
When response speed setting is slower, the instruction of pulse output is slower than the instruction of manual pulse generator input.
Factory setting: 5</td></tr>
<tr><td>≧5</td><td>4ms (factory setting)</td></tr>
<tr><td>4</td><td>32ms</td></tr>
<tr><td>3</td><td>108ms</td></tr>
<tr><td>2</td><td>256ms</td></tr>
<tr><td>1 or 0</td><td>500ms</td></tr>
<tr><td rowspan="10"></td><td rowspan="10">#47</td><td rowspan="10">H’41BF</td><td rowspan="10">×</td><td rowspan="10">R</td><td rowspan="10">Terminal status</td><th>bit #</th><th>Status</th><th>Description</th></tr>
<tr><td>b0</td><td>START input</td><td>When START input is On, b0 is On.</td></tr>
<tr><td>b1</td><td>STOP input</td><td>When STOP input is On, b1 is On.</td></tr>
<tr><td>b2</td><td>DOG input</td><td>When DOG input is On, b2 is On.</td></tr>
<tr><td>b3</td><td>PG0 input</td><td>When PG0 input is On, b3 is On.</td></tr>
<tr><td>b4</td><td>LSP input</td><td>When LSP input is On, b4 is On.</td></tr>
<tr><td>b5</td><td>LSN input</td><td>When LSN input is On, b5 is On.</td></tr>
<tr><td>b6</td><td>A phase input</td><td>When A phase input is On,
b6 is On.</td></tr>
<tr><td>b7</td><td>B phase input</td><td>When B phase input is On,
b7 is On.</td></tr>
<tr><td>b8</td><td>CLR output</td><td>When CLR output is On, b8 is On.</td></tr>
<tr><td></td><td>#48</td><td>H’41C0</td><td>○</td><td>R</td><td>System version</td><td colspan="3">System version is in hexadecimal. e.g. software V1.00 is for H’0100.</td></tr>
</table>

*1: Unit setting varies based on b0 and b1 setting of CR#5.

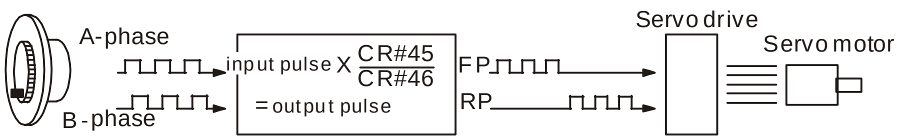
*2: Use max. Pulse output if upper limit is exceeded. Use min. pulse output if lower limit is exceeded.

*3. When ERROR LED is on, it indicates DVP01PU-S hardware malfunction or error parameter setting when error LED flashes. ERR code is recorded in CR#39.

Error code	Description	Error code	Description
H'0000	No error	H'0014	JOG speed (V_{JOG}) setting error
H'0001	Target position (I) setting error	H'0020	CW pulse is forbidden
H'0002	Target address (II) setting error	H'0021	CCW pulse is forbidden
H'0010	Running speed (I) setting error	H'0030	Low voltage
H'0011	Running speed (II) setting error	H'0080	Hardware error in internal memory
H'0012	Zero return deceleration (V_{CR}) setting error	H'0081	Data write in error in internal memory
H'0013	Zero return (V_{RT}) setting error		

*4. When the working mode CR#32 b5 is set to On, it means that the manual pulse generator input working mode is started.

A. Manual pulse generator to generate A/B phase pulse and input them to ΦA and ΦB. The relationship between the FP/RP output and the input pulse is as shown in the figure below:



B. During operation, if LSP or LSN is started, the output will stop immediately. If LSP is started, CW pulse is prohibited, and CCW pulse is allowed. If LSN is started, CCW pulse is prohibited, and CW pulse is allowed.

C. Default for Positioning completed is CR#38 b6=Off. When positioning is completed, positioning completion indication will become **CR#38 b6=On**.

D. Output operating speed is proportional to the input frequency of manual pulse generator and electronic gears (CR#40, CR#41).

※ CR#0 ~ CR48: user can use the corresponding addresses H'4190 ~ 41C0 to read/write data via RS-485 communication.

1. Baud rate supportive: 4,800, 9,600, 38,400, 57,600, and 115,200 bps.
2. Modbus ASCII/RTU: ASCII mode is 7 bits, even bit and 1 stop bit (7, E, 1). RTU mode is 8 bits, even bit and 1 stop bit (8, E, 1).
3. Function code: 03'H for read data from CR; 06'H for write one word in CR; 10'H for write many words in CR.

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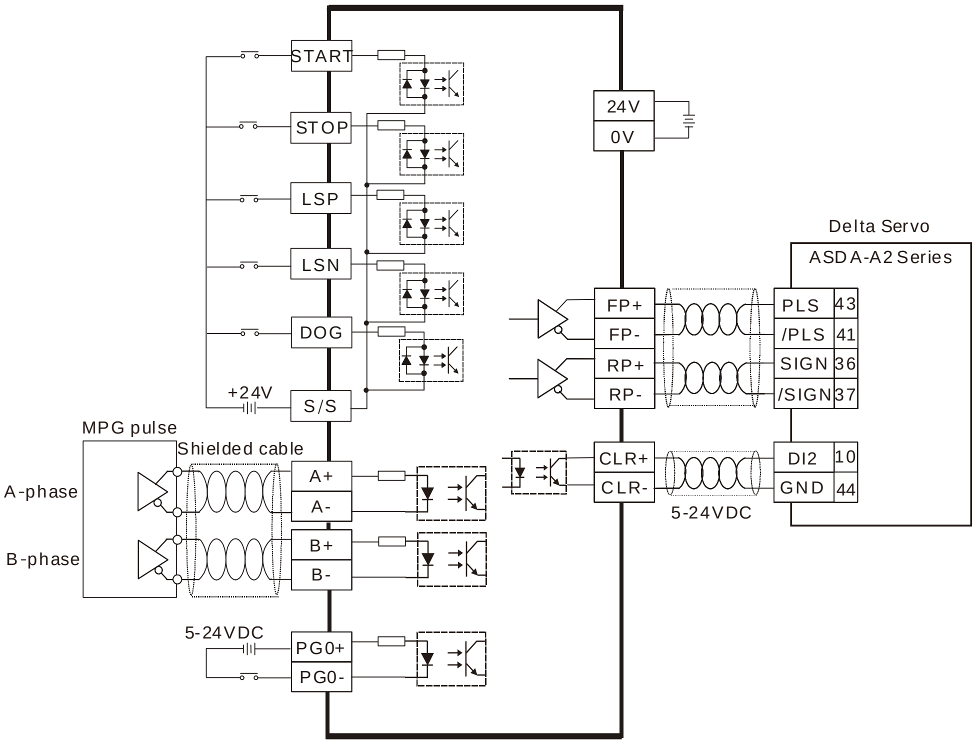
10.5 Wiring



1. Please use 22-16AWG (1.5mm) wiring (either single or multiple core) for I/O wiring terminals. PLC terminal screws should be tightened to 1.90kg-cm (1.65lb-in). Use copper conductors only, 60/75oC.
2. DO NOT arrange the wiring of I/O signal wires or power supply in the same wiring duct.
3. Make sure the terminals ⏚ of power module and DVP01PU-S are properly grounded or connected to the cover of power distribution cabinet.
4. DO NOT wire to null terminal ●.
5. Use only 60/75°C copper conductors.

10.6 Troubleshooting

When the DVP01PU-S module encounters an error, the ERROR indicator will be illuminated. Use the FROM instructions to read the error status data register (CR#39). Refer to the table below to identify the error and execute the corresponding solutions.

No.	ERROR LED	Description	Solution
H’0000	OFF	Normal	
H’0001	Blinking	Target position (I) setting error	1. Target position (I) cannot be 0。 2. If at the positive limit, the target position (I) should not be a positive value. 3. If at the negative limit, the target position (I) should not be a negative value.
H’0002	Blinking	Target position (II) setting error	Target position (II) cannot be 0.。
H’0010	Blinking	Operating speed (I) setting error	Check if the speed setting is within this range: VMAX>V (I) >VBIAS
H’0011	Blinking	Operating speed (II) setting error	Check if the speed setting is within this range: VMAX>V (II) >VBIAS
H’0012	Blinking	Zero return deceleration (V_{CR}) setting error	Check if the speed setting is within this range: VRT>VCR
H’0013	Blinking	Zero return (V_{RT}) setting error	Check if the speed setting is within this range: VMAX>VRT>VBIAS
H’0014	Blinking	JOG speed (V_{JOG}) setting error	Check if the JOG speed exceeds the maximum speed VMAX.
H’0020	Blinking	CW pulse is forbidden	Check if the running instruction CR#31 bit2 is set correctly and verify that whether the executed instruction runs in the clockwise direction.
H’0021	Blinking	CCW pulse is forbidden	Check if the running instruction CR#31 bit3 is set correctly and verify that whether the executed instruction runs in the clockwise direction.
H’0030	Blinking	Low voltage signal	Check whether the module input voltage is correct.
H’0080	Blinking	Hardware error in internal memory	Reset the module
H’0081	Blinking	Data writing error in internal memory	Reset the module

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Chapter 11 DVP-S Series Left-Side High-Speed Analog Input/Output Module

Table of Contents

11.1 General Specifications

11.1.1 DVP04AD-SL Specifications

11

- **Electrical Specifications**

Model name	DVP04AD-SL
Number of inputs	4
Analog-to-digital conversion	Voltage input/current input
Power supply	24VDC (20.4VDC~28.8VDC) (-15%~+20%)
Connector type	Removable terminal block
Response time	250us/channel
Connect to DVP-PLC CPU	Connect to the left side of CPU, numbered from 100 to 107 according to the position of module from the closest to farthest to CPU.
Weight	106.5g

- **Functional specifications**

Analog/digital module	Voltage input				Current input		
Analog input channel	4channel/each module						
Range of analog input	±10V	±5V	0~5V	1~5V	±20mA	0~20mA	4~20mA
Range of digital conversion	±32,000	±32,000	0~32,000	0~32,000	±32,000	0~32,000	0~32,000
Hardware input limit*1	±10.12V	±5.06V	-0.06~5.06V	0.952~5.048V	±20.24 mA	-0.24~20.24mA	3.808~20.192 mA
Digital conversion limit*2	±32,384	±32,384	-384~32,384	-384~32,384	±32,384	-384~32,384	-384~32,384
Hardware resolution	16 bits	16 bits	15 bits	15 bits	16 bits	15 bits	15 bits
Input impedance	≧1MΩ				250Ω		
Absolute input range*3	± 15V				± 32mA		
Digital data format	16 bits two's complement number, 15 significant bits						
Average function	Yes, CR#8 ~ CR#11, setting range: K1 ~ K20.						
Self-diagnosis function	Detecting if exceeding upper and lower limits or channel disconnection.						
Overall Accuracy	25° C / 77° F: The allowed error range is ±0.3% of full scale. 0° C to 55° C / 32° F to 131° F: The allowed error range is ±0.5% of full scale.						
Response time	250us/channel						
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500VAC Isolation between an analog circuit and a ground: 500VAC Isolation between an analog circuit and a digital circuit: 500VAC Isolation between the 24 VDC and a ground: 500VAC						

*1. If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value.

*2. If the input signal exceeds the hardware input limit, it also exceeds the digital conversion limit, and a conversion limit error appears. For example, in the voltage input mode (-10 V to +10 V), when the input signal is -10.25 V, exceeding the hardware lower limit, it also exceeds the conversion lower limit. The module uses the lower limit value (-32384) as the input signal and a conversion limit error appears.

*3. If an input signal exceeds the absolute range, it might damage the channel.

11.1.2 DVP04DA-SL Specifications

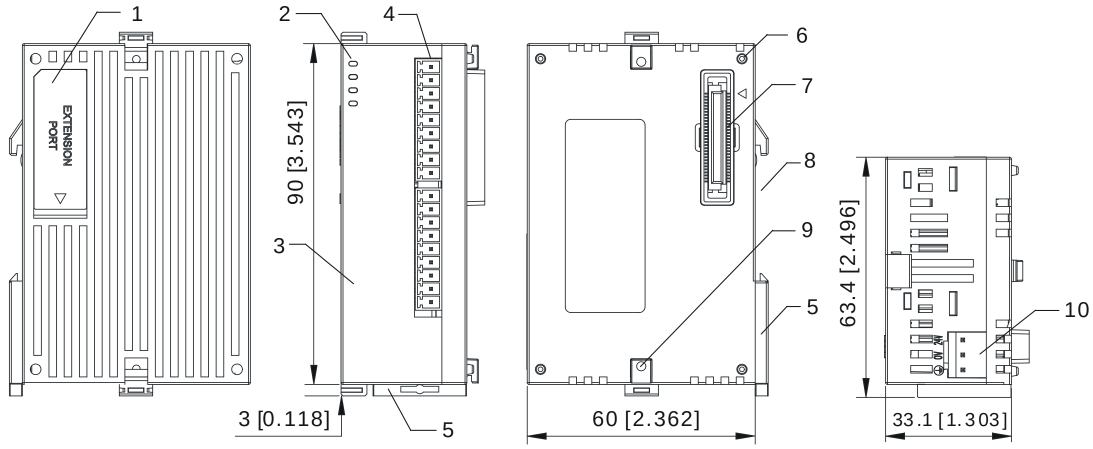
- **Electrical specifications**

Module name	DVP04DA-SL
Number of outputs	4
Analog-to-digital conversion	Voltage output/ Current output
Supply voltage	24VDC（20.4~28.8VDC）(-15%~+20%)
Connector type	Removable terminal block
Short circuit protection	The module is with short circuit protection, but if the duration of a short circuit is too long, it can cause circuit damage. Current output can be open circuit.
Connect to DVP-PLC CPU	Connect to the left side of CPU, numbered from 100 to 107 according to the position of module from the closest to farthest to CPU.
Weight	107g

- **Functional specifications**

Analog/digital module	Voltage output		Current output	
Analog output channel	4channel/each module			
Rated output range	±10V	0~10V	0~20mA	4~20mA
Digital conversion range	±32,000	0~32,000	0~32,000	0~32,000
Digital conversion limit	±32,000	0~32,000	0~32,000	0~32,000
Hardware resolution	16 bits	15 bits	15 bits	15 bits
Maximum output current	10mA		-	
Load impedance	≧1KΩ		≦500Ω	
Output impedance	≦0.5Ω		≧1MΩ	
Overall accuracy	25° C / 77° F: The allowed error range is ±0.3% of full scale. 0° C to 55° C / 32° F to 131° F: The allowed error range is ±0.5% of full scale.			
Response time	250us/channel			
Digital data format	16 bits two's complement number, 15 significant bits.			
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500VAC Isolation between an analog circuit and a ground: 500VAC Isolation between an analog circuit and a digital circuit: 500VAC Isolation between the 24 VDC and a ground: 500VAC			

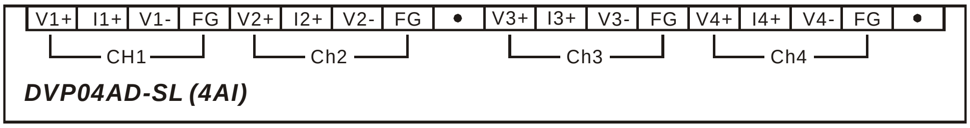
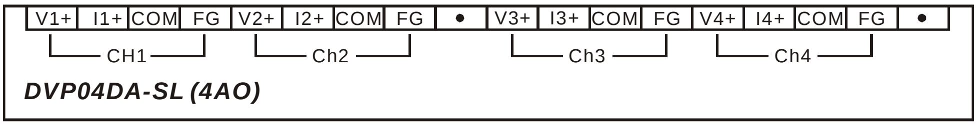
11.2 Module Profiles and Dimensions



Unit:mm

No.	Name	Description
1	Extension module connection port	Connect the modules.
2	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	ERROR LED indicator	Error status of the module. ON: A serious module error has occurred OFF: the module is normal. Blinking (0.2 seconds ON/OFF): A non-serious module error occurs, can NOT operate normally
	Run LED indicator	Indicates the operating status of the module.
3	Model name	Model name of the module.
4	I/O Terminals	The inputs are connected to sensors. The outputs are connected to loads to be driven.
5	DINrail securing clip	Secure the module on the set.
6	Extension unit positioning hole	For positioning between modules.
7	Extension port	Connect the PLC or the modules.
8	DIN rail slot（35mm）	For the DIN rail.
9	Extension unit fixing clip	For securing the extension module.
10	Power input port	Expansion unit power input.

11.3 Terminals

DVP04AD-SL	
DVP04DA-SL	

11.4 Control Registers

11.4.1 DVP04AD-SL Control Register

CR#	Attrib.		Register name	Explanation
#0	O	R	Model name	Set up by the system: DVP04AD-SL model code = H'4400
#1	O	R	Firmware version	Display the current firmware version in hex.
#2	X	R/W	CH1 input mode setting	Input mode: Default = H'0000. Take CH1 for example: Mode 0 (H'0000): Voltage input (±10V) Mode 1 (H'0001): Current input (±20mA) Mode 2 (H'0002): Current input (0~+20mA) Mode 3 (H'0003): Current input (+4~+20mA) Mode 4 (H'0004): Voltage input (±5V) Mode 5 (H'0005): Voltage input (0V~+5V) Mode 6 (H'0006): Voltage input (1V~+5V) Mode -1 (H'FFFF): Channel unavailable
#3	X	R/W	CH2 input mode setting	
#4	X	R/W	CH3 input mode setting	
#5	X	R/W	CH4 input mode setting	
#8	X	R/W	CH1 sampling range	Set sampling range in CH1 ~ CH4: Range = K1 ~ K20 Default = K10
#9	X	R/W	CH2 sampling range	
#10	X	R/W	CH3 sampling range	
#11	X	R/W	CH4 sampling range	
#12	X	R	CH1 average input value	Average value of input signals at CH1 ~ CH4
#13	X	R	CH2 average input value	
#14	X	R	CH3 average input value	
#15	X	R	CH4 average input value	
#16	X	R	CH1 present input value	Present value of input signals at CH1 ~ CH4
#17	X	R	CH2 present input value	
#18	X	R	CH3 present input value	
#19	X	R	CH4 present input value	
#20	X	R/W	Set value of CH1 upper bound	Set value of CH1~CH4 upper bound. Default = K32767.
#21	X	R/W	Set value of CH2 upper bound	
#22	X	R/W	Set value of CH3 upper bound	
#23	X	R/W	Set value of CH4 upper bound	
#24	X	R/W	Set value of CH1 lower bound	Set value of CH1~CH4 lower bound. Default = K-32768.
#25	X	R/W	Set value of CH2 lower bound	
#26	X	R/W	Set value of CH3 lower bound	

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CR#	Attrib.		Register name	Explanation
#27	X	R/W	Set value of CH4 lower bound	
#28	X	R/W	Adjusted Offset value of CH1	Set the adjusted Offset value of CH1 ~ CH4. Default = K0, unit= LSB.
#29	X	R/W	Adjusted Offset value of CH2	
#30	X	R/W	Adjusted Offset value of CH3	
#31	X	R/W	Adjusted Offset value of CH4	
#34	X	R/W	Adjusted Gain value of CH1	Set the adjusted Gain value in CH1 ~ CH4. Default = K16,000, unit= LSB.
#35	X	R/W	Adjusted Gain value of CH2	
#36	X	R/W	Adjusted Gain value of CH3	
#37	X	R/W	Adjusted Gain value of CH4	
※ Input Mode 2(0mA ~ 20mA), Mode 3(4mA ~ 20mA), Mode 5(0V ~ 5V), Mode 6(1V~ 5V) do not support adjusted OFFSET & GAIN value. ※ When input mode changes, the adjusted OFFSET and GAIN value automatically resets.				
#42	X	R/W	Function: Return to default setting	b0 ~ b3: corresponding to CH1 ~ CH4 b4 ~ b15: reserved Default = H'0000. Give CH1 setting for example: When b0 is set to 1, all settings are reset to default setting.
#43	X	R	Error status	Register for storing all error status. Refer to table of error status for more information. Default = H'0000.
Symbols: O means latched. X means not latched. R means can read data by using FROM instruction. W means can write data by using TO instruction. LSB (Least Significant Bit): 1. Voltage input: 1_{LSB}=10V/32,000=312.5μV 2. Current input: 1_{LSB}=20mA/32,000=625nA				

※ CR#43 Error status value. See the table below.

Bit	Error Status	Content Value	Bit	Error Status	Content Value
b0	K1 (H'0001)	Power supply error	b1	K2 (H'0002)	Hardware error
b2	K4 (H'0004)	Mode setting error	b3	K8 (H'0008)	Reserved
b4	K16 (H'0010)	CH1 Upper / lower bound error	b5	K32 (H'0020)	CH2 Upper / lower bound error
b6	K64 (H'0040)	CH3 Upper / lower bound error	b7	K128 (H'0080)	CH4 Upper / lower bound error
b8	K256 (H'0100)	CH1 Conversion error	b9	K512 (H'0200)	CH2 Conversion error
b10	K1024 (H'0400)	CH3 Conversion error	b11	K2048 (H'0800)	CH4 Conversion error
b12	K4096 (H'1000)	Reserved	b13	K8192 (H'2000)	Hardware error
b14	K16384 (H'4000)	Default setting error	b15	K32768 (H'8000)	Reserved
Note: Each error status is determined by the corresponding bit and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error.					

※ **Adjust A/D Conversion Curve**

Users can adjust the conversion curves according to the actual needs by changing the Offset value (CR#28 ~ CR#31) and Gain value (CR#34 ~ CR#37).

※ Input Mode 2(0mA ~ 20mA)、Mode 3(4mA ~ 20mA)、Mode 5(0V ~ 5V)、Mode 6 (1V~ 5V) do not support adjusted OFFSET and GAIN value.

- Equation for voltage input Mode 0

$$Y = 16000 \times \left(\frac{X(V)}{10(V)} \times 32000 - Offset \right) \Big/ (Gain - Offset)$$

Y=Digital output, X=Voltage input

Resolution：0.3125mV=20V/64,000

- Equation for voltage input Mode 4/ Mode 5

$$Y = 16000 \times \left(\frac{X(V)}{5(V)} \times 32000 - Offset \right) \Big/ (Gain - Offset)$$

Y=Digital output, X=Voltage input

Resolution：0.15625mV=10V/64,000=5V/32,000

- Equation for current input Mode 1/ Mode 2

$$Y = 16000 \times \left(\frac{X(mA)}{20(mA)} \times 32000 - Offset \right) \Big/ (Gain - Offset)$$

Y=Digital output, X=Current input

Resolution：0.625μA=40mA/64,000=20mA/32,000

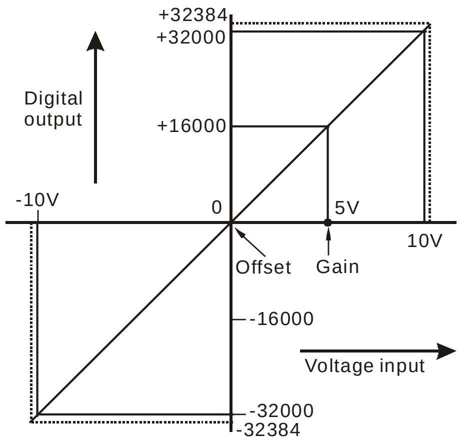
Gain: The corresponding voltage/current input value when the digital output value = 16,000.

Offset: The corresponding voltage/current input value when the digital output value = 0.

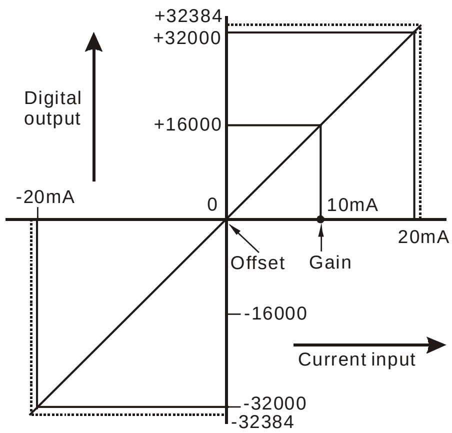
※ **A/D Conversion Curve**

Mode 0	-10~+10V，Gain=16,000（$=5\mathrm{V}/312.5\mathrm{uV}$）, Offset=0
Mode 1	-20~+20mA，Gain=16,000（$=10mA/625nA$）, Offset=0
Range of digital conversion	-32,000 $_{LSB}$~+32,000 $_{LSB}$
Max./Min. range of digital conversion	-32,384 $_{LSB}$~+32,384 $_{LSB}$

Mode 0

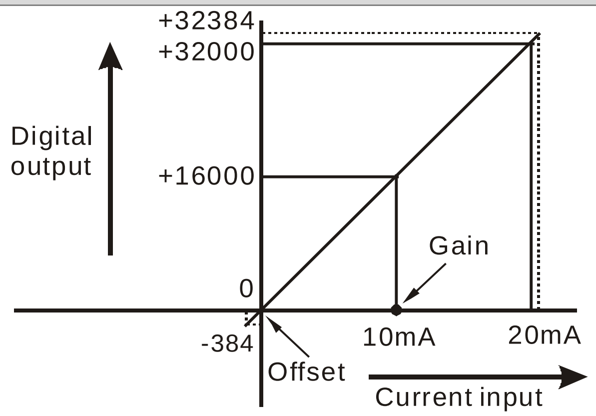


Mode 1

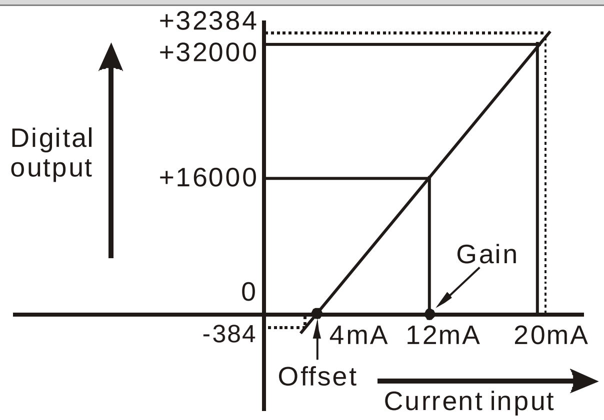


Mode 2	0~+20mA，Gain=16,000（$=10mA/625nA$）, Offset=0
Mode 3	4~+20mA，Gain=19,200（$=12mA/625nA$）, Offset=6,400（$=4mA/625nA$）
Range of digital conversion	0 $_{LSB}$~+32,000 $_{LSB}$
Max./Min. range of digital conversion	-384 $_{LSB}$~+32,384 $_{LSB}$

Mode 2

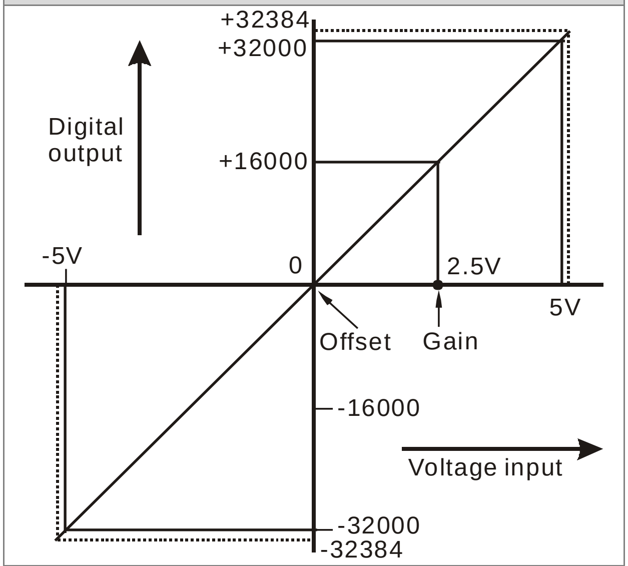


Mode 3



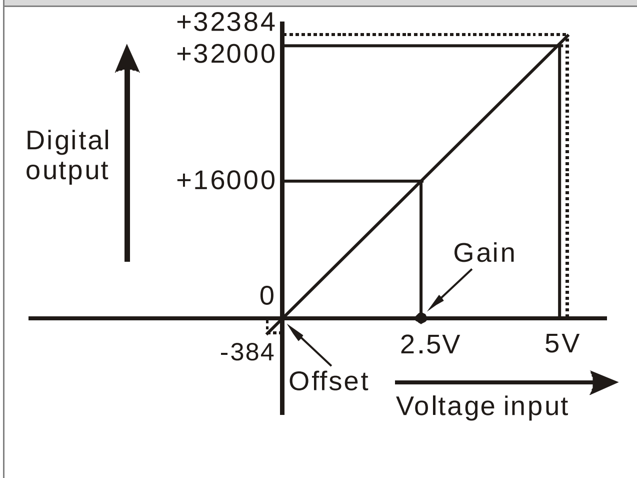
Mode 4	-5~+5V，Gain=16,000（$=2.5V/156.25uV$）, Offset=0
Range of digital conversion	-32,000 LSB~+32,000 LSB
Max./Min. range of digital conversion	-32,384 LSB~+32,384 LSB

Mode 4

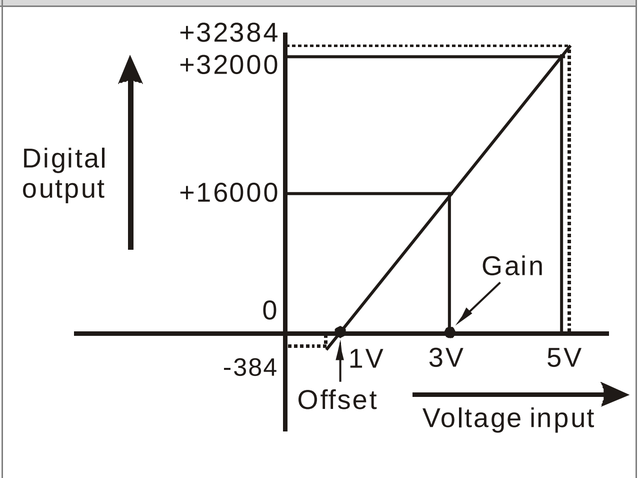


Mode 5	0~+5V，Gain=16,000（$=2.5V/156.25uV$）, Offset=0
Mode 6	1~+5V，Gain=19,200（$=2.5V/156.25uV$）, Offset=6,400（$=1V/156.25uV$）
Range of digital conversion	0 LSB~+32,000 LSB
Max./Min. range of digital conversion	-384 LSB~+32,384 LSB

Mode 5



Mode6



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11.4.2 DVP04DA-SL Control Register

CR#	Attrib.		Register name	Explanation
#0	O	R	Model name	System used; data length is 8 bits (b7 ~ b0). Model code = H'4401. User can read the data from program to check if there is I/O module.
#1	O	R	Firmware version	Display the current firmware version in hex. For example: 1.0A means CR#1 = H'010A.
#2	X	R/W	CH1 output mode setting	Output mode: Default = H'0000. Take CH1 for example: Mode 0 (H'0000): Voltage output (±10V) Mode 1 (H'0001): Current output (0~+20mA) Mode 2 (H'0002): Current output (+4~+20mA) Mode 3 (H'0003): Voltage output (0V~10V) Mode -1 (H'FFFF): All channels are unavailable
#3	X	R/W	CH2 output mode setting	
#4	X	R/W	CH3 output mode setting	
#5	X	R/W	CH4 output mode setting	
#6	X	R/W	The enabling function of table output	Please refer to the table of CR#6 below for detail. Default = H'0000
#7	X	R/W	Enable table output function	Bit 0~ bit 3 activate the table output function on CH1 ~ CH4. Modifying the parameters in output table during table output process is not allowed. 0: Stop, 1: Run, Default = H'0000.
#8	X	R/W	Curves of table output function	Please refer to the table of CR#8 for detail. Default = H'0000
#16	X	R/W	CH1 output signal value	Voltage output range: K-32,000~K32,000 Current output range: K0~K32,000 Default: K0
#17	X	R/W	CH2 output signal value	
#18	X	R/W	CH3 output signal value	
#19	X	R/W	CH4 output signal value	
#20	X	R	CH1 output value in the current table	Default = K32767
#21	X	R	CH2 output value in the current table	
#22	X	R	CH3 output value in the current table	
#23	X	R	CH4 output value in the current table	
#24	X	R	Current CH1 transition point in the table	Default = K0
#25	X	R	Current CH2 transition point in the table	
#26	X	R	Current CH3 transition point in the table	
#27	X	R	Current CH4 transition point in the table	
#28	X	R/W	Adjusted OFFSET value of CH1	Set the adjusted OFFSET value of CH1 ~ CH4. Default = K0
#29	X	R/W	Adjusted OFFSET value of CH2	
#30	X	R/W	Adjusted OFFSET value of CH3	
#31	X	R/W	Adjusted OFFSET value of CH4	
#34	X	R/W	Adjusted GAIN value of CH1	Set the adjusted GAIN value of CH1 ~ CH4. Default = K16,000.
#35	X	R/W	Adjusted GAIN value of CH2	
#36	X	R/W	Adjusted GAIN value of CH3	
#37	X	R/W	Adjusted GAIN value of CH4	
※ Output Mode 2(4mA ~ 20mA), Mode 3(0V~10V) do not support adjusted OFFSET & GAIN value. ※ When output mode changes, the adjusted OFFSET and GAIN value automatically reset.				
#43	X	R	Error status	Register for storing all error status. Refer to table of error status for more information. Default setting: H'0000.
#44	X	R	Status of table output	

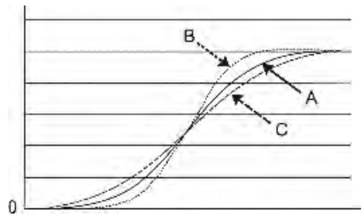
CR#	Attrib.		Register name	Explanation
				Used when output mode=1 b0~b3: Display the output completed status of CH1~CH4. Display value = 1 indicates the end of output. b4~b7: Display the CH1~CH4 output table parameter error status. Display value = 1 indicates parameter error. b8~b15: reserved
#100	X	R/W	Number of transition points for CH1 table output	range: K0~K10 Default = K0 (Refer to the transition point table below for more information on the channel table outputs.)
#125	X	R/W	Number of transition points for CH2 table output	
#150	X	R/W	Number of transition points for CH3 table output	
#175	X	R/W	Number of transition points for CH4 table output	
Symbols: O means latched. X means not latched. R means can read data by using FROM instruction. W means can write data by using TO instruction. LSB (Least Significant Bit):1. Voltage output: 1_{LSB} = 10V/32,000 = 312.5μV. 2. Current output: 1_{LSB} = 20mA/32,000 = 625nA				

※ CR#6: The Enabling Function of Table Output. See the below

b15 ~ b12	b11 ~ b8	b7 ~ b4	b3 ~ b0
CH4	CH3	CH2	CH1
K0: Disable (Default)			
K1: Acyclic Table Output			
K2: Cyclic Table Output			
Note: 1. Table output function is enabled when the table output mode is not set as 0. 2. When table output function is enabled, the value set in CR#16~CR#19 is invalid.CR#20~CR#23 stores the present table output value for users to read. CR#24~CR#27 indicate the present transition point of table output in each channel.			

※ CR#8: Curves of Table Output Function. See the table below.

b15~b12	b11~b8	b7~b4	b3~b0
CH4	CH3	CH2	CH1
K0：Linearity (Default)			
K1：S carve(A)			
K2：S carve(B)			
K3：S carve(C)			



※ CR#43: Error status value. See the table below.

Bit	Error Status	Content Value
b0	K1 (H'0001)	Power source abnormal
b1	K2 (H'0002)	Hardware malfunction
b2	K4 (H'0004)	Setting mode error
Note: Each error status is determined by the corresponding bit (b0 ~ b15) and there may be more than 2 errors occurring at the same time. 0 = normal; 1 = error. b3~b15 reserved.		

※ CR#100~CR#200: Transition points for table output. See the table below:

CR#	Description	Value
CR#100	Transition points of CH1 table output	Max. = 10
CR#101	Output value of point 1 in CH1	D1
CR#102	Duration between point 1 and point 2 in CH1	T1
CR#103	Output value of point 2 in CH1	D2
CR#104	Duration between point 2 and point 3 in CH1	T2
CR#105	Output value of point 3 in CH1	D3
CR#106	Duration between point 3 and point 4 in CH1	T3
CR#107	Output value of point 4 in CH1	D4
CR#108	Duration between point 4 and point 5 in CH1	T4
CR#109	Output value of point 5 in CH1	D5
CR#110	Duration between point 5 and point 6 in CH1	T5
CR#111	Output value of point 6 in CH1	D6
CR#112	Duration between point 6 and point 7 in CH1	T6
CR#113	Output value of point 7 in CH1	D7
CR#114	Duration between point 7 and point 8 in CH1	T7
CR#115	Output value of point 8 in CH1	D8
CR#116	Duration between point 8 and point 9 in CH1	T8
CR#117	Output value of point 9 in CH1	D9
CR#118	Duration between point 9 and point 10 in CH1	T9
CR#119	Output value of point 10 in CH1	D10
CR#120~ CR#124	Reserved	-

✐Note: Duration between points. Set range: K1 ~ K100 (Unit: 10 ms)

✐Note: CR#100~CR#200 are CRs for transition point setting in CH1~CH4.

Take CH1 for example, CR#100 sets the total transition points. Max. 10 points (CR#101~CR#119: D1~D10) can be allocated in the output waveform. Duration between points can be specified by T1~T9. CR#120~CR#124 are reserved.

Same CR function applies on CH2 ~ CH4.

※ **D/A Conversion Curve**

Users can adjust the conversion curves according to the actual needs by changing the OFFSET value (CR#28 ~ CR#31) and GAIN value (CR#34 ~ CR#37)

Output Mode 2(4mA ~ 20mA), Mode 3(0V~10V) do not support adjusted OFFSET and GAIN value.

- Equation for Voltage output Mode 0 adjustment

$$Y(V)=\left[\frac{X\times(Gain-Offset)}{16000}+Offset\right]\times\left(\frac{10(V)}{32000}\right)$$

Y=Voltage output, X=Digital input

Resolution: 0.3125mV=20V/64,000

- Equation for Current output Mode 1 adjustment

$$Y(mA)=\left[\frac{X\times(Gain-Offset)}{16000}+Offset\right]\times\left(\frac{20(mA)}{32000}\right)$$

Y=Current output, X=Digital input

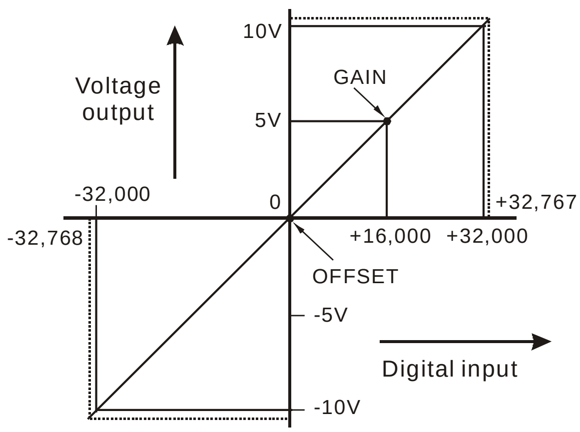
Resolution: 0.625μA=20mA/32,000

GAIN: The corresponding voltage/current output value when setting the digital output value = 16,000.

OFFSET: The corresponding voltage/current output value when setting the digital output value = 0.

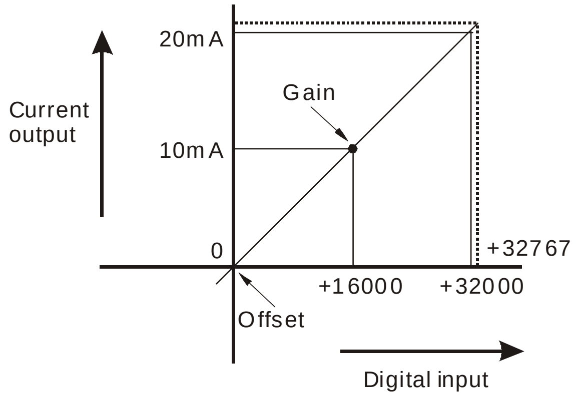
Mode 0	-10~+10V，GAIN=16,000（$=5V/312.5uV$）, OFFSET=0
Range of digital data	-32,000 LSB~+32,000 LSB
Max./Min. range of digital data	-32,768 LSB~+32,767 LSB

Mode 0



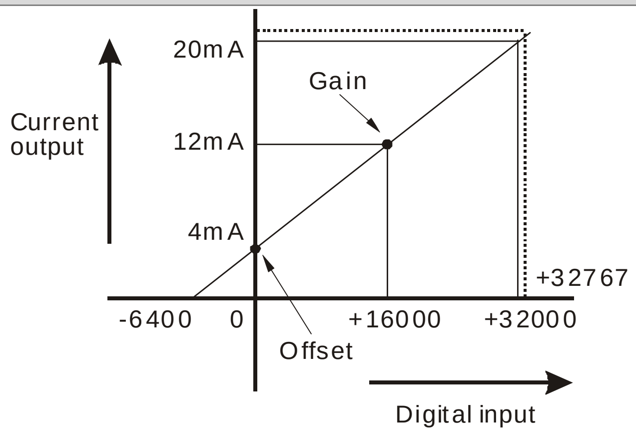
Mode 1	0~+20mA，GAIN=16,000（$=10mA/625nA$）, OFFSET=0
Range of digital data	0 LSB~+32,000 LSB
Max./Min. range of digital data	0 LSB~+32,767 LSB

Mode 1



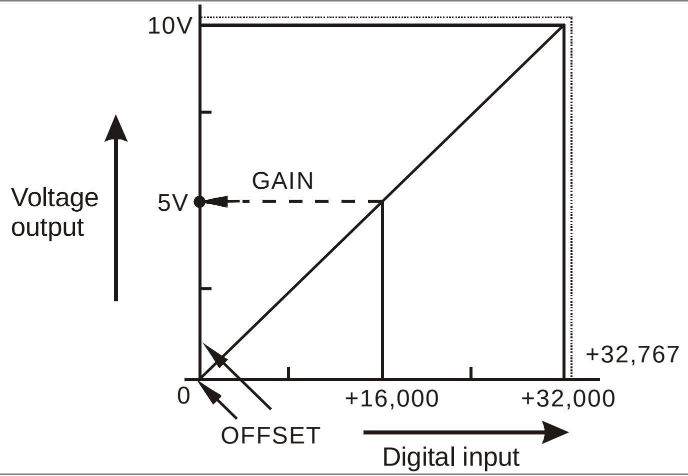
Mode 2	+4~+20mA，GAIN=19,200（$=12mA/625nA$）, OFFSET=6,400（$=4mA/625nA$）
Range of digital data	0 LSB~+32,000 LSB
Max./Min. range of digital data	-6400 LSB~+32,767 LSB

Mode 2



Mode 3	0~+10V，GAIN=16,000 ($=5V/312.5uV$)，OFFSET=0
Range of digital data	0 LSB~+32,000 LSB
Max./Min. range of digital data	0 LSB~+32,767 LSB

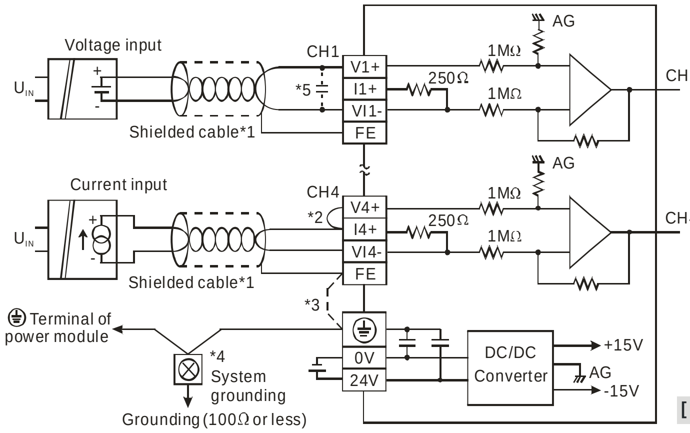
Mode 3



11.5 Wiring

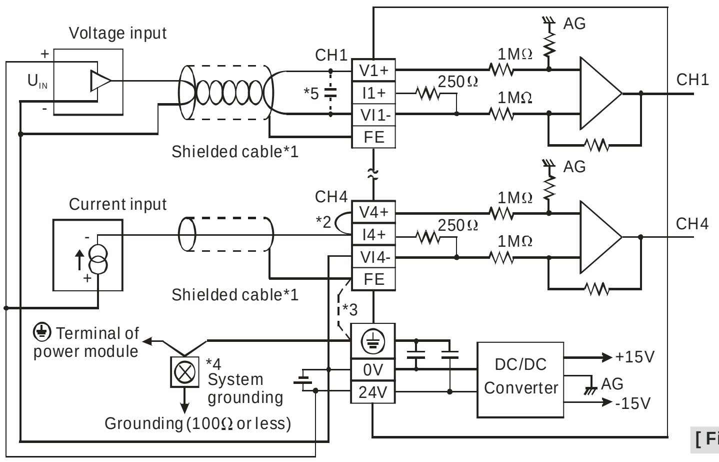
11.5.1 Wiring DVP04AD-SL

- Active type



[Figure 2]

- Passive type



[Figure 3]

Note 1: When performing analog input, please isolate other power wirings.

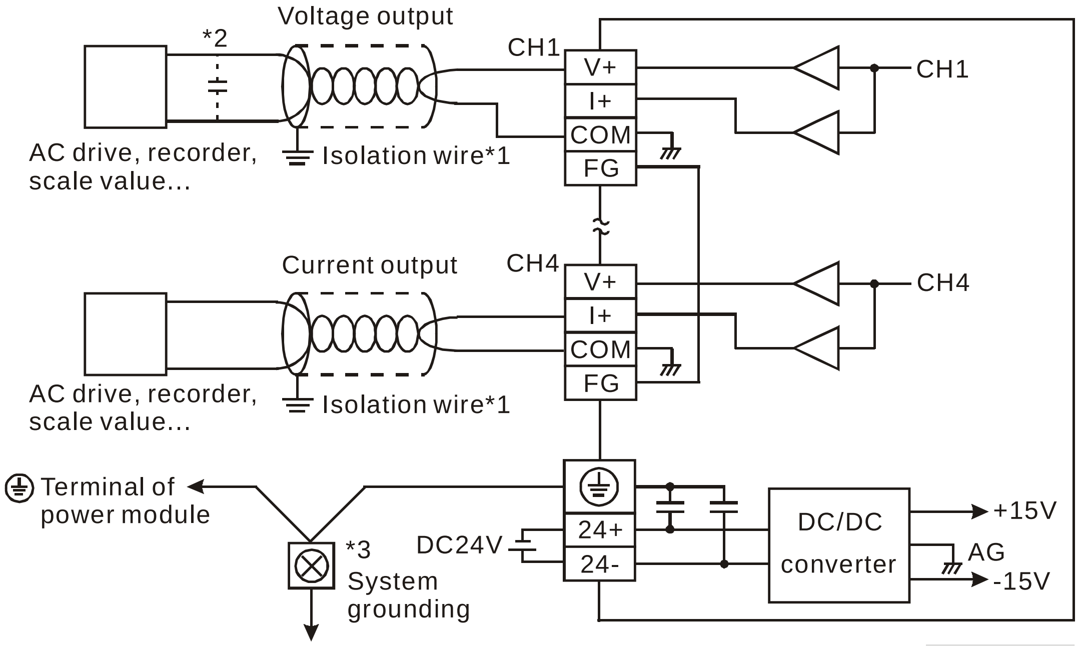
Note 2: When the A/D module is connected to current signals, make sure you short-circuit "V+" and "I+" terminals.

Note 3: If the noise is too significant, please connect FE to the grounding terminal.

Note 4: Please connect the ⏚ terminal on both the power module and A/D module to the system earth point and ground the system contact or connect it to the cover of power distribution cabinet.

Note 5: If the ripples at the loaded input terminal are too significant that causes noise interference on the wiring, connect the wiring to 0.1 ~ 0.47μF 25V capacitor.

11.5.2 Wiring DVP04DA-SL



[Figure 2]

Note 1: Please isolate analog output and other power wiring.

Note 2: If noise interferes from loaded input wiring terminal is significant, please connect a capacitor with 0.1 ~ 0.47μF 25V for noise filtering.

Note 3: Please connect ⏚ power module terminal and ⏚ analog output module terminal to system earth point and make system earth point be grounded or connects to machine cover.

11.6 Troubleshooting

When an error occurs in the left-side high-speed analog (AD/DA) modules (DVP04AD-SL/DVP04DA-SL), an error indicator will start blinking. Once you see an error indicator starts blinking, you can use the FROM instruction to read the error codes stored in CR#43. The bit 0 to bit 15 indicates the error codes. It is possible to have two errors at the same time. 0 indicates normal and 1 indicates error. Refer to the following table for more the causes and the solutions for troubleshooting

Bit No.	RUN LED	ERROR LED	LV LED	Description	Solution
bit0	OFF	OFF	ON	The external voltage is abnormal.	Check the power supply.
bit1	RUN: Blinking STOP: OFF	-	-	NA	
bit2		Blinking	OFF	Channel mode setting is out of range	Check the mode setting
bit3		-	-	NA	
bit4		Blinking	OFF	Input signal exceeds the set upper/lower bound of CH1	Upon restoring the input signal within the set upper/lower limits, this error state will be automatically cleared.
bit5		Blinking	OFF	Input signal exceeds the set upper/lower bound of CH2	Upon restoring the input signal within the set upper/lower limits, this error state will be automatically cleared.
bit6		Blinking	OFF	Input signal exceeds the set upper/lower bound of CH3	Upon restoring the input signal within the set upper/lower limits, this error state will be automatically cleared.
bit7		Blinking	OFF	Input signal exceeds the set upper/lower bound of CH4	Upon restoring the input signal within the set upper/lower limits, this error state will be automatically cleared.
bit8		Blinking	OFF	The signal received by channel 1 exceeds the range of analog inputs	Check the signal received by channel 1
bit9		Blinking	OFF	The signal received by channel 2 exceeds the range of analog inputs	Check the signal received by channel 2
bit10		Blinking	OFF	The signal received by channel 3 exceeds the range of analog inputs	Check the signal received by channel 3
bit11		Blinking	OFF	The signal received by channel 4 exceeds the range of analog inputs	Check the signal received by channel 4
bit12		-	-	NA	
bit13		ON	OFF	Internal memory eror	Contact the factory
bit14		ON	OFF	Abnormal factory calibration values	Contact the factory

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Chapter 12 DVP-S Series Left-Side High-Speed Load Cell Module

Table of Contents

12.1 Principle of Load Cell

If a metallic material undergoes tension or strain, it will become thin, and its electrical impedance will increase. If a metallic material is compressed, its electrical impedance will become small. A strain gauge adopting this principle is called a load cell. Such sensing device is able to convert physical pressure into electrical signals, and therefore it is widely used on occasions on which loads, tension and pressure need to be converted into electrical signals

12.2 Introduction of Load Cell

A load cell module provides 4-wire or 6-wire load cells with various eigenvalues. Therefore, its response time can be adjusted according to users' requirements. On this basis, the requirements of load application markets can be easily met. Besides, a DVP series PLC* can read data in a load cell module or write data to a load cell module by means of the instruction FROM/TO.

*: DVP-SV series PLCs, DVP-EH2-L series PLCs, DVP-SA2 series PLCs, and DVP-SX2 series PLCs support left-side extension modules.

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12.3 General Specification

12.3.1 DVP01LC-SL/DVP02LC-SL Specification

Module name	DVP01LC-SL/DVP02LC-SL
Supply voltage	24VDC（20.4~28.8VDC）(-15%~+20%)
Power consumption	3W
Maximum current consumption	125mA
Input signal range	±40mVDC
Sensibility	+5VDC +/-10%
Resolution	Hardware（ADC）: 20 bits Data output：16 bits
Communication interface	RS-232/RS-485
Applicable sensor type	4-wire or 6-wire load cell
Expanding a temperature coefficient	≤ ± 50ppm/K v. E
Reducing a temperature coefficient to zero	≤ ± 0.4μV/K
Linearity error	≤ 0.02%
Response time	2、10、20、40、80、200、380ms × channels
Eigenvalue applicable to a load cell	0~1、0~2、0~4、0~6mV/V
Maximum distance for connecting a load cell	100 meters
Maximum output current	5VDC * 300mA
Allowable load	40~4,010Ω
Common-mode rejection ratio (CMRR@50/60 Hz)	≥ 100dB
Dynamic value filter	DVP01LC-SL: Setting range: K1~K9 DVP02LC-SL: Setting range: K1~K5
Average value filter	Setting range: K1~K100
Isolation	Between a digital circuit and the ground: 500 V AC Between an analog circuit and the ground: 500 V AC Between an analog circuit and a digital circuit: 500 V AC

Module name		DVP01LC-SL/DVP02LC-SL
Series connection to DVP-PLC MPU		Connectable to the left side of MPU, numbered from 100 to 107 according to the position of module from the closest to farthest to MPU.
Weight	DVP01LC-SL	122g
	DVP02LC-SL	132g

- Complying with DIN1319-1, the tolerance of measured value should be ≤ 0.05% under 20°C + 10K temperature range.
- When the corrected ambient temperature and the actual temperature have a difference of more than 10°C, it is suggested that you re-correct it.

12.3.2 DVP201LC-SL / DVP202LC-SL / DVP211LC-SL Specification

Module name		DVP201LC-SL/DVP202LC-SL/DVP211LC-SL
Rated supply voltage		24VDC (20.4~28.8VDC) (-15%~+20%)
Power consumption		5W
Static minimum/maximum voltage		20.4V/28.8VDC
Dynamic minimum/maximum voltage		18.5V/30.2VDC
Maximum current consumption		150mA
Input signal range		±200mVDC
Sensibility		+5VDC +/-5%
Resolution		Hardware (ADC) : 24 bits Data output : 32 bits
Highest precision		0.04%
Communication interface		RS-232 · RS-485
Applicable sensor type		4-wire or 6-wire load cell
Expanding a temperature coefficient		≤ ± 20ppm/K v. E
Reducing a temperature coefficient to zero		≤ ± 0.1μV/K
Linearity error		≤ 0.015%
Response time		2.5、10、16、20、50、60、100、200, and 400ms
Eigenvalue applicable to a load cell		0~1、0~2、0~4、0~6、0~20、0~40, and 0~80mV/V
Maximum distance for connecting a load cell		100 meters
Maximum output current		5VDC * 300mA
Allowable load		40~4,010Ω
Filtering		Extrema/ Average/ Low-pass filtering
Common-mode rejection ratio (CMRR @50/60 Hz)		≥100dB
Isolation		Between a digital circuit and the ground: 500 V AC Between an analog circuit and the ground: 500 V AC Between an analog circuit and a digital circuit: 500 V AC
Series connection to DVP-PLC MPU		Connectable to the left side of MPU, numbered from 100 to 107 according to the position of module from the closest to farthest to MPU.
Weight	DVP201LC-SL	122g
	DVP202LC-SL	132g
	DVP211LC-SL	

		DVP211LC-SL	
		Electrical specifications for input terminals	Electrical specifications for output terminals
Input/Output terminal		X0、X1	Y0、Y1、Y2、Y3
Type		Digital input	Transistor
Form		DC(sinking or sourcing)	--
Specifications		Input current:24VDC，5mA	Voltage specifications:5~30VDC*1
Input impedance		4.7KΩ	--
Maximum switch frequency		10kHz	1kHz
Action level	**OFF→ON**	>15VDC	--
	ON→OFF	<5VDC	--
Response time	**OFF→ON**	<20μs	<100μs
	ON→OFF	<50μs	<150μs
Maximum load	**Resistive load**	--	0.5A/1 output（4A/COM）*2
	Inductive load	--	15W（30VDC）
	Bulb	--	2.5W（30VDC）

Note: In order to meet DIN 1319-1, an error needs to be less than or equal to 0.05% at 20 °C + 10 K.

#1: UP and ZP should be connected to a 24 V DC power supply. The current that an output terminal consumes is approximately 1 mA.

#2: In an NPN mode, ZP is used. In a PNP mode, UP is used.

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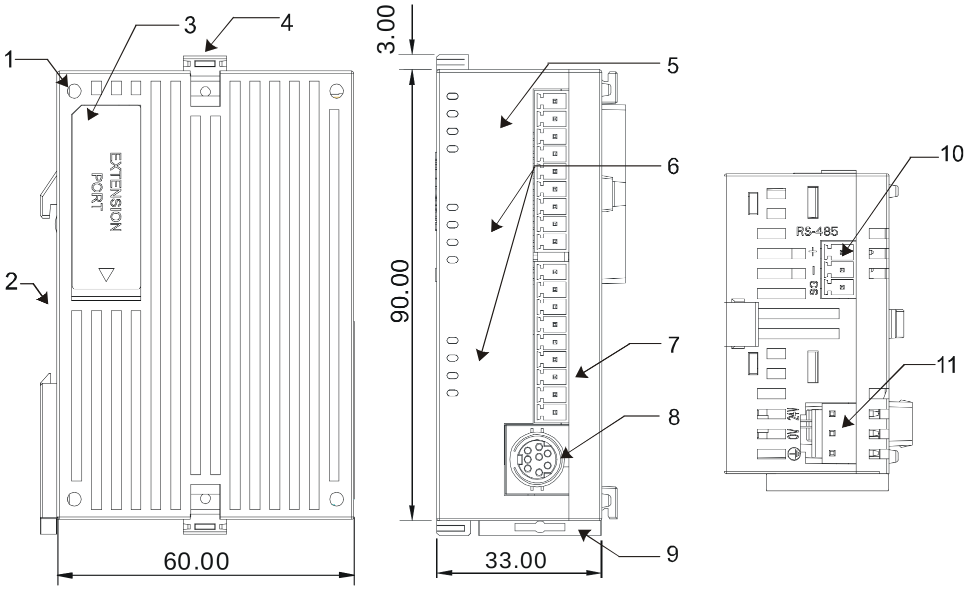
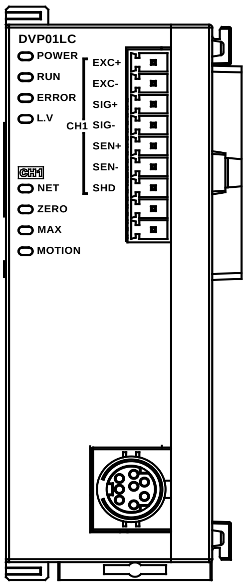
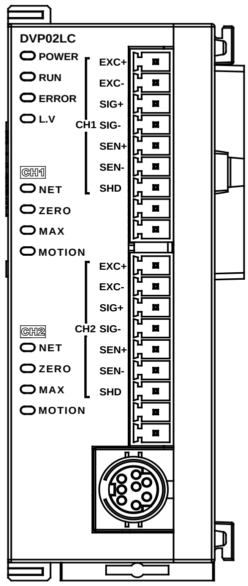
12.4 Module Profiles and Dimensions



Unit: mm

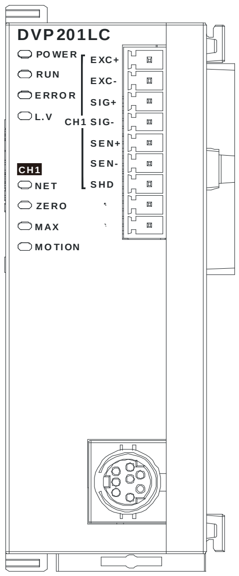
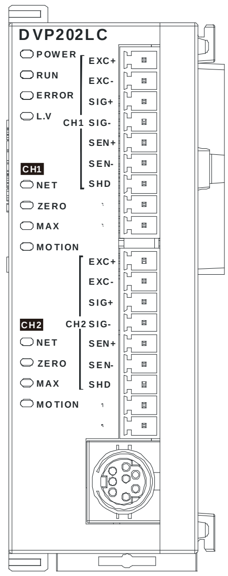
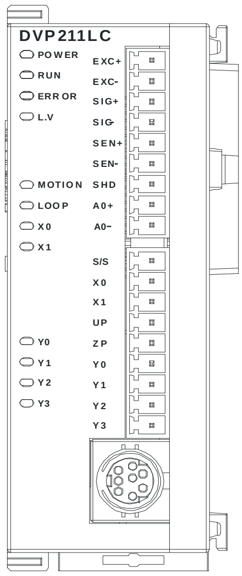
No.	Name	Description
1	Extension unit positioning hole	For positioning between modules.
2	DIN rail slot (35mm)	For the DIN rail.
3	Extension module connection port	Connect the modules.
4	Extension unit fixing clip	For securing the extension module.
5	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	Run LED indicator	Indicates the operating status of the module
	ERROR LED indicator	Error status of the module. ON: A serious module error has occurred OFF: the module is normal. Blinking (0.2 seconds ON/OFF): A non-serious module error occurs, can NOT operate normally
	Low voltage LED indicator	Indicates the low voltage status of the module ON: module voltage is too low OFF: module voltage is normal
6	Functional status indicator	DVP01/02LC: Channel Net Weight, Zero Point, Maximum Value, Stability Status Indicator DVP201/202LC: Weight Display, Zero Weight, Weight Upper Limit, Stability Status Indicator DVP211LC: Stability Function, Loop Control, Digital Input/Output Status Indicator
7	Terminals	The inputs are connected to sensors. The outputs are connected to loads to be driven.
8	RS-232 port	For wiring RS-232 communication
9	DIN rail securing clip	Secure the module on the set.
10	RS-485port	For wiring RS-485 communication.
11	Power input port	Expansion unit power input.

12.4.1 Indicators of DVP01LC-SL / DVP02LC-SL

DVP01LC-SL	DVP02LC-SL
	

Name	Color	Function
POWER indicator	Green	Displaying power
RUN indicator	Green	Displaying the status of the module
ERROR indicator	Red	Displaying an error
L.V indicator	Red	Showing that the voltage of the an external power is low
Net indicator	Orange	Net/Gross weight indicator
Zero indicator	Orange	Once the weight value is in the zero point range, this indicator is ON.
Max indicator	Orange	Maximum weight indicator
Motion indicator	Orange	Showing that measurement is stable

12.4.2 Indicators of DVP201LC-SL / DVP202LC-SL / DVP211LC-SL

DVP201LC-SL	DVP202LC-SL	DVP211LC-SL
		

Name	Color	Function
POWER indicator	Green	Displaying power
RUN indicator	Green	Displaying the status of the module
ERROR indicator	Red	Displaying an error
L.V indicator	Red	Showing that the voltage of the an external power is low
LOOP indicator	Green	LOOP control
MOTION indicator	Orange	Showing that measurement is stable
X0/X1	Red	Showing that X0/X1 is On/Off
Y0~Y3	Red	Showing that Y0/Y1/Y2/Y3 is On/Off
NET indicator	Orange	Net/Gross weight indicator
ZERO indicator	Orange	Once the weight value is in the zero point range, this indicator is ON.
MAX indicator	Orange	Maximum weight indicator

12.5 Terminals

DVP01LC-SL	EXC+ EXC- SIG+ SIG- SEN+ SEN- SHD ● ● *DVP01LC-SL*
DVP02LC-SL	EXC+ EXC- SIG+ SIG- SEN+ SEN- SHD ● ● EXC+ EXC- SIG+ SIG- SEN+ SEN- SHD ● ● *DVP02LC-SL*
DVP201LC-SL	EXC+ EXC- SIG+ SIG- SEN+ SEN- SHD ● ● *DVP201LC-SL*
DVP202LC-SL	EXC+ EXC- SIG+ SIG- SEN+ SEN- SHD ● ● EXC+ EXC- SIG+ SIG- SEN+ SEN- SHD ● ● *DVP202LC-SL*
DVP211LC-SL	EXC+ EXC- SIG+ SIG- SEN+ SEN- SHD AO+ AO- S/S X0 X1 UP ZP Y0 Y1 Y2 Y3 *DVP211LC-SL*

12.6 DVP01LC-SL / DVP02LC-SLControl Registers

12.6.1 DVP01LC-SLControl Register

CR#	Add.	Attrib.		Register name	Explanation
#0	H1000	O	R	Model name	Set up by the system: DVP01LC-SL model code = H'4106
#1	H1001	O	R	Firmware version	Displaying the current firmware version in hex.
#2	H1002	O	R/W	Eigenvalue	Mode 0 (H'0000): 1 mV/V Mode 1 (H'0001): 2 mV/V, default Mode 2 (H'0002): 4 mV/V Mode 3 (H'0003): 6 mV/V
#3	H1003	O	R/W	Reaction time for measurement	Mode 0 (H'0000): 2 ms Mode 1 (H'0001): 10 ms Mode 2 (H'0002): 20 ms Mode 3 (H'0003): 40 ms Mode 4 (H'0004): 80 ms, default Mode 5 (H'0005): 200 ms Mode 6 (H'0006): 380 ms
#6	H1006	X	R/W	Tare gotten from CH1	Reading the present average value as tare. bit0: CH1
#7	H1007	O	R/W	Gross/Net weight	Taking the present weight as the gross weight (K0) or the net weight (K1).
#8	H1008	O	R/W	Gross weight from CH1 (Low word)	Users can input the value or use the instruction to read the gross weight. Default: 0
#9	H1009	O	R/W	Gross weight from CH1 (High word)	
#10	H100A	O	R/W	Average number of times gotten from CH1	Default: K10; Range: K1~K100 If the setting value exceeds the range, it will be automatically changed to K1 or K100.
#12	H100C	X	R	Weight gotten from CH1 (Low word)	Displaying the weight. Default: K0
#13	H100D	X	R	Weight gotten from CH1 (High word)	Displaying the weight. Default: K0
#16	H1010	O	R/W	Number of times the stability of the values gotten from CH1 is checked	Default: K5; Range: K1~K500
#18	H1012	O	R/W	Range within which the stability of the values gotten from CH1 is checked	Default: K10; Range: K1~K10,000
#20	H1014	O	R/W	Number of decimal places gotten from CH1	Default: K2; Range: K0~K4
#22	H1016	O	R/W	Unit of measurement for weight gotten from CH1	Four ASCII words at most
#23	H1017	O	R/W	Unit of measurement for weight gotten from CH1	
#26	H101A	X	R/W	Weight correction command	For correcting the weight Default: H'0000 H'0001: Reset the weight gotten from CH1 to zero H'0002: The weight of the weights gotten from CH1 (Please use CR#41 to make the correction parameter retentive after finishing correcting the weight.)

CR#	Add.	Attrib.		Register name	Explanation
#33	H1021	O	R/W	Weight of the weights gotten from CH1	The default in CR#33 and CR#34 is K1,000. Range: K-32,768~K32,767 Steps for the correction: 1: Place no weights on the load cell 2: Write H'000 into CR#26. 3: Place standard weights on the load cell. 4: Write the weight of the weights on the plate into CR#33. 5: Write H'0002 into CR#26.
#35	H1023	O	R	Maximum weight gotten from CH1 (Low word)	The user can set the maximum weight. If the weight gotten is larger than the maximum weight set by the user, the error code will be recorded.
#36	H1024	O	R	Maximum weight gotten from CH1 (High word)	
#37	H1025	O	R/W	Upper limit for taking the weight gotten from CH1 as zero	For judging the zero status If the weight is within this range, the status code will be a zero bit, indicating that there are no weights. Default: K10 Range: K-32,768 to K32,767
#39	H1027	O	R/W	Lower limit for taking the weight gotten from CH1 as zero	For judging the zero status If the weight is within this range, the status code will be a zero bit, indicating that there is no weight. Default: K-10 Range: K-32,768 to K32,767
#41	H1029	X	R/W	Storing the setting value (H'5678)	The present setting value is stored. All setting values are written into the internal flash memory so that they can be used next time DVP01LC-SL is turned on. H0: No action (default) H'FFFF: The value is stored successfully. H'5678: All setting values are written into the internal flash memory. After H'5678 is written into the register, all setting values will be stored in the flash memory. After the values are stored, the value in CR#41 becomes H'FFFF. If the value written into the register is not H'5678, the value will automatically return to H0. For example, if K1 is written into the register, K1 will return to K0.
#42	H102A	X	R/W	Restoring DVP01LC-SL to its factory settings	After H'1A2B is written to CR#42, DVP01LC-SL will be restored to its factory settings.
#43	H102B	X	R/W	Setting the percentage of signals filtered for CH1	Default: K2 Range: K1 to K9 (Unit: 10%)
#50	H1032	X	R	Status code	b0 (H'0001): The weight gotten from CH1 is zero. (No load) b2 (H'0004): The weight gotten from CH1 exceeds the maximum weight. (Overload) b4 (H'0010): The measured value gotten from CH1 is stable. b6 ~ b15: Reserved
#51	H1033	X	R	Error code	All error statuses are stored in the register. See

CR#	Add.	Attrib.		Register name	Explanation
					"Error Code Table" below. Default: H'0000
#52	H1034	O	R/W	RS-232 station address	The default in CR#52 and CR#54 is K1. Range: K1~K255 The default in CR#53 and CR#55 is H'0000; Range: ASCII, 9600, 7, E, 1. See "Communication Format Table" below.
#53	H1035	O	R/W	RS-232 communication format	
#54	H1036	O	R/W	RS-485 station address	
#55	H1037	O	R/W	RS-485 communication format	
Symbols: O indicates that the register is latched. X indicates that the register is not latched. R indicates that the data can be read. W indicates that the data can be written.					

※ Error Code Table for CR#51:

bit	Value	Error	bit	Value	Error
b0	K1 (H'0001)	The power supply is abnormal.	b1	K2 (H'0002)	The hardware breaks down.
b2	K4 (H'0004)	The conversion gotten from CH1 is incorrect.	b3	K8 (H'0008)	The voltage of SEN in CH1 is incorrect.
B4 ~ b15		Reserved			
Note: Every error status depends on its corresponding bit. There may be more than two error statuses occurring at the same time. 0 indicates that there is no error. 1 indicates that an error occurs.					

※ Communication Format Table for CR#53, CR#55:

bit15	bit14~bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
ASCII/RTU	Reserved	Serial transmission speed				Data length	Stop bit	Parity bit	

Description					
bit15	ASCII/RTU	0	ASCII	1	RTU
bit7~bit4	Serial transmission speed	0	9,600 bps	1	19,200 bps
		2	38,400 bps	3	57,600 bps
		4	115,200 bps	5	Else none
bit3	Data length (RTU = 8 bits)	0	7	1	8
bit2	Stop bit	0	1 bit	1	2 bits
bit1~bit0	Parity bit	0	Even	1	Odd
		2	None	3	None

12.6.2 DVP02LC-SL Control Register

CR#	Add.	Attrib.		Register name	Explanation
#0	H1000	O	R	Model name	Set up by the system: DVP02LC-SL model code = H'4206
#1	H1001	O	R	Firmware version	Display the current firmware version in hex.
#2	H1002	O	R/W	Characteristic value	Mode 0 (H'0000): 1 mV/V Mode 1 (H'0001): 2 mV/V, default Mode 2 (H'0002): 4 mV/V Mode 3 (H'0003): 6 mV/V
#3	H1003	O	R/W	Reaction time for measurement	Mode 0 (H'0000): 2 ms Mode 1 (H'0001): 10 ms Mode 2 (H'0002): 20 ms Mode 3 (H'0003): 40 ms Mode 4 (H'0004): 80 ms, default Mode 5 (H'0005): 200 ms Mode 6 (H'0006): 380 ms
#4	H1004	O	R	Average value of all channels	Sum up CH1 average value and CH2 average value and equalize them. Equation: (CH1 average value + CH2 average value)/2
#6	H1006	X	R/W	CH1 to CH2 read tare weight	Read present average value as tare weight value bit0: CH1; bit1: CH2; bit2 to bit15: reserved
#7	H1007	O	R/W	CH1 to CH2 gross/net weight	Display present weight as Gross (K0) or Net (K1). bit0 to bit3: CH1; bit4 to bit7: CH2; bit8 to bit15: reserved. Take CH1 for example: bit3 to bit0 = 0000, gross; bit3 to bit0 = 0001, net; bit3 to bit0 = 1111, channel disabled.
#8	H1008	O	R/W	CH1 tare weight	The user can write in the weight or read it by commands. Default: K0; Range: -K32,768 to K32,767.
#9	H1009	O	R/W	CH2 tare weight	
#10	H100A	O	R/W	CH1 average times	Default: K10; Range: K1 to K100. When the set value exceeds the range, it will automatically be changed to K1 or K100.
#11	H100B	O	R/W	CH2 average times	
#12	H100C	X	R	CH1 average weight	Display average weight.
#13	H100D	X	R	CH2 average weight	
#14	H100E	X	R	CH1 present weight	Display present weight.
#15	H100F	X	R	CH2 present weight	
#16	H1010	O	R/W	CH1 standstill times	Default: K5 Range: K1 to K500
#17	H1011	O	R/W	CH2 standstill times	
#18	H1012	O	R/W	CH1 standstill range	Default: K10 Range: K1 to K10,000
#19	H1013	O	R/W	CH2 standstill range	
#20	H1014	O	R/W	CH1 decimal place	Default: K2 Range: K0 to K4
#21	H1015	O	R/W	CH2 decimal place	
#22	H1016	O	R/W	CH1 unit of measurement	Enter max. 4 ASCII words.
#23	H1017	O	R/W	CH1 unit of measurement	
#24	H1018	O	R/W	CH2 unit of measurement	
#25	H1019	O	R/W	CH2 unit of measurement	
#26	H101A	X	R/W	Weight correction command	For the user to correct the weight. Default: H'0000 H'0001: CH1 Calibration command H'0002: CH1 Weight base point command

CR#	Add.	Attrib.		Register name	Explanation
					H’0003: CH2 Calibration command H’0004: CH2 Weight base point command (Please use CR#41 to make the correction parameter retentive after finishing correcting the weight.)
#33	H1021	O	R/W	CH1 weight base point	For CR#33 to CR#34 default = K1,000; Range: K-32,768 to K32,767 Steps for correction: Take CH1 for example 1: Place no weights on the load cell 2: Set up CR#26 command = “H’0001” 3: Place standard weights on load cell 4: Write the weight of the weights on the plate into CR#33. 5: Set up CR#26 command = “H’0002”
#34	H1022	O	R/W	CH2 weight base point	
#35	H1023	O	R	CH1 max. weight	Set up the max. weight. When the measured value exceeds the set value, error codes will be recorded.
#36	H1024	O	R	CH2 max. weight	
#37	H1025	O	R/W	Upper limit for CH1 zero point check	Reference for reset to zero. When the weight is within this range, the status code will be set to “zero bit”, indicating the current zero weight status. Default: K10 Range: K-32,768 to K32,767
#38	H1026	O	R/W	Upper limit for CH2 zero point check	
#39	H1027	O	R/W	Lower limit for CH1 zero point check	Reference for reset to zero. When the weight is within this range, the status code will be set to “zero bit”, indicating the current zero weight status. Default: K-10 Range: K-32,768 to K32,767
#40	H1028	O	R/W	Lower limit for CH2 zero point check	
#41	H1029	X	R/W	Saving set value (H’5678)	Save the present set value and write all the set values into the internal Flash for use next time DVP02LC-SL is switched on. H0: No action, Default H’FFFF: Saving is successful H’5678: Write to internal Flash When H’5678 is written in, all set values will be saved in Flash. When the saving is completed, CR#41 will become H’FFFF. If the value written in is not H’5678, it will automatically return to H0, e.g. write K1 into CR# to return to K0.
#42	H102A	X	R/W	Restoring DVP02LC-SL to its factory settings	After H’1A2B is written to CR#42, DVP02LC-SL will be restored to its factory settings.
#43	H102B	X	R/W	CH1 filter percentage	Default: K2 Range: K1 to K5 (Unit: 10%)
#44	H102C	X	R/W	CH2 filter percentage	
#45	H102D	X	R/W	CH1 filter average value	Display average weight after filtering. Condition to enable filter: average time ≥ 30
#46	H102E	X	R/W	CH2 filter average value	
#47	H102F	X	R/W	Reset to zero command	H’0001: CH1 Reset to zero command H’0002: CH2 Reset to zero command
#50	H1032	X	R	Status code	b0 (H’0001): CH1 zero weight (empty) b1 (H’0002): CH2 zero weight (empty) b2 (H’0004): CH1 exceeds max. weight (overload)

CR#	Add.	Attrib.		Register name	Explanation
					b3 (H'0008): CH2 exceeds max. weight (overload) b4 (H'0010): CH1 stable measured value b5 (H'0020): CH2 stable measured value b6 ~ b15: Reserved
#51	H1033	X	R	Error code	Store all the error statuses. See "Error Code Table" below. Default: H'0000
#52	H1034	O	R/W	RS-232 node address	For CR#52, CR#54 default = 1 Range: K1 to K255 For CR#53, CR#55 default = H'0000; Range: ASCII, 9600, 7, E, 1. See "Communication Format Table" below.
#53	H1035	O	R/W	RS-232 communication setting	
#54	H1036	O	R/W	RS-485 node address	
#55	H1037	O	R/W	RS-485 communication setting	
Symbols: O means latched. X means not latched. R means can read data. W means can write data.					

※ Error Code Table for CR#51:

bit	Content	Error	bit	Content	Error
b0	K1 (H'0001)	Power supply abnormality	b1	K2 (H'0002)	Hardware abnormality
b2	K4 (H'0004)	CH1 conversion error	b3	K8 (H'0008)	CH1 SEN voltage error
b4	K16 (H'0010)	CH2 conversion error	b5	K32 (H'0020)	CH2 SEN voltage error
b6 ~ b15	K64 (H'0040)	Reserved			
Note: Every error status is decided by its corresponding bit, so there might be more than 2 error statuses occurring at the same time. 0 refers to no error; 1 refers to error occurring.					

※ Communication Format Table for CR#53, CR#55:

bit15	bit14~bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
ASCII/RTU	Reserved	Baud rate				Data length	Stop bit	Parity	

Description					
bit15	ASCII/RTU	0	ASCII	1	RTU
bit7~bit4	Baud rate	0	9,600 bps	1	19,200 bps
		2	38,400 bps	3	57,600 bps
		4	115,200 bps	5	Reserved (unit: bps)
bit3	Data length (RTU = 8 bits)	0	7	1	8
bit2	Stop bit	0	1 bit	1	2 bits
bit1~bit0	Parity	0	Even	1	Odd
		2	reserved	3	reserved

12.6.3 Functions Description

12.6.3.1 Measuring Net Weight

You can choose to measure the net weight or the gross weight of an object. A net weight is the weight of a product, that is, the actual weight of a product without its package. The weight of a package is a tare. A gross weight is a total weight, namely a net weight plus a tare.

- Tare：A tare is the weight of a package
- Net Weight：A net weight is the weight of a product, that is, the actual weight of a product without its package.
- Gross Weight：A gross weight is a total weight, namely the weight of a product itself (a net weight) plus the weight of a package (a tare).
- Gross weight=Net weight+Tare

  Example: A product weighs 10 kilograms, and the carton in which the product is packed weighs 0.2 kilograms. The total weight gotten is 10 kilograms.

  Net weight=10 kg

  Tare=0.2 kg

  Gross weight=10.2 kg

- Relevant control registers
  - CR#6：Read Tare
  - CR#7：Gross /Net
  - *CR#8~9：Tare Weight*
- Example

Display net weight using CH1 measurement values and disable CH2. (If the weight of the packaging material is known, the tare reading step can be skipped.)

1. Read tare weight:

   Step1：Write H’0000 to CR#7.

   Step2：Place the packaging material on CH1 Load Cell.

   Step3：Write H’0001 to CR#6 to set the current weight of the packaging material as the tare weight.

2. Set CR#7=H’00F1.

12.6.3.2 Stability Check

When an object is put on a load cell, users can utilize this function to check whether the current measurement weight has stabilized.

- If a weight measured is in a stability range specified by users (CR#18/CR#19), the bit in CR#50 will be set to 1.
- If a weight measured exceeds a range specified by users, the bit in CR#50 will be set to 0. It remains 0 until the stability check count (CR#16, CR#17) is within the stability range again. Once the stability check count is within the range, the bit of CR#50 will be set to 1.

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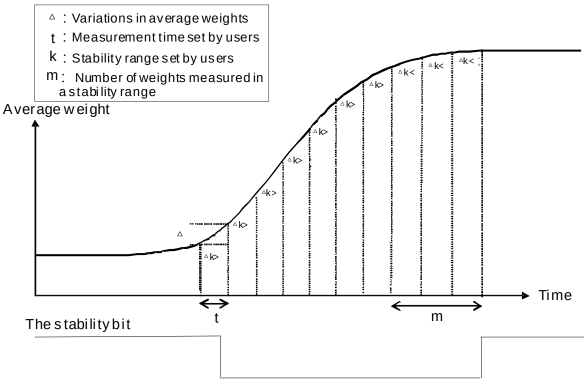
Example: The measurement time set is 10 milliseconds, the number of weights measured in a stability range is 10, and the stability range set is 1000 grams. If a variation exceeds 1000 grams, bit in CR#50 will be set to 0. If the variations in 100 milliseconds (10×10 ms) are within 1000 grams, bit in CR#50 will be set to 1. (Users should judge whether the present weight measured is in the stability range set before they perform control.)



- Relevant control registers
  1. DVP01LC-SL
     - ■ CR#16：Number of weights measured in a stability range
     - ■ CR#18：Stability check range
  2. DVP02LC-SL
     - ■ CR#16、CR#17：Number of weights measured in a stability range
     - ■ CR#18、CR#19：Stability check range

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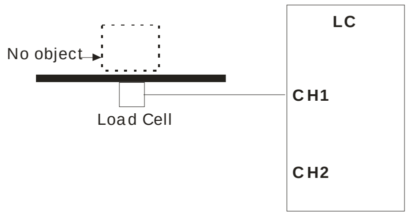
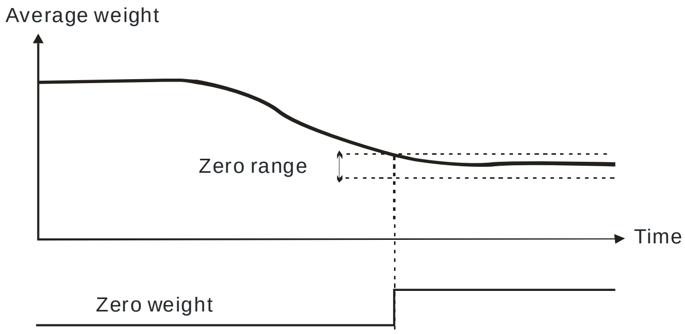
12.6.3.3 Determining Zero

Users can utilize this function to determine when an item has been completely removed from the Load Cell. When the user observes that the stability bit for the measurement value is 1 and the zero point weight bit is also 1, it indicates that the item has been successfully removed from the Load Cell. At this point, users can perform the next control step. (The zero point weight bit is 1 within the zero point detection range.)

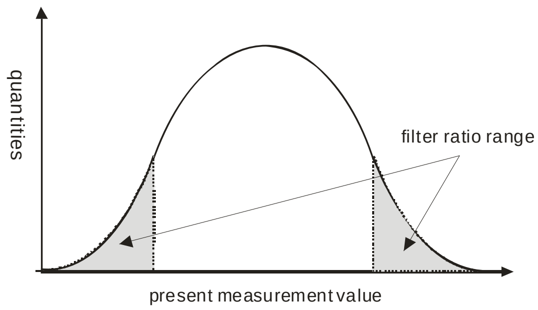




- Relevant control registers
  - ■ CR#37~CR#40：Range for determining whether a weight measured is 0 grams

12.6.3.4 Filtering out Weights

The averaging function involves summing up the read values to obtain a smoothed result, but in real-world environments, unavoidable external forces can lead to drastic spikes in the readings. This can cause significant fluctuations in the calculated average. The filtering function is designed to exclude abrupt spike values from the summation average, ensuring that the filtered average is not heavily influenced by these sudden spikes. The filtering operation is triggered when the averaging count is equal to or greater than 30, and the filtering ratio is within the range of 10% to 50%. This helps mitigate the impact of abrupt spikes on the averaged values.



- Relevant control registers:

1. DVP01LC-SL

■ CR#43：Filter ratio setting

2. DVP02LC-SL

■ CR#43、CR#44：Filter ratio setting

■ CR#45、CR#46：Filtered average

12.7 DVP201LC-SL / DVP202LC-SL / DVP211LC-SL Control Register

12.7.1 Control Register

CR#	Address	Attribute		Register name	Explanation
#0	H1000	O	R	Model name	The model code of a load cell module is defined by the module's system. DVP201LC-SL's model code=H'5106 DVP202LC-SL's model code=H'5206 DVP211LC-SL's model code=H'5906
#1	H1001	O	R	Firmware version	Hexadecimal value The current firmware version of a load cell module is displayed.
#2	H1002	O	R/W	Characteristic value	CH1: Bit 0~bit 7; CH2: Bit 8~bit 15 Mode 0: 1 mV/V; Mode 4: 20 mV/V Mode 1: 2 mV/V; Mode 5: 40 mV/V Mode 2: 4 mV/V; Mode 6: 80 mV/V Mode 3: 6 mV/V
#3	H1003	O	R/W	Reaction time for measurement	CH1: bit0~bit7; CH2: bit8~bit15 Mode 0: 2.5ms; Mode 5: 60ms Mode 1: 10ms; Mode 6: 100ms Mode 2: 16ms; Mode 7: 200ms Mode 3: 20ms; Mode 8: 400ms Mode 4: 50ms (factory setting)
#6	H1006	X	R/W	Returning to zero/ Subtracting a tare	K1: Subtracting the tare measured by CH1 K2: Not subtracting the tare measured by CH1 K3: Restoring the weight measured by CH1 to 0 K4: Subtracting the tare measured by CH2 K5: Not subtracting the tare measured by CH2 K6: Restoring the weight measured by CH2 to 0
#7	H1007	O	R/W	Displaying a gross weight/net weight	CH1: Bit 0~bit 7; CH2: Bit 8~bit 15 K0: Displaying a gross weight K1: Displaying a net weight DVP202LC-SL can be configured to close this channel (HFF)
#8	H1008	X	R/W	Tare measured by CH1 (Low word)	Displaying a tare
#9	H1009	X	R/W	Tare measured by CH1 (High word)	
#10	H100A	X	R/W	Tare measured by CH2 (Low word)	
#11	H100B	X	R/W	Tare measured by CH2 (High word)	
#12	H100C	X	R	Weight measured by CH1 (Low word)	Displaying a weight
#13	H100D	X	R	Weight measured by CH1 (High word)	
#14	H100E	X	R	Weight measured by C2 (Low word)	
#15	H100F	X	R	Weight measured by C2	

CR#	Address	Attribute		Register name	Explanation
				(High word)	
#16	H1010	O	R/W	Number of weights measured by CH1 in a stability range	Setting range: K1~K500 (Factory setting: K5)
#17	H1011	O	R/W	Number of weights measured by CH2 in a stability range	Setting range: K1~K500 (Factory setting: K5)
#18	H1012	O	R/W	Stability range for CH1	Setting range: K1~K10000 (Factory setting: K10)
#19	H1013	O	R/W	Stability range for CH2	Setting range: K1~K10000 (Factory setting: K10)
#20	H1014	O	R/W	Lower limit of the zero return for CH1	Provide a judgment of whether the weight value is zero. When the weight value is within this range, the status code's empty load bit will be set, indicating that the current weight value is in the empty load state. The factory default value is K-10, and the set value range is K-1 to K-32768.
#21	H1015	O	R/W	Lower limit of the zero return for CH2	
#25	H1019	O	R/W	Total number of points which need to be calibrated	Setting range: K2~K20 (Factory setting: K2)
#26	H101A	X	R/W	Calibration command	CH1: K1~K20 CH2: K21~K40
#27	H101B	O	R/W	Selecting a calibration point for CH1	K1~K19
#28	H101C	O	R/W	Selecting a calibration point for CH2	K1~K19
#29	H101D	O	R/W	Raw data given to a calibration point for CH1 (Low word)	The firmware will load the relevant raw data automatically while calibrating. You can get a similar result of measurement curves by copying the raw data of calibrated points and settings associated to the measurement to other modules, which use the same model of sensors, without calibration. Please notice that the above acts may cause unpredictable errors and deviation in the result of measurement curves because of different features between sensors and environment.
#30	H101E	O	R/W	Raw data given to a calibration point for CH1 (High word)	
#31	H101F	O	R/W	Raw data given to a calibration point for CH2 (Low word)	
#32	H1020	O	R/W	Raw data given to a calibration point for CH2 (High word)	
#33	H1021	O	R/W	Digital value given to a calibration point for CH1 (Low word)	Digital values (weight values) correspond to calibration points1~19. E.g. To calibrate a 100g weight to be shown as 1000 on the LCD display, you'll have to write 1000 to CR#33 before calibration. Please refer to chapter 12 section 10 for more details.
#34	H1022	O	R/W	Digital value given to a calibration point for CH1 (High word)	
#35	H1023	O	R/W	Digital value given to a calibration point for CH2 (Low word)	
#36	H1024	O	R/W	Digital value given to a calibration point for CH2 (High word)	
#37	H1025	O	R/W	Maximum which can be measured by CH1 (Low word)	Specify the maximum weight which can be measured by CH1/CH2. If a weight measured exceeds the maximum weight, an error code (CR#51) will be stored.
#38	H1026	O	R/W	Maximum which can be measured by CH1 (High word)	
#39	H1027	O	R/W	Maximum which can be	

CR#	Address	Attribute		Register name	Explanation
				measured by CH2 (Low word)	
#40	H1028	O	R/W	Maximum which can be measured by CH2 (High word)	
#41	H1029	X	R/W	Storing all setting values (H'5678)	Storing all setting values, and writing them to the flash memory in the load cell module used Others: No action (factory setting) H'5678: Writing all setting values to the flash memory in the load cell module used
#42	H102A	X	R/W	Restoring all settings to factory settings	Restoring all settings to factory settings (H'55AA)
#43	H102B	X	R/W	Way in which weights measured by CH1 are filtered out	K0: Not filtering weights (factory setting) K1: Extrema filtering K2: Average filtering K3: LPF 5Hz K4: LPF 10Hz K5: LPF 20Hz K6: LPF 50/60Hz Note: When set to K3-K6 (Only supported by FW V1.14 and above), the transfer time would be set to 10ms which is mandatory.
#44	H102C	X	R/W	Way in which weights measured by CH2 are filtered out	
#45	H102D	X	R/W	Filter parameter for CH1	Extrema filtering: K0~K8 Average filtering: The number of weights which need to be averaged should be in the range of K1 to K100.(Supported only by FW V1.12 and above) Low-pass filtering (LPF): Invalid
#46	H102E	X	R/W	Filter parameter for CH1	
#48	H1030	O	R/W	Upper limit for determining whether the digital value corresponding to a weight measured by CH1 is 0 grams	Provide a judgment of whether the weight value is zero. When the weight value is within this range, the status code's empty load bit will be set, indicating that the current weight value is in the empty load state. The factory default value is K10, and the set value range is K0 to K32767.
#49	H1031	O	R/W	Upper limit for determining whether the digital value corresponding to a weight measured by CH2 is 0 grams	
#51	H1033	X	R/W	Status code	The status of the load cell module used is stored in this register. Please refer to the status table below for more information. Factory setting: H'0000
#52	H1034	O	R/W	RS-232 station address	The default value in CR#52/CR#54 is K1. The setting values in CR#52 and CR#54 should be in the range of K1 to K255. The default value in CR#53/CR#55 is H'0000 (ASCII, 9600 bps, 7 data bits, even parity bit, one stop bit). Please refer to the communication format table below for more information.
#53	H1035	O	R/W	RS-232 communication format	
#54	H1036	O	R/W	RS-485 station address	
#55	H1037	O	R/W	RS-485 communication format	
#95	H105F	O	R/W	Zero point tracking range of CH1	Setting range: 0 ~ 30000; when set the setting to 0, it indicates zero point tracking is disabled.
#96	H1060	O	R/W	Zero point tracking time of CH1	Setting range: 5 ~ 1000; unit: 0.1 s
#97	H1061	O	R/W	Zero point tracking range of CH2	Setting range: 0 ~ 30000; when set the setting to 0, it indicates zero point tracking is disabled.
#98	H1062	O	R/W	Zero point tracking time of	Setting range: 5 ~ 1000; unit: 0.1 s

CR#	Address	Attribute		Register name	Explanation
				CH2	
#100	H1064	O	R/W	Current output	Setting range: K0~K4000
#101	H1065	X	R	Digital input terminal	Bit 0: X0; Bit 1: X1
#102	H1066	X	R/W	Digital output terminal	Bit 0: Y0; Bit 1: Y1; Bit 2: Y2; Bit 3: Y3
#103	H1067	O	R/W	Way of outputting a current	K0: Digital value(CR#100) corresponding to a current output in the range of 0 mA to 20 mA (factory setting) K1: Digital value(CR#100) corresponding to a current output in the range of 4 mA to 20mA K2: Weight corresponding to a current output in the range of 0 mA to 20mA K3: Weight corresponding to a current output in the range of 4 mA to 20mA
#104	H1068	O	R/W	Way in which a digital input terminal operates	X0: Bit 0~bit 7; X1: Bit 8~bit 15 H0: General digital input terminal (factory setting) H1: If a digital input terminal is ON, a weight will be restored to zero, H2: If a digital input terminal is ON, a tare will be measured. H3: If a digital input terminal is ON, a tare will be subtracted. H4: If a digital input terminal is OFF, a net weight will be measured. H6: If a digital input terminal is ON, zero will be adjusted. H7: If a digital input terminal is ON, the first point will be adjusted. H8: rising edge triggered: Y0~Y3 open outputs; falling edge triggered: Y0~Y3 close outputs H9: rising edge triggered: Y0~Y3 close outputs; falling edge triggered: Y0~Y3 open outputs HA: rising edge triggered: Y0~Y3 hold outputs; falling edge triggered: Y0~Y3 open outputs HB: rising edge triggered: Y0~Y3 open outputs; falling edge triggered: Y0~Y3 hold outputs H'8 and H'B: ● Hold state: State remains Hold while changing Y0 ~ Y3 and CR#109 = 2 (HOLD state). ● When the output is in the active state: the modified status of Y0~Y3 will be output
#105	H1069	O	R/W	Way in which a digital output terminal operates	**Bit 15~bit 12**: **Y3**; **Bit 11~bit 8**: **Y2**; **Bit 7~bit 4**: **Y1**; **Bit 3~bit 0**: **Y0** H0: General digital output terminal (factory setting) H1: If no weight is measured, a digital output terminal will be ON. H2: If no weight is measured, a digital output terminal will be OFF. H3: If a weight measured is greater than the maximum weight specified, a digital output terminal will be ON. H4: If a weight measured is greater than the maximum weight specified, a digital output terminal will be OFF. H5: If an excitation voltage is abnormal, a digital output

CR#	Address	Attribute		Register name	Explanation
					terminal will be ON. H6: If an excitation voltage is abnormal, a digital output terminal will be OFF. H7: If a weight measured is in the stability range specified, a digital output terminal will be ON. H8: If a weight measured is in the stability range specified, a digital output terminal will be OFF. H'9: If a weight measured is greater than the weight value that is set to output, a digital output terminal will be ON. H'A: If a weight measured is greater than t the weight value that is set to output, a digital output terminal will be OFF.
#106	H106A	O	R/W	Weight changing of CH1	Default: K0; setting range: K0 ~ K32767
#107	H106B	O	R/W	Weight changing of CH2	Default: K0; setting range: K0 ~ K32767
#109	H106D	X	R/W	Status of Y point	Work with CR#104 and Y points 0: Y point output enabled (default) 1: Y point output closed (the status of Y0-Y3 is OFF) 2: Y point output on hold (the status of Y0-Y3 cannot be changed)
#110	H106E	O	R/W	Y0 weight output setting value (Low word)	When the weight is greater than the weight value that is set to output, you can set the Y point output to ON or OFF.
#111	H106F	O	R/W	Y0 weight output setting value (High word)	
#112	H1070	O	R/W	Y1 weight output setting value (Low word)	
#113	H1071	O	R/W	Y1 weight output setting value (High word)	
#114	H1072	O	R/W	Y2 weight output setting value (Low word)	
#115	H1073	O	R/W	Y2 weight output setting value (High word)	
#116	H1074	O	R/W	Y3 weight output setting value (Low word)	
#117	H1075	O	R/W	Y3 weight output setting value (High word)	
#118	H1076	O	R/W	Y0 delay output time	Default: 0; setting range: 0 ~ 300;

CR#	Address	Attribute		Register name	Explanation
#119	H1077	O	R/W	Y1 delay output time	unit: 10 ms
#120	H1078	O	R/W	Y2 delay output time	
#121	H1079	O	R/W	Y3 delay output time	
Symbols: O indicates that the register is latched. X indicates that the register is not latched. R indicates that the data can be read. W indicates that the data can be written.					

※Function Code: 03H: Read data from the register; 06H: Write one word of data to the register; 10H: Write multiple words of data to the register

※ CR#51: Status code

bit	Content	Description	bit	Content	Description
b0	K1（H'0001）	Abnormal power	b1	K2（H'0002）	Hardware failure
b2	K4（H'0004）	The weight measured by CH1 exceeds the maximum weight which can be measured, or the voltage of SEN is incorrect.	b3	K8（H'0008）	CH1 is adjusted incorrectly.
b4	K16（H'0010）	The weight measured by CH1 exceeds the maximum weight which can be measured.	b5	K32（H'0020）	No weight is measured by CH1.
b6	K64（H'0040）	A weight measured by CH1 is in the stability range specified.	b7	K128（H'0080）	The conversion of a weight measured by CH2 into a digital value is incorrect, or the voltage of SEN is incorrect.
b8	K256（H'0100）	CH2 is adjusted incorrectly.	b9	K512（H'0200）	The weight measured by CH2 exceeds the maximum weight which can be measured.
b10	K1024（H'0400）	No weight is measured by CH2.	b11	K2048（H'0800）	A weight measured by CH2 is in the stability range specified.
b12~b15	reserved				
Note: Each status is determined by the corresponding bit, and it is possible to generate two or more statuses at the same time. 0 represents normal, while 1 indicates that one or more machine status occured.					

※ CR#53、CR#55Communication format:

Bit 15	Bit 14~Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ASCII/RTU	Reserved	Serial transmission speed				Data length	Stop bit	Parity bit	

Description					
Bit 15	ASCII/RTU	0	ASCII	1	RTU
Bit 7~bit 4	Serial transmission speed	0	9,600 bps	1	19,200 bps
		2	38,400 bps	3	57,600 bps
		4	115,200 bps	5	Reserved
Bit 3	Data length (RTU=8 bits)	0	7	1	8
Bit 2	Stop bit	0	1 bit	1	2 bits
Bit 1~bit 0	Parity bit	0	Even	1	Odd
		2	Reserved	3	Reserved

12.7.2 Functions Descriptions

12.7.2.1 Measuring Net Weight

Users can choose to measure the net weight or the gross weight of an object. A net weight is the weight of a product, that is, the actual weight of a product without its package. The weight of a package is a tare. A gross weight is a total weight, namely a net weight plus a tare

- Tare:A tare is the weight of a package
- Net Weight:A net weight is the weight of a product, that is, the actual weight of a product without its package
- Gross Weight: A gross weight is a total weight, namely the weight of a product itself (a net weight) plus the weight of a package (a tare)
- Gross weight=Net weight+Tare

  Example: A product weighs 10 kilograms, and the carton in which the product is packed weighs 0.2 kilograms. The total weight gotten is 10.2 kilograms.

  Net weight=10KG，Tare=0.2KG，Gross weight=10.2KG。

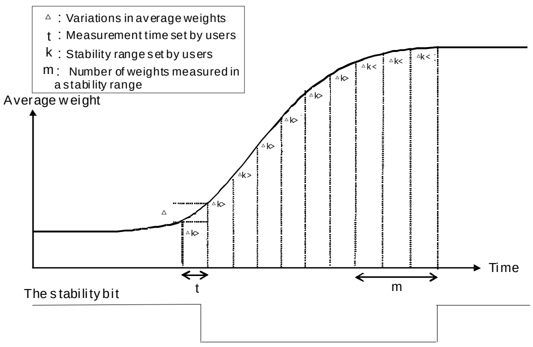
- Relevant control registers
  - CR#6： Returning to zero/Subtracting a tare
  - CR#7：Displaying a gross weight/net weight
  - CR#8~9：Measured tare

12.7.2.2 Stability Check

When an object is put on a load cell, users can utilize this function to check whether the current measurement weight has stabilized

- If a weight measured is in a stability range specified by users (CR#18/CR#19), the bit in CR#51 will be set to 1
- If a weight measured exceeds a range specified by users, the bit in CR#51 will be set to 0. It remains 0 until the stability check count (CR#16, CR#17) is within the stability range again. Once the stability check count is within the range, the bit of CR#51 will be set to 1.

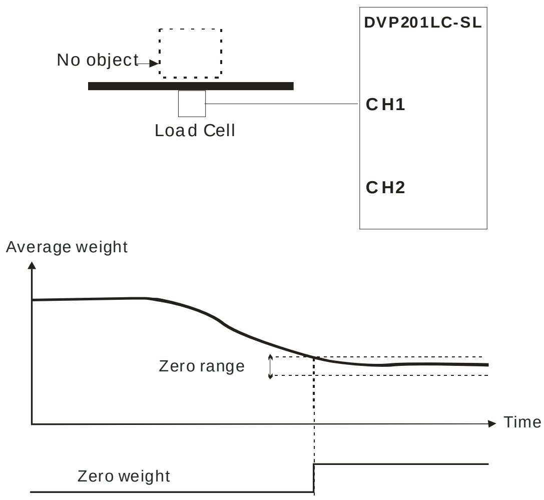
Example: The measurement time set is 10 milliseconds, the number of weights measured in a stability range is 10, and the stability range set is 1000 grams. If a variation exceeds 1000 grams, bit in CR#51 will be set to 0. If the variations in 100 milliseconds (10×10 ms) are within 1000 grams, bit in CR#51 will be set to 1. (Users should judge whether the present weight measured is in the stability range set before they perform control.)



- Relevant control registers
  - CR#16、CR#17：Number of weights measured in a stability range
  - CR#18、CR#19：Stability check range

12.7.2.3 Determining Zero

Users can utilize this function to determine when an item has been completely removed from the Load Cell. When the user observes that the stability bit for the measurement value is 1 and the zero point weight bit is also 1, it indicates that the item has been successfully removed from the Load Cell. At this point, users can perform the next control step. (The zero point weight bit is 1 within the zero point detection range.)



- Relevant control registers
  - CR#20/CR#21/CR#48/CR#49：Range for determining whether a weight measured is 0 grams.

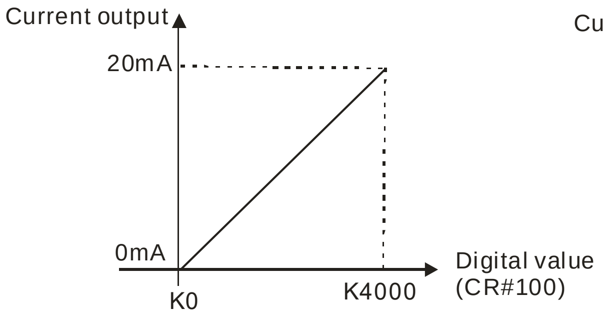
12.7.2.4 Filtering out Weight

There are three ways to filter out weights

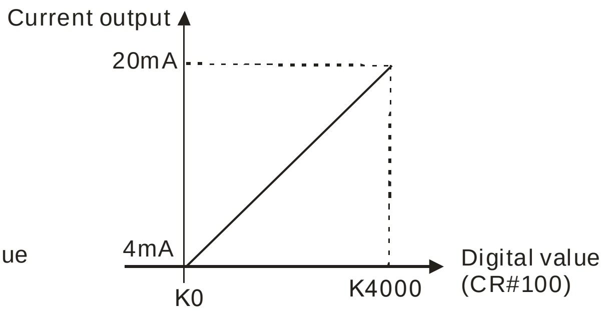
- Filtering out the maximum/minimum weight measured: If there is a maximum weight or a minimum weight, CR#45 can be used to filter out the maximum weight or the minimum weight. If the value in CR#45 is bigger, more weights will be filtered out. Setting range: K0~K8
- Averaging weights: The values read are averaged so that a steady value is obtained. There may be peak values due to unavoidable external factors, and the average value obtained changes accordingly. The maximum number of values which can be averaged are 100.
- Low-pass filters (LPF) with different cutoff frequencies are provided. (Supported by firmware V1.14 and above.)

12.7.2.5 Correspondence between Current Outputs and Weights

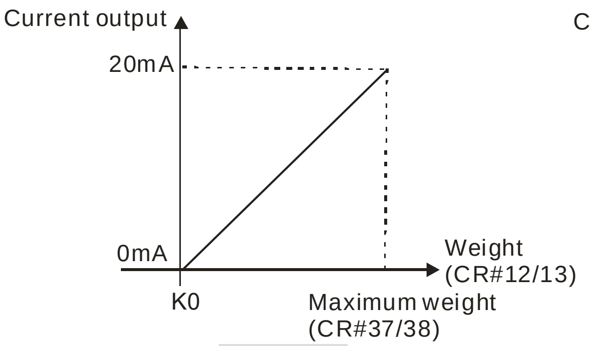
Currents outputs directly correspond to weights. Currents vary with weights. Users can set a current output mode by means of CR#103.



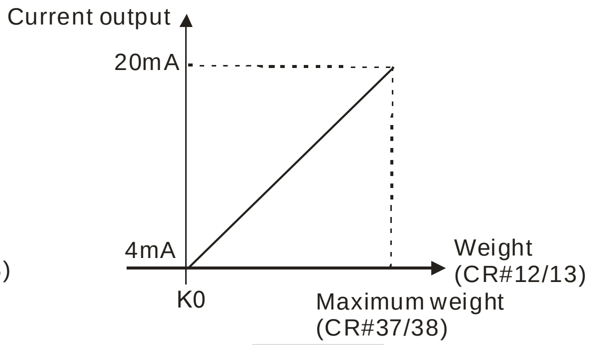
(Mode 0)



(Mode 1)



(Mode 2)



(Mode 3)

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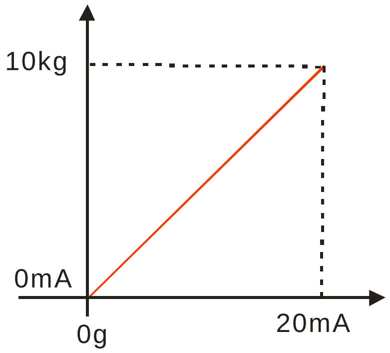
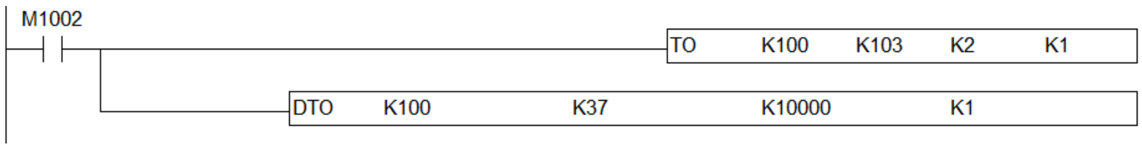
Example: 10 kg correspond to 20 mA.



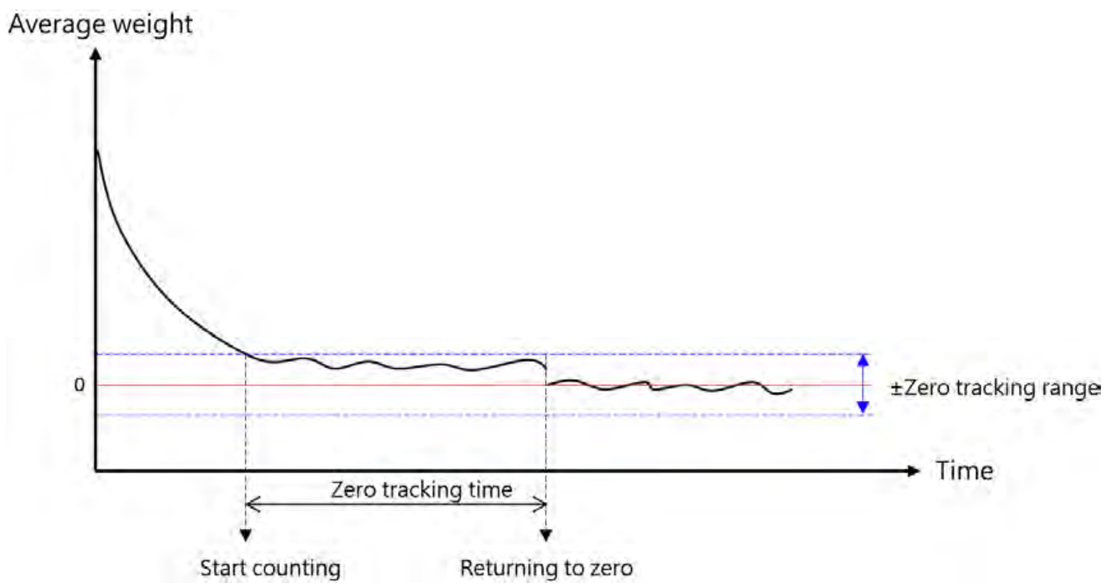
A load cell module is directly connected to the left side of a DVP series PLC. The instruction TO is used to set parameters.

CR#103 is set to K2, and CR#37/CR#38 is set to K10000. Please see the WPLSoft program shown below.



12.7.2.6 Zero Tracking

That is Auto-zero function. Sensor may lose flexibility and accuracy after being used for a long time. In this case, you can set up a range for time and weight that zero tracking is attempted. Please refer to CR#95~CR#98 for relevant information of settings.

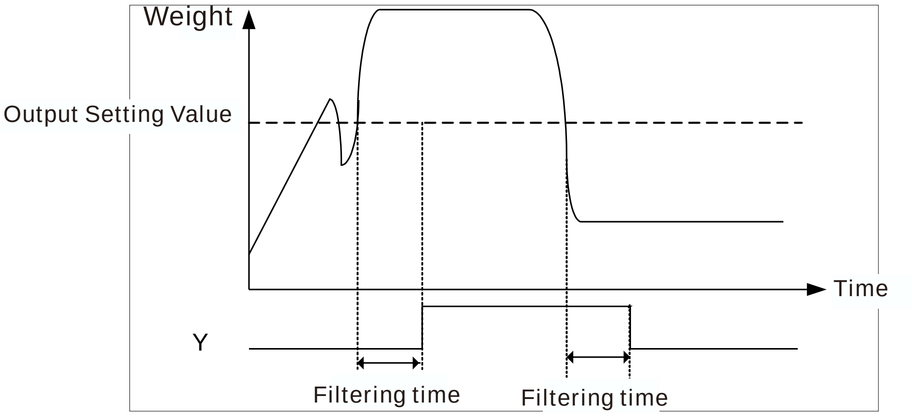


12.7.2.7 Weight Updates

Weight values would be updated in real time while using control registers. Meanwhile, you are allowed to configure the settings of changes in weight values in CR#106~CR#107 and the weight value would only be updated when the changes is greater than the setting value.

12.7.2.8 Output Values Set for Y Points

When the weight is greater than the weight value that is set to output, you can set the Y point output to ON or OFF. With delay output time, you can prevent multiple Y points from being enabled at the same time. Please refer to CR#110~CR#121 for details of the related settings.



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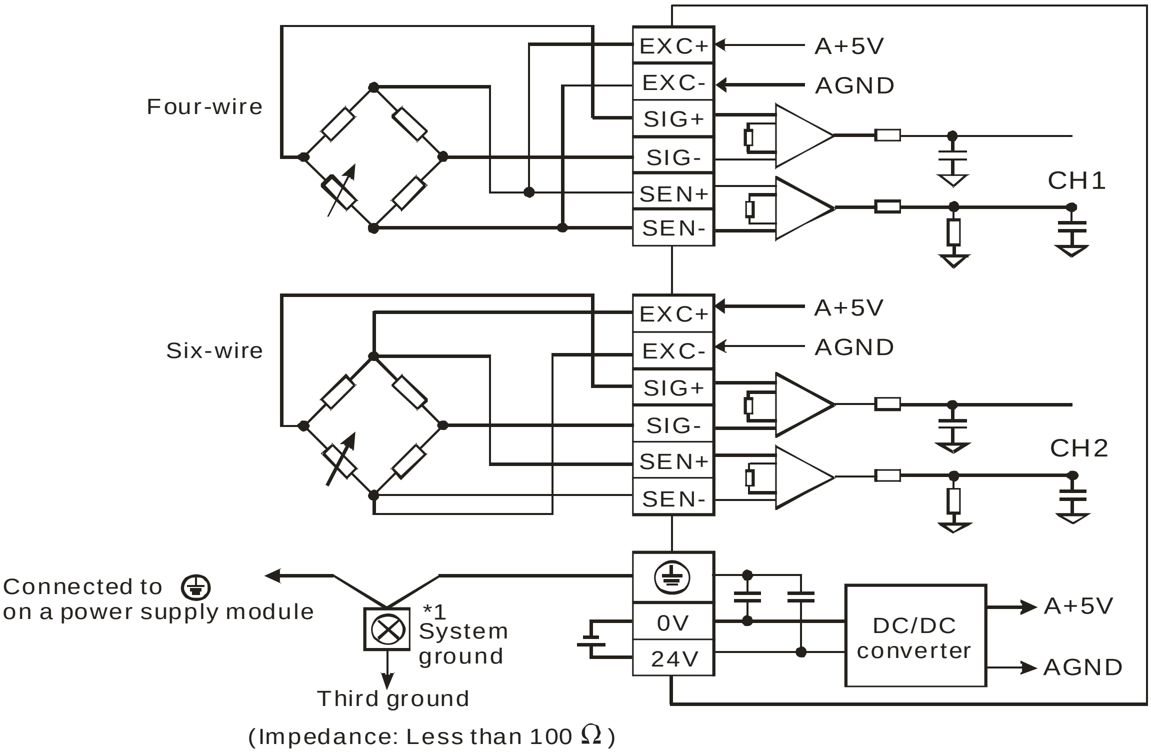
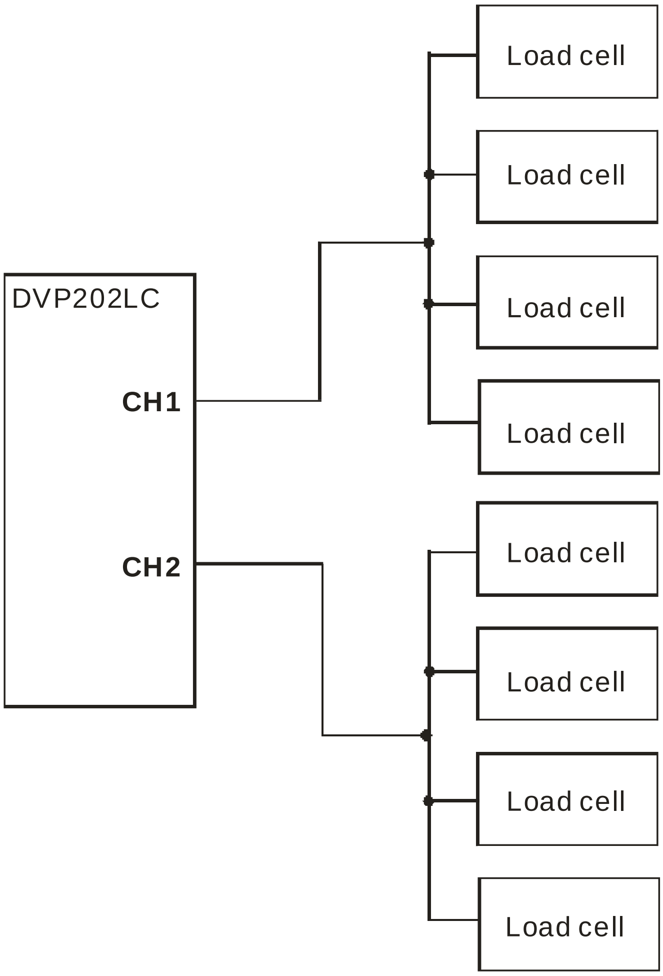
12.8 Wiring

12.8.1 DVP01LC-SL / DVP02LC-SL / DVP201LC-SL / DVP202LC-SL / DVP211LC-SL Wiring



Note 1: Please connect ⏚ on a power supply module and ⏚ on the load cell module to a system ground, and then ground the system ground or connect the system ground to a distribution box.

- Multiple load cells connected in parallel are connected to a single load cell module. Take DVP202LC-SL for example.

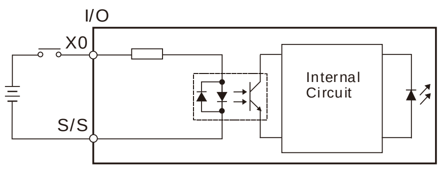
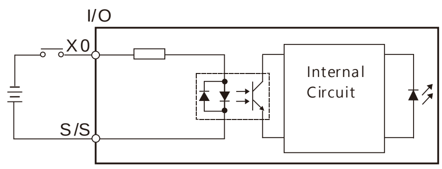


Note 1: Please connect ⏚ on a power supply module and ⏚ on the load cell module to a system ground, and then ground the system ground or connect the system ground to a distribution box.

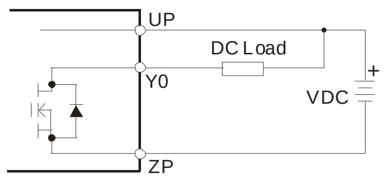
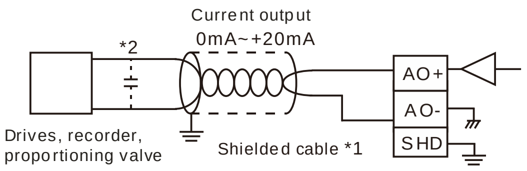
Note 2: If multiple load cells are connected in parallel, the total impedance should be greater than 40 Ω.

12.8.2 DVP211LC-SL Wiring Digital Input

When the digital input signal is DC input, there are two DC input types, Sinking and Sourcing. See the definition below.

● Sinking	● Sourcing
	

12.8.3 DVP211LC-SL Wiring Output

● NPN Transistor output	● Analog output
	

*1. Use shielded cables to isolate the analog input signal cable from other power cables.

*2. If noise in the input voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47 μF with a working voltage of 25 V.

12.9 Software Interface Instructions

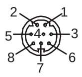
The following content takes the DVP01LC-SL model as an example.

12.9.1 Initial Settings

1. Connect DVP01LC-SL module to the PC, as illustrated below.

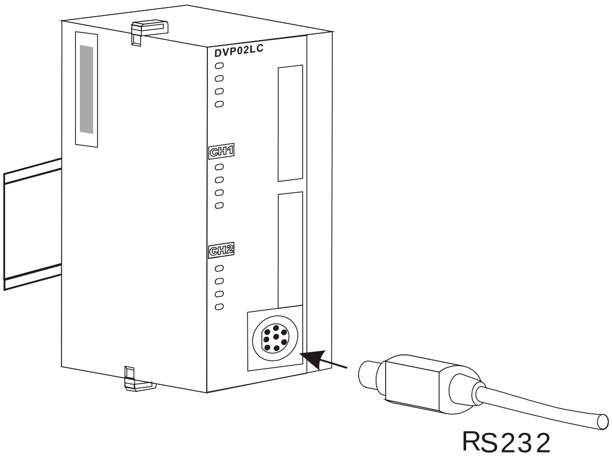
   - Please follow the PIN definitions for the wiring.

PC COM Port 9 PIN D-SUB female		↔	DVP01LC COM Port 8 PIN MINI DIN	
Rx	2	↔	5	Tx
Tx	3	↔	4	Rx
GND	5	↔	8	GND
	7		1, 2	5V
	8			
	1			
	4			
	6			

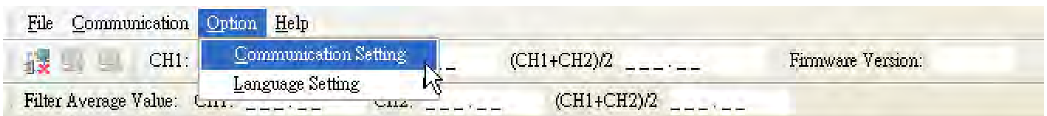


   - There are 2 communication interfaces in DVP01LC-SL available for the communication with the PC and other devices. COM1 is the RS-232 port, and COM2 is the RS-485 port. Both ports comply with standard Modbus protocol. The PC can communicate directly with DVP01LC-SL through COM1.

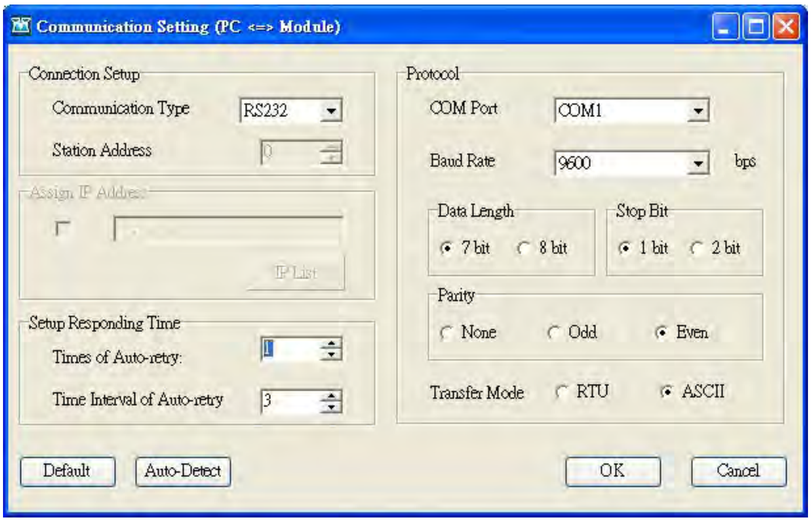
   - We recommend you use Delta's power supply modules for DVP01LC-SL.



2. Open the software. Select "Option" -> "Communication Setting".



3. Set up the communication parameters according to the settings below.



- Setting up responding time

  Times of auto-retry: Default = 1, range: 0 ~ 50

  Time interval of auto-retry: Default = 3, range: 1 ~ 20

- Setting up COM port

  COM port: Select the communication port to be connected with the MPU.

  Baud rate: 9600, 19200, 38400, 57600 or 115200

  Data length: 7 bit or 8 bit. When the transmission mode is set to RTU, it will automatically be set to "8 bit".

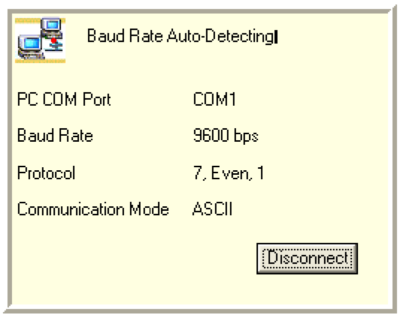
  Stop bit: 1 bit or 2 bit

  Parity: None, Odd or Even

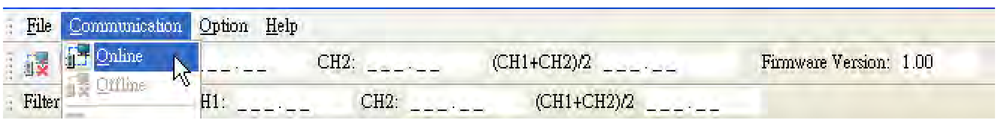
  Transfer (transmission) mode: RTU or ASCII

- Auto-detection

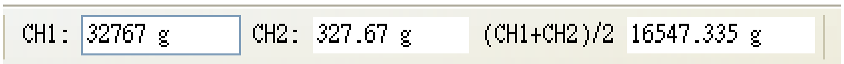
  Click the "Auto-Detect" button, and all the connections will be auto-detected in the current transmission mode.



4. After the communication settings are completed, click the  icon on the toolbar, or select "Communication" -> "Online" to establish the connection between the software and DVP01LC-SL.



5. When clicking “online”, a window for uploading module information will appear, asking whether to upload the module data to the PC. If the user selects "Yes" the module's configuration values will be uploaded to the software and overwrite the previous software settings.
6. Once you enter the online status, the screen will show the real-time data of DVP01LC-SL, including its current firmware version, the average values of CH1. You can click a value, and a window displaying the enlarged character will appear.
   - The average values

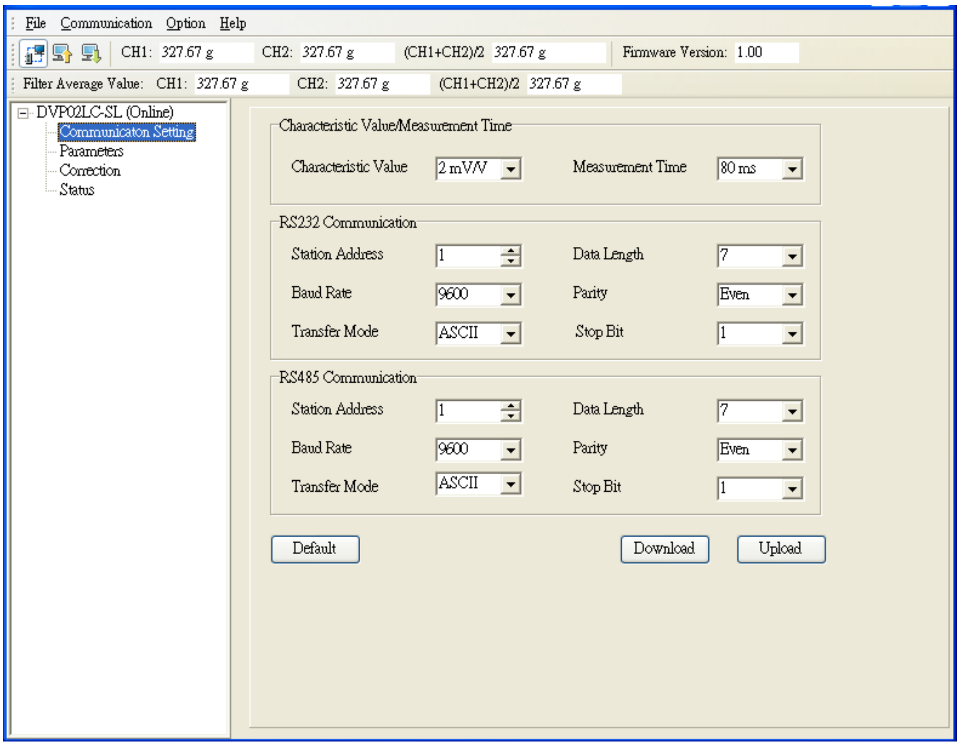


Click on a value, and the enlarged characters of the value will appear.

7. In the connection, if you would like to upload the data in DVP01LC-SL to software, click the icon . Or click the icon if you would like to download all the parameters set in the software to the module.

12.9.2 Communication Settings

The communication setting window allows you to set up the communication formats for RS-232 and RS-485, the characteristic value (eigenvalue) and measuring time. When all the settings are done, click the icon to download the parameters to DVP01LC-SL, or click “Upload” to display the parameters of DVP01LC-SL in the software. Click “Default” and all the parameters set will return to the default settings.



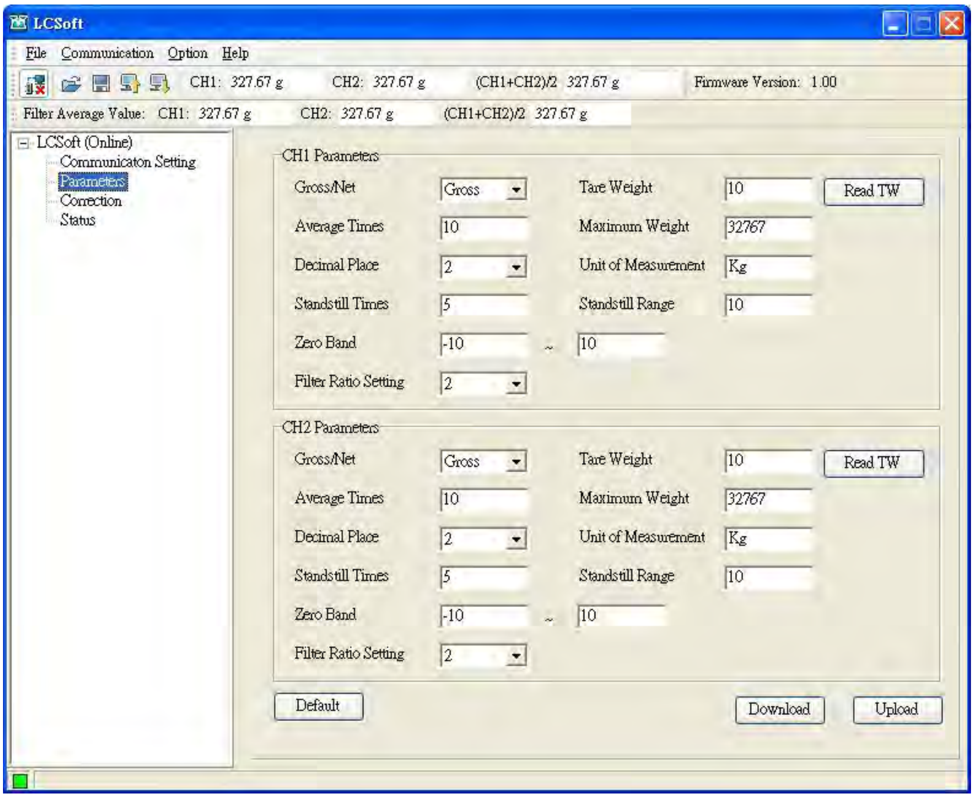
(for illustration purposes only)

- Characteristic Value/Measurement time
  - Characteristic value: The eigenvalue, corresponding to the value set in CR#2. Scroll down to select 1mV/V, 2 mV/V, 4 mV/V or 6 mV/V. The default setting is 2 mV/V.
  - Measurement time: Corresponds to the value set in CR#3. Scroll down to select 2ms, 10ms, 20ms, 40ms or 80 ms. The default setting is 80 ms.

- RS-232 Communication
  - Station address: The node address, corresponding to the value set in CR#52. Click to set the station address, the range is 1 to 255, and the default setting is 1
  - Baud rate: Corresponds to bit4 to bit7 of CR#53. Scroll down to select 9600, 19200, 38400, 57600 or 115200. The default setting is 9600
  - Transfer mode: The transmission mode, corresponding to bit15 of CR#53. Scroll down to select RTU or ASCII. The default setting is ASCII.
  - Data length: Corresponds to bit3 of CR#53. Scroll down to select 7 or 8. The default setting is 7. When the transmission mode is set to be RTU, the data length will be automatically set to 8.
  - Parity: Corresponds to bit0 to bit1 of CR#53. Scroll down to select none, odd or even. The default setting is even.
  - Stop bit: Corresponds to bit2 of CR#53. Scroll down to select 0 or 1. The default setting is 1.
- RS-485Communication
  - Station address: The node address, corresponding to the value set in CR#54. Click to set the station address, the range is 1 to 255, and the default setting is 1
  - Baud rate: Corresponds to bit4 to bit7 of CR#55. Scroll down to select 9600, 19200, 38400, 57600 or 115200. The default setting is 9600
  - Transfer mode: The transmission mode, corresponding to bit15 of CR#55. Scroll down to select RTU or ASCII. The default setting is ASCII
  - Data length: Corresponds to bit3 of CR#55. Scroll down to select 7 or 8. The default setting is 7. When the transmission mode is set to be RTU, the data length will be automatically set to 8.
  - Parity: Corresponds to bit0 to bit1 of CR#55. Scroll down to select none, odd or even. The default setting is even.
  - Stop bit: Corresponds to bit2 of CR#55. Scroll down to select 0 or 1. The default setting is 1.

12.9.3 Parameter Settings

The parameter setting window allows you to set up parameters for CH1 and CH2, including displaying the net weight or gross weight, the tare weight, average times, maximum weights, units for measurements, the decimal point place, range and times for standstill checks, zero point checks and filter percentages. When all the settings are done, click “download” to download the parameters to DVP01LC-SL, or click “Upload” to display the parameters of DVP01LC-SL in the software.



(for illustration purposes only)

- Gross/Net

  Corresponds to the value in CR#7. Scroll down to select displaying the gross weight or net weight.

- Tare Weight

  Enter the weight value for tare weight settings here or click "Tare" to set it. The range is -32768 to 32767, with a default software value of 0.

- Maximum Weight

  When the measured value exceeds the maximum weight, an error will be displayed in the status.

  The range is -32768 to 32767, with a default software value of 32767.

- Unit of Weight Measurement

  The weight measurement unit for CH1 corresponds to CR#22 and CR#23. Enter the weight unit here for user reference, with a maximum of 4 characters. The default software value is "KG."

- Standstill times

  The times of standstill checks, corresponding to the value in CR#16 and CR#17. Enter the times here. The range is 1 to 500, and the default setting is 5.

- Standstill Range

  The stability check range for CH1 corresponds to CR#18. Enter the value here to set the stability check range, ranging from 1 to 10000. The default software value is 10.

- Zero Band

  The upper limit of the zero band detection for CH1 corresponds to CR#37, and the lower limit corresponds to CR#39. This range is used for zero-state detection reference. When the weight value is within this range, the status code is set to the zero bit, indicating an empty state. Enter values here to set the upper and lower limits of the zero-point check range, with a range of -32768 to 32767. The default software value is -10 to 10.

- Average Times

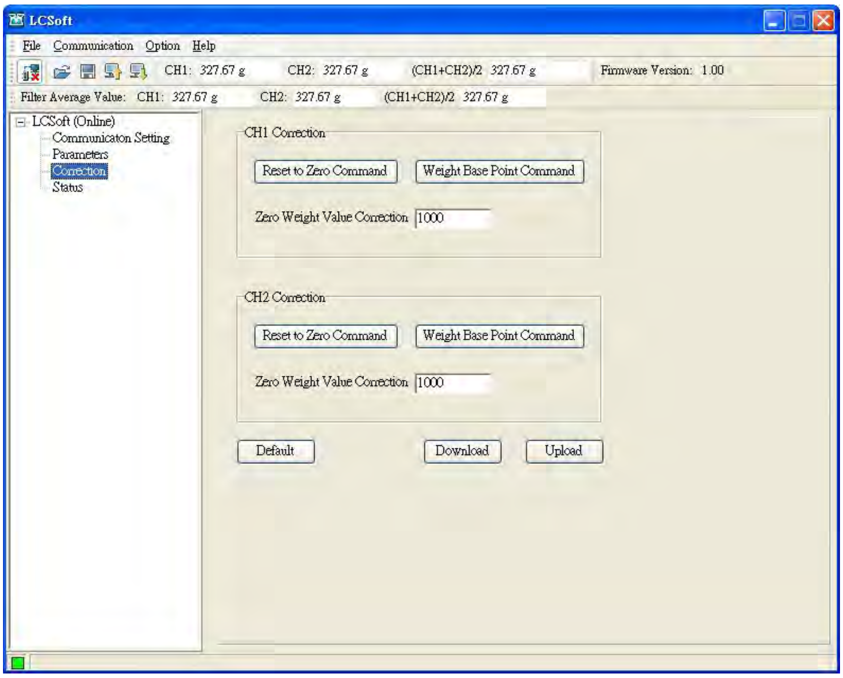
  The range is 1 to 100, and the default setting is 10.

- Filter ratio setting

  The filter ratio setting for CH1 corresponds to CR#43. This is used to configure the filter ratio for the dynamic filtering function, with a setting range of 1 to 9. The weighted average of the weight after dynamic filtering is displayed in the CH1 filter average value on the toolbar, or can be viewed in CR#45 filter average value. The default software value is 2

12.9.4 Correction Setting

Here we introduce parameters and corresponding control registers related to correction in the software. Parameters include reset to zero point commands, weight base point commands and weight correction commands. When all the settings are done, click “download” to download the parameters to DVP01LC-SL, or click “Upload” to display the parameters of DVP01LC-SL in the software.



(for illustration purposes only)

- Zero weight value correction

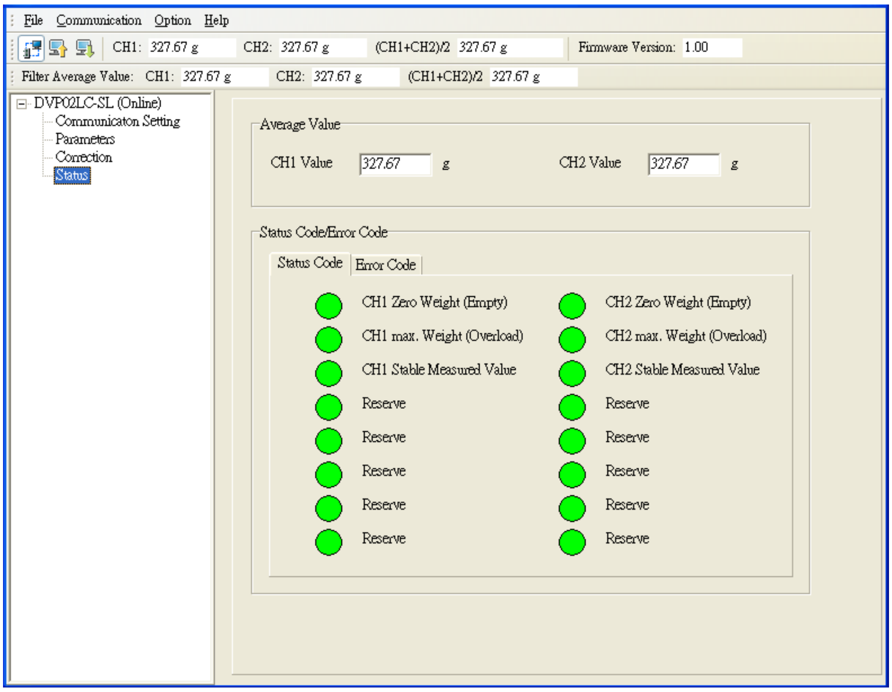
  Corresponds to CR#33 and CR#34. Enter the weight base value here. The default setting is 1,000.

- Relative Digital Values

Digital values corresponding to the actual weight of the calibration weight.

12.9.5 Status Settings

In the status setting window, you can view the measuring results and the operation status of DVP01LC-SL, including the present average value in CH1, the unit of measurement, status codes and error codes.



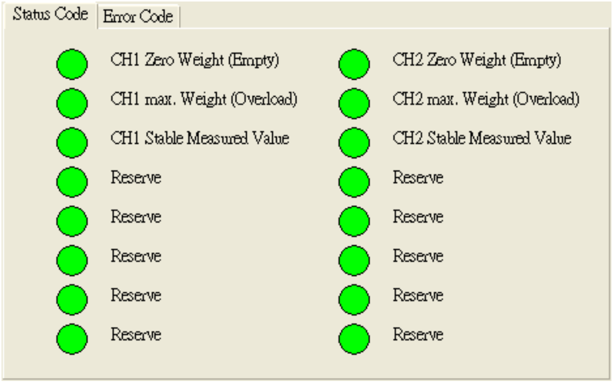
(for illustration purposes only)

- Weight value

  The current measured weight value, displayed in the unit previously set for weight measurement.

- Status code

  Corresponds to the value set in CR#50, indicating the measuring statuses at CH1 and CH2, including the empty load, overload and whether the measured values are stable.

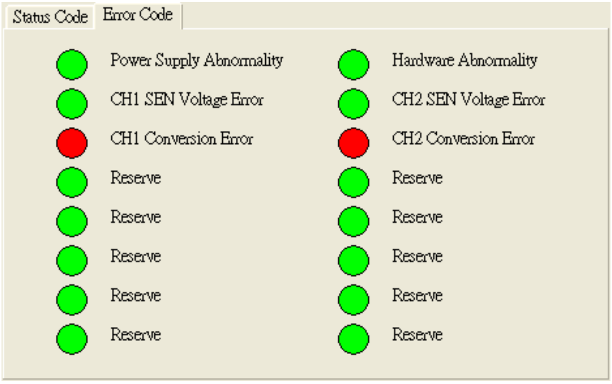


(for illustration purposes only)

- CH1 zero weight (empty): Corresponds to bit0 of CR#50. When the value measured at CH1 equals 0, the indicator will turn red.
- CH1 max. weight (overload): Corresponds to bit2 of CR#50. When the value measured at CH1 exceeds the maximum weight set, the indicator will turn red.
- CH1 stable measured value: Corresponds to bit4 of CR#50. When the value measured at CH1 is stable, the indicator will turn red.

- Error code

Corresponds to the value in CR#51, displaying the operation status, including power supply abnormality, hardware abnormality, SEN voltage errors and conversion errors.



(for illustration purposes only)

- Power supply abnormality: Corresponds to bit0 of CR#51. When the power supply encounters abnormality, the indicator will turn red.
- Hardware abnormality: Corresponds to bit1 of CR#51. When the hardware encounters abnormality, the indicator will turn red.
- CH1 SEN voltage error: Corresponds to bit3 of CR#51. When the SEN signal input at CH1 encounters error, i.e. abnormal load cell signal occurs, the indicator will turn red.
- CH1 conversion error: Corresponds to bit4 of CR#51. When the conversion of the measured signal at CH1 encounters an error, the indicator will turn red.

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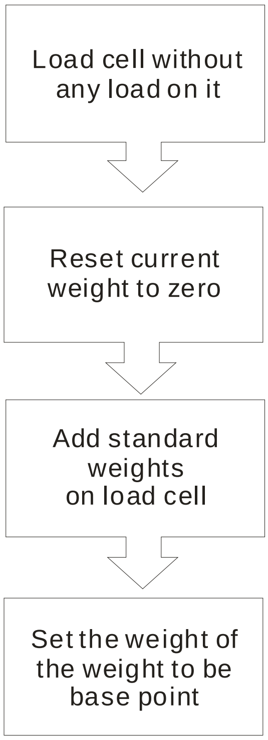
12.10 Correction

12.10.1 DVP01LC-SL / DVP02LC-SL Correction

The following content uses the DVP01LC-SL model as an example.

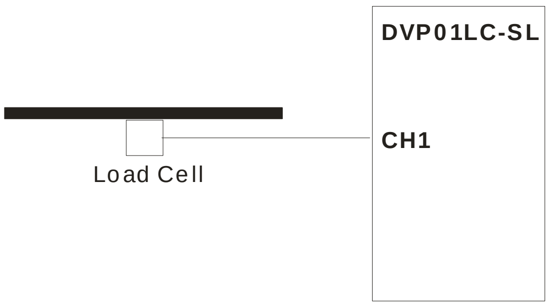
Calibration is performed to align the module with the weight values of the Load Cell and allows for the adjustment of the curve as desired. The calibration steps are illustrated in the diagram below. Calibration can be divided into mainframe calibration and software calibration. Mainframe calibration involves connecting the DVP-PLC mainframe to the DVP01LC-SL module and using TO/FROM instructions to carry out the calibration steps. Software calibration, on the other hand, requires the PC to connect to the DVP01LC-SL module using an RS-232 communication cable. The module calibration steps are then performed in the software, without the need for sending control commands through the DVP-PLC mainframe. The following will introduce the mainframe calibration and software calibration steps separately.



12.10.1.1 Correction by MPU

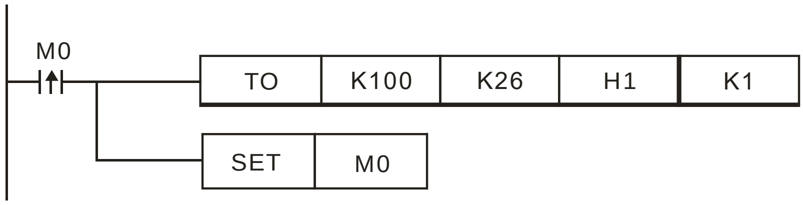
In this example, we connect DVP02LC-SL to a DVP series PLC MPU and correct CH1 by TO instruction.

1. Connect the DVP01LC-SL module to the left side of the mainframe and provide power supply individually according to the requirements.
2. Connect the Load Cell to module CH1, as illustrated in the diagram below. Please refer to section 12.8 for the wiring details.

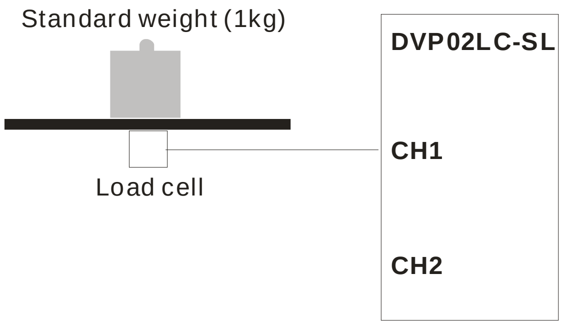


3. Set up every parameter and eigenvalue according to the actual measuring requirements and specifications of the load cell. In this example, we use the default settings of all parameters.

4. Execute the reset to zero command by writing H’0001 into CR#26, as the WPLSoft program below.

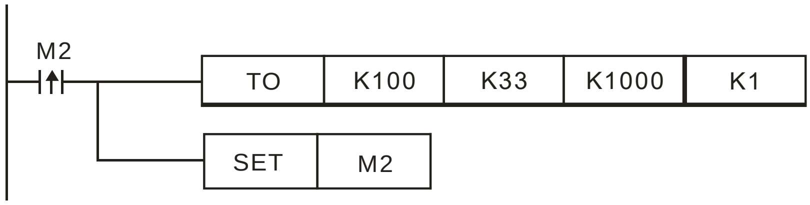


5. Add a 1kg weight on the load cell. Please be aware of the maximum weight the load cell can take.



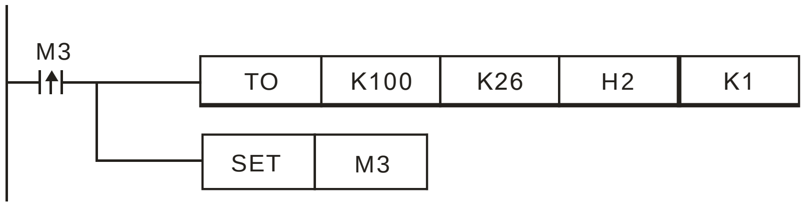
(for illustration purposes only)

6. Write the corresponding digital value for the 1kg calibration weight (in this example, 1kg corresponds to K1000) into CR#33 and CR#34 (CH1 calibration weight baseline), as shown in the WPLSoft program in the following diagram.

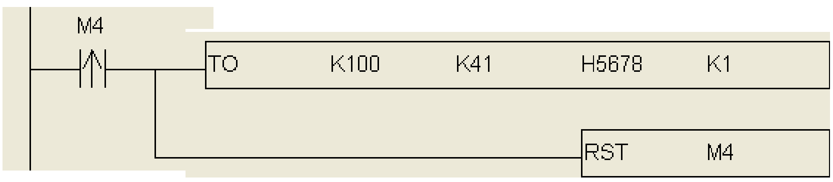


Note: Users can set arbitrary values, and the corresponding curve graph will also differ. Please refer to section 12.10.1.3 for guidance.

7. Execute the weight base point command by writing H’0002 into CR#26, as the WPLSoft program below.



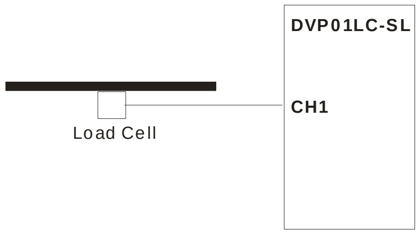
8. Save the calibration results for future use upon the next power-up. Write H'5678 into CR#41, as illustrated in the WPLSoft program shown below.



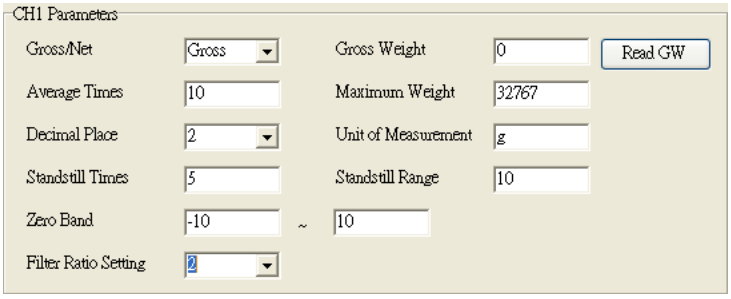
12.10.1.2 Correction by Software

In this example, we will demonstrate how to correct CH1 on DVP01LC-SL by the software.

1. Install the communication connection cable. Connect the PC to the DVP01LC-SL module using an RS-232 communication cable, and provide power supply according to the requirements.
2. Connect the Load Cell to module CH1, as illustrated in the diagram below. Please refer to section 12.8 for the wiring details.

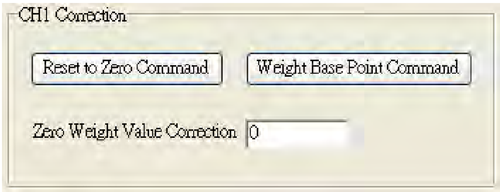


3. Open the software and see 12.9.1 for how to set up the connection between the software and DVP01LC-SL.
4. Click “Parameters” on the left-hand side column to start setting up the parameters. Set up every parameter and eigenvalue according to the actual measuring requirements and specifications of the load cell. After the parameter setups are done, click “Download”.



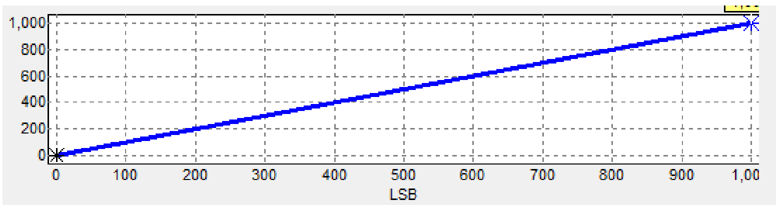
(for illustration purposes only)

5. .Click on "Calibration" in the left window. Begin by entering the actual weight of the calibration weight as 1000 and inputting the corresponding digital value as 1000 (in this example, 1kg corresponds to K1000). Click on the next step command to start the calibration.

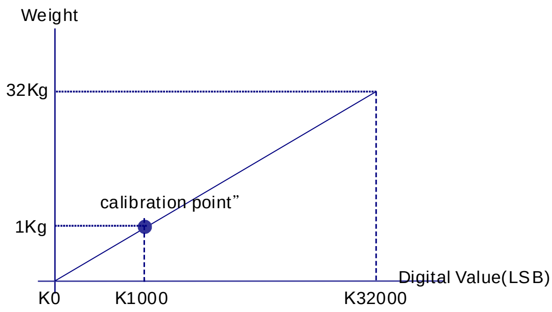


(for illustration purposes only)

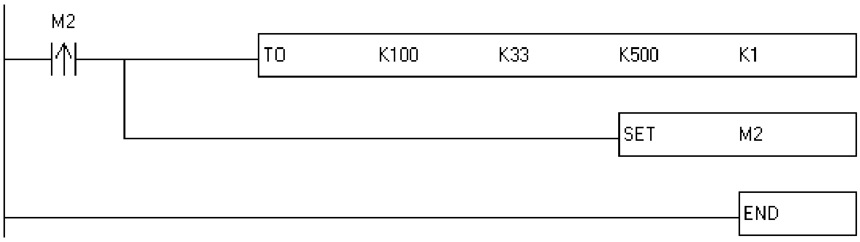
6. In the state where no items are placed on the Load Cell, the CH1 weight display is equal to 0g. Click on the next step command.
7. Place a standard 1kg calibration weight on the Load Cell. Note: Please refer to the maximum weight that the Load Cell can bear at the time. Click on the next step command.
8. Calibration completed. The diagram below displays the relationship between the digital values and corresponding weight values.



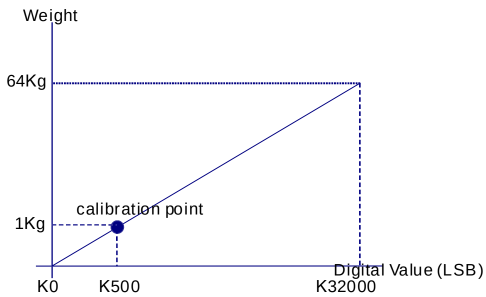
12.10.1.3 Example Curve Graph After Calibration



The digital values corresponding to the calibration weight can be written arbitrarily by the user, and the generated curve graph will also differ. For example, if you modify the 1kg calibration weight corresponding to K1000 to 1kg corresponding to K500, write it into CR#33 (CH1 calibration weight baseline), as shown in the WPLSoft program in the following diagram.

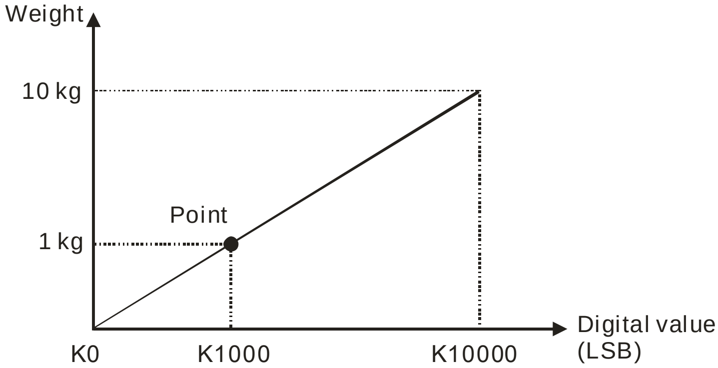


After calibration, the curve graph is as follows:



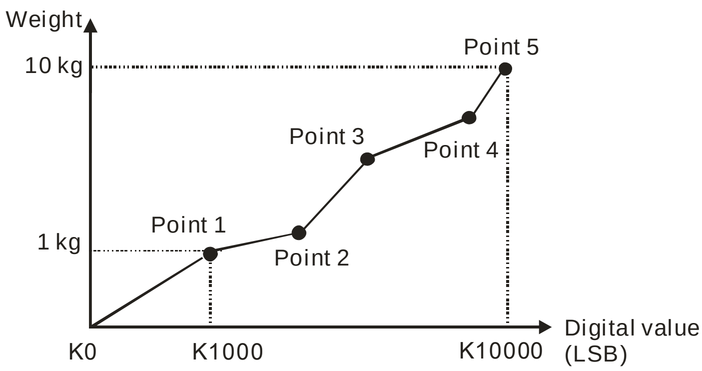
12.10.2 DVP201LC-SL / DVP202LC-SL / DVP211LC-SL Correction

The purpose of making adjustment is to make the weight measured by a cell correspond to the digital value displayed in a load cell module. Generally, two points are adjusted. After a system is set up, users can put no load on the scale. The weight measured is 0 grams when no load is put on the scale. The users can put a given weight on the scale, and set a digital value corresponding to the weight. The two points are adjusted. For example, if a load cell sensor which can measure a maximum weight of 10 kg is used, and 1 kg correspond to K1000, the curve presented will be like the one shown below.



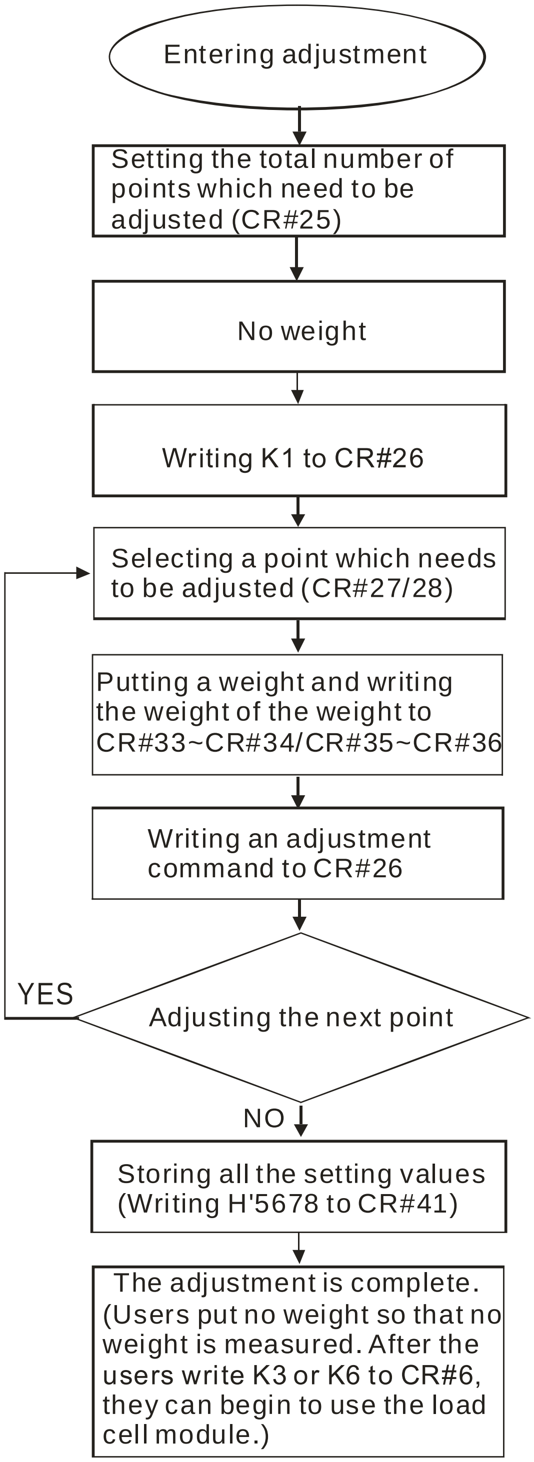
Adjusting two points

In addition to the adjustment of two points, a load cell supports the adjustment of multiple points (20 points at most). A characteristic curve is shown below.



Adjusting multiple points

12.10.2.1 Steps in correction

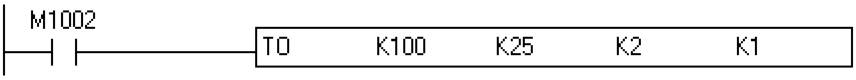


12.10.2.2 Example 1

EX: One point is adjusted. (A weight which weighs 1 kg corresponds to 1000 lsb.)

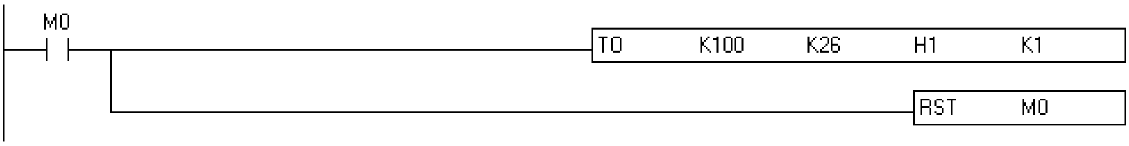
A load cell module is directly connected to the left side of a DVP series PLC. The instruction TO is used to make adjustment. The steps in making adjustment are as follows.

Step 1: Write K2 to CR#25. Please see the WPLSoft program shown below.

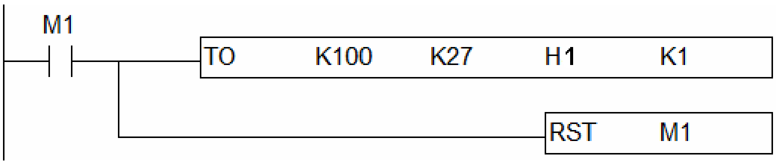


Step 2: Connect a load cell to a module, and put no load on the load cell.

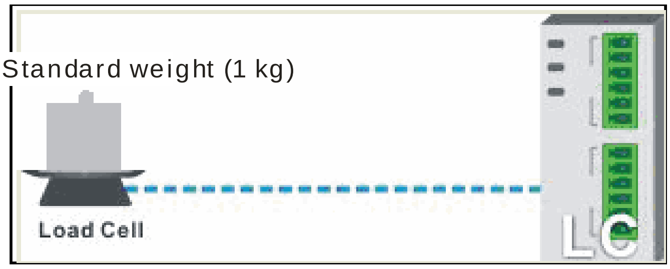
Step 3: Write H'0001 to CR#26. Please see the WPLSoft program shown below.



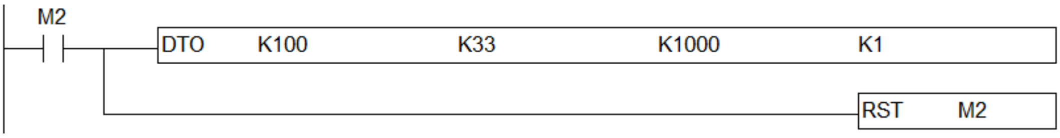
Step4: Select point 1 (default setting), and write H1 to CR#27. Please see the WPLSoft program shown below.



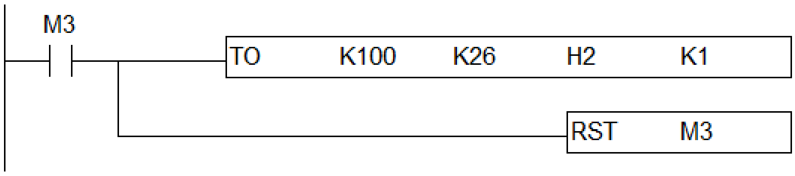
Step5: Put a standard weight which weighs 1000 g on the load cell.



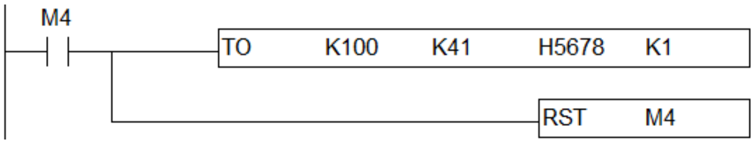
Step 6: Write K1000 (1000 g) to CR#33.



Step 7: Write H2 to CR#26.



Step 8: Make sure that the value displayed is correct, and make the adjustment retentive. Write H’5678 to CR#41. Please see the WPLSoft program shown below.



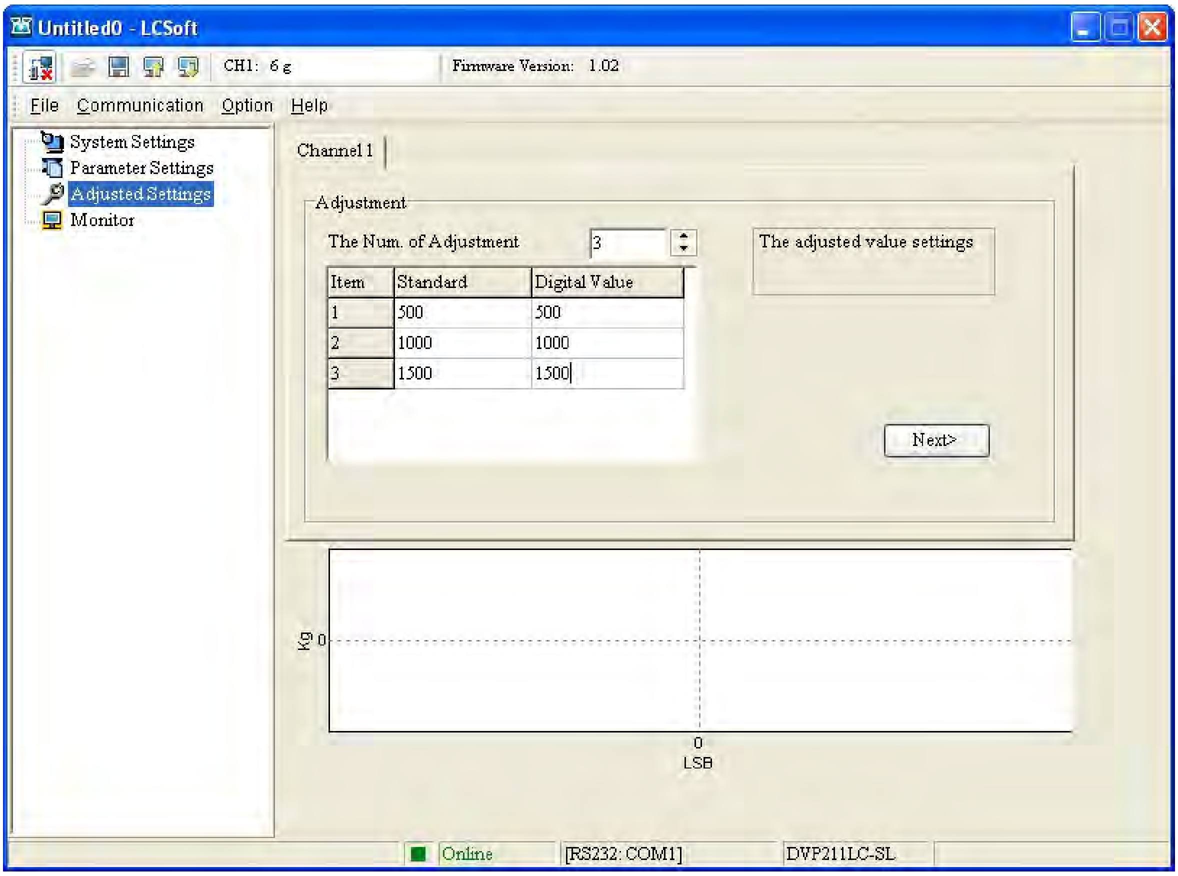
12.10.2.3 Example 2

Example: Three points are adjusted.

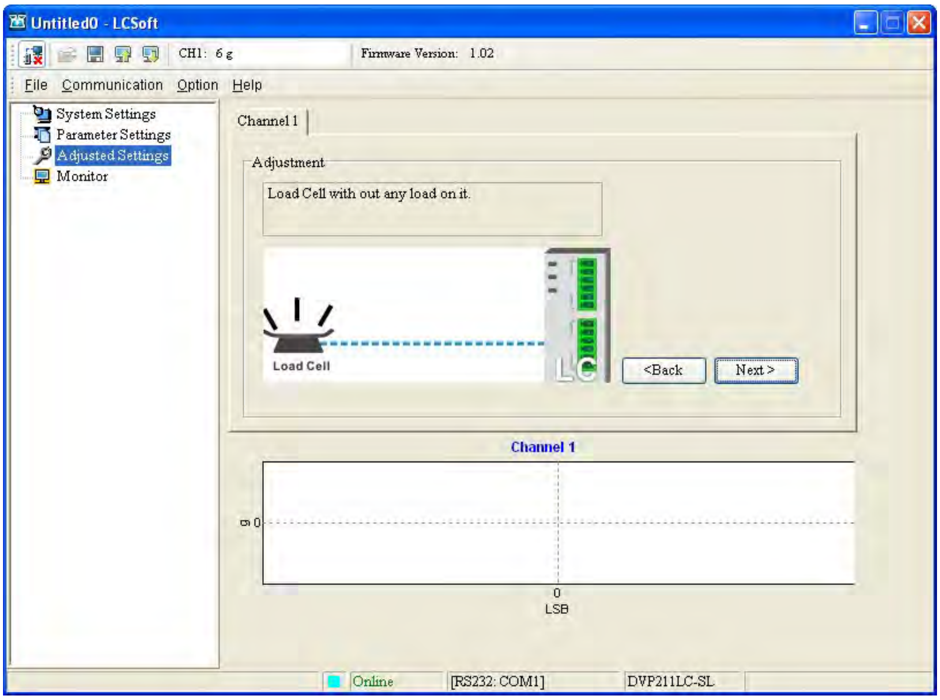
Note: The "Decimal Point Setting" and "Weight Measurement Unit" on LCSoft are for software display purposes only and will not affect the digital values of the module itself.

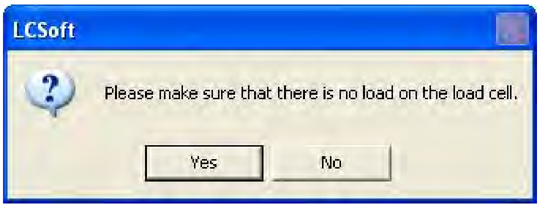
A load cell module is used independently. The steps in making adjustment are as follows.

Step 1: Select **3** in the **The Num. of Adjustment** box. The weight of the first weight is 500 g. It corresponds to 500 lsb. The weight of the second weight is 1000 g. It corresponds to 1000 lsb. The weight of the third weight is 1500 g. It corresponds to 1500 lsb. Please see the figure below.

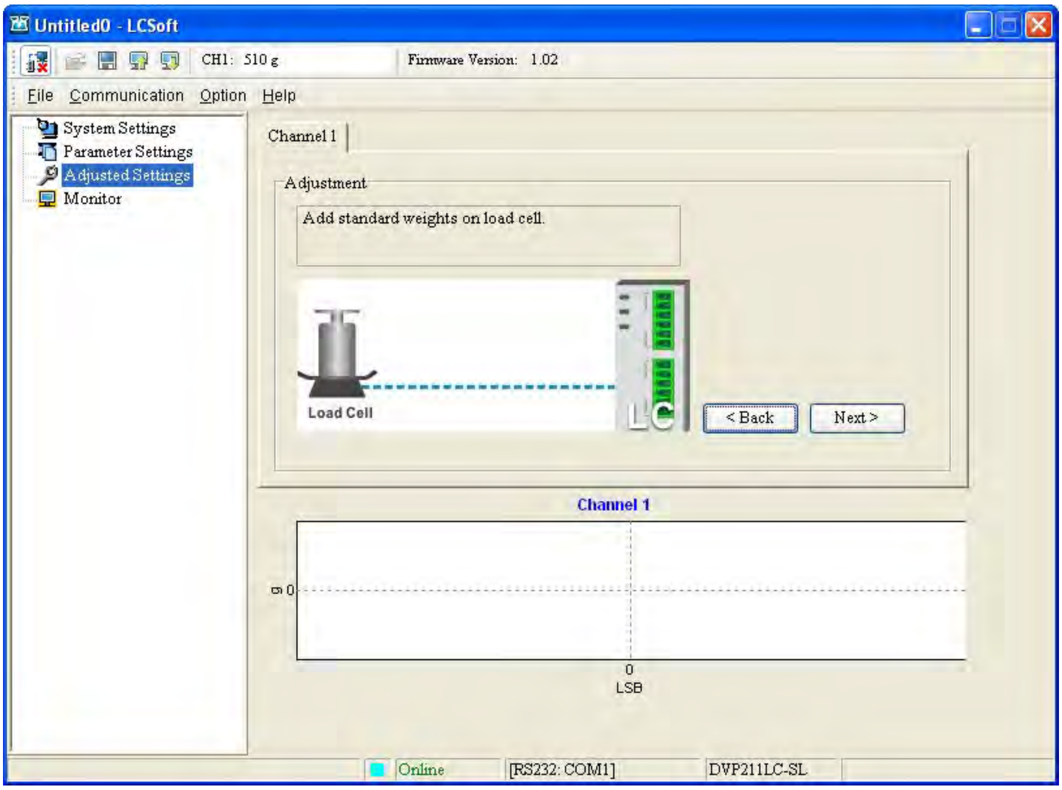


Step 2: Put no load on the load cell used. Click "Next." Please see the figures below.

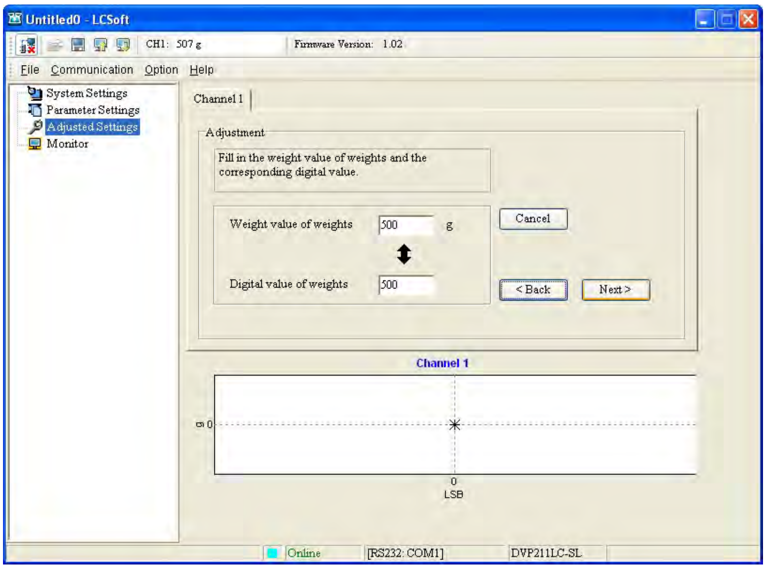


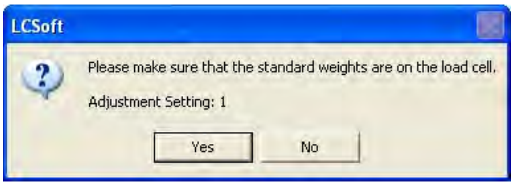


Step 3: Put a standard weight which weighs 500 g on the load cell used, and click **Next**. Please see the figure below.

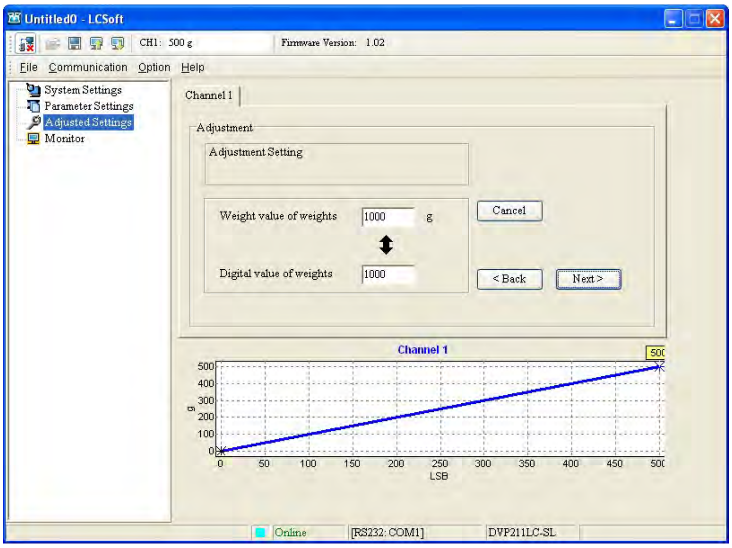


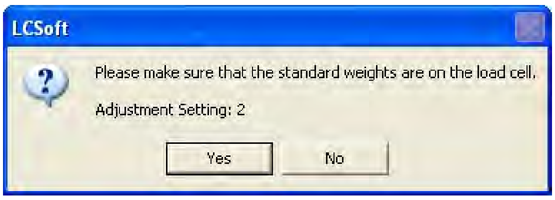
Step 4: Type “500” in the **Wight value of weights** box, type “500” in the **Digital value of weights** box, and click **Next**. Please see the figures below.



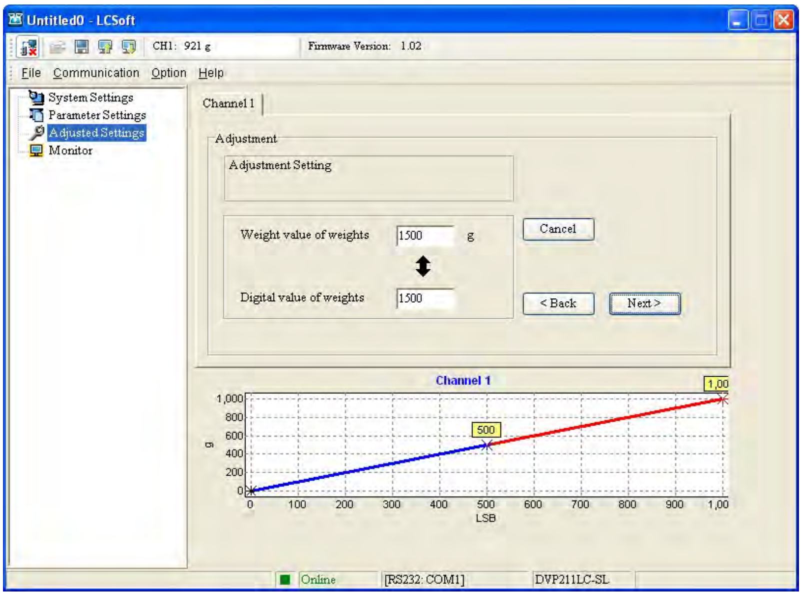


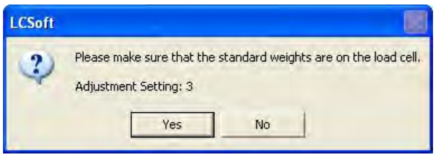
Step 5: Put a standard weight which weighs 1000 g on the load cell used. Type “1000” in the **Wight value of weights** box, type “1000” in the **Digital value of weights** box, and click **Next**. Please see the figures below.



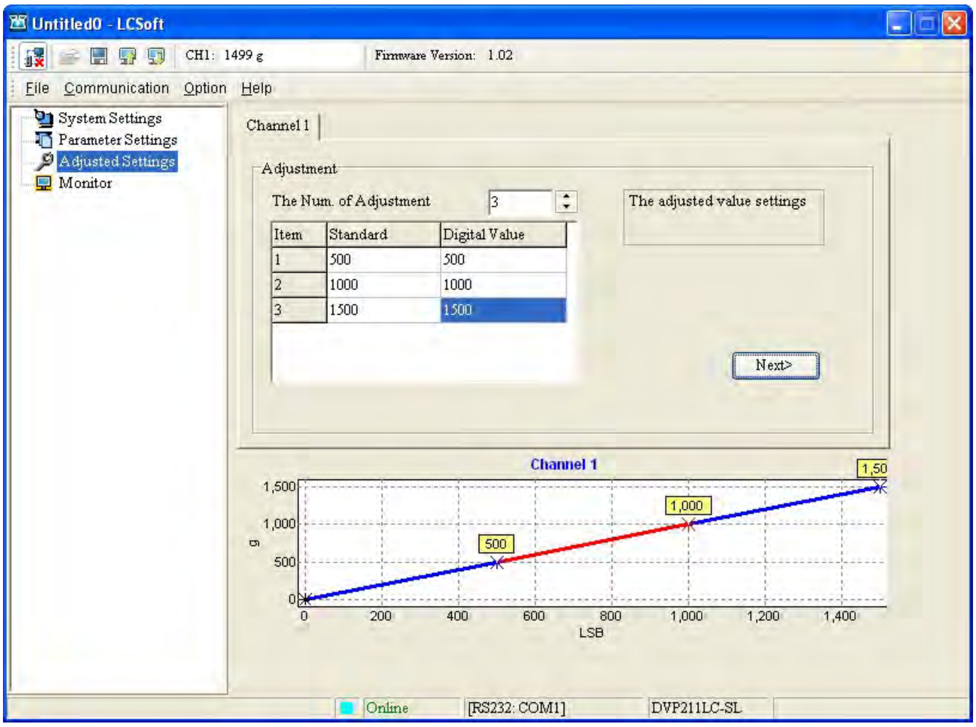


Step 6: Put a standard weight which weighs 1500 g on the load cell used. Type “1500” in the **Wight value of weights** box, type “1500” in the **Digital value of weights** box, and click **Next**. Please see the figures below.





Step 7: The adjustment made is complete, and a curve is displayed. Please see the figures below.



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12.11 Troubleshooting

When an error occurs in the left-side high-speed weighing (LC) module, an error indicator will start blinking. Once you see an error indicator starts blinking, you can use the FROM instruction to read the error codes stored in CR#51. The bit 0 to bit 15 indicates the error codes. It is possible to have two errors at the same time. 0 indicates normal and 1 indicates error. Refer to the following table for more the causes and the solutions for troubleshooting.

12.11.1 DVP01LC-SL / DVP02LC-SL

Bit No.	RUN LED	ERROR LED	Descripton	Solution
bit0	OFF	Blinking	The external voltage is abnormal	Check the power supply.
bit1	No change	Blinking	Hardware malfunction	Contact the factory.
bit2	No change	Blinking	CH1conversion error	Check the input signal of CH1
bit3	No change	Blinking	CH1 SEN voltage error	Check the wiring of CH1.
bit4	No change	Blinking	CH2 conversion error	Check the input signal of CH2
bit5	No change	Blinking	CH2 SEN voltage error	Check the wiring of CH2.

12.11.2 DVP201LC-SL / DVP202LC-SL / DVP211LC-SL

Bit No.	RUN LED	ERROR LED	Description	Solution
bit0	OFF	ON	The external voltage is abnormal	Check the power supply.
bit1	No change	ON	Hardware malfunction	Contact the factory
bit2	No change	Blinking	CH1 input exceeds measurement range or SEN voltage error	Check the wiring of CH1
bit3	No change	Blinking	CH1calibration error	CH1 recalibration, the calibration curve cannot be turned.
bit4	No change	Blinking	CH1 exceeds the upper weight limit	Check if the input signal of CH2 exceeds the upper weight limit.
bit5	No change	Blinking	CH1 no load	Status flag, non-error
bit6	No change	Blinking	CH1 measurement value is stable	Status flag, non-error
bit7	No change	Blinking	CH2 input exceeds measurement range or SEN voltage error	Check the wiring of CH2
bit8	No change	Blinking	CH2calibration error	CH2 recalibrates, the calibration curve cannot be turned.
bit9	No change	Blinking	CH2 exceeds the upper weight limit	Check if the input signal of CH2 exceeds the upper weight limit.
bit10	No change	Blinking	CH2 no load	Status flag, non-error
bit11	No change	Blinking	CH2measurement value is stable	Status flag, non-error

13

Chapter 13 DVP-S Series Left-Side High-Speed Communication Module

Table of Contents

13.1 DVPEN01-SL

13.1.1 Introduction

DVPEN01-SL is an Ethernet communication module for remote setting and communication through DVP-CPU project editing software. DVPEN01-SL features functions such as sending E-mail, automatic network correction for RTC in PLC, data exchange, etc. It supports MODBUS TCP communication protocol and can conduct remote monitoring by using SCADA (Supervisor Control and Data Acquisition) software or HMI (Human Machine Interfaces). DVPEN01-SL can be the master of MODBUS TCP, sending out MODBUS TCP instructions and controlling the peripheral equipment. In addition, under MDI/MDI-X auto-detection, it does not need to use a crossing cable. See the contents below for more detailed instructions on DVPEN01-SL module.

13.1.1.1 Function

- Auto-detects 10/100Mbps transmission speed
- MDI/MDI-X auto-detection
- Supports MODBUS TCP protocol (supports Master and Slave mode at the same time)
- Able to send out E-mails (Does not support TLS/SSL certificates)
- Auto-corrects the RTC in PLC through the Internet time correction function
- Supports point-to-point data exchange (Max. data exchange length: 200 bytes)
- Firmware version V2.18 and above (inclusive) support DVP-SV3 and DVP-SX3 hosts.

13.1.1.2 Specifications

- Internet interface

Item	Specifications
Interface	RJ-45 with Auto MDI/MDIX
Number of ports	RS-232 1 Port
Transmission method	IEEE802.3，IEEE802.3u
Transmission cable	Category 5e/UC-PRG030-20A（3M）
Transmission speed	10/100Mbps Auto-Detect
Network protocol*1	DHCP、SMTP、SNMP、NTP、MC Protocol、MODBUS TCP

*1. When installed on the left side of DVP-SV3 and DVP-SX3 hosts, SMTP, SNMP, and MC Protocol are not supported.

Item		Specification
MODBUS TCP	**Client: Maximum number of connections**	24（data exchange table） 2（CR data exchange function）
	Server: Maximum number of connections	16
	Maximum data length for a single connection	100 words
MC Protocol	**Communication type**	UDP
	Client: Maximum number of connections	10
	Server: Maximum number of connections	8
	Maximum data length for a single connection	100 words
RTU-EN01	**Maximum connection count*2**	4
IP filter function	**Number of entries in the whitelist.**	8

Item		Specification
SNMP	**Version**	SNMPv2
	Number of community	2
	Permissions	GET、GET/SET
SMTP （Email function）	**Number of E-mails**	4

*2. The mapping function using RTU-EN01 does NOT take up MODBUS TCP connection slots.

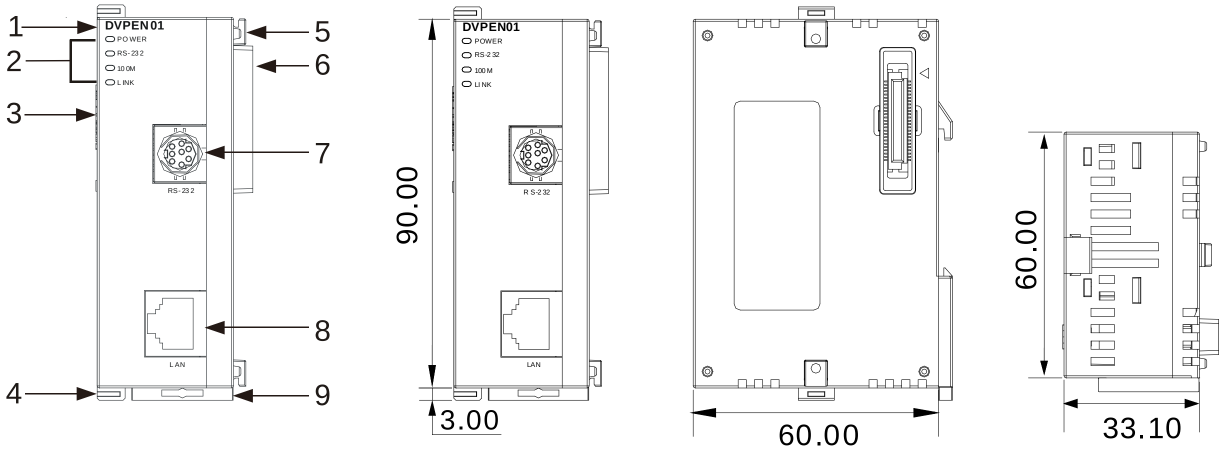
- **Serial communication interface**

Item	Specification
Interface	RS-232
Number of ports	1 Port
Function	Supports only parameter settings.
Transmission cable	UC-MS030-01A (3M) / UC-MS010-02A (1M) / UC-PRG020-12A (2M)

- **Electrical specifications**

Item	Specification
Power supply voltage	24VDC (-15%~20%) (Power is supplied by the internal bus of MPU.)
Power consumption	1.5W
Insulation voltage	500V
Weight (g)	92 (g)

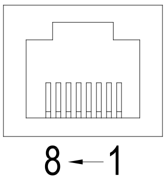
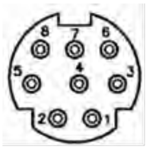
13.1.2 Module Profiles and Dimension



Unit: mm

No.	Name	Description
1	Model name	Module model number.
2	POWER LED indicator(Green)	Indicates the power status of the power supply ON: the power is on OFF: no power
	LINK indicator(Green)	ON: Network connection normal Blinking: Network in operation Off: Not connected to the network
	RS-232 indicator(Red)	Blinking: Data transmission in progress Off: No data transmission
	100M indicator(Orange)	ON: Ethernet transmission speed is 100Mbps OFF: Ethernet transmission speed is 10Mbps
3	Extension module connection port	Connect the modules.
4	Extension unit fixing clip	For securing the extension module.
5	Extension unit positioning hole	For positioning between modules.
6	Extension module connection port	Connect the PLC or the module.
7	RS-232communication port	For wiring RS-232 communication.
8	Ethernet communication port	For connecting Ethernet network.
9	DIN rail securing clip	Secure the modules on the set

13.1.3 Terminals

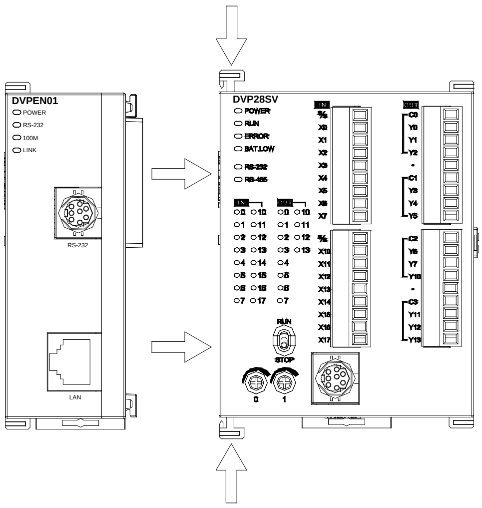
Ethernet（RJ-45）Pin Definition				
	Pin no.	Definition	Pin no.	Definition
	1	TX+	5	N/C
	2	TX-	6	RX-
	3	RX+	7	N/C
	4	N/C	8	N/C
RS-232 Pin Definition				
	Pin no.	Definition	Pin no.	Definition
	1	N/C	5	TX
	2	N/C	6	N/C
	3	N/C	7	N/C
	4	RX	8	GND

13.1.4 Installation and Wiring

13.1.4.1 Installation

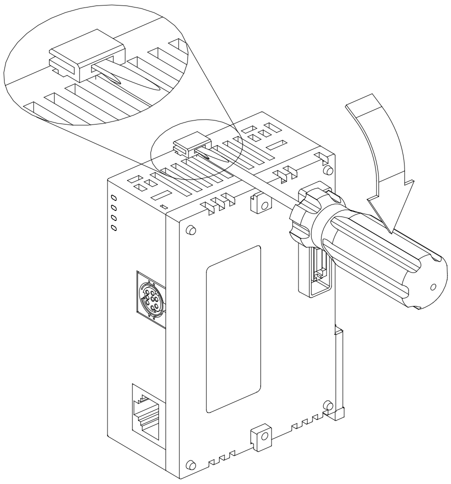
1. **Connecting PLC MPU to DVPEN01-SL:**

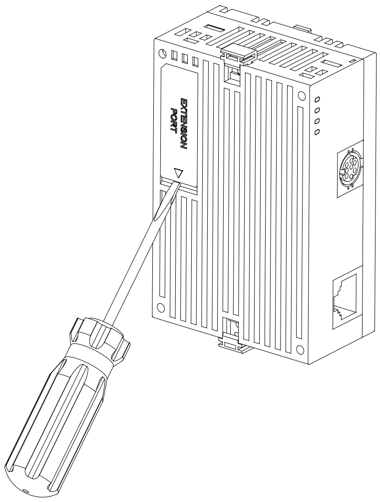
- Adjust the I/O module clip on the left side of the MPU
- Meet the I/O module port of the MPU with DVPEN01-SL as shown in the figure below.
- Fasten the I/O module clip on the left side of the MPU.



2. Connecting DVPEN01-SL to other I/O modules

To connect DVPEN01-SL with the other I/O module, lift the extension clip of the I/O module by a screwdriver and open the side cover.

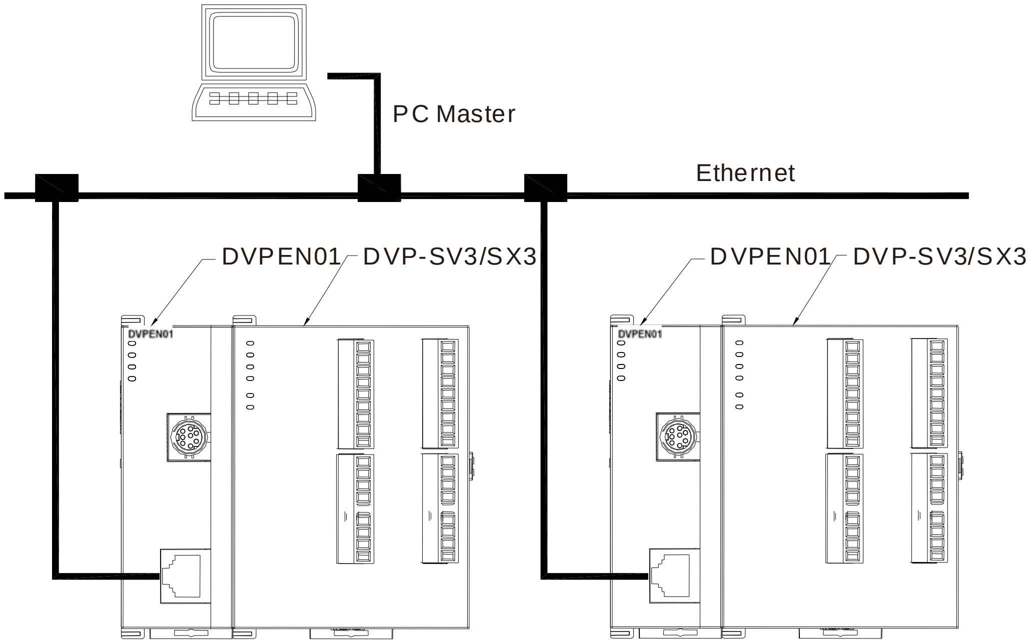




13.1.4.2 Wiring

Connect DVPEN01-SL to the Ethernet Hub by twisted pair cable CAT-5e. DVPEN01-SL has Auto MDI/MDIX function; therefore, DVPEN01-SL does not need to use a crossing cable between the PC and DVPEN01-SL.

Network connections between the PC and DVPEN01-SL:



13.1.5 Control Register

<table>
<tr><th colspan="2">CR#</th><th rowspan="2">Type</th><th rowspan="2">Content</th><th colspan="4" rowspan="2">Explanation</th></tr>
<tr><th>HW</th><th>LW</th></tr>
<tr><td></td><td>#0</td><td>R</td><td>Model name</td><td colspan="4">Read only; The model code of DVPEN01-SL = H’4050</td></tr>
<tr><td></td><td>#1</td><td>R</td><td>Firmware version</td><td colspan="4">Displaying the current firmware version in hex, e.g. V1.00 is indicated as H’0100.</td></tr>
<tr><td></td><td rowspan="3">#2</td><td rowspan="3">R</td><td rowspan="3">Communication mode</td><td colspan="4">0: Disabled; 1: Enabled</td></tr>
<tr><td></td><td>b0</td><td colspan="3">Setting for MODBUS TCP mode</td></tr>
<tr><td></td><td>b1</td><td colspan="3">Setting for data exchange mode</td></tr>
<tr><td></td><td>#3</td><td>W</td><td>Trigger E-Mail Event 1</td><td colspan="4" rowspan="4">Trigger email sending</td></tr>
<tr><td></td><td>#4</td><td>W</td><td>Trigger E-Mail Event 2</td></tr>
<tr><td></td><td>#5</td><td>W</td><td>Trigger E-Mail Event 3</td></tr>
<tr><td></td><td>#6</td><td>W</td><td>Trigger E-Mail Event 4</td></tr>
<tr><td colspan="8">CR#3 ~ CR#6: After the E-Mail is sent, the CR will automatically be set to 0. Please use differential commands to trigger CR#3 ~ CR#6 to avoid continual sending of e-mails.</td></tr>
<tr><td></td><td>#7</td><td>R</td><td>Status of E-Mail 1, 2</td><td>b0~b7</td><td>Status of E-Mail 2</td><td>b8~b15</td><td>Status of E-Mail 1</td></tr>
<tr><td></td><td>#8</td><td>R</td><td>Status of E-Mail 3, 4</td><td>b0~b7</td><td>Status of E-Mail 4</td><td>b8~b15</td><td>Status of E-Mail 3</td></tr>
<tr><td colspan="8">CR#7 ~ CR#8: E-Mail Status. See the table below.</td></tr>
</table>

CR value	E-Mail status	CR value	E-Mail status
0	Not being sent	11	Incorrect e-mail address of recipient
1	Processing	12	SMTP server communication error
2	Successfully sent	13	No available TCP connections
10	Unable to connect to SMTP server		

<table>
<tr><td></td><td>#9</td><td>R/W</td><td>Code after title of E-Mail 1</td><td rowspan="4">Filled in by the user. The subject of the email will be included and sent along with the email.</td></tr>
<tr><td></td><td>#10</td><td>R/W</td><td>Code after title of E-Mail 2</td></tr>
<tr><td></td><td>#11</td><td>R/W</td><td>Code after title of E-Mail 3</td></tr>
<tr><td></td><td>#12</td><td>R/W</td><td>Code after title of E-Mail 4</td></tr>
<tr><td></td><td>#13</td><td>R/W</td><td>Data exchange enabled flag</td><td>0: Disabled
1: Trigger the CR data exchange function once
2: Continuously execute the data exchange table
3: Execute the data exchange mode table once.</td></tr>
<tr><td colspan="5">CR#13:</td></tr>
</table>

CR content	Description
0	Disabled
1	Trigger the CR data exchange function once
2	Use when the software setting startup condition is 'Program Start'. After writing, continue executing data exchange until CR#13 is set to 0 to stop.
3	Use when the software setting startup condition is 'Program Start'. After writing, perform one data exchange. When execution finished, automatically set CR#13 to 0. Supported in version V2.06 and later.

<table>
<tr><td></td><td>#14</td><td>R</td><td>Data exchange status register.</td><td>Displays the status of CR data exchange function:
0: Data not received
1: Data exchange in progress
2: Data exchange successful</td></tr>
</table>

CR# HW	CR# LW	Type	Content	Explanation
				3: Data exchange failed
CR#14: 0 => data not received; 1 => data exchange being processed; 2 => data exchange successful; 3 => data exchange fails.				
	#15	R/W	RTU mapping enabled flag	1: Enabled; 0: Disabled (default) Supported in firmware versions V2.0 and later.
	#16	R/W	Connection status for RTU-EN01 mapping function.	b0: Connection status of RTU slave 1 b1: Connection status of RTU slave 2 b2: Connection status of RTU slave 3 b3: Connection status of RTU slave 4
	#17	R/W	Data exchange cycle time	The communication minimum update period (ms) for configuring the data exchange mode table can be set. The default value is 0, indicating that the next record is sent immediately upon receipt without waiting for a period.
#19	#18	R	Communication error status for the data exchange table.	CR#19 b0 ~ b15: Error in data exchange table 1 ~ 16 CR#18 b0 ~ b7: Error in data exchange table 17 ~ 24 1: Error occurs
21	20	R/W	Initiate control for the data exchange item.	CR#21 b0-b15: Activation status of data exchange tables 1 ~ 16. CR#20 b0-b7: Activation status of data exchange tables 17 ~ 24. A status of 1 indicates that it is activated.

CR#18~CR#21：

Corresponding to the data exchange table numbers as follows:

CR#19 & CR#21																
bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
NO.	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
CR#18 & CR#20																
bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	bit	b5	b4	b3	b2	b1	b0
NO.	Reserved								24	23	22	21	20	19	18	17

CR# HW	CR# LW	Type	Content	Explanation
	22	R/W	TCP/IP RT(Retransmission Timeout) Setting	The TCP retransmission timeout can be adjusted. When a TCP packet exceeds this time, it will be automatically retransmitted. If the response time from the slave is longer, this parameter can be increased in order to reduce the number of retransmitted packets. Unit: ms, Range: 20~3000 ms, Default value: 20 ms.
#26	#25	R/W	Remote IP address for CR data exchange function.	Configure the IP address of the slave device for CR data exchange.
CR#25 ~ CR#26: Before setting up the destination IP address, set CR#28 to 0. Ex: If the user wants to set the destination IP address to 192.168.0.2, write H'0002 to CR#25 and H'C0A8 to CR#26. (K192 = H'C0, K168 = H'A8, K0 = H'00, K2 = H'02)				
	#27	R/W	Data exchange table synchronous read/write function.	Configure the MODBUS TCP function code used by the data exchange table.
CR#27: The default value is 0. When both read and write are configured, use function code 0x17 for data exchange.				

CR# HW	CR# LW	Type	Content	Explanation
When set to 1, use function code 0x03 for reading, function code 0x06 for single write, and function code 0x10 for multiple writes				
	#28	R/W	Selection of CR data exchange IP list.	Select the slave IP address for CR data exchange from the data exchange table.
CR#28: The default value is 0, using the values of CR#25 and CR#26 as the slave IP address. When set to the slave station number in the data exchange table (i.e., K1~K255), it will search the IP address corresponding to that station number in the data exchange table list.				
#29~#48		R/W	Transmission buffer for CR data exchange.	Starting address of the storage area for transmitting data in the CR data exchange function.
#49~#68		R	Reception buffer for CR data exchange.	Starting address of the storage area for receiving data in the CR data exchange function.
	#81	R/W	Read address for CR data exchange.	Starting address of the buffer for transmitting data from the slave in the CR data exchange function
	#82	R/W	Read data length for CR data exchange	Configure the number of registers for reading data in the CR data exchange function (range: K1~K100).
	#83	R/W	Received address for CR data exchange	Starting address of the buffer for receiving data at the master station in the CR data exchange function.
	#84	R/W	Written address for CR data exchange	Starting address of the buffer for receiving data from the slave in the CR data exchange function.
	#85	R/W	Written data length for CR data exchange	Configure the number of registers for transmitting data in the CR data exchange function (range: K1~K100).
	#86	R/W	Sent address for CR data exchange	Starting address of the buffer for transmitting data at the master station in the CR data exchange function.
CR#81~CR #86: Configure the MODBUS address for the local (master station) CR data exchange function's transmission buffer. Unless there are specific requirements, it is not recommended to use this method. For example, write H1000 (D0) to CR#81, write K1 to CR#82, fill in H1064 (D100) to CR#83; when the data exchange is successful, the value of slave D0 will be written to master D100. Write H1002 (D2) to CR#84, write K4 to CR#85, fill in H1008 (D8) to CR#86; when the data exchange is successful, the values of local (master) D8~D11 will be written to slave D2~D5. It is enabled to simultaneously perform both transmit and receive functions. If both CR#82 and CR#85 are 0, the CR data exchange transmission buffer (CR#29~CR#68) and the default number of registers (K20) will be used.				
	#87	R/W	Mode of setting IP address	0: Static IP address 1: DHCP
#89	#88	R/W	IP address	Setting an IP address If an IP address is 192.168.1.5, set the value in CR#88 be H0105, and the value in CR#89 be HC0A8.
#91	#90	R/W	Netmask	Setting a netmask If a netmask is 255.255.255.0, set the value in CR#90 be HFF00, and the value in CR#91 be HFFFF.
#93	#92	R/W	Gateway IP address	Setting a gateway IP address If a gateway IP address is 192.168.1.5, set the value in CR#92 be H0105, and the value in CR#93 be HC0A8.
	#94	R/W	Enabling the setting of an IP address	Executing the setting of an IP address. When set to 1, execute the IP configuration function. After configuration is complete, the CR value is automatically set back to 0.
	#95	R	Status of setting an IP address	Showing the status of setting an IP address

<table>
<tr><th colspan="2">CR#</th><th rowspan="2">Type</th><th rowspan="2">Content</th><th rowspan="2">Explanation</th></tr>
<tr><th>HW</th><th>LW</th></tr>
<tr><td></td><td></td><td></td><td></td><td>0: Not executed.
1: In progress
2: IP configuration completed
Please verify the legality of the IP address and ensure that the IP address and default gateway are on the same subnet.</td></tr>
<tr><td></td><td>#102</td><td>R/W</td><td>MC Protocol UDP port</td><td>UDP communication port number for the MC Protocol data exchange slave device, default value is 1025.</td></tr>
<tr><td>#105</td><td>#104</td><td>R</td><td rowspan="2">MAC Address</td><td rowspan="2">Assuming the MAC address is 00 18 23 AA BB CC, set
CR#104=H0018，CR#105=H23AA，
CR#106=HBBCC</td></tr>
<tr><td></td><td>#106</td><td>R</td></tr>
<tr><td></td><td>#111</td><td>R/W</td><td>bit processing mode</td><td>Configure the MODBUS TCP command transmission function bit mode:
0: Use 16-bit mode (default)
1: Use 8-bit mode</td></tr>
<tr><td></td><td>#112</td><td>R/W</td><td>MODBUS TCP keep-alive time-out</td><td>Unit: second
Range: 0 ~ 65535, setting it to 0 is equivalent to 65535.
The default value is 30s. If the connection is idle for more than the connection keep-alive time, the idle connection will be terminated.</td></tr>
<tr><td></td><td>#113</td><td>R</td><td>Status of MODBUS TCP connection</td><td>Displays the current TCP connection status for MODBUS TCP:
0: The current TCP connection is closed.
1: TCP connection has been established.</td></tr>
<tr><td></td><td>#114</td><td>R/W</td><td>MODBUS TCP communication time-out</td><td>Set the communication timeout period (ms) for the MODBUS TCP command transmission function.</td></tr>
<tr><td></td><td>#115</td><td>R/W</td><td>Sending MODBUS TCP command</td><td>Set the data transmission mode for the MODBUS TCP command transmission function.</td></tr>
<tr><td colspan="5">CR#115:
When set to 1, activate the data transmission for the MODBUS TCP command transmission function. After data transmission is complete, the CR value is automatically set back to 0. Use rising or falling edge contacts to trigger.
When set to 2, activate the data transmission for the MODBUS TCP command transmission function. After data transmission is complete, the TCP connection will be maintained, awaiting the next transmission.
When set to 3, it will terminate the current TCP connection.</td></tr>
<tr><td></td><td>#116</td><td>R/W</td><td>MODBUS TCP status</td><td>Current status of the MODBUS TCP mode
0: Data not received
1: Data exchange in progress
2: Data exchange successful
3: Data exchange failed</td></tr>
<tr><td>#118</td><td>#117</td><td>R/W</td><td>Destination IP in MODBUS TCP mode</td><td>Configure the IP address of the remote communication device for the MODBUS TCP command transmission function. Refer to the explanation for CR#25 and CR#26 for the configuration method.</td></tr>
<tr><td></td><td>#119</td><td>R/W</td><td>Data length in MODBUS TCP mode</td><td>Configure the length of data in the communication in MODBUS TCP mode
In 8-bit mode, it ranges from K1 to K100
in 16-bit mode, it ranges from K1 to K200.</td></tr>
<tr><td colspan="2">#120~#219</td><td>R/W</td><td>Buffers for data transmission in MODBUS TCP mode</td><td>Buffers for sent/received data in MODBUS TCP mode</td></tr>
</table>

CR#		Type	Content	Explanation
HW	LW			
	#222	R	Number of MODBUS TCP Server connections	Maximum: 16
	#223	R	Number of MODBUS TCP Client connections	Maximum: 26

CR#222~223:

- Supported in firmware version V2.18 and above.
- MODBUS TCP Client and Server quantities are counted separately.
- The number of MODBUS TCP Server connections includes connections used by project software monitoring.

HW	LW	Type	Content	Explanation
	#229	R	Number of RTU corresponding function client connections	Maximum: 4
	#230	R	Number of TCP connections	Maximum:88

CR#229~230:

- Supported in firmware version V2.18 and above.
- RTU corresponding function connections and MODBUS TCP connections are counted separately.
- TCP connection count includes all connections using the TCP protocol (including but not limited to MODBUS TCP, RTU), totaling both Client and Server connections.

HW	LW	Type	Content	Explanation
	#231	R/W	TCP/IP Reset	The default value is 0. When set to 0x1013, reset the TCP/IP function.

CR#231:

- Supported in firmware version V2.18 and above.
- Users must clear the value of CR#231 on their own.
- It will interrupt all existing communication. Please use it with caution.

HW	LW	Type	Content	Explanation
	#251	R	Error code	Each bit represents a specific error condition.

CR#251:

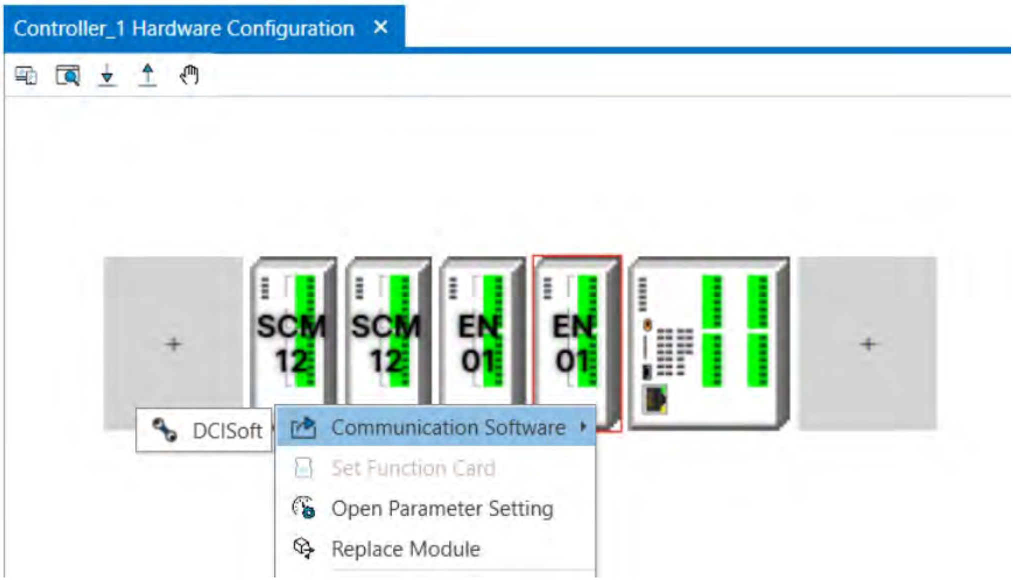
Bit	Error status
0	No network connected.
1	IP setting error
2	CR#13 is configured for data transmission, but data exchange is disabled.
3	CR#13 is configured for data transmission, but data exchange mode is not activated.
4	NTP-Server connection failed.
7	SMTP-Server connection faile.d
8	DHCP did not obtain correct network parameters.

Symbols:
R: Able to read data through the use of FROM instruction; W: Able to write data through the use of TO instruction
The No. for left-side high-speed I/O modules: 100 ~ 107 (m1 = 100 ~ 107)

13.1.6 Software Setting

This section gives instructions on how to set DVPEN01-SL by DCISoft and explanations on each setup page. Before you start a setup page, you have to select Ethernet in the Communication Setting window. Next, you can search by IP address or use Auto-Search. You also can open the setup page for DVPEN01-SL by RS-232. DVPEN01-SL is set by UDP port 20006; therefore, you have to be aware of the relevant settings of the firewall.

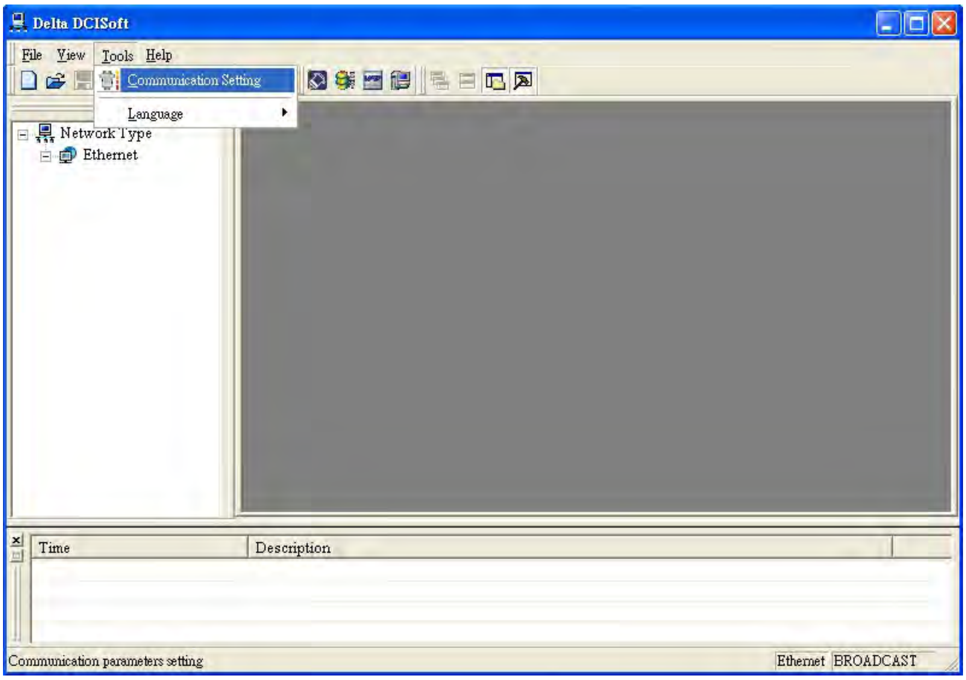
When installed on the left side of the DVP-SV3/SX3 main unit, you can also right-click on the module icon on the hardware configuration page of DIADesigner and open DCISoft.



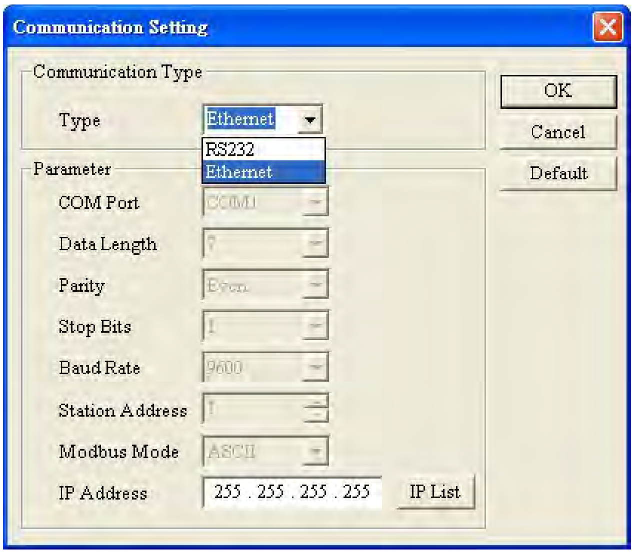
13.1.6.1 Communication & Modules Searching Setting

- **Communication settings**

1. Open DCISoft in your PC and click on **Communication Setting**

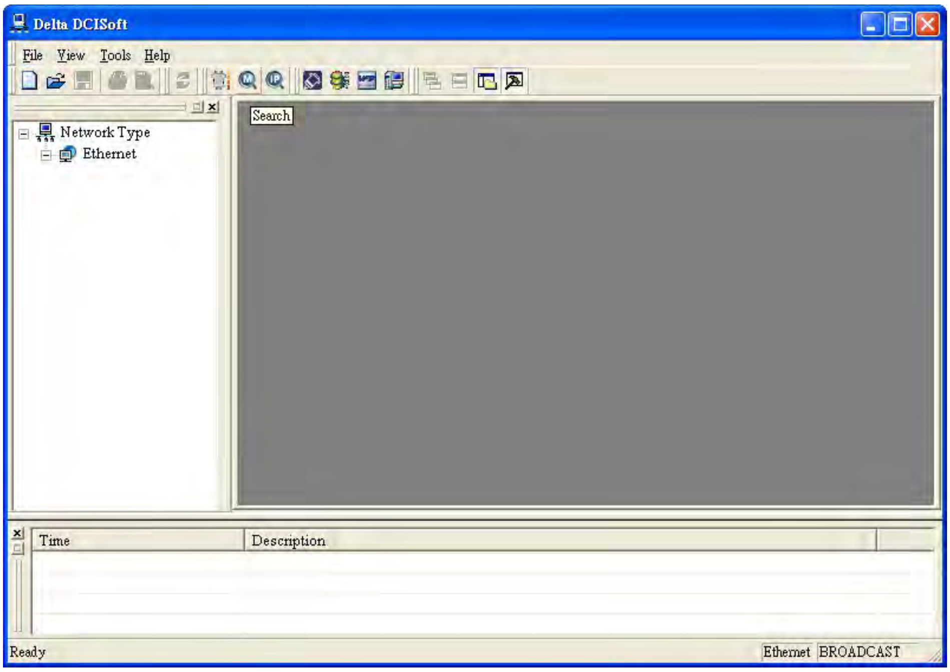


2. Select **Ethernet** as the transmission type.



- **Broadcast search**

1. Click Search in DCISoft to search for all Delta Ethernet products on the network. The window on the left-hand side shows the models found, and the window on the right-hand side displays the device list of all models.



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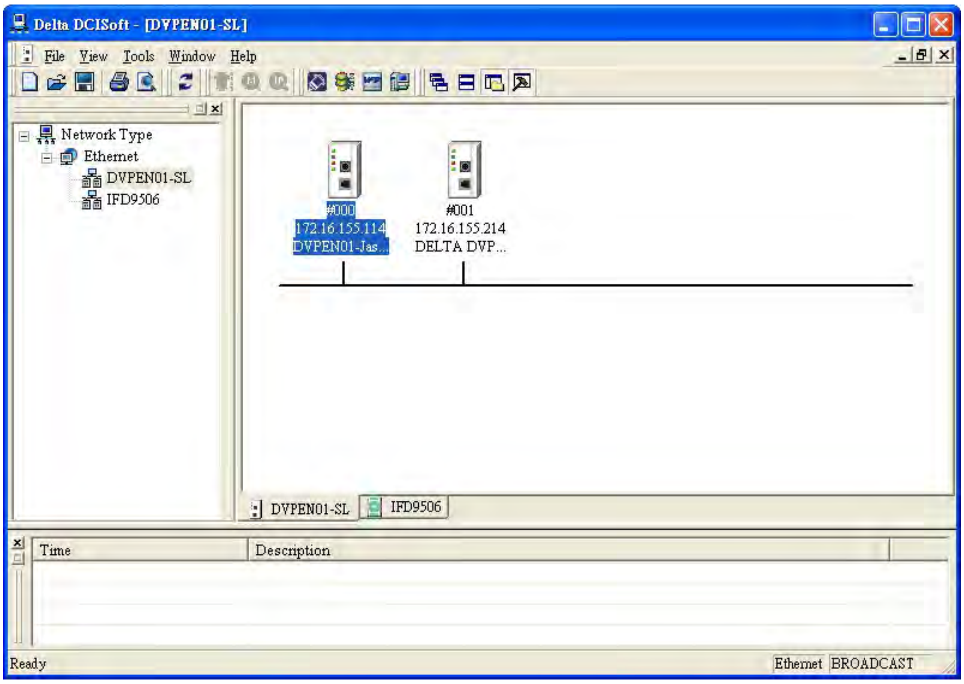
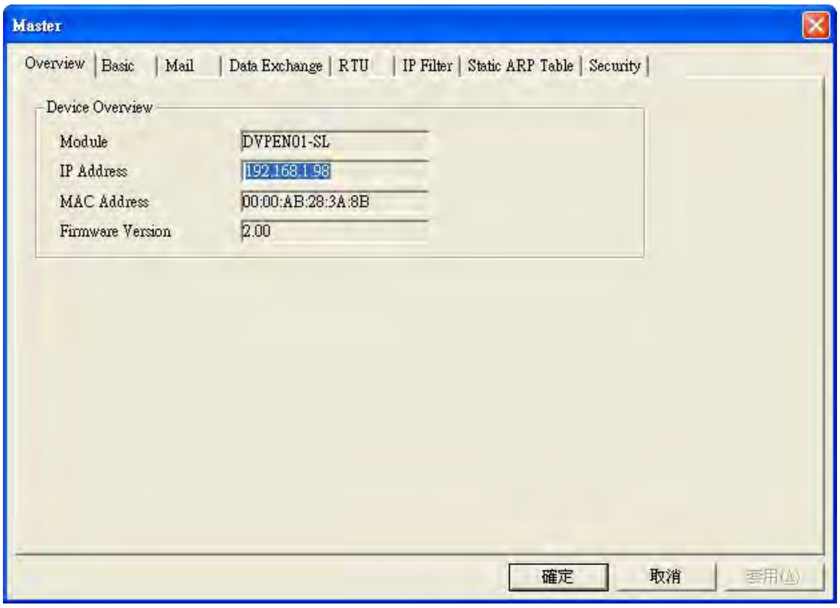
2. Click a model on the left-hand side, and you will see the device list of the model selected on the right-hand side. Click the device to be set to enter the setup page.

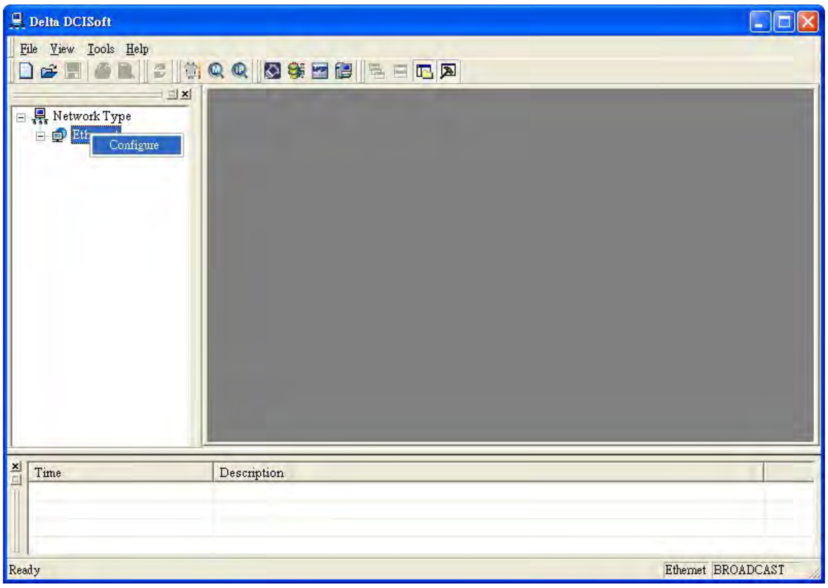


3. You will see the basic setup page as follow.

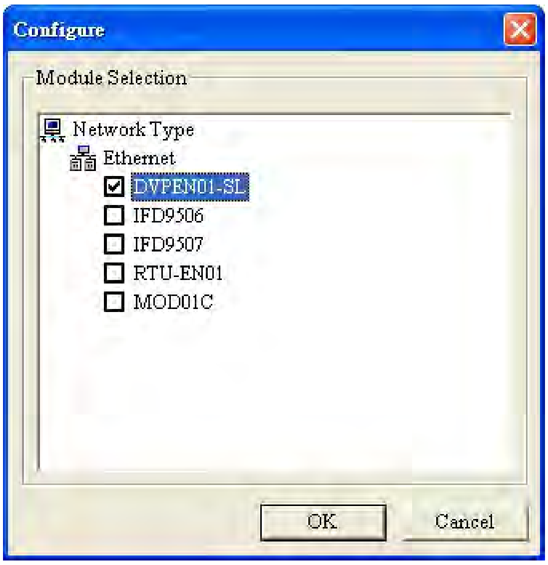


- Designating a model to search

1. Right click **Ethernet** on the left-hand side window and click **Configure** to designate a model to search for.



2. After configuring a model, select the DVPEN01-SL checkbox and click OK to auto-search for DVPEN01-SL modules on the network.



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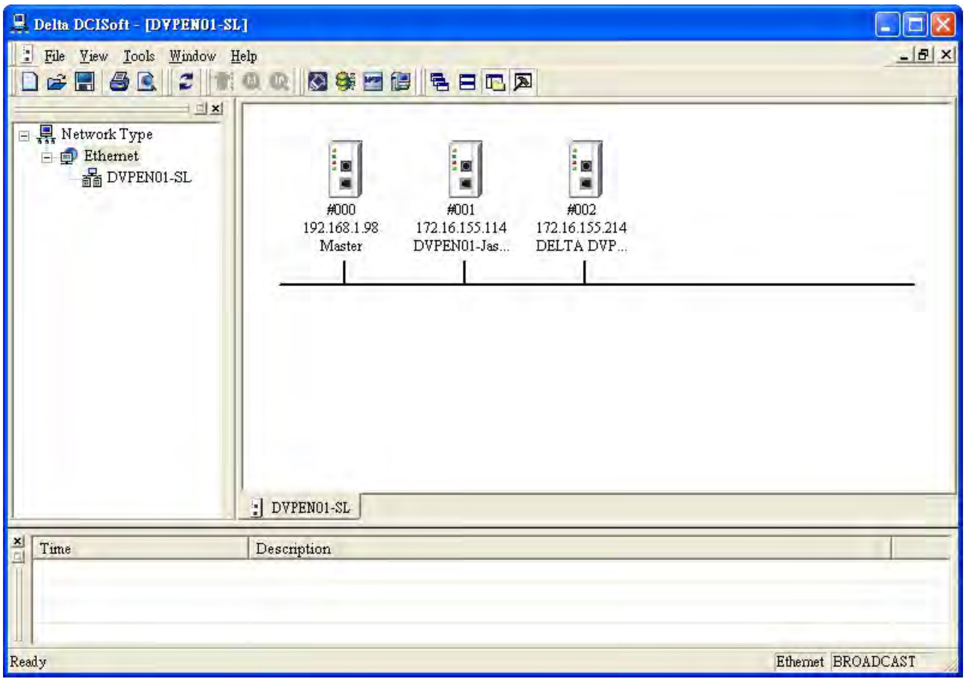
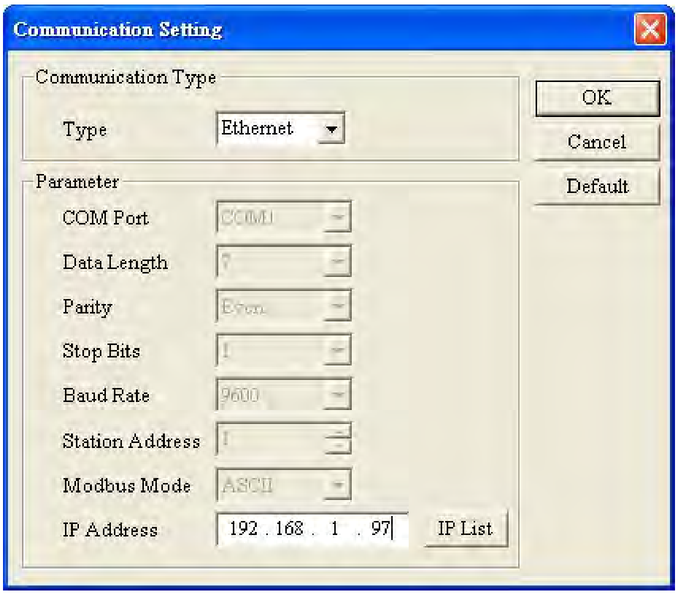
3. List of the current DVPEN01-SL modules

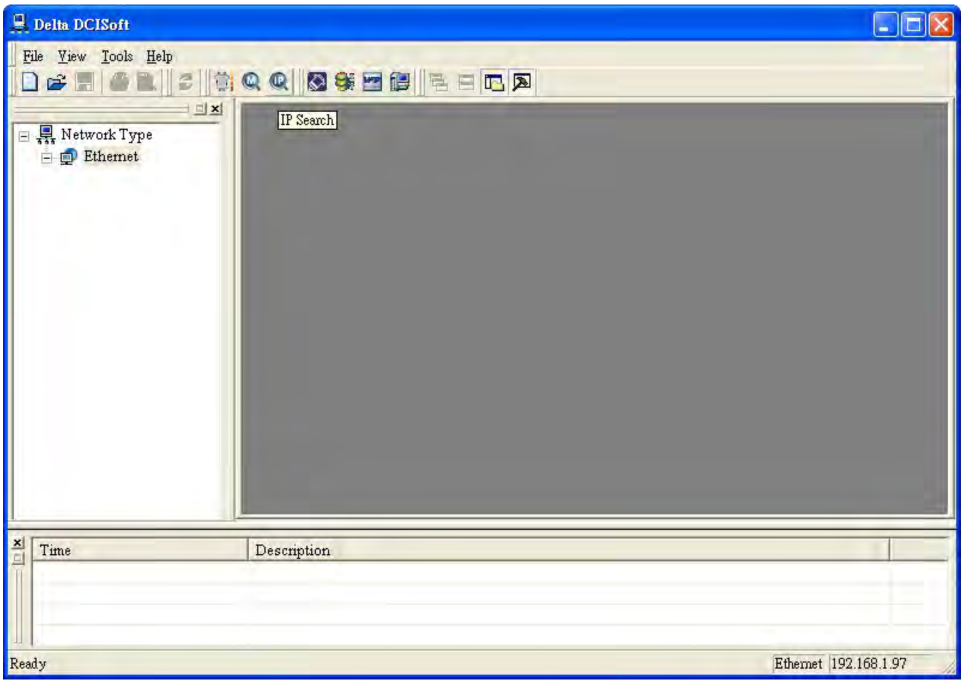


- Searching by IP address

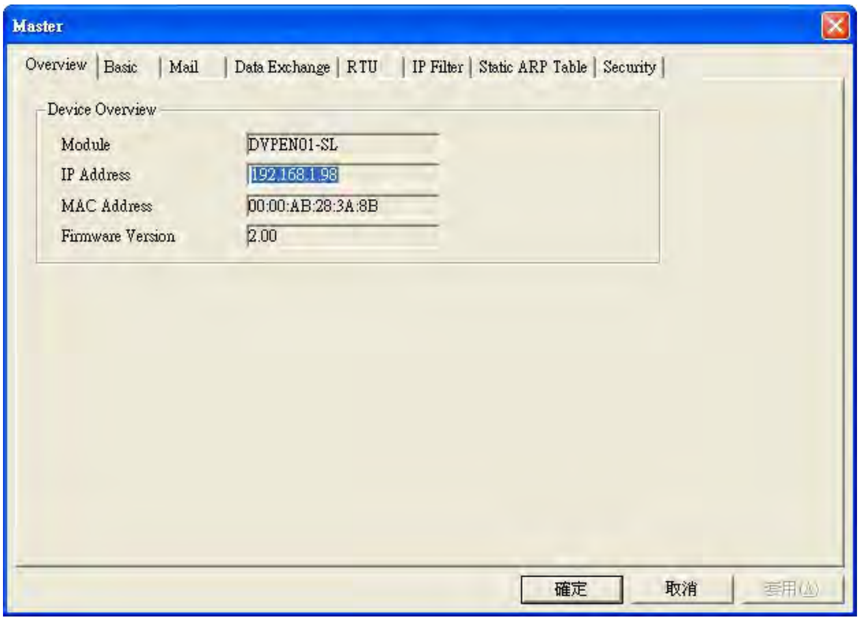
1. Select Ethernet in the Communication Type section and enter the IP address. Click OK



2. Click **IP Search** to start searching for the designated IP address.

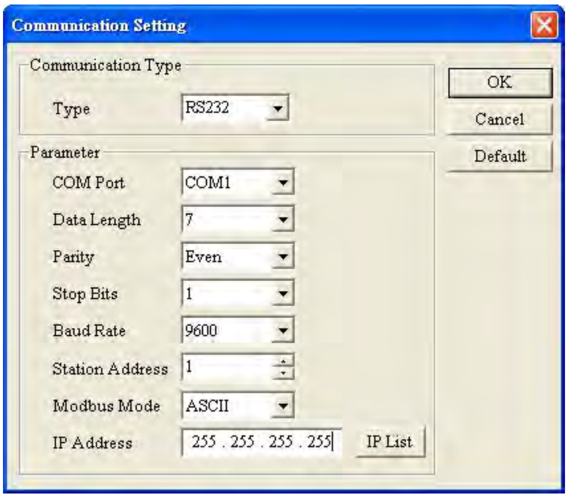


3. The DVPEN01-SL module found will be displayed in the right-hand side window. Double click to enter the setup page.



- **Opening the DVPEN01-SL setup page by RS-232**

1. Select RS232 as the transmission type in the Communication Setting window. You will have to designate a communication port. When DVPEN01-SL is searched by RS-232, you do not need to set the parameters (i.e. data length, parity, stop bits and baud rate)

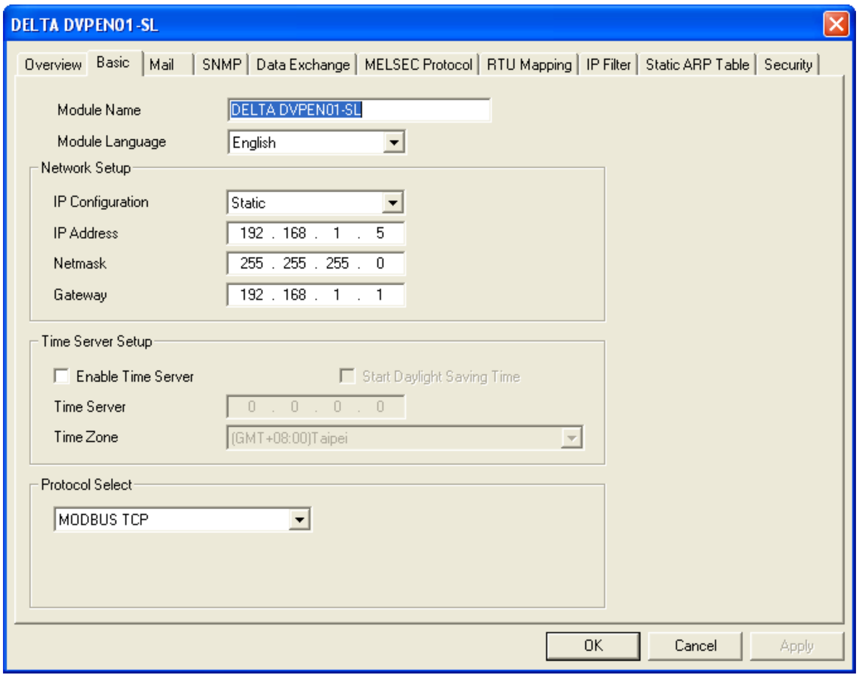


2. After setting the communication port, click Search. If the searching is successful, the setup page for DVPEN01-SL will open automatically.

13.1.6.2 Basic Settings

The basic settings include parameters as module name, language, enabling MODBUS TCP and time correction.

- Basic settings



1. **Module Name**

   There can be many DVPEN01-SL modules in the network. Thus, you can set a module name for each module to identify the module when you need to use them.

2. **Module Language**

   You can select a language for each module name, and the windows will be displayed in the selected language.

3. **Enable** MODBUS **TCP**

   To enable or disable MODBUS TCP. When MODBUS TCP is disabled, WPLSoft will not be able to upload or download.

4. **Enable Time Server**

   DVPEN01-SL adopts NTP (Network Time protocol), which means it can acquire correct time automatically from the time server in the network and correct the RTC in the MPU every fixed period of time to ensure correct time in the MPU. The **Enable Time Server** is unselected by default.

5. **Start Daylight Saving Time**

   Daylight Saving Time; also known as summer time is a conventional local time adopted by many countries in the world on a seasonal basis. Most commonly DST is obtained by adjusting the official local time forward, by one hour, for the spring, summer, and early autumn periods. Daylight Saving Time is not implemented in Taiwan; therefore, you do not need to check this item.

6. **Time Server**

   IP address of the time server. You can acquire correct time from the time server to correct the time in the MPU.

7. **Time Zone**

   A time zone is a region of the Earth that has adopted the same standard time, usually referred to as the local time. Most adjacent time zones are exactly one hour apart, and by convention compute their local time as an offset from Greenwich Mean Time (see also UTC). Standard time zones can be defined by geometrically subdividing the Earth's spheroid into 24 lunes (wedge-shaped sections), bordered by meridians each 15° of longitude apart. The local time in neighboring zones is then exactly one hour different. However, political and geographical practicalities can result in irregularly shaped zones that follow political boundaries or that change their time seasonally (as with daylight saving time), as well as being subject to occasional redefinition as political conditions change. You should choice the Time zone that you are.

8. **Protocol Select**

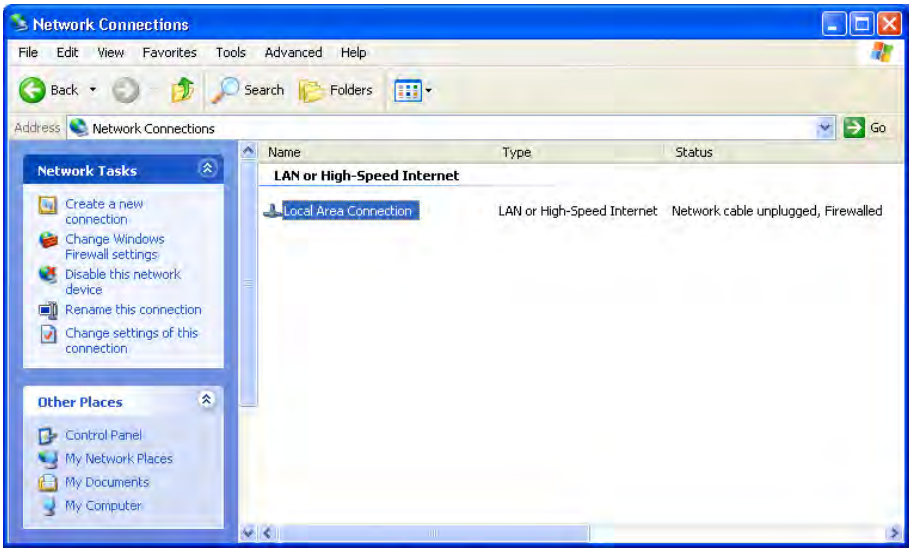
   DVPEN01-SL supports MODBUS TCP and the Mitsubishi MELSEC protocol in a UDP mode. The default setting is MODBUS TCP.

13.1.6.3 Network Settings

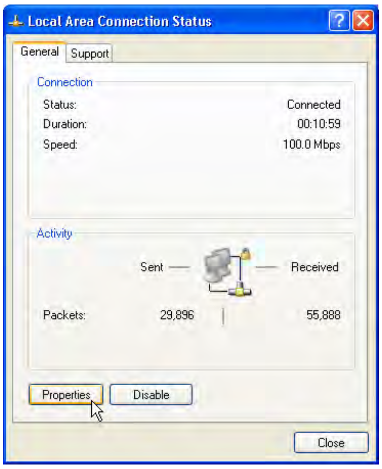
The first step for all the network equipment to connect to the network is to have its own IP address (Internet Protocol). The IP address is like a number for every network equipment to be identified in the network

- **Setting the static IP address of the PC**

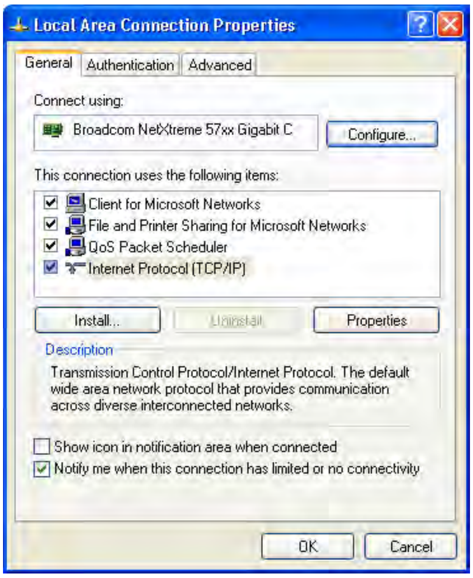
1. Enter the Control Panel window→ Enter the Network Connections window. Click on Local Area Connection.



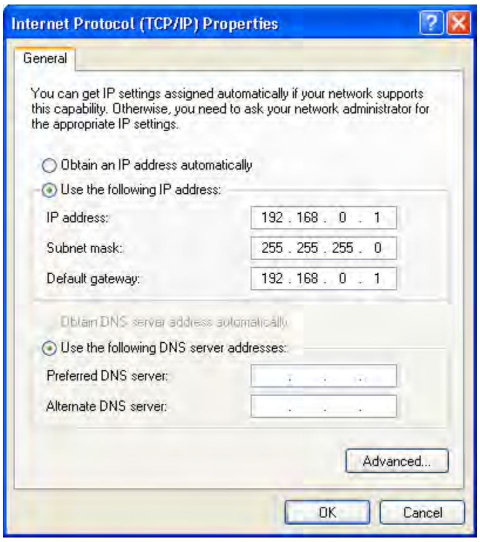
2. You will see the Local Area Connection Status window. Click on Properties.



3. Click on Internet Protocol (TCP/IP).

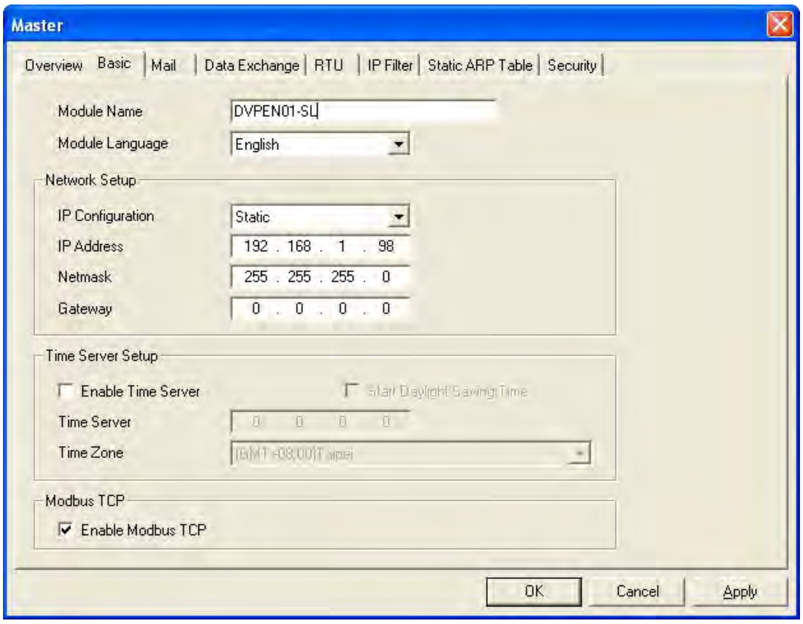


4. Enter 192.168.0.1 into the IP address box. Click on OK to complete the IP address setting of the PC.



13

- **Setting the DVPEN01-SL network**



1. IP Configuration:

   There are two types of IP address, static IP addresses and DHCP.

   Static IP address: Preset or manually modified by the user.

   DHCP: Automatically updated by the server. There has to be a server in the LAN.

IP	Explanation
Static	Enter the IP address, subnet mask and gateway.
DHCP	DHCP server offers the IP address, subnet mask and gateway.

2. IP Address:

   IP address is the location of the equipment in the network. Every equipment connected to the network has to have an IP address. Incorrect IP address will result in connection failure on the equipment or even other equipment. Ask your ISP for IP address setup. The default IP address for DVPEN01-SL is 192.168.1.5.

3. Netmask:

   Subnet mask is an important parameter for setting the subnet, used for checking if the destination IP address and the local equipment are in the same subnet. If not, the equipment will send the packet to the gateway, and the gateway will send the packet to another subnet. Incorrect setting may cause the destination equipment unable to communicate with DVPEN01-SL. To check whether the setting is correct, conducting a bitwise AND operation on one's own IP and the destination device's IP with their respective subnet masks. If the two values are identical, they are within the same subnet. The default subnet mask of DVPEN01-SL is 255.255.255.0.

4. Gateway:

   Gateway is the gate for two different subnets, allowing the two ends in different subnets to communicate. For example, if the LAN has to be connected to WAN, it will need a gateway to bridge the communication. The IP address of the gateway has to be in the same subnet as DVPEN01-SL. The default gateway IP address of DVPEN01-SL is 192.168.1.1.

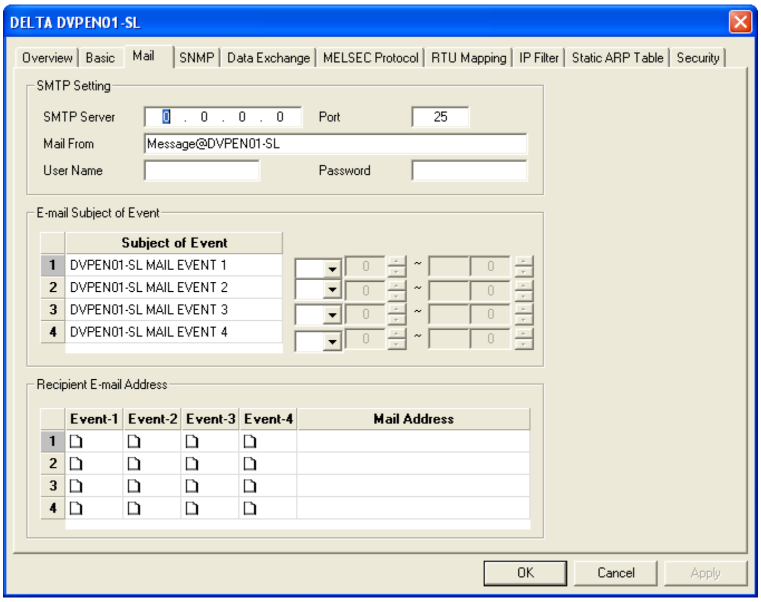
13.1.6.4 Emails Setting

DVPEN01-SL has E-mail functions for the user to pre-save a segment of text messages, which can be a descriptive message or error message, into the subject of the E-mail. When the E-mail is triggered, DVPEN01-SL will send the messages to the user by E-mail.

DVPEN01-SL does not support TLS/SSL encrypted communication. Please ensure to verify the communication specifications of your email server before use.

Provide four sets of E-Mail current value information. Users can define the registers or bit information they want to read. When a trigger occurs, DVPEN01-SL will retrieve the current values set for the specified registers or bits and add them to the E-Mail. Each set provides a maximum of 100 consecutive register information. The introduction is as follows:

- **Mails Setting**



1. **SMTP Setting**

   The E-mail will first be sent to SMTP server, and SMTP server will send it to the designated address. For example, assume there is an E-mail to be sent to test@delta.com.tw, and the SMTP server is 172.16.144.122. The E-mail will be sent to SMTP server first, and the server will further send it to the recipient test@delta.com.tw.

   The setting boxes are described below.

   A. SMTP Server: Setting the IP address of the SMTP server.

   B. Port: Entering the port of the SMTP server (The default value is 25.)

   C. Mail From: Setting the mail address used to send E-mails (63 characters at most can be entered.)

   D. Username: Account used to log in to the SMTP server.

   E. Password: Password used to log in to the SMTP server.

2. **E-mail Subject of Event**

   You can enter text message in the column, and the message will be placed in the subject of the E-mail and sent to the recipient. DVPEN01-SL is able to contain 1~4 E-mail subjects (max. 63 English characters are allowed).

   You can select additional information for the E-mail. Every E-mail is able to contain the present values in 100 consecutive registers.

3. **Recipient E-mail Address**

   You can enter 4 E-mail addresses. One mail can be sent to 4 addresses (max. 63 English characters are allowed).

4. **Selecting recipients**

   After you have set all the parameters for the E-mail, you will need to select recipients. The E-mail will be sent to the designated recipients when the E-mail is triggered. The triggering condition is set when control registers (CR#3~CR#6) are configured to 1.

5. See section 13.1.7.7 for more details and examples.

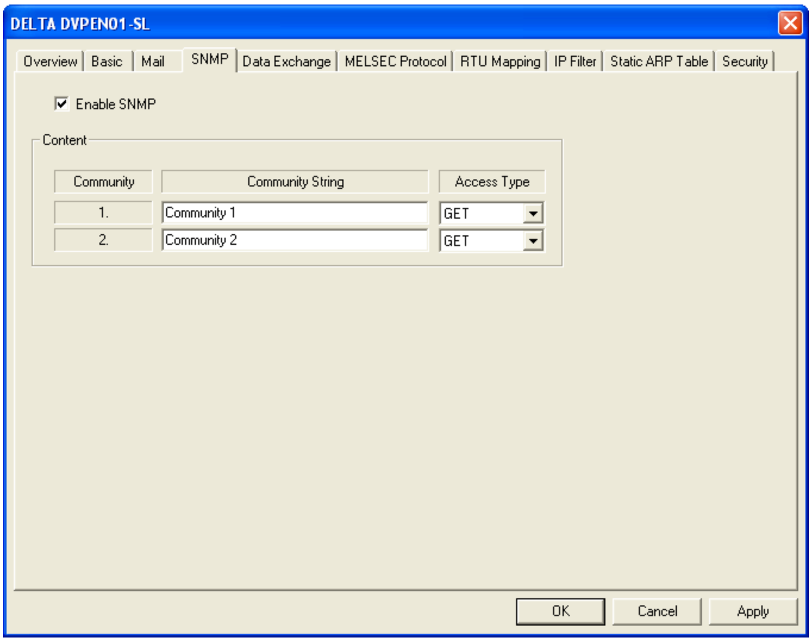
Note:

To correctly send out E-mails, there has to be a SMTP server in the network. When we send out an E-mail, the mail will be sent to SMTP server first, and the server will further send the mail to the designated address.

13.1.6.5 SNMP

SNMP is a simple network management function. Users can read and control the registers in PLC by means of a SNMP network management tool. (DVPEN01-SL version 2.06 and above support this function.

- SNMP Setting



1. **Enable SNMP**: Disable/enable the SNMP function.

2. **Community**

   Users can set two communities. The relevant setting boxes are described below.

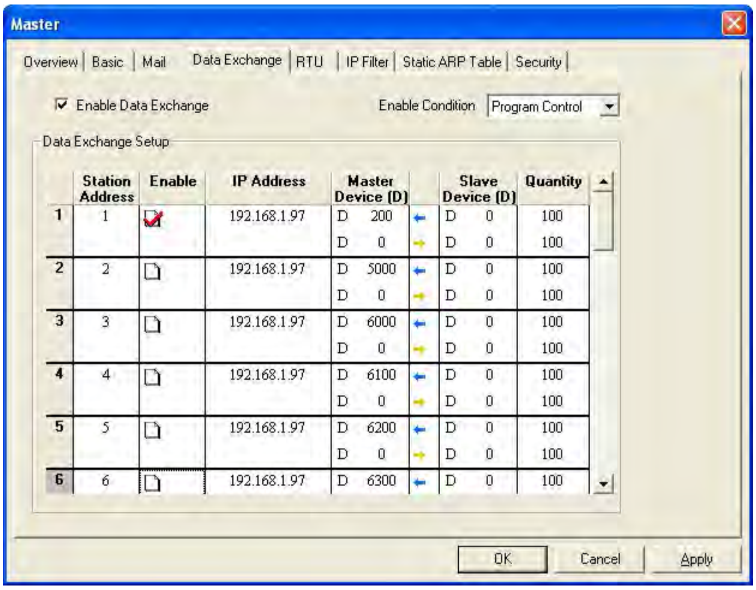
   - Community String: Name given to the community which is connected (63 English characters at most can be entered.)

   - Access Type: Select GET (reading) or GET/SET (reading/writing).

13.1.6.6 Data Exchange

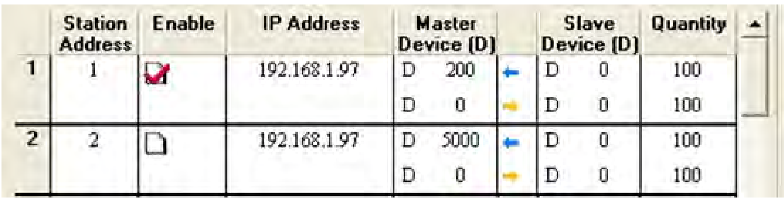
DVPEN01-SL is able to designate a data exchange area for PLC MPUs to exchange and synchronize their data.

- **Data exchange setting**



1. **Enable Data Exchange**

   Check/uncheck the station addresses to enable/disable data exchange. The station address can be selected individually. For example, check Station Address 1 to enable the data exchange and uncheck the Station Address 2 to disable the data exchange as the image shown below. This can also be achieved by setting up CR#20~21. Please refer to section 13.1.5 in this manual for more information.



2. **Enable Condition**

   You can select “Always Enable” or “Program Control”. If Always Enable is selected, DVPEN01-SL will execute data exchange continuously until the setting in DCISoft is changed. If Program Control is selected, DVPEN01-SL will execute data exchange according to the program setting (CR#13=2: Executing data exchange; CR#13=0: Stopping executing data exchange.)

3. **Station Address and IP Address**

   You have to enter the IP address of DVPEN01-SL at the other end. For example, if you would like DVPEN01-SL to exchange data with 192.168.0.1, set No. 1 as 192.168.0.1. When the data are being exchanged, if the value in CR#28 is H’0001, the data will be exchanged with 192.168.0.1.

4. **Master Device, Slave Device, and Quantity**

Reading (←): Start address of the master's receiving register←Start address of the slave's sending register

Writing (→): Start address of the master's sending register→Start address of the slave's receiving register

When data exchange is executed, DVPEN01-SL executes the writing (→) first before the reading (←)

Quantity: A slave is able to send and receive the data in 100 consecutive registers at the same time.

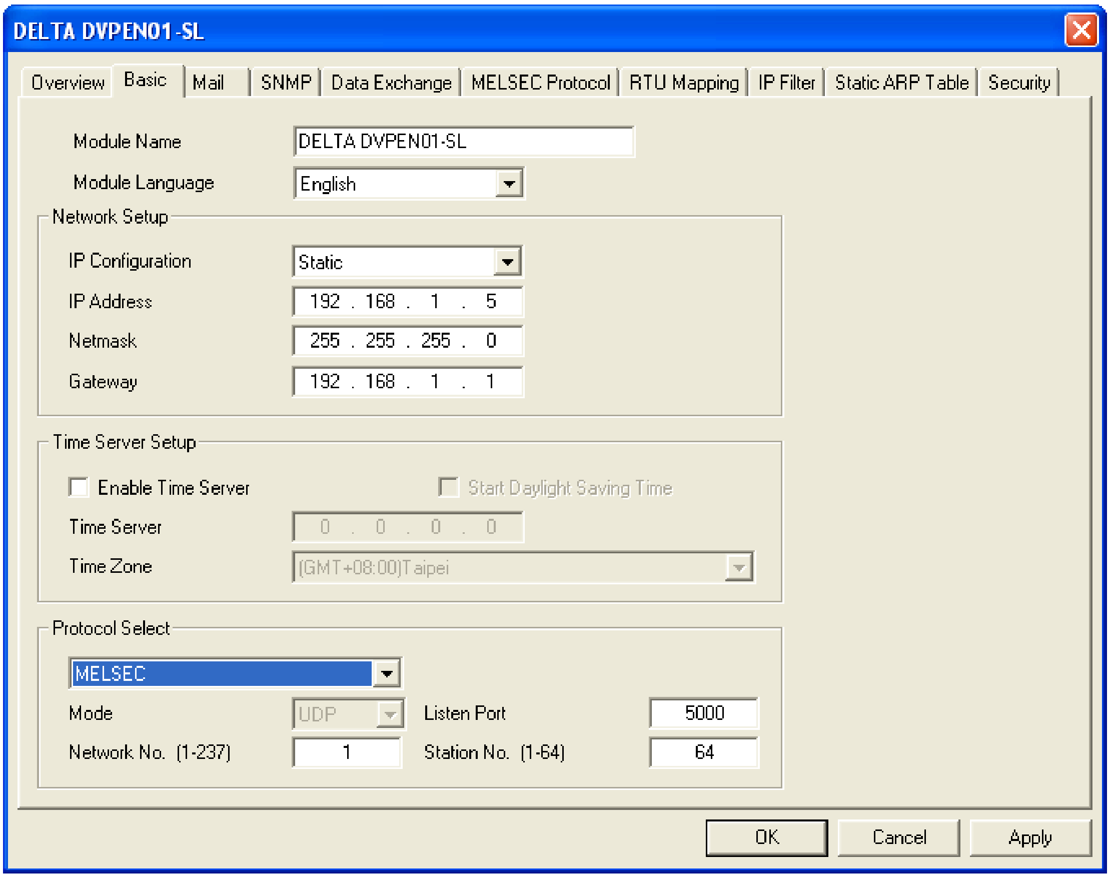
※ For data exchange, D register is parted into 2 sections, D0000~D4095 and D4096~D9999. Please DO NOT use different sections for the consecutive sent and received data (start address + number of data).

5. See section 13.1.7.9~ section13.1.7.11 for more details and examples.

13.1.6.7 MELSEC Protocol

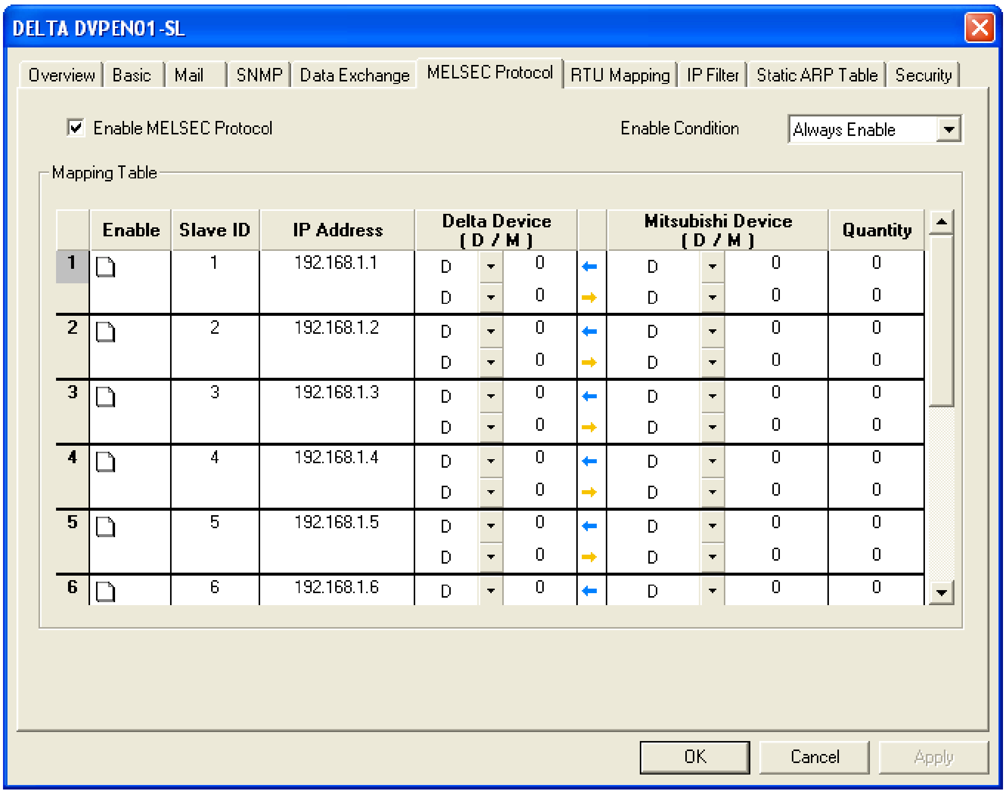
DVPEN01-SL can communicate with Mitsubishi devices by means of the MELSEC protocol. It supports the communication with a master and the communication with slaves simultaneously. Only UDP communication is allowed. (DVPEN01-SL version 2.10 and above support this function.)

- MELSEC Protocol mode setting



1. **Protocol Select**: Setting the MELSEC function.
2. **Listen Port**: Setting the communication port of the MELSEC protocol slave.
3. **Network No./Station No.:** Setting the network number and the station number of the MELSEC protocol device.

- **MELSEC Protocol data exchange setting**



1. **Enable MELSEC Protocol**

   Users can disable/enable the MELSEC protocol. After the MELSEC protocol is enabled, data exchange will be carried out according to the data which has been set.

2. **Enable Condition**

   Users can select **Always Enable** or **Program Control**. If **Always Enable** is selected, DVPEN01-SL will execute data exchange continuously until the setting in DCISoft is changed. If **Program Control** is selected, DVPEN01-SL will execute data exchange according to the program setting (CR#13=2: Executing data exchange; CR#13=0: Stopping executing data exchange).

3. **Slave ID** and **IP address**

   Users need to type the IP address and the slave ID of a Mitsubishi device which supports the MELSEC protocol. For example, users can type the slave ID 1 and the IP address 192.168.0.1. If data exchange is executed, DVPEN01-SL will exchange data with the device whose slave ID is 1 and IP address is 192.168.0.1 by means of the MELSEC communication.

4. **Delta Device**, **Mitshbishi Device**, and **Quantity**

   Reading (←): Start address of the Delta device's receiving register←Start address of the Mitsubishi device's sending register

   Writing (→): Start address of the Delta device's sending register→Start address of the Mitsubishi device's receiving register

   When data exchange is executed, DVPEN01-SL executes the writing (→) first before the reading (←).

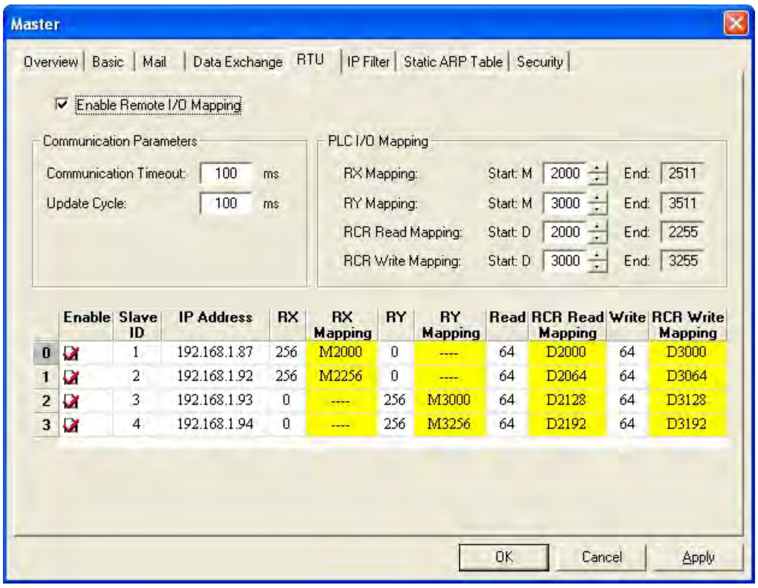
   Quantity: A slave is able to send and receive the data in 100 consecutive registers at the same time.

   Please refer to section 13.1.7.15 for more information.

13.1.6.8 RTU

Use the RTU function to conduct mapping between Delta's network modules DVPEN01-SL and RTU-EN01.Set the mapping information first, then users will be able to use WPLSoft in DVPEN01-SL to save and retrieve the mapped bit (M) and register (D) in order to operate the remote RTU-EN01.

- **RTU Setting**



1. **Enable Remote I/O Mapping**

   Users can select the **Enable Remote I/O Mapping** checkbox. After the checkbox is selected, the network module used will be mapped onto RTU-EN01 according to the data set.

2. **Communication Parameters**

   Users can enter a time interval in the **Communication Timeout** box, and a cycle in the **Update Cycle** box.

3. **PLC I/O Mapping**

   Users can set the bit devices and the registers which correspond to digital inputs(X), digital outputs(Y), and analog registers (RCR) on RTU-EN01. The bit devices set start from M2000. The registers used for the reading of data start from D2000, and the registers used for the writing of data start from D3000. The software automatically calculates end addresses according to the numbers set.

4. **Remote Device Mapping Setting**

   After users check **Enable** cell, users have to enter the station address of RTU-EN01, IP address, the number of digital inputs (RX), the number of digital outputs (RY), the number of registers used for the reading of data(Read), and the number of registers used for the writing of data(Write).

   DVPEN01-SL can be mapped onto four slaves. The maximum number of digital inputs used for mapping, the maximum number of digital outputs used for mapping, the maximum number of registers used for mapping are described below:

   Digital I/O (RX+RY) : 256

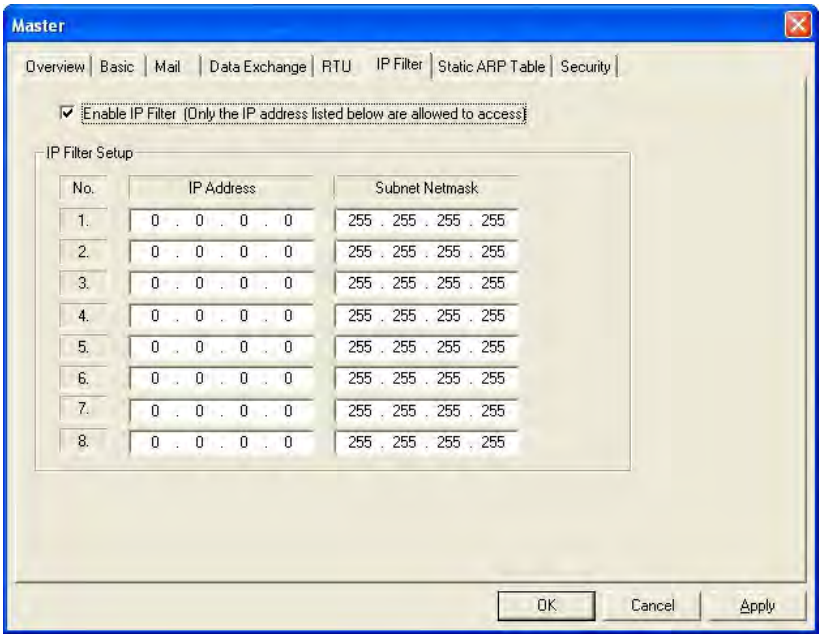
   Analog (Read) register:64

   Analog (Write) register:64

13.1.6.9 IP Filter

IP filter is used for restricting the connection of the network in case some uncertain IP addresses will cause errors. Only the IP addresses set within a certain range can establish a connection. Other IP addresses will be rejected.

- **IP Filter Setting**



1. **Enable IP Filter**

   Check the box to enable IP filter.

2. **IP Address**

   IP addresses that are allowed to establish connections. Maximum 8 IP addresses are allowed.

3. **Subnet Netmask**

   The subnet of the IP address is allowed to establish a connection. To see whether the destination IP address is allowed, conduct bitwise AND operations between the allowed IP address and subnet mask and destination IP address and subnet mask. If the two values obtained are the same, the destination IP address is allowed by the IP filter. For example, assume the IP address is 192.168.0.1 and subnet mask 255.255.255.255, the only one IP address allowed to establish a connection is 192.168.0.1. If the subnet mask is 255.255.255.0, the IP addresses s allowed to establish connections will become 192.168.0.0~192.168.0.255.

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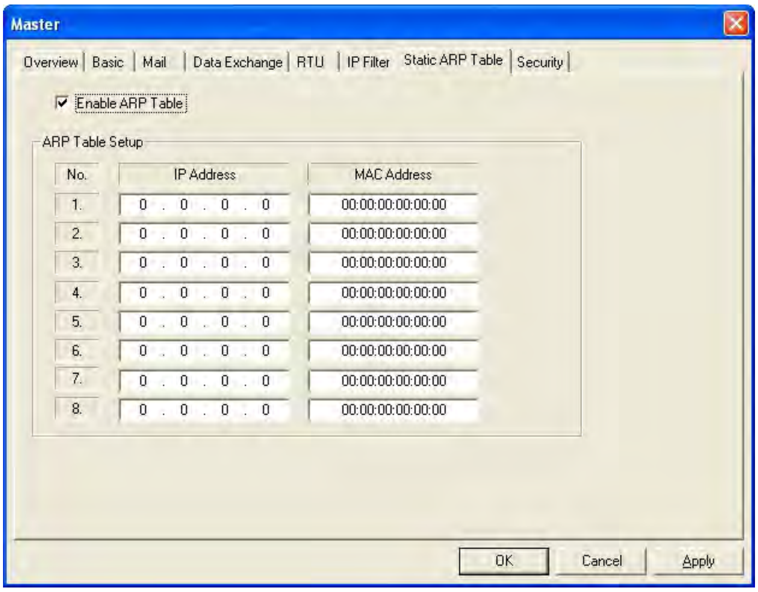
13.1.6.10 Static ARP Table

ARP (Address Resolution Protocol) is used for obtaining the MAC address corresponding to the IP address in data transmission. For example, there is a datum to be sent to 172.16.155.250, but you do not know the corresponding MAC address. You can use ARP to look up the MAC address by IP address, and the corresponding MAC address will be saved, so you do not need to look it up again when sending the next datum. Therefore, if you do not know the MAC address, you will have to spend some time looking up the MAC address. If you want to enhance the transmission efficiency, use static ARP table to save time. For example, assume the IP address is 192.168.0.1 and MAC is 00:14:22:56:0F:7F. As long as there are data sent to 192.168.0.1, you will get the MAC address from the table.

- **Static ARP Table Setting**



1. **IP Address**

   Destination IP address in data transmission.

2. **MAC Address**

   The MAC addresses corresponding to the IP address.

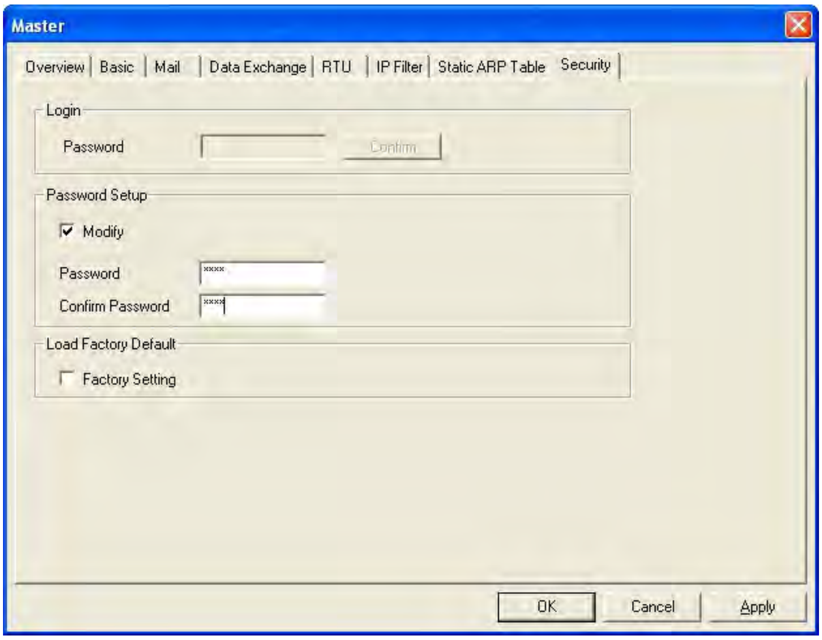
Note:

Incorrect settings may result in connection failure. Therefore, DO NOT include MAC addresses of devices outside the network in the list.

13.1.6.11 Password Setting

To prevent the set values in DVPEN01-SL from being modified, you can set a password to lock the settings in DVPEN01-SL.

- **Password Setting**



1. **Modify**

   Check the box to modify the password.

2. **New password**

   Maximum 4 characters are allowed. Leave the column blank to disable the password protection function.

3. **Confirm Password**

   Enter the new password again.

4. See section 13.1.7.4 for more details.

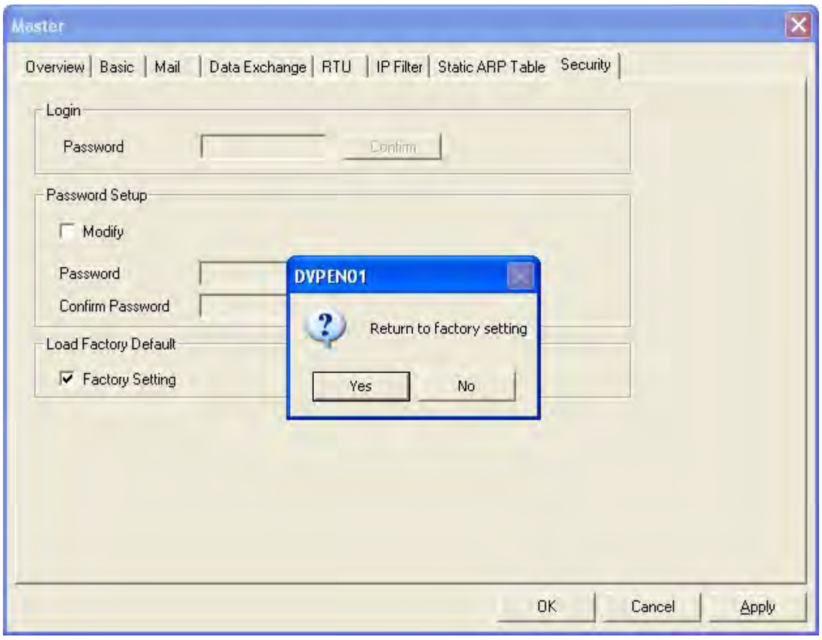
Note:

After the password is locked, all the pages cannot be set unless you unlock the password. However, if you set DVPEN01-SL by RS-232, you can return the setting to default setting whether the password is locked or not. For example, if you have locked DVPEN01-SL but forget the password, you have to return DVPEN01-SL to factory default setting by RS-232, and all the settings will return to default ones.

13.1.6.12 Return to Default Setting

If you need to clear all the settings after many modifications on the settings and return the settings to default ones, select the **Factory Setting** checkbox.

- **Return to Default Settings**



Select the **Factory Setting** checkbox, and click on **Yes**

Note:

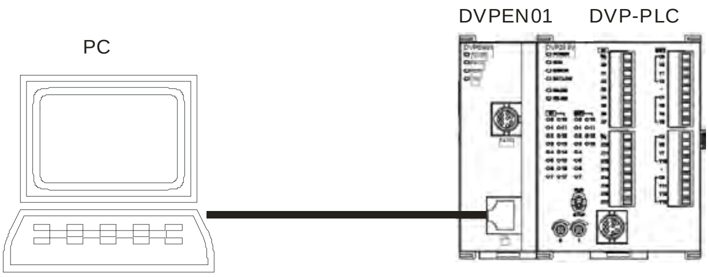
If you set DVPEN01-SL by RS-232, you can return the setting to default setting whether the password is locked or not. It takes approximately 10 seconds to return to default setting, so DO NOT switch off the power within the 10 seconds.

13.1.7 Application Examples

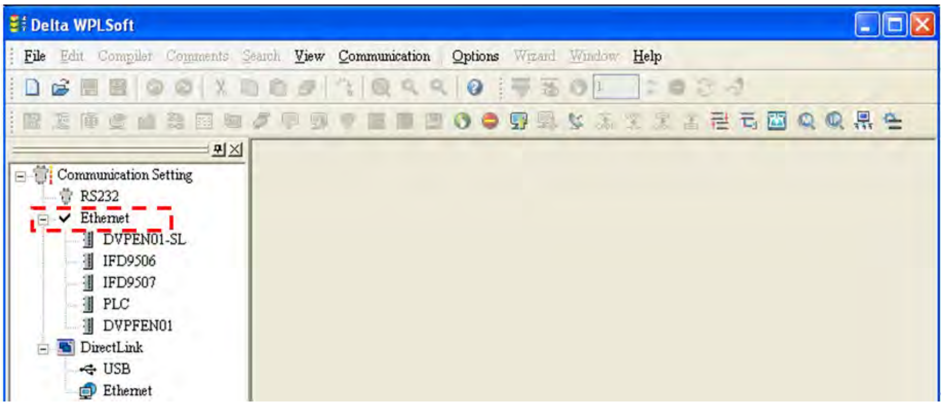
13.1.7.1 Setting IP Address and Communication through WPLSoft

Application	Setting the network parameters of DVPEN01-SL directly on the PC.
Network environment	(1) IP address of the PC executing WPLSoft: 192.168.0.3 (2) Subnet mask: 255.255.255.0; Gateway: 192.168.0.1 (3) IP address of DVPEN01-SL: 192.168.0.4 (4) Connect the PC and DVPEN01-SL by RJ-45 cable. Note: Both PC and DVPEN01-SL have to adopt a static IP address.

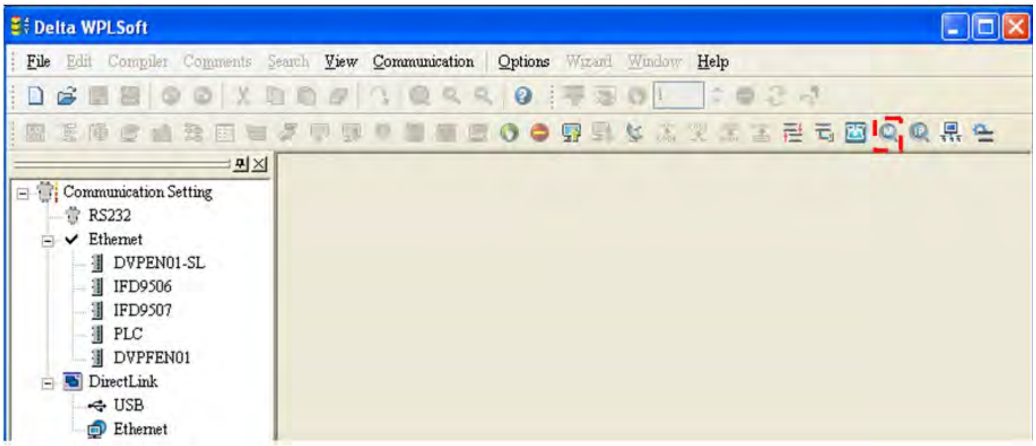
1. The connection



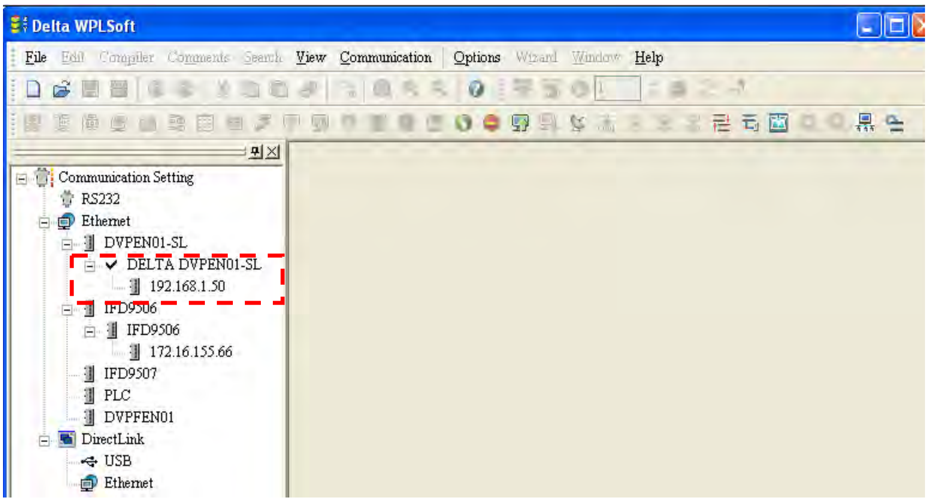
2. Start WPLSoft and click **Ethernet** in the **Communication Setting** Section.



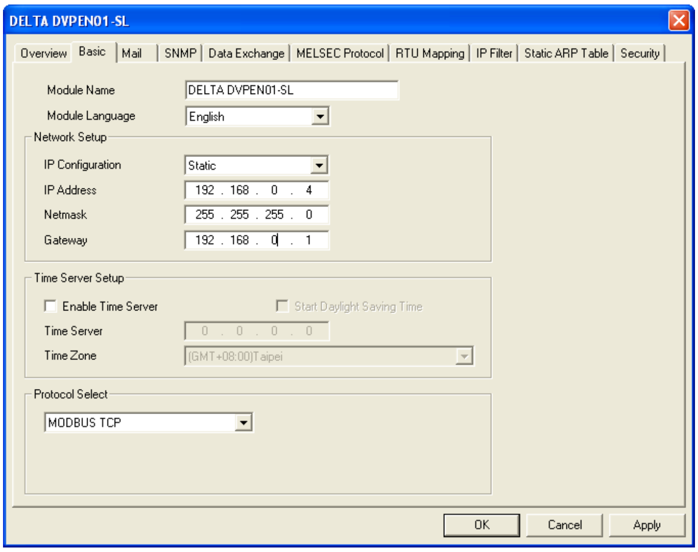
3. Click **Auto-Search Ethernet Module** to search for all the Ethernet modules on the network.



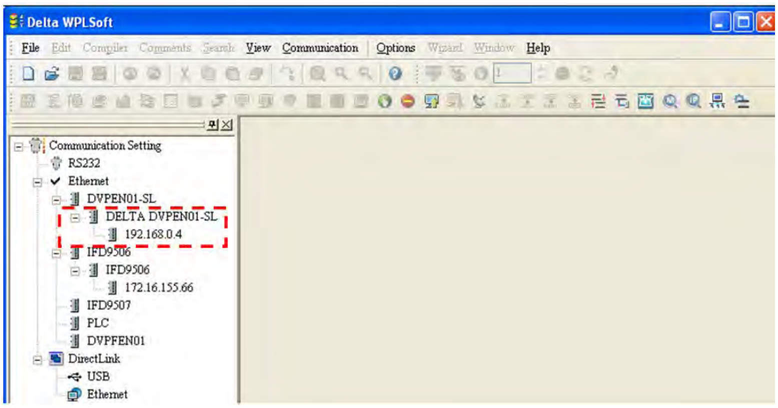
4. All the devices connected to the network are shown in the **Ethernet** section. After **DELTA DVPEN01-SL** is clicked, WPSoft can communicate with the MPU by means of DVPEN01-SL.



5. Double-clicked **DELTA DVPEN01-SL** in the **Ethernet** section, and DCISoft will be started. Please refer to section 13.1.6.3 for more information about setting IP address.



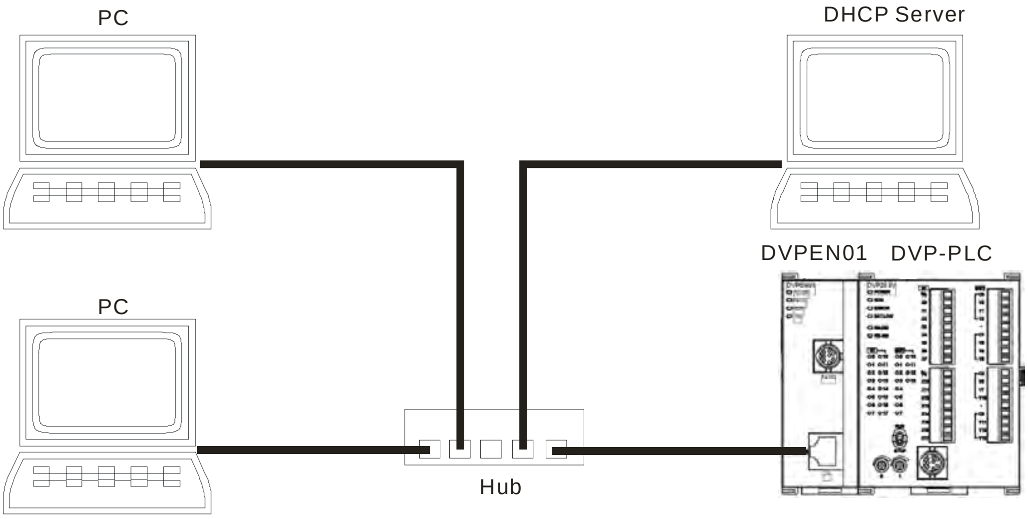
6. After the IP address setting is complete, repeat step 2~step 4 to use the modified IP address for communication.



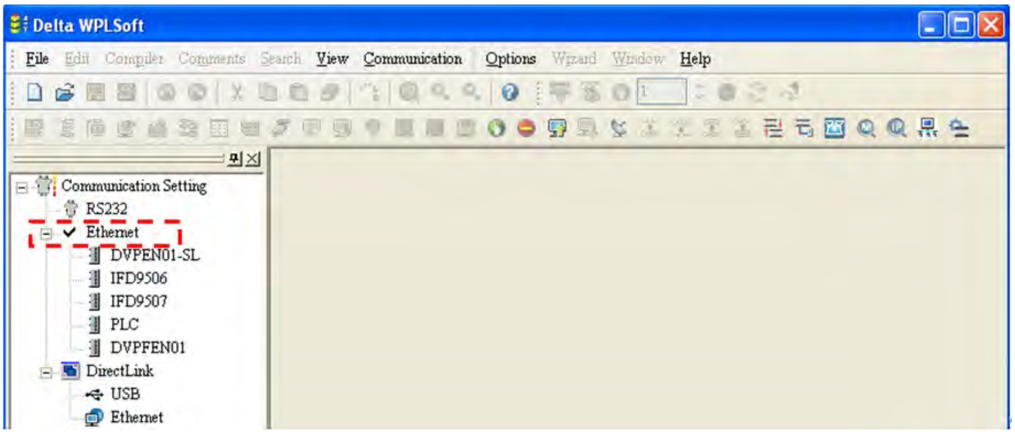
13.1.7.2 Connecting the PC with DVPEN01-SL through LAN

Application	Setting the network parameters of DVPEN01-SL by WPLSoft through LAN.
Network environment	(1) Connect the PC and DVPEN01-SL by using DHCP server through LAN. (2) DVPEN01-SL obtains its IP address through DHCP mode. **Note:** DVPEN01-SL can use a RJ-45 cable with/without a jump wire.

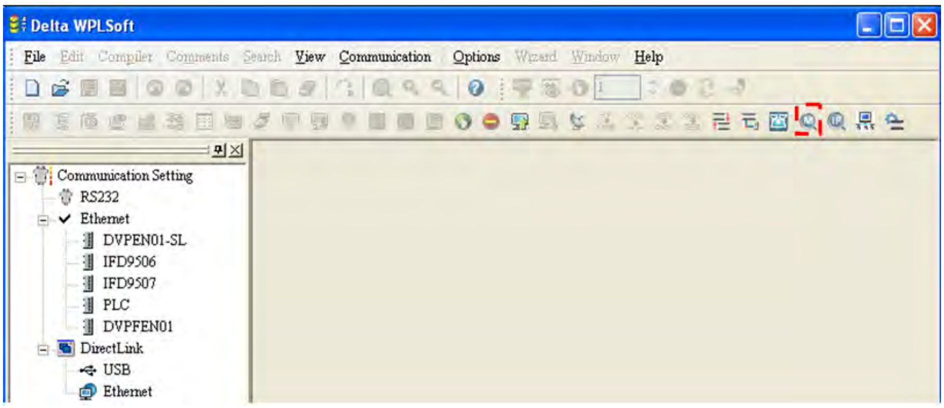
1. The connection



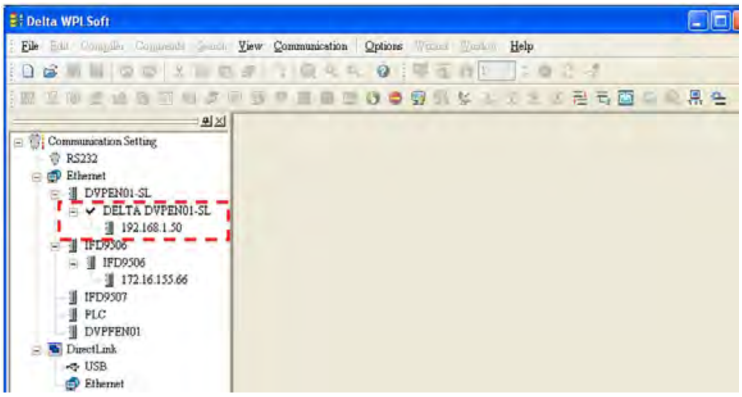
2. Start WPLSoft and click **Ethernet** in the **Communication Setting** Section.



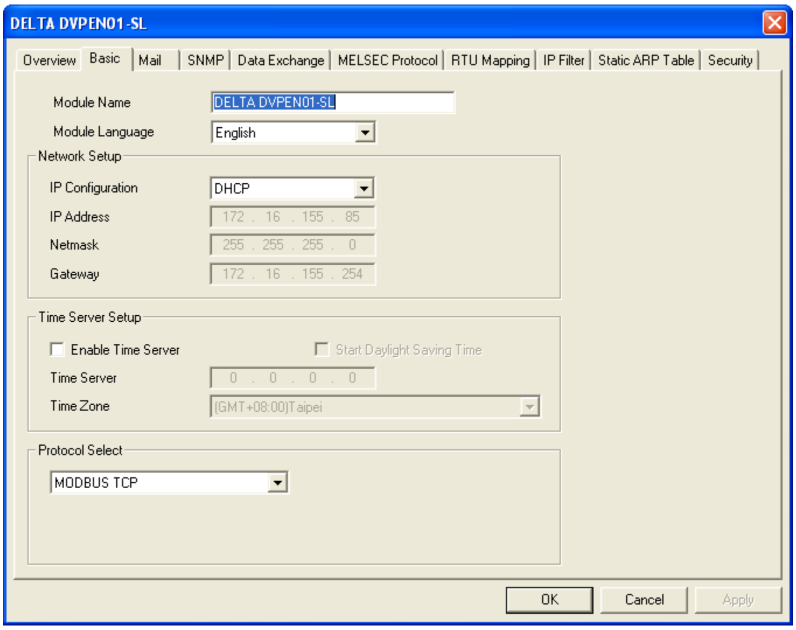
3. Click **Auto-Search Ethernet Module** to search for all the Ethernet modules on the network.



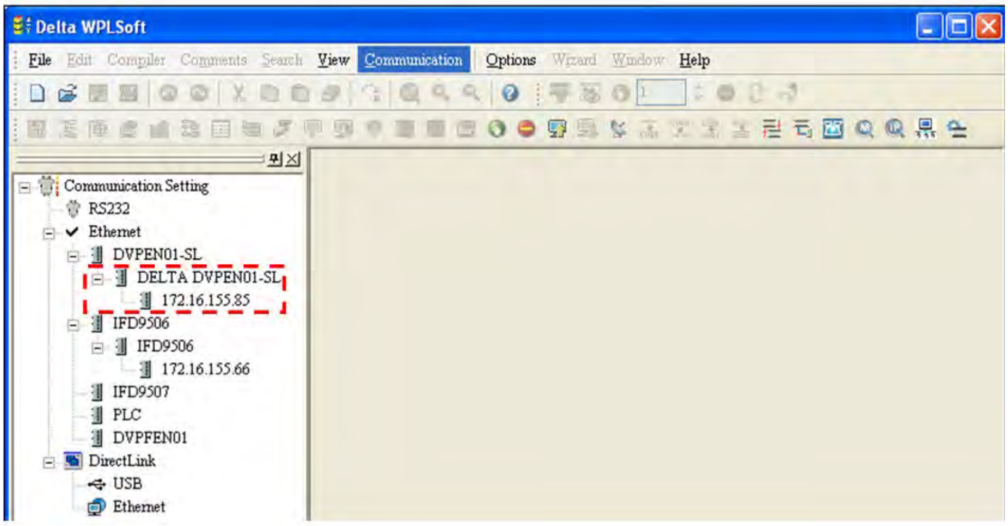
4. All the devices connected to the network are shown in the **Ethernet** section. After **DELTA DVPEN01-SL** is clicked, WPSoft can communicate with the MPU by means of DVPEN01-SL.



5. Double-clicked **DELTA DVPEN01-SL** in the **Ethernet** section, DCISoft will be started. Please refer to section 13.1.6.3 for more information about setting IP address.



6. After the IP address setting is complete, repeat step 2~step 4 to use the modified IP address for communication.

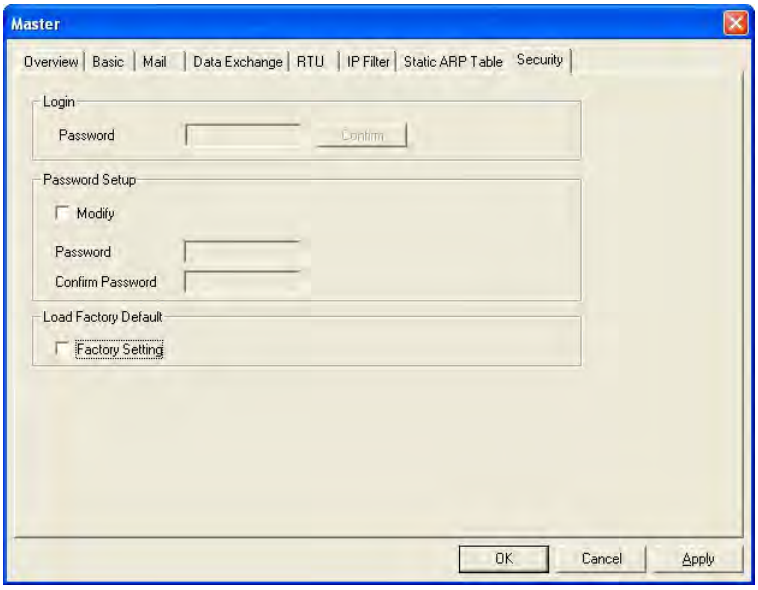


13.1.7.3 Password Setting and Removal

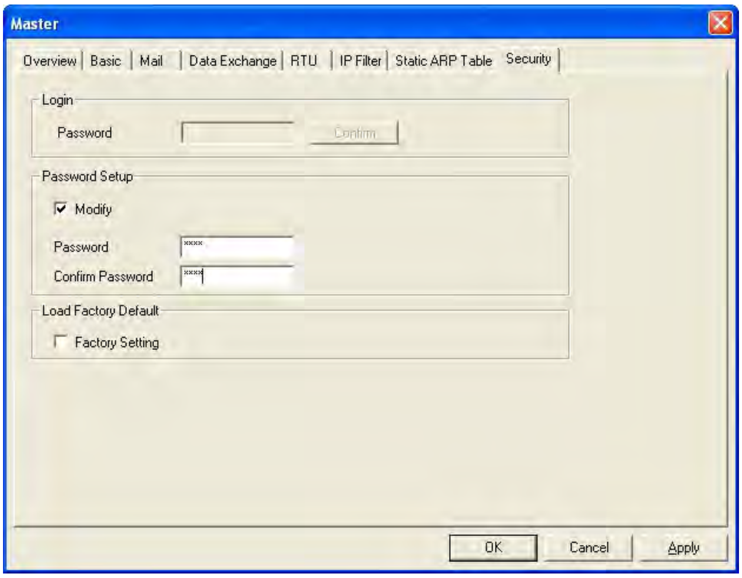
Application	Setting and clearing a password by WPLSoft
Network environment	(1) Set password in DVPEN01-SL (2) Unlock DVPEN01-SL (3) Clear the password in DVPEN01-SL

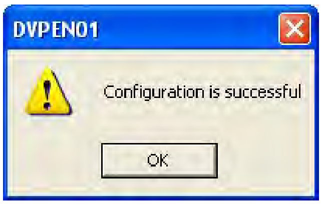
1. Please refer to section 13.1.7.1 for the connection and how to set the communication.

2. Open the setup page and switch to the **Security** page

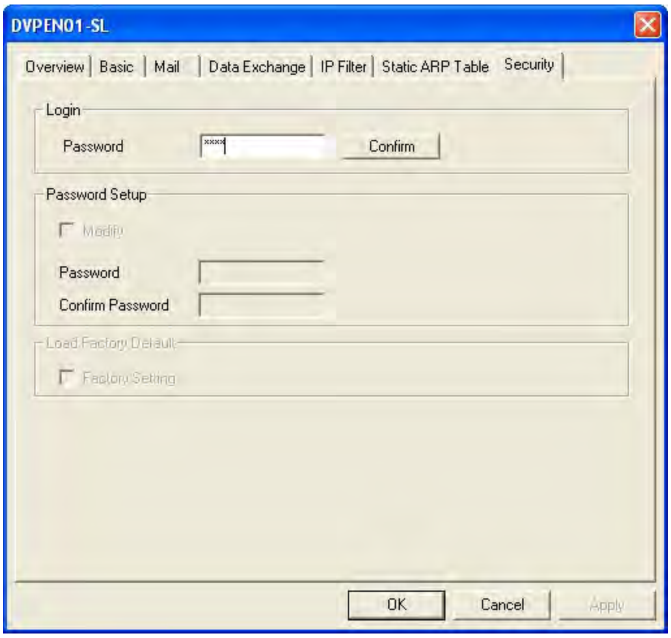


3. Select the **Modify** checkbox, and enter "aabb" in the **Password** box and the **Confirm Password** box. Click on **OK** to save the password.

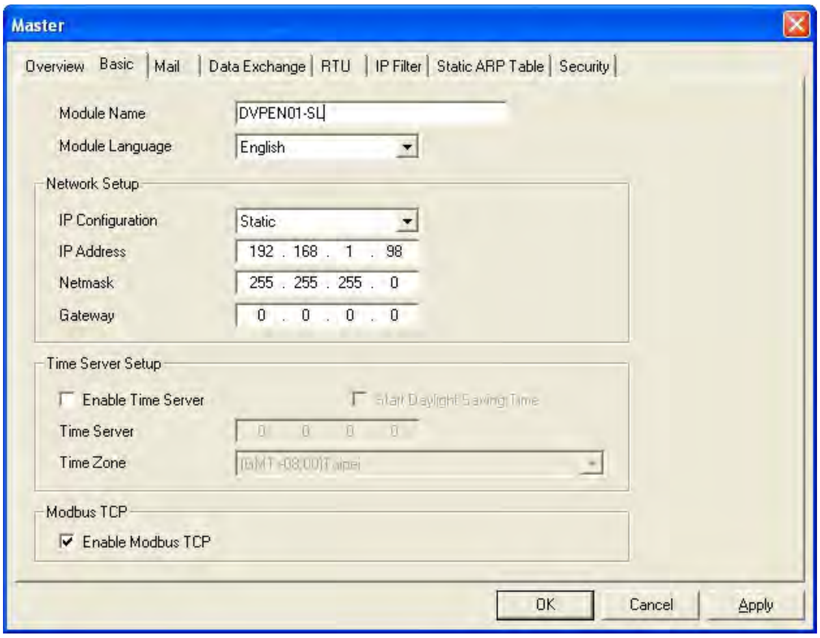




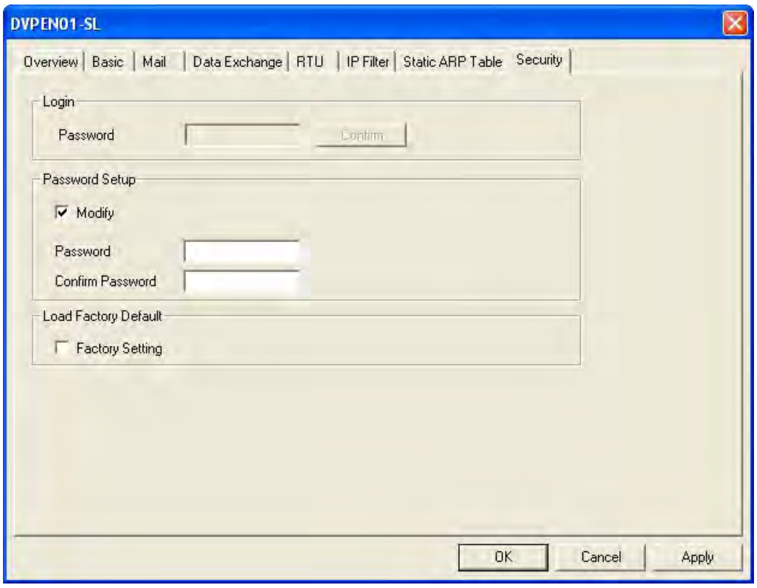
4. Open the setup page again, and DVPEN01-SL is now locked by the password. You cannot open any of the settings now. Click on **Confirm** to leave the entering password window.



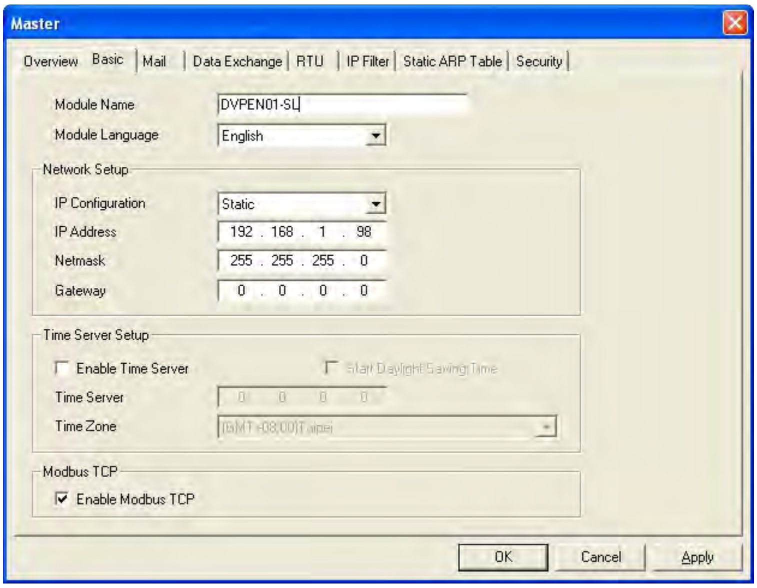
5. Enter the password to temporarily unlock the protection and modify the parameters. If you close the setup page, the locking will automatically be recovered.



6. To clear the password, simply leave the password columns blank. Click on **Apply** to clear the password.



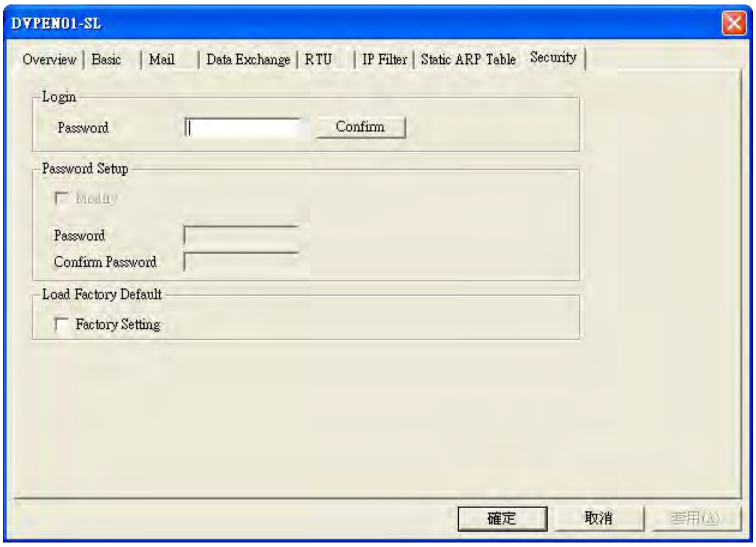
7. After the password is cleared, you can modify the parameters.



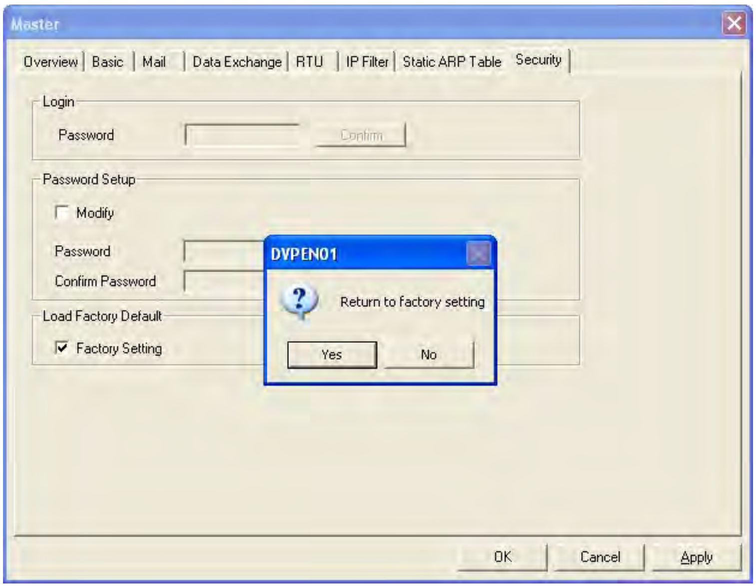
13.1.7.4 When the Password is Lost (Return to Default Setting by RS-232)

Application	Return to default setting by RS-232
Network environment	(1) DVPEN01-SL is set with a password. (2) The password is forgotten. User can return to default setting by RS-232.

1. Use UC-PRG020-12A cable to connect the PC and DVPEN01-SL and open the setup page. Open the **Security** page.



2. After the **Factory Setting** box is selected, a confirmation window will appear. Click on **Yes** to return to default settings (in approx. 5~10 seconds), and the password will be cleared as well.



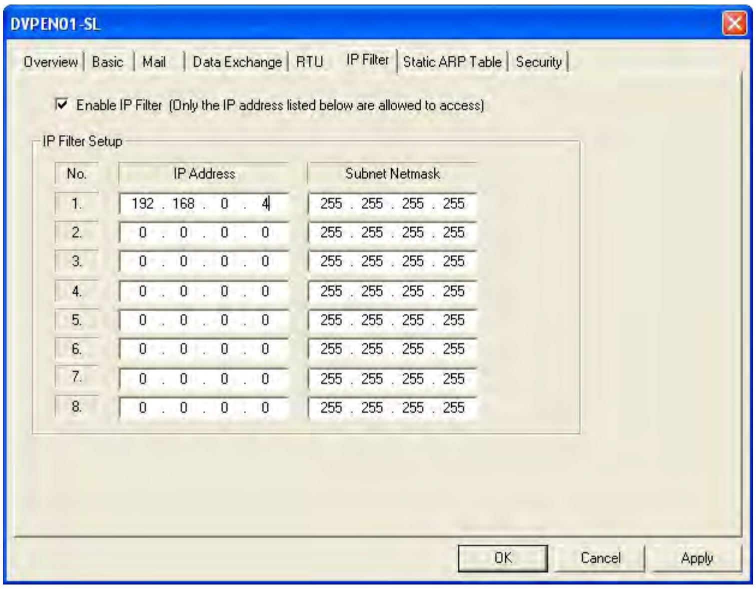
3. After the searching, all the parameters have already returned to their default settings.

13.1.7.5 IP Filter Protection

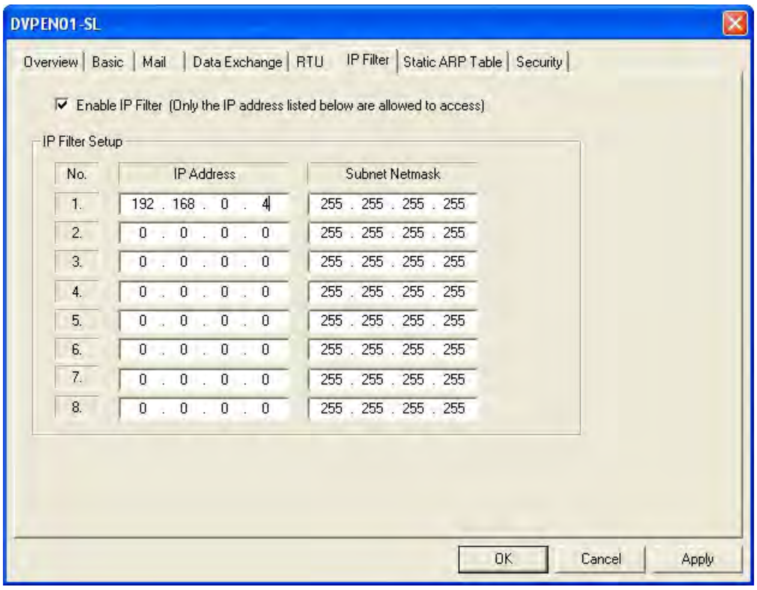
Application	Setting the IP filter protection
Network environment	(1) IP address of DVPEN01-SL: 192.168.0.4 (2) Only connections to 192.168.0.7 and 172.16.0.1~172.16.0.255 are allowed.

1. Please refer to section 13.1.7.1 for the connection and how to set the communication.

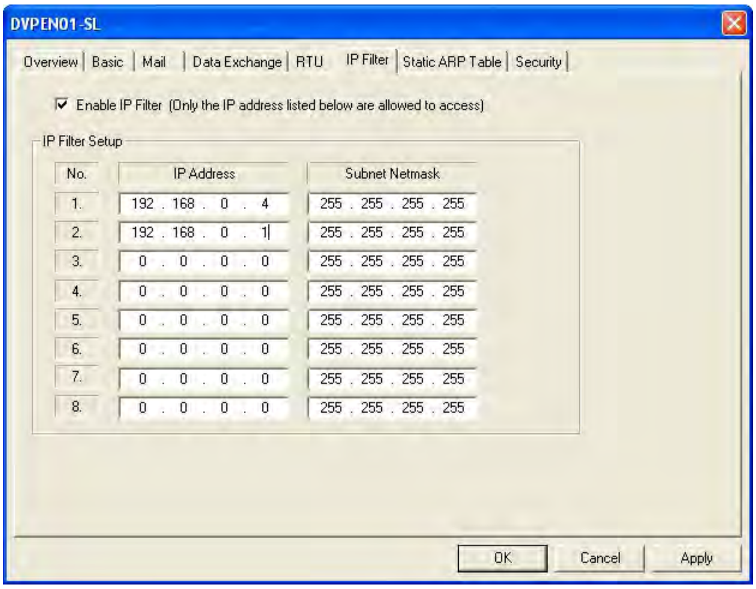
2. Open the setup page and switch to the **IP Filter** page



3. Select the **Enable IP Filter** checkbox. Enter "192.168.0.4" in the **No. 1 IP Address** box and "255.255.255.255" in the **No. 1 Subnet Netmask** box.



4. Enter “192.168.0.1” in the **No. 2 IP Address** box and “255.255.255.0” in the No.2 **Subnet Netmask** box. Click on **OK** to complete the setting. Only the equipment within the IP address range can be connected.



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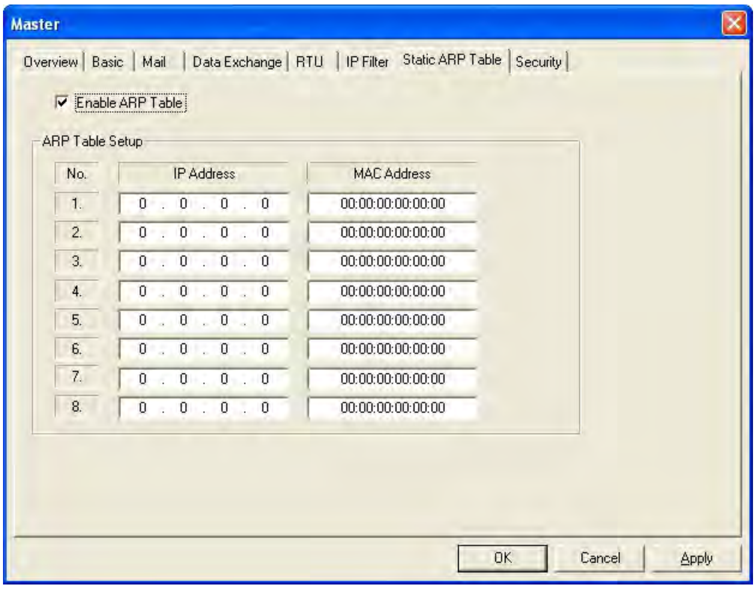
13.1.7.6 Static ARP Table Setting

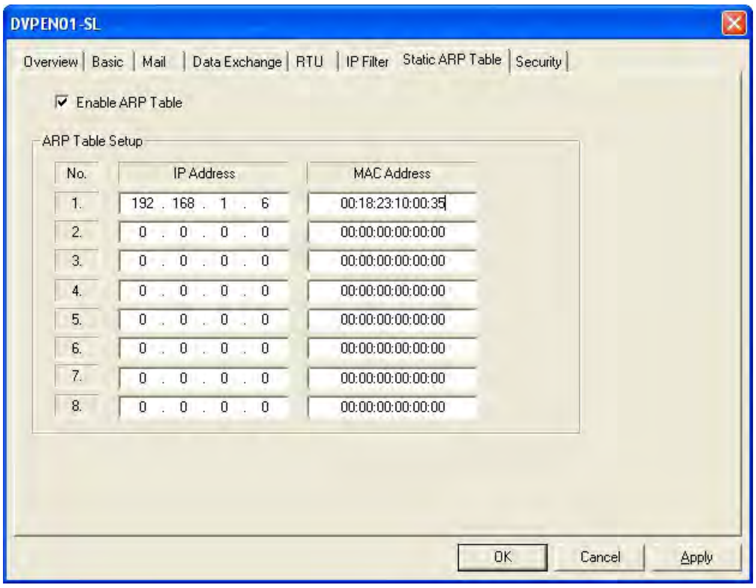
Application	Setting static ARP table
Network environment	(1) MAC address of equipment 192.168.1.6 is 00 : 18 : 23 : 10 : 00 : 35 (2) MAC address of equipment 192.168.1.1 is 00 : 18 : 23 : 10 : 00 : 04

1. Please refer to section 13.1.7.1 for the connection and how to set the communication.

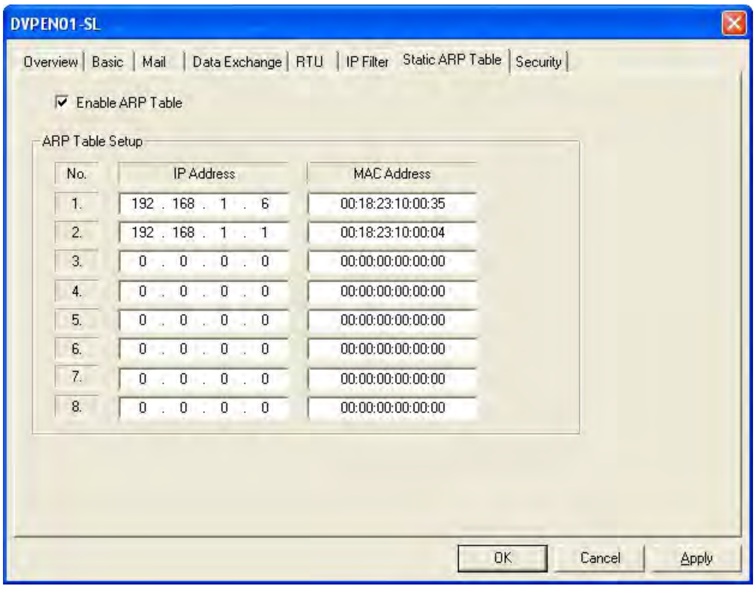
2. Open the setup page and switch to the **Static ARP Table** page.



3. Select the **Enable ARP Table** checkbox. Enter "192.168.1.6" in the **No. 1 IP Address** box, and its corresponding MAC address is "00:18:23:10:00:35".



4. Enter “192.168.1.1” in **No.2 IP Address** box, and its MAC address is “00:18:23:10:00:04”. Click on **OK** to complete the setting. Only the equipment within the IP address range can be connected.



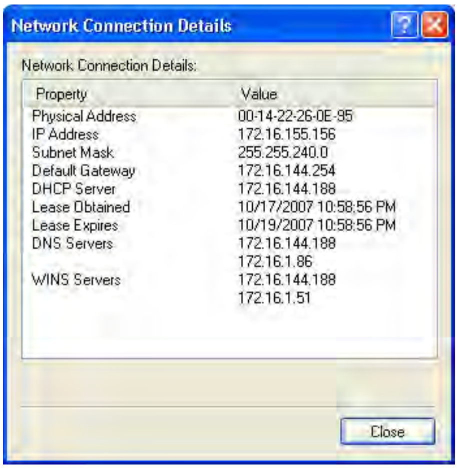
Note:

The MAC address of DVPEN01-SL can be obtained from WPLSoft or the MAC address sticker on the equipment.

The MAC address of PC can be found in the **Network Connection Details** widow (see below).

MAC address

001823100022



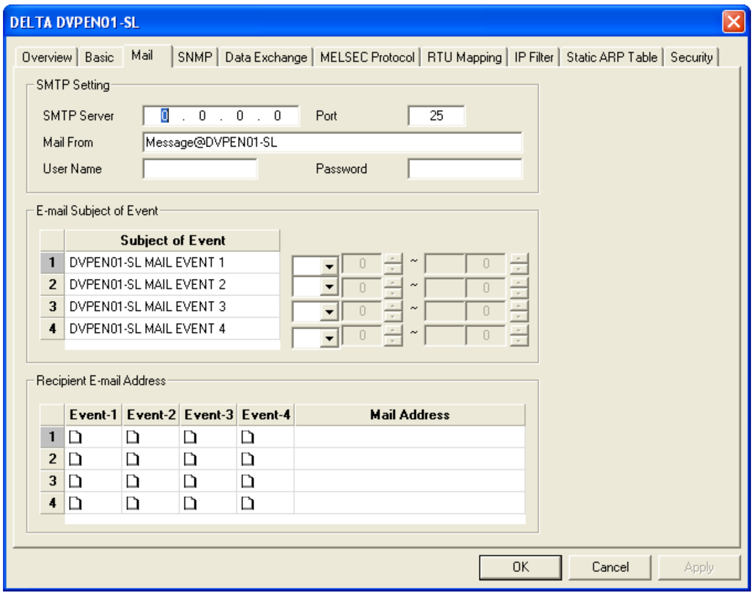
13.1.7.7 E-Mail Application

Application	Sending an E-mail to notify the administrator when the current status of X0 and Y0 is changed.
Network application	(1) IP address of the SMTP server: 172.16.144.121 (2) E-mail address of administrator: test@sample.com (3) An E-mail message will be generated when the status of X0 and Y0 is changed.

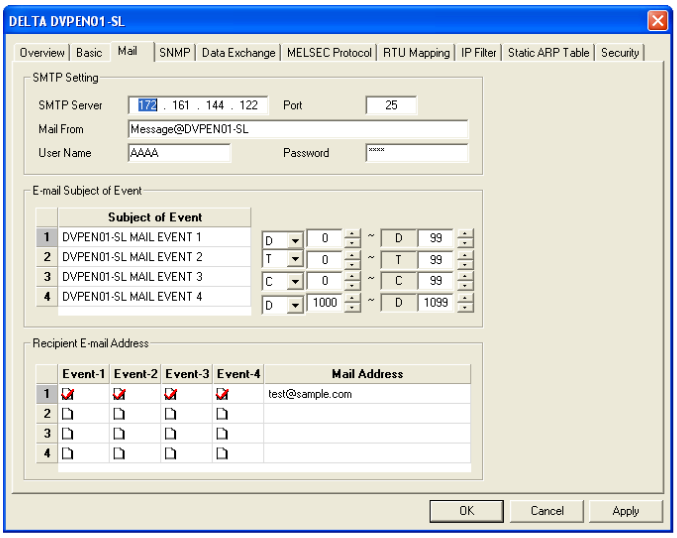
1. Please refer to section 13.1.7.1 for the connection and how to set the communication.

2. DVPEN01-SL does not support TLS/SSL encrypted communication. Please verify the communication specifications of the mail server before use.

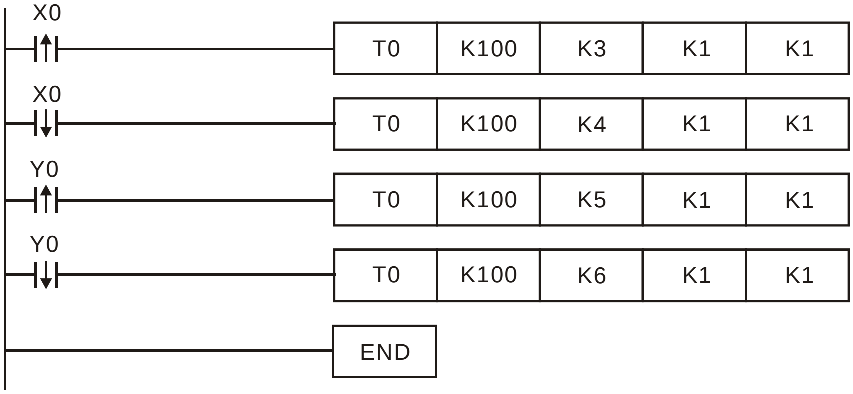
3. Open the setup page and switch to the **Mail** page.



4. Set E-mails and select events. Enter the address of the SMTP server, the subjects of the E-mails, username/password, the E-mail addresses of the recipients, the present values in the registers (D devices, T devices, and C devices) attached to the E-mails, and the number of values. Check the Event cells for recipient 1. Click Apply to complete the setting of E-mails.



5. After all the settings in DVPEN01-SL are completed, compile the ladder diagram in the MPU and download it to the MPU. See below for the program design:



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Explanations:

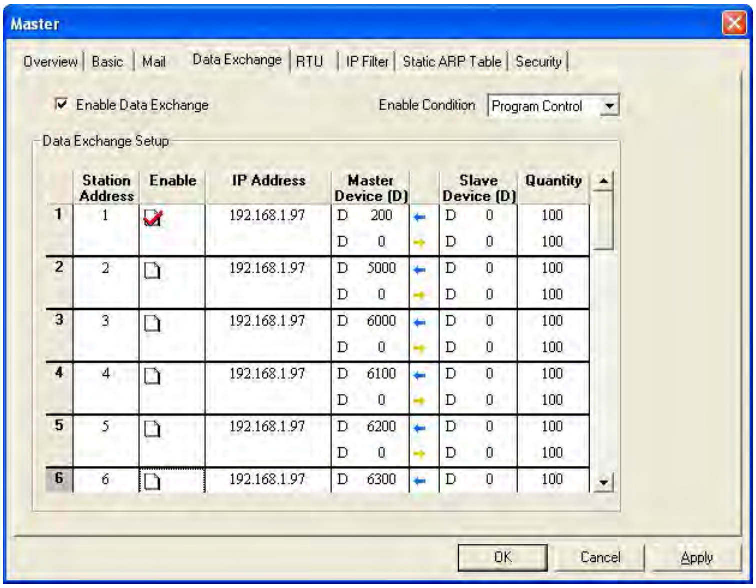
- If the rising-edge of X0 is triggered, X0 will go from Off to On. Write “1” into CR#3 of DVPEN01-SL, and the first E-mail will be sent out.
- If the falling-edge of X0 is triggered, X0 will go from On to Off. Write “1” into CR#4 of DVPEN01-SL, and the second E-mail will be sent out.
- If the rising-edge of Y0 is triggered, Y0 will go from Off to On. Write “1” into CR#5 of DVPEN01-SL, and the third E-mail will be sent out.
- If the falling-edge of Y0 is triggered, Y0 will go from On to Off. Write “1” into CR#6 of DVPEN01-SL, and the fourth E-mail will be sent out.

13.1.7.8 Data Exchange Application (1)

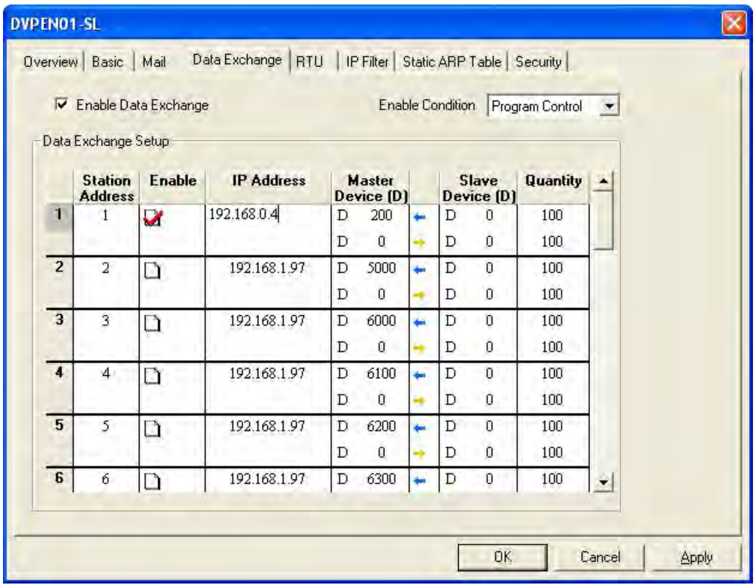
Application	Writing the time in RTC in PLC_B into D0~D6 of PLC_A
Network environment	(1) Adopt a static IP address. (2) IP address of PLC_A: 192.168.0.4 (3) IP address of PLC_B: 192.168.0.5 (4) Update from PLC_B to PLC_A.

1. Please refer to section 13.1.7.1 for the connection and how to set the communication.

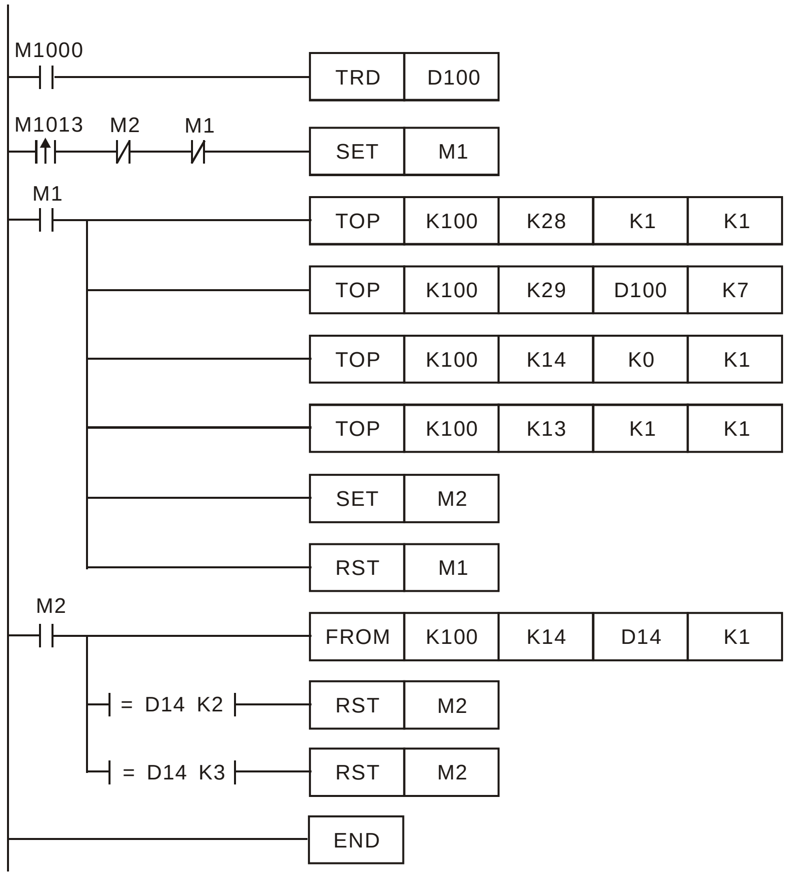
2. Open the setup page of PLC_B and switch to the **Data Exchange** page.



3. Select the **Enable Data Exchange** checkbox. Select Program Control in the **Enable Confition** drop-down list box. Enter the IP address of PLC_A "192.168.0.4" in the **IP Address** cell corresponding to station address 1. Click on **Apply** to complete the setting.



4. After all the settings in PLC_B are completed, compile the ladder diagram in the MPU and download it to PLC_B. The program designed is like the one shown below:

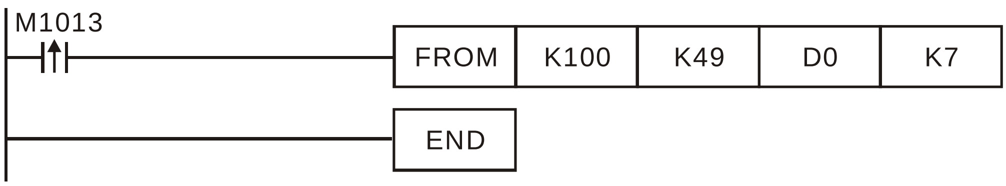


Explanations:

- The data exchange will be executed every one second.
- Write the communication address of the destination PLC in CR#28, and DVPEN01-SL will automatically detect by the previous setting that No. 1 IP address is “192.168.0.4".
- Write the data in RTC into CR#29~CR#35.
- Write “1” into CR#13 to start the data exchange.

CR#14=2 refers to successful exchange. CR#14=3 refers to failed exchange.

5. Compile the ladder diagram for PLC_A and download it to PLC_A.



Explanations:

- The received data are stored in CR#49~CR#55.
- The data received every one second are written into D0~D6.

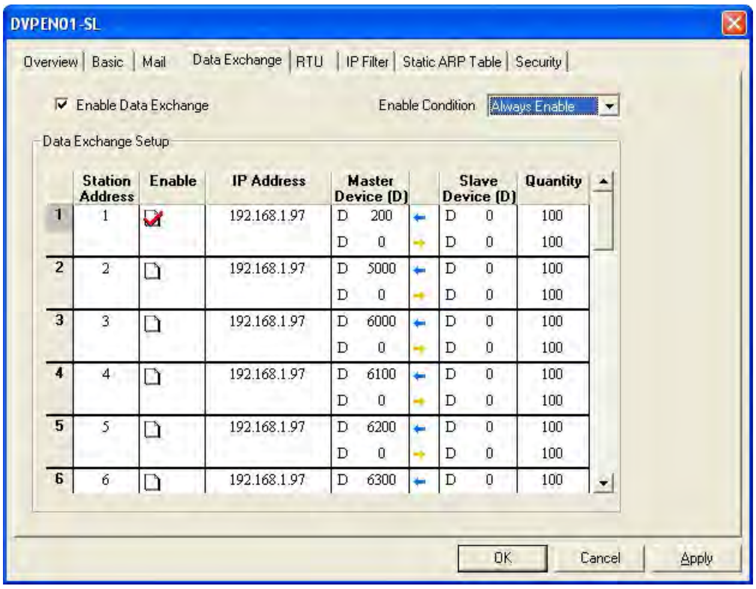
13.1.7.9 Data Exchange Application (2)

Application	Select Always Enable in the Enable Condition drop-down list box. Enable a timer and write the timer values into D0~D99. Continuously write the present values in D0~D99 of PLC_A into D0~D99 of PLC_B, and write the values in D0~D99 of PLC-B into D200~D299 of PLC_A.
Network environment	(1) Adopt a static IP address. (2) IP address of PLC_A: 192.168.1.99 (3) IP address of PLC_B: 192.168.1.97 (4) Update from PLC_A to PLC_B and PLC_B to PLC_A.

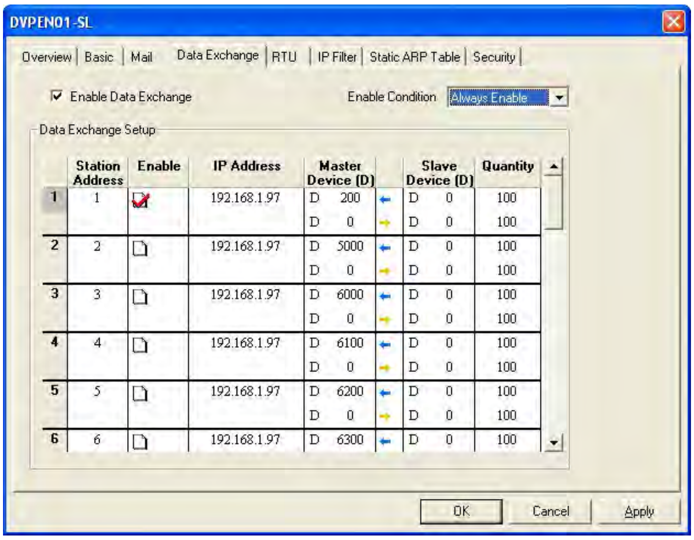
※ Firmware version 2.0 and above support this function.

1. Please refer to section 13.1.7.1 for the connection and how to set the communication.

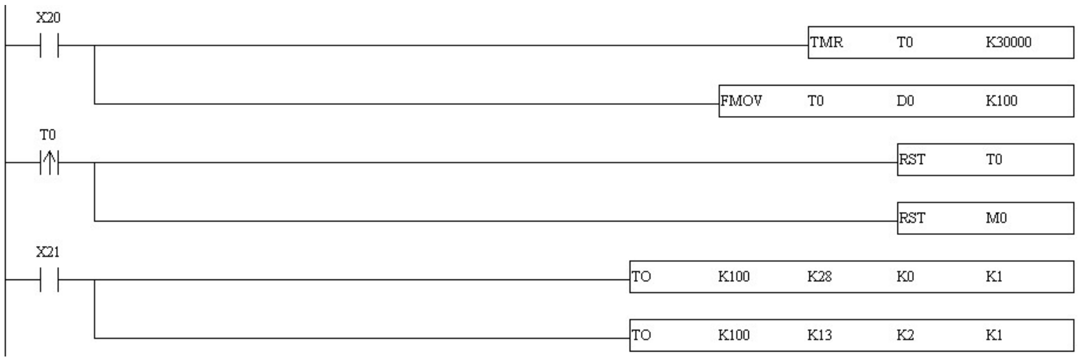
2. Open the setup page of PLC_A and switch to the **Data Exchange** page.



3. Choose '**Enable Data Exchange**,' select the execution mode as '**Always Enable**.' Check the '**Enable'** option for the first data exchange group, enter PLC_B IP as '192.168.1.97' in the first IP address of the group. Set D200←D0 and D0→D0, both with a quantity of 100 records.



4. After all the settings in PLC_A are completed, you have to write a ladder diagram for the MPU and download it to PLC_B. The program designed is like the one shown below:



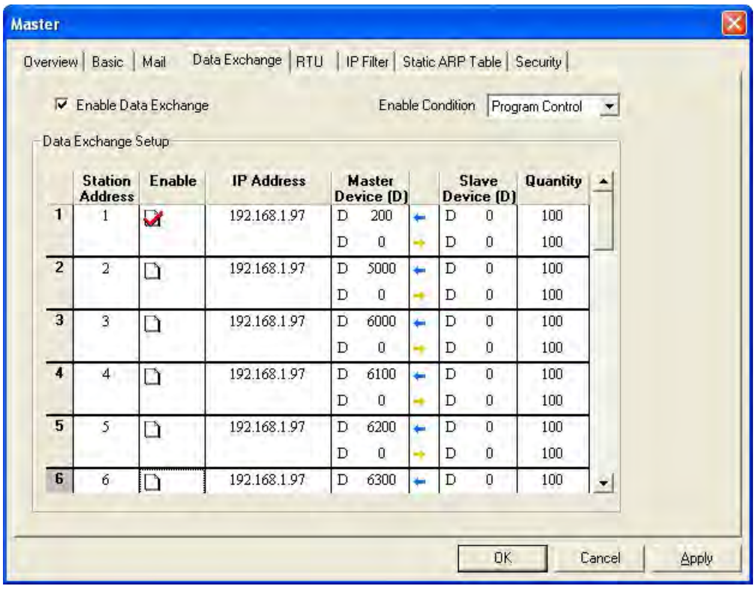
13.1.7.10 Data Exchange Application (3)

Application	Enable a timer (X20) and write the timer values into D0~D99. Control the program (X21) and write the present values in D0~D99 of PLC_A into D0~D99 of PLC_B, and write the values in D0~D99 of PLC-B into D200~D299 of PLC_A. Control the program (X21) to stop the execution.
Network environment	(1) Adopt a static IP address. (2) IP address of PLC_A: 192.168.1.99 (3) IP address of PLC_B: 192.168.1.97 (4) Update from PLC_A to PLC_B and PLC_B to PLC_A.

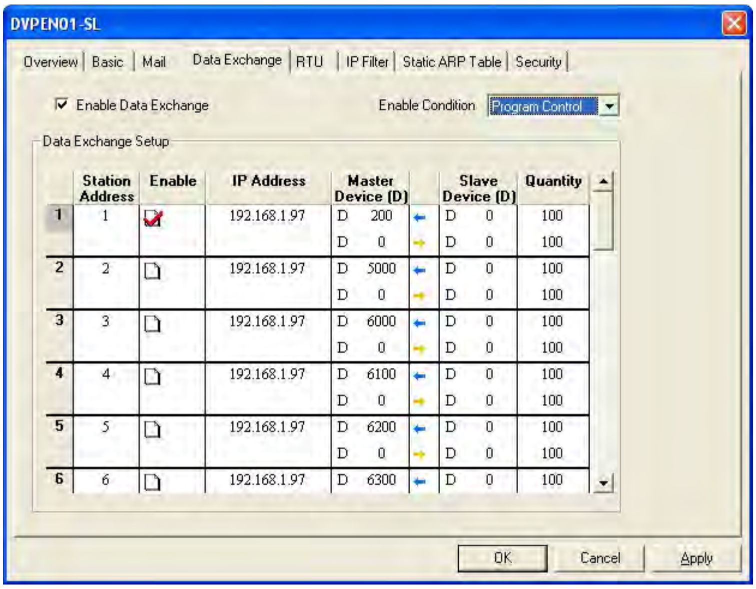
※ Firmware version 2.0 and above support this function.

1. Please refer to section 13.1.7.1 for the connection and how to set the communication.

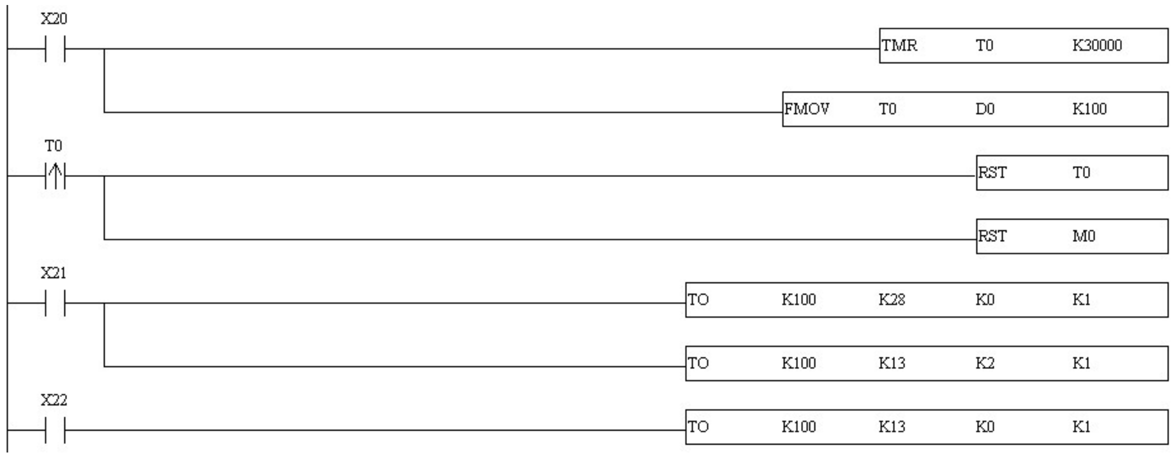
2. Open the setup page of PLC_A and switch to the **Data Exchange** page.



3. Check '**Enable Data Exchange**,' select the execution mode as '**Program Control**.' Check the '**Enable'** option for the first data exchange group, enter PLC_B IP as '192.168.1.97' in the first IP address of the group. Set D200←D0 and D0→D0, both with a quantity of 100 records.



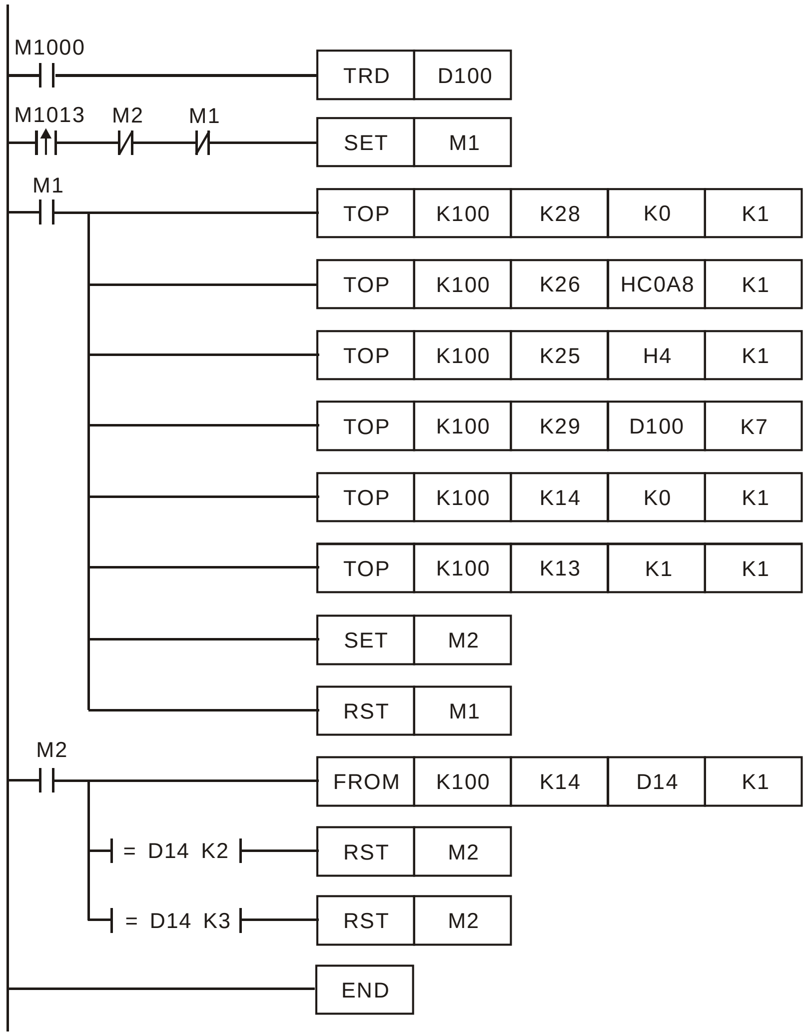
4. After all the settings in PLC_A are completed, you have to write a ladder diagram for the MPU and download it to PLC_B. The program designed is like the one shown below.



13.1.7.11 Data Exchange Application (4)

Application	Writing the time of the RTC in PLC_B into D0~D6 of PLC_A by, and using a ladder diagram to designate an IP address.
Network environment	(1) Adopt a static IP address. (2) IP address of PLC_A: 192.168.0.4 (3) IP address of PLC_B: 192.168.0.5 (4) Update from PLC_B to PLC_A

1. Please refer to section 13.1.7.1 for how to set the communication. Compile the ladder diagram in the MPU and download it to PLC_B. The program designed is like the one shown below.

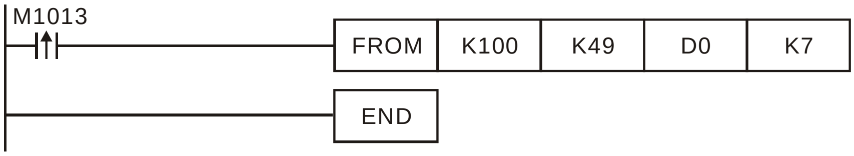


Explanations:

- The data exchange will be executed every one second.
- Write “0” into CR#28, and PLC_B will use CR#25~CR#26 as the IP address of the destination PLC.
- Write the IP address of PLC_A into CR#25 and CR#26. The first two IP codes (192.168=H’C0A8) should be written into CR#26, and the last two IP codes (0.4=H’0004) into CR#25.
- Write the data in RTC into CR#29~CR#35.
- Write “1” into CR#13 to start the data exchange.

  CR#14=2 refers to successful execution. CR#14=3 refers to failed execution.

2. Compile the ladder diagram for PLC_A and download it to PLC_A.



Explanations:

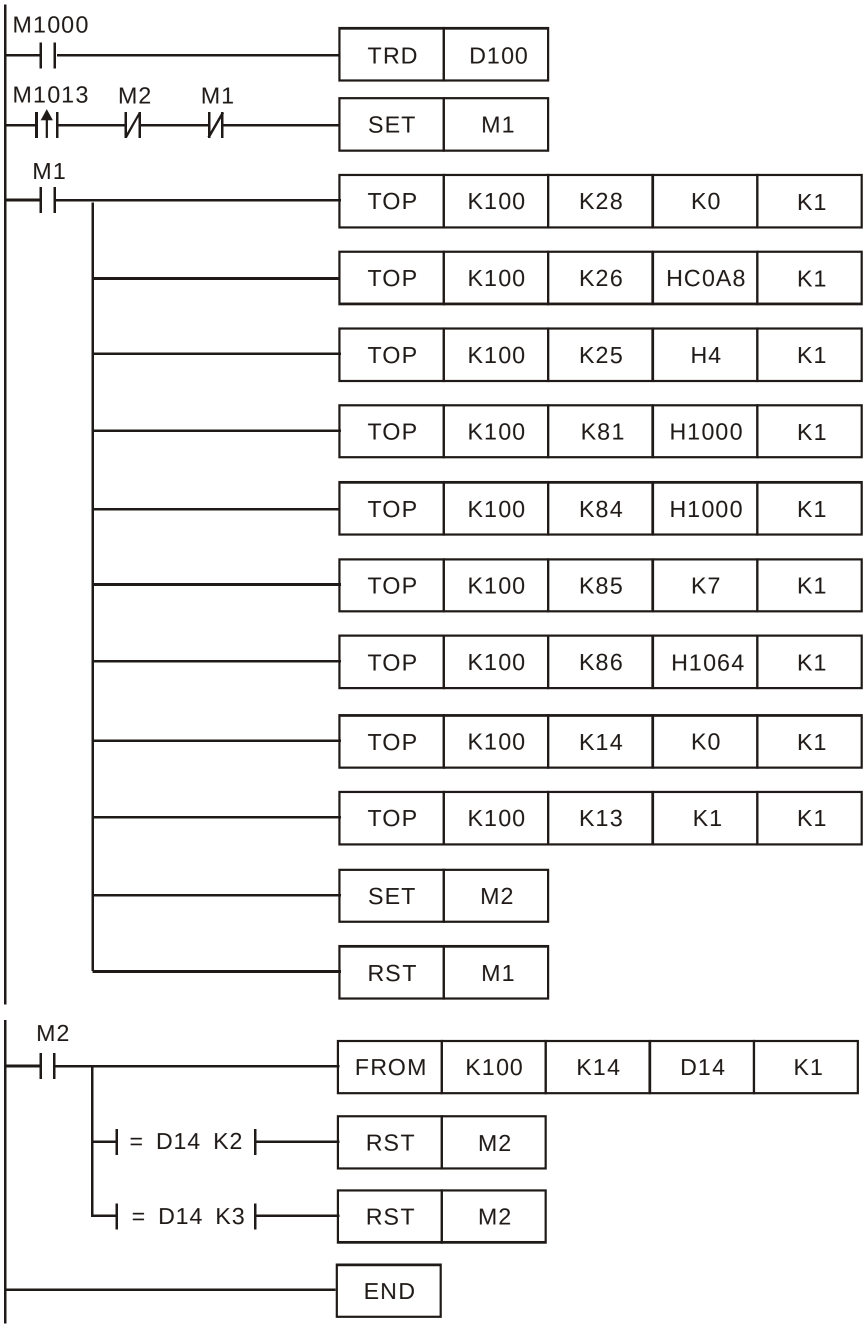
The received data are stored in CR#49~CR#55.

The data received every one second are written into D0~D6.

13.1.7.12 Data Exchange Application (5)

Application	Writing the time in RTC in PLC_B directly into D0~D6 of PLC_A without writing in ladder diagram into PLC_A.
Network environment	(1) Adopt a static IP address. (2) IP address of PLC_A: 192.168.0.4 (3) IP address of PLC_B: 192.168.0.5 (4) Update from PLC_B to PLC_A.

1. Please refer to section 13.1.7.1 for how to set the communication.
2. Compile the ladder diagram in the MPU and download it to PLC_B. Do NOT need to write any corresponding ladder diagram into PLC_A.



Explanations:

The data exchange will be executed every one second.

Write “0” into CR#28, and PLC_B will use CR#25~CR#26 as the IP address of the destination PLC.

Write the IP address of PLC_A into CR#25 and CR#26. The first two IP codes (192.168=H’C0A8) should be written into CR#26, and the last two IP codes (0.4=H’0004) into CR#25.

Write the MODBUS address of D0 (H’1000) in PLC_A into CR#81 and CR#84.

Write the MODBUS address of D100 (register of RTC) (H’1064) into CR#86.

Write the number of registers K7 into CR#85.

Write “1” into CR#13 to start the data exchange.

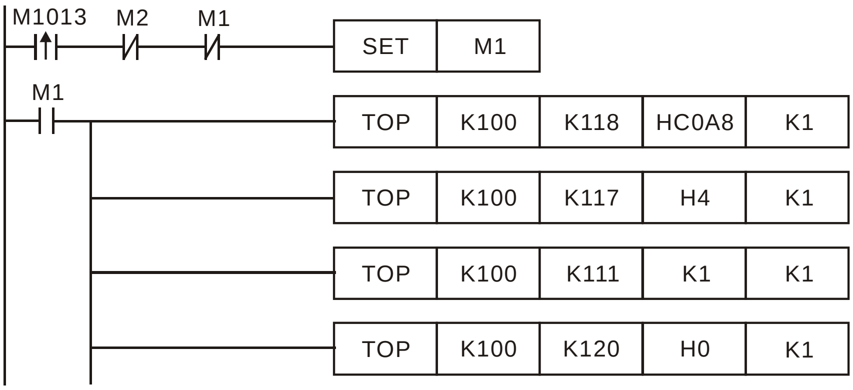
CR#14=2 refers to successful execution. CR#14=3 refers to failed execution.

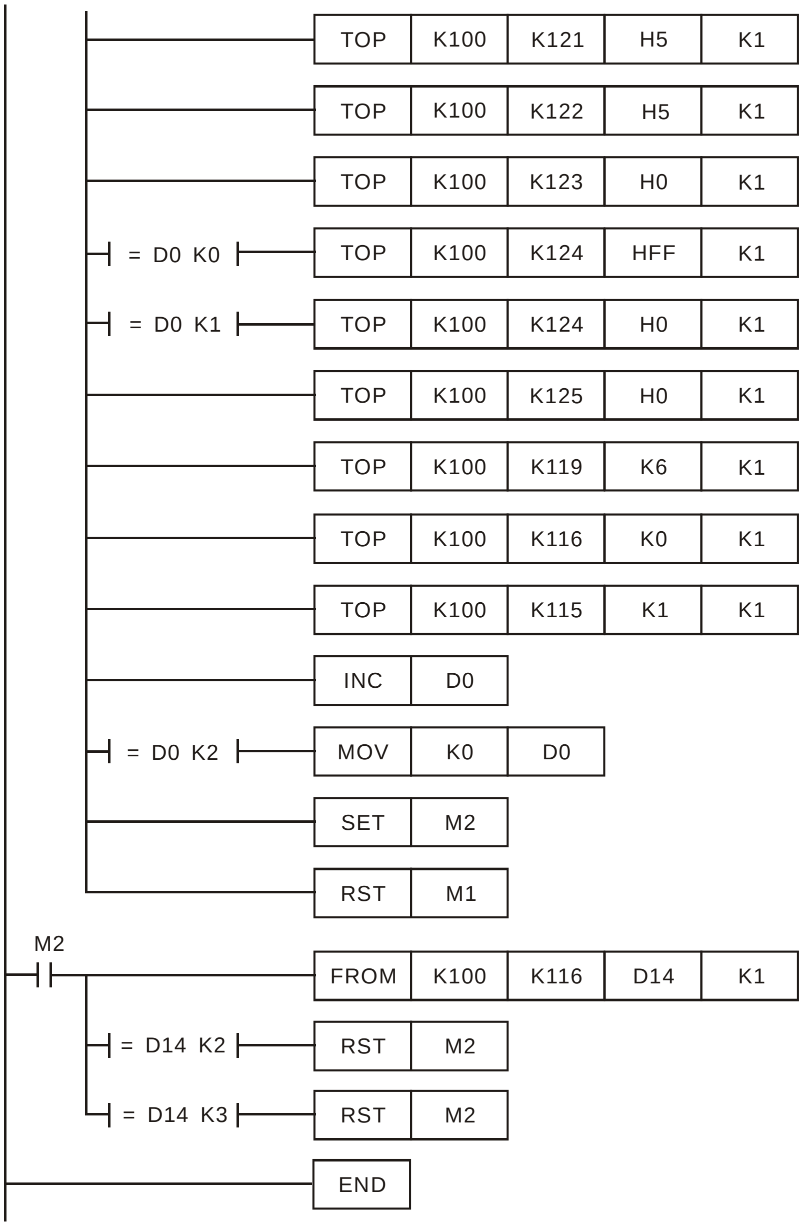
Once the data exchange is successful, the values in D1313~D1318 in PLC_B will be written into D0~D6 of PLC_A.

13.1.7.13 MODBUS TCP Master Application

Application	Compiling MODBUS instruction by PLC_B, making Y0 of PLC_A flashing
Network environment	(1) Adopt a static IP address. (2) IP address of PLC_A: 192.168.0.4 (3) IP address of PLC_B: 192.168.0.5 (4) Update from PLC_B to PLC_A (5) Use MODBUS instruction 050500FF00 to set "On" Y0. (6) Use MODBUS instruction 0505000000 to set "Off" Y0. (7) Y0 goes between On/Off once every one second.

1. Please refer to section 13.1.7.1 for how to set the communication
2. Compile the ladder diagram in the MPU and download it to PLC_B. See below for the program design. Do NOT need to write any corresponding ladder diagram into PLC_A.





Explanations:

The data exchange will be executed every one second.

Write the IP address of PLC_A into CR#117 and CR#118. The first two IP codes (192.168=H'C0A8) should be written into CR#118, and the last two IP codes (0.4=H'0004) into CR#117.

Set CR#111 as "1" to enable the 8-bit mode. The MODBUS instruction is stored in the low byte of CR#120~CR#247.

Write MODBUS instruction into CR#120~CR#125. CR#120 is the MODBUS address.

Write the length of the instruction into CR#119.

Write "1" into CR#115 to start the execution of MODBUS TCP instruction.

CR#116=2 refers to successful execution. CR#116=3 refers to failed execution.

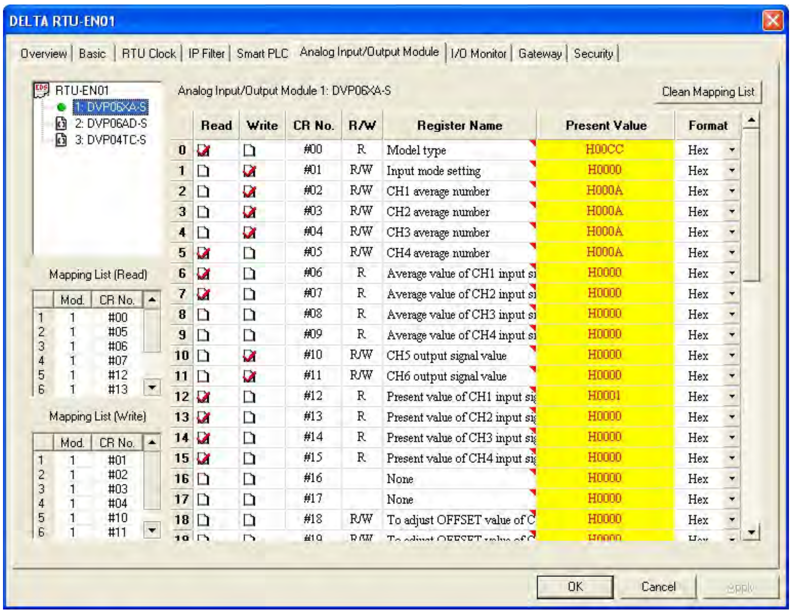
If the execution is successful, Y0 on PLC_A will go between On and Off every one second.

13.1.7.14 RTU Mapping

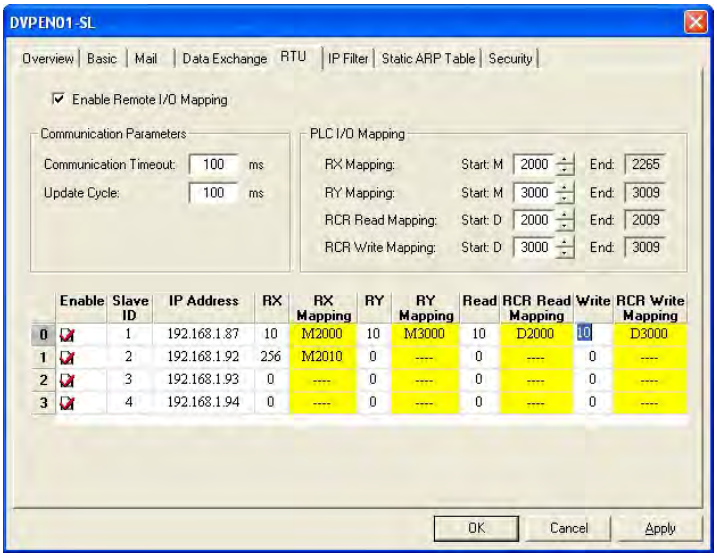
Application	Using RTU mapping to read/write the remote digital I/O and analog I/O registers. DVP28SV+DVPEN01-SL→RTU-EN01+DVP06XA+DVP16SP.
Network environment	Adopt static IP address. IP address of DVPEN01-SL: 192.168.1.90 IP address of RTU-EN01: 92.168.1.91 Use DCISoft for RTU-EN01and check 10 mapping data for read and 10 mapping data for write. Set the mapping start address and number of data for RX, RY, RCR (read) and RCR (write) at DVPEN01-SL. Enable the mapping function in DVP-SV PLC at DVPEN01-SL. Use M2000 and D2000 in DVP-SV to read and M3000 and D3000 to write the value in the remote RTU-EN01.

1. Please refer to section 13.1.7.1 for more information about setting communication

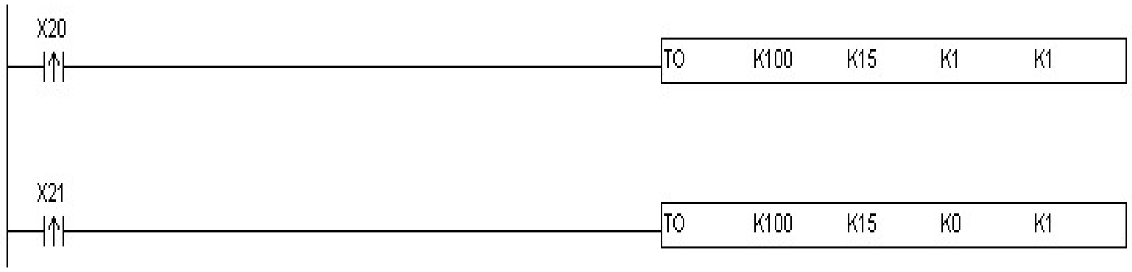
2. Use DCISoft for RTU-EN01 to set mapping control registers used for reading/writing.



3. Use DCISoft for DVPEN01-SL to set start addresses and numbers. (RX: M2000~M2009; RY: M3000~M3009; RCR (Reading): D2000~D2009; RCR (Writing): D3000~D3009)



4. Edit a ladder diagram, and download it to DVPEN01-SL. The program edited is like the one shown below.



Explanations:

1. Enabling mapping: CR15=1
2. Disabling mapping: CR15=0
3. After CR#15 is enabled, M2000~M2009 and D2000~D2009 will be used to read data, and present values will be read before M3000~M3009 and D3000~D3009 are used to write data.
4. During the execution of mapping, other devices cannot be used to modify the values in mapping registers.

13.1.7.15 MELSEC Protocol Application

Application	Using **Always Enable** in the **Enable Condition** drop-down list box to read/write registers in a Mitsubishi PLC. DVP28SV+DVPEN01-SL→Mitsubishi PLC
Network environment	(1) Use a static IP address. (2) The IP address of DVPEN01-SL is 192.168.1.5, and the sending communication port is 9002. (3) The IP address of RTU-EN01 is 192.168.1.39, and the receiving communicaiton port is 9002. (4) Data mapping: D100~D199 in DVP28SV are mapped onto D100~D199 in the Mitsubishi PLC, and D0~D99 in the Mitsubishi PLC are mapped ont D0~D99 in DVP28SV.

※ Firmware version 2.10 and above support this function.

※ Please visit the Mitsubishi website for more information about the Mitsubish PLC models which support the MELSEC communication protocol.

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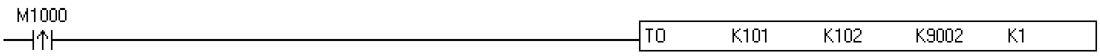
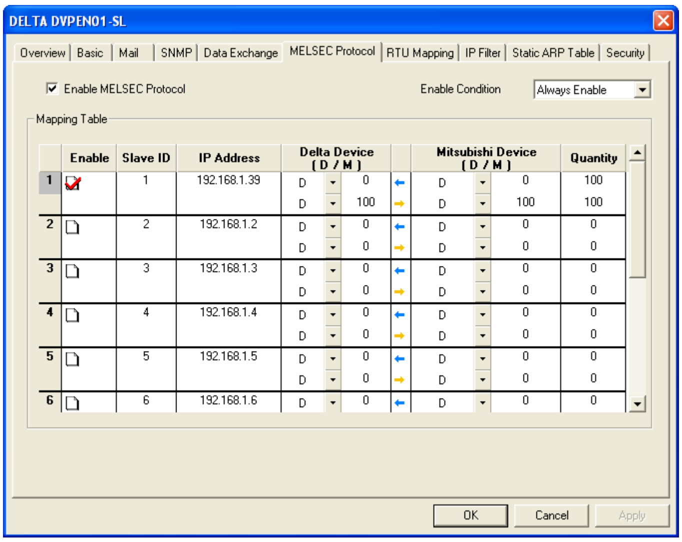
1. Please refer to section 13.1.7.1 for more information about setting communication.
2. Use the Mitsubishi software to set the IP address of the Mitsucishi PLC and the communication parameters.
   - Communication protocol: MC protocl
   - Communication mode: UDP
   - Communication port: 9002
3. Write a program for the MPU, and download it to DVPEN01-SL. The program designed is like the one shown below



4. Use DCISof to set data exchange for DVPEN01-SL.



※ After the settings are downloaded, DVPEN01-SL will read the data in D0~D99 in the Mitsubish PLC into D0~D99 in DVP28SV, and write the data in D100~D199 in DVP28SV into D100~D199 in the Mitsubish PLC.

13.1.8 LED Indictor and Troubleshooting

13.1.8.1 LED Indication

LED	LED Status	Indication	How to correct
POWER (green)	Constantly ON	Power supply is normal.	--
	Constantly OFF	No power supply	Check whether the CPU module supplies power normally, and DVPEN01-SL is connected tightly.
RS-232 (red)	Flashing	There are data being transmitted in the serial port	--
	Constantly OFF	No data transmission	Check whether the RS-232 cable is connected to the COM port on DVPEN01-S when in RS-232 communication.
100M (orange)	Constantly ON	Connected to Ethernet at 100Mbps	--
	Constantly OFF	Connected to Ethernet at 10Mbps	Check whether the network cable is connected correctly, the transmission speed is 100Mbps, and the RJ45 connector is connected normally.
LINK (green)	Constantly ON	The network connection is normal.	--
	Flashing	Network in operation	--
	Constantly OFF	The network is not connected	Check whether the network cable is connected correctly, and the RJ45 connector is connected normally.

13.1.8.2 Troubleshooting

Abnormality	Cause	Solution
DCISoft search or page opening abnormality	DVPEN01-SL is not connected to a network.	Check whether DVPEN01-SL is correctly connected to a network.
	Blocked by network firewall or router.	If the computer and DVPEN01-SL are in different network segments or separated by two or more switches, please use the specified IP for detection or utilize RS-232 for relevant configurations.
	Network interference.	If occasionally experiencing situations where searches are successful while at other times unsuccessful, it may be due to network congestion, causing packets to be unable to transmit in real-time. Please simplify the network and proceed with the configuration again or utilize RS-232 for relevant settings.
Able to open DVPEN01-SL setup page but fail to upload /download program and monitor by WPLSoft	The network setting for DVPEN01-SL is incorrect.	Check whether the network setting for DVPEN01-SL is correct. Consult the IT staff if you are using the Intranet in the company or refer to the network setting instructions provided by your ISP.
Unable to send emails	The network setting for DVPEN01-SL is incorrect.	Check whether the network setting for DVPEN01-SL is correct.
	Incorrect CR settings	Check whether the CR is used correctly.
	Incorrect settings for e-mail server	Confirm the IP address of the SMTP server.
	The mail server does not support TLS/SSL	Please use email server that supports TLS/SSL.

13.2 DVPDNET-SL

13.2.1 Introduction

DVPDNET-SL running on the left side of PLC can serve as the DeviceNet master or slave with the PLC together.

1. When used as a master station, it has the following functions:
   - Automatically exchanges data with the PLC MPU. Users can monitor the slave station by manipulating specific registers on the PLC host.
   - Supports client functionality for Explicit messages.
   - Supports various IO connections with slave stations: Polled, Bit-Strobed, Change of State, Cyclic.
   - Serves as an interface for DeviceNetBuilder configuration software and DeviceNet network connection. The configuration software can directly configure the network through the DNET module.
   - Supports sending Explicit message read/write slave station data through PLC ladder diagram.
   - Maximum data length for input and output is 380 bytes, respectively.
2. When used as a slave station, it has the following functions:
   - Automatically exchanges data with the PLC MPU. Users only need to program the PLC's D registers, eliminating the need for FROM/TO instructions.
   - Supports server functionality for Explicit messages and supports Group 2 only server connection mode.
   - Supports polled connection.
   - Maximum data length for input and output is 255 bytes, respectively.

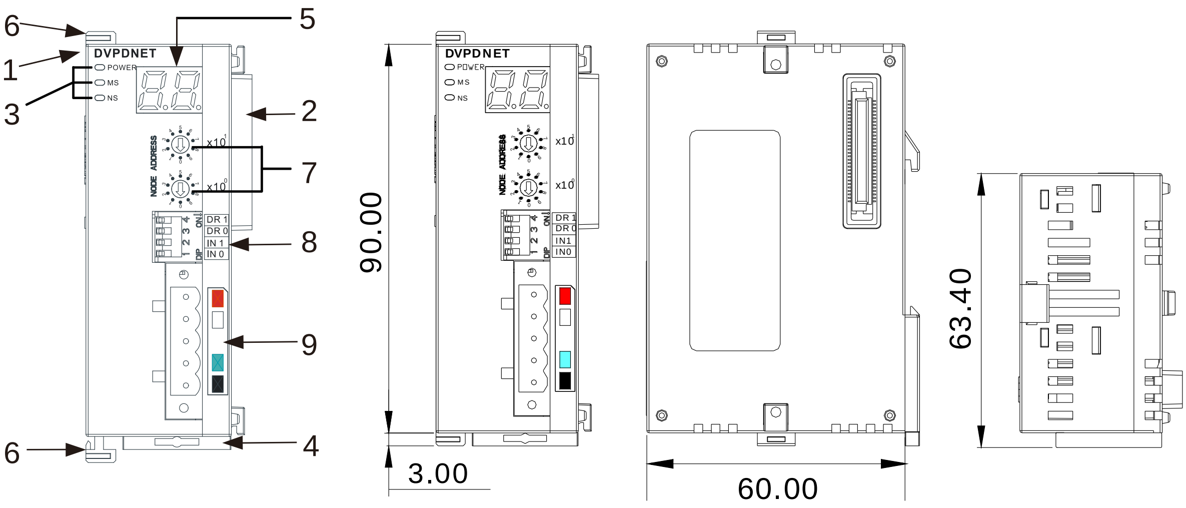
13.2.1.1 Features

- Serves as DeviceNet master by connecting to the PLC and supports standard DeviceNet protocol.
- DeviceNet Builder provides the convenient graphic configuration interface; automatically scans and recognizes all slaves on the DeviceNet network.
- Supports DeviceNet Master and Slave modes.
- Supports eight types of baud rates: 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800kbps, 1M kbp

13.2.1.2 Specification

Module name	DVPDENT-SL
Supply voltage	Provided by PLC MPU
DeviceNet connector	Removable connector（5.08mm）
Transmission method	CAN
Transmission cable	TAP-CB01 cable and TAP-CB02 cable are recommended. (The shielded wire must be grounded, and the cable should be away from the power line)
Message type	Explicit connection, IO polled connection, bit-strobe connection, COS/CC connection
Baud rate	Standard mode: 125k、250k、500kbps Extended mode:10k、20k、50k、125k、250k、500k、800k、1Mkbps
Product code	Master mode: 64 Slave mode: 82
Product type	12
Manufacturer ID	799（Delta Electronics Inc.）
Connect to DVP-PLC CPU	Connect to the left side of CPU, numbered from 100 to 107 according to the position of module from the closest to farthest to CPU
Weight	115g

13.2.2 Module Profiles and Dimension

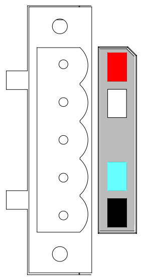


Unit: mm

No.	Name	Description
1	Model name	Model name of the module
2	Extension port	Connect the PLC or the modules.
3	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	MS indicator	OFF: no power Green light blinking: Module not configured Green light ON: Input/output data is normal Red light blinking: DNET as master: Abnormal operation of slave tasks in the scan list DNET as slave: Configuration issue Red light ON: internal module error
	NS indicator	OFF: No power/Failed to establish duplicate ID check procedure Green light blinking: Online but not connected to the DeviceNet network Green light ON: Online and connected to the DeviceNet network Red light blinking: Communication error Red light ON: Network failure, duplicate node address, no network power, or network bus interruption (BUS-OFF)
4	DIN rail clip	Secure the module on the set
5	Digital indicator	The digital indicator is used to show the node address, error information, and error messages from the slave station of the DVPDNET-SL module
6	Extension clip	For securing the extension module
7	Address switch	DeviceNetcommunication address setting
8	Function switch	Communication speed and I/O data action settings.
9	DeviceNet connection port	Connect to DeviceNet

13.2.3 Terminals

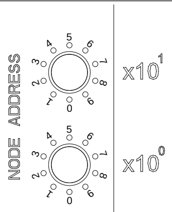
DeviceNet Pin Definition



Pin	Signal	Color	Function
1	V-	Black	0VDC
2	CAN_L	Blue	Signal-
3	Drain	-	Shield
4	CAN_H	White	Signal+
5	V+	Red	24VDC

Note: Either end of the communication cable should be connected with a terminal resistor of 121Ω and the resistors should be connected between “Signal+” and “Signal-”.

Address Switch



Switch setting	Content
0 … 63	Valid DeviceNet node address
Others	Invalid DeviceNet MAC ID address setting

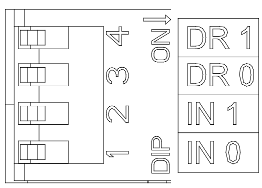
Example:

If you need to set the node address of DVPDNET-SL to 26, simply switch the corresponding switch of x101 to 2 and the corresponding switch of x100 to 6.

Note:

- Please set up the node address when the power is switched off. After the setup is completed, re-power DVPDNET-SL.
- Use the slotted screwdriver to rotate the switch carefully in case you scratch the switch.

Function Switch



DR1	DR0	Baud rate
OFF	OFF	125kbps
OFF	ON	250kbps
ON	OFF	500kbps
ON	ON	Entering the mode of extended baud rate

IN0：

ON–When the slave is off-line, the I/O data in the buffer area will be held

OFF–When the slave is off-line, the I/O data in the buffer area will be cleared

IN1： reserved

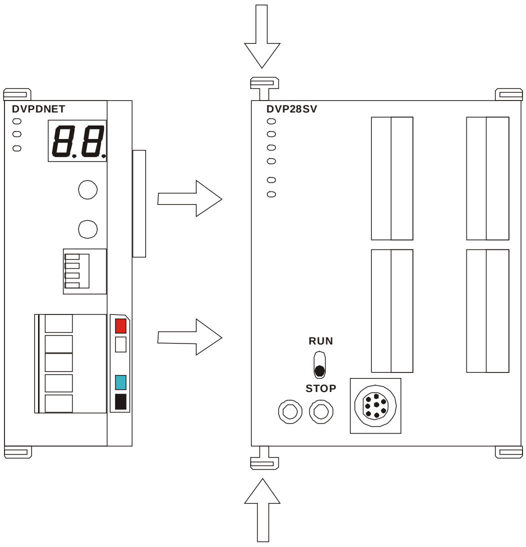
Note:

- After setting up the function switch, re-power DVPDNET-SL and then the setting is effective.
- Use the slotted screwdriver to adjust the DIP switch carefully in case you scratch the switch.

13.2.4 Installation

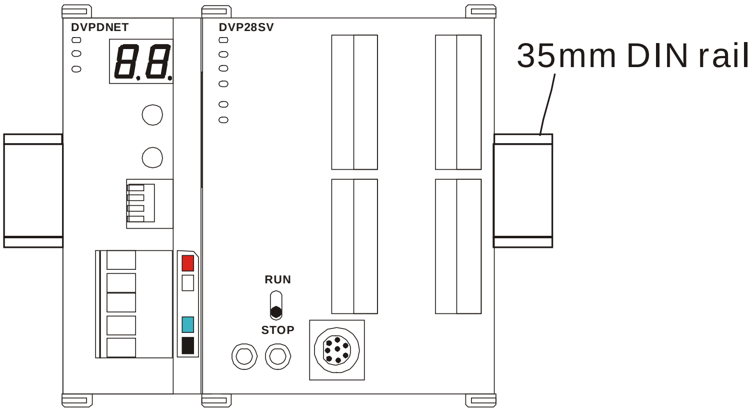
1. Connecting DVPDNET-SL to PLC

   - Adjust the extension clips on the left side of the PLC.
   - Meet the extension port of the PLC with DVPDNET-SL as shown in the figure below.
   - Fasten the extension clips.



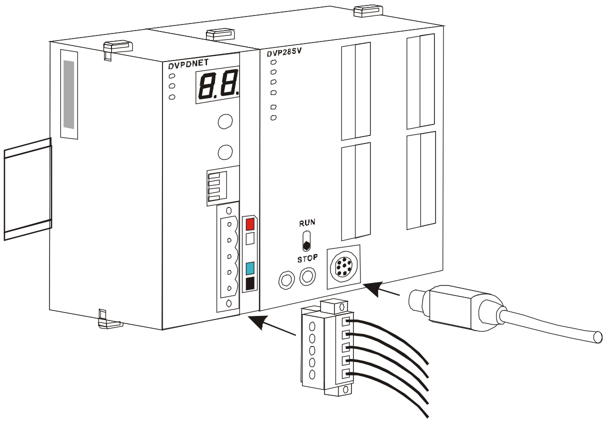
2. Install DVPDNET-SL and PLC on DIN Rail

   - Use 35mm DIN rail.
   - Open the DIN rail clip on the PLC and DVPDNET-SL. Insert the PLC and DVPDNET-SL onto the DIN rail.
   - Clip up the DIN rail clips on the PLC and DVPDNET-SL to fix the PLC and DVPDNET-SL on the DIN rail, as shown below.



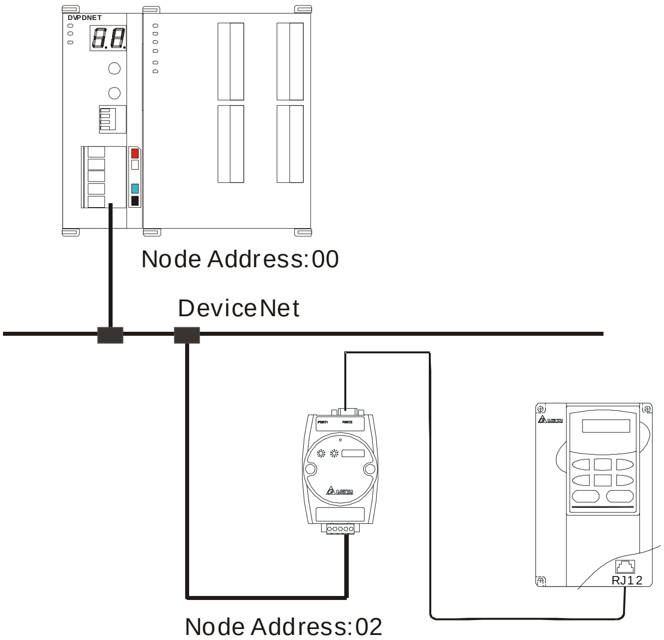
3. Connect to DeviceNet Connection Port

- The colors on the PINs on the DeviceNet connection port match the colors of the connection cables. Make sure you connect the cable to the right PIN.
- We recommend you also apply Delta's power module in the connection.



13.2.5 Connect to DeviceNet

Please wire according to the pin definitions of the communication connector and connect it to the DeviceNet network.



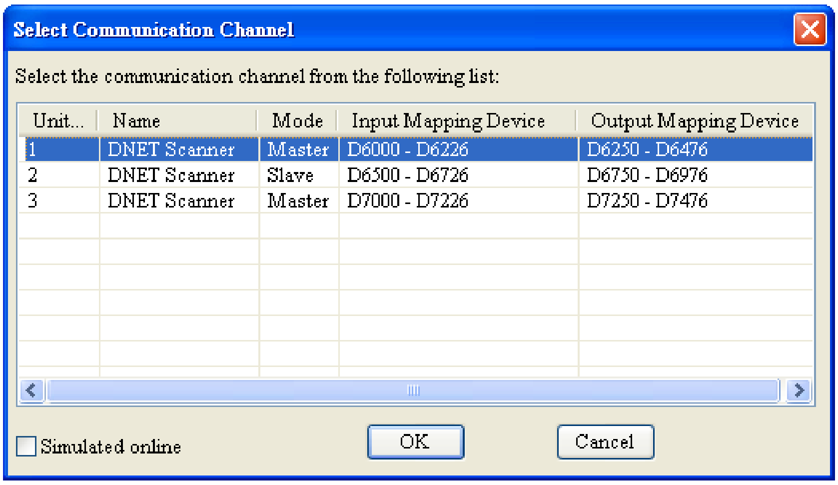
13.2.6 Software Introduction

Before DVPDNET-SL starts to work, it must be configured through DeviceNet Builder software.

Note: Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas. We take DVP-SV as the PLC for description below.

13.2.6.1 Communication Channel Selection

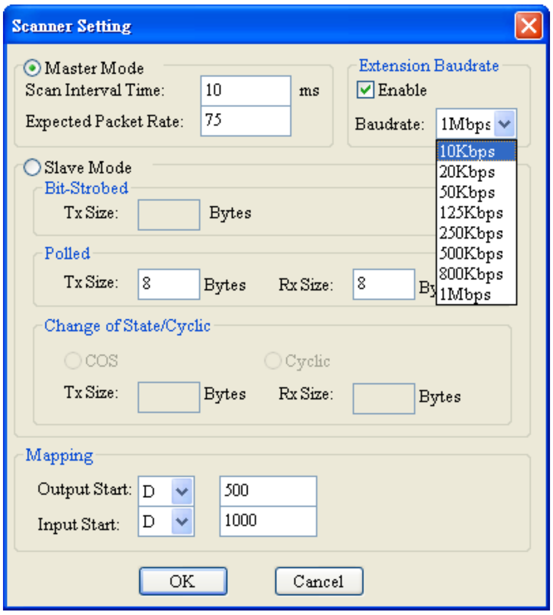
Max. 8 DVPDNET-SL modules can be connected to the left side of the PLC and every DVPDNET-SL is a communication channel. When there are three DVPDNET-SL modules connected to PLC's left side and DeviceNet Builder software is online, the following dialog box will pop up for you to select the current channel.



Parameter	Explanation
Unit No.	The unit No. of the first DVPDNET-SL (DNET Scanner) on the left side of PLC is 1. PLC's left side can be connected with max 8 DVPDNET_SL. The further DVPDNET-S is from the PLC, the larger its unit No is.
Name	DVPDNET-SL's name in software.
Code	For displaying the current mode of DVPDNET-SL: master mode or slave mode.
Input mapping	The register areas which PLC MPU distributes to DVPDNET-SL. The areas are mainly used to receive the message from DeviceNet Slaves and the data from slaves on the bus will be automatically updated to these registers.
Output mapping	The register areas which the PLC has assigned to DVPDNET-SL. The areas are mainly used to control DeviceNet slave and the control data in these registers will be automatically sent to DeviceNet slave in the bus. Slave will take some action accordingly after receiving the data.

13.2.6.2 Scan Module Setup

The following dialog is for setting DVPDNET-SL's current mode: master mode or slave mode.

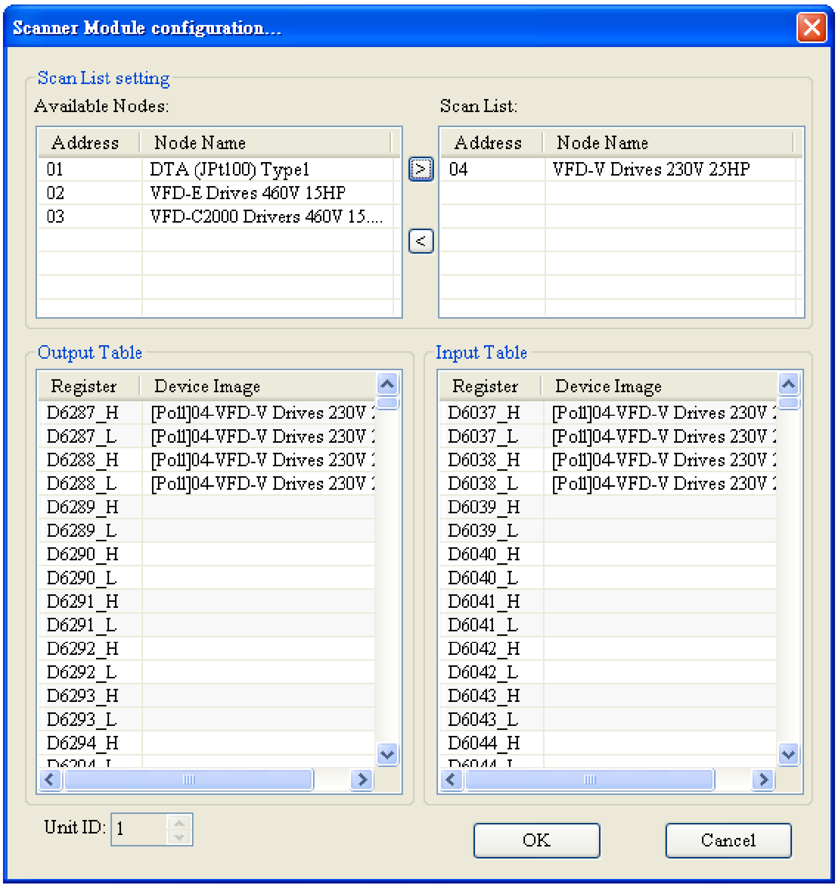


Parameter	Explanation
Master mode	For setting DVPDNET-SL as master.
Scan interval time	The cycle time for master to send and receive the real time data after real-time data connection is successful.
Expected Packet Rate	The result value of the parameter multiplied by 4 is the timeout time. (Unit: ms) Master assumes that the slave is offline if it receives no response from slave after the timeout time is elapsed.
Extension baud rate	The parameter is effective only when DVPDNET is in master mode. Selecting "Enable" activates the function. Select an appropriate baud rate according to actual demand.
Slave mode	For setting DVPDNET-SL as slave
Bit-strobed	Reserved; no actual purpose now.
Polled	The parameter is effective only when DVPDNET is in slave mode. The filled byte numbers correspond to the data length of outputs and inputs as DVPDNET-S is in slave mode. "TxSize" corresponds to "Output length" and "RxSize" corresponds to "Input length".
Change of State/Cyclic	Reserved; no actual purpose now.
Mapping	Available for AH models only; no actual purpose now.

Note: These parameters and the configuration information are downloaded to DVPDNET-SL together.

13.2.6.3 Scan List Setup

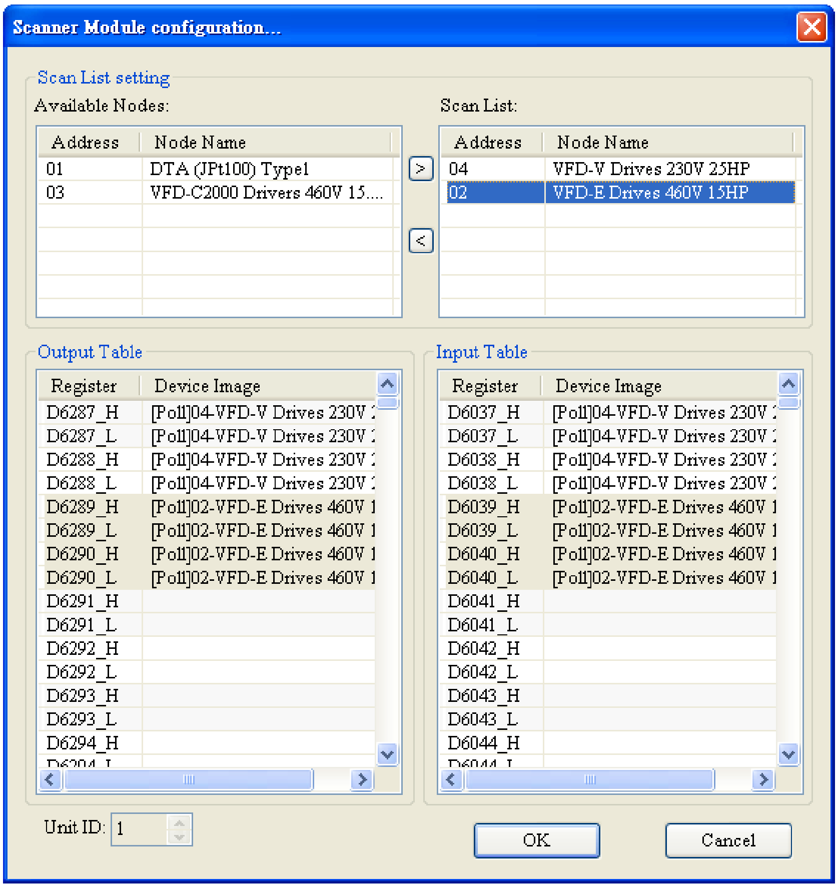
Double click the existing icon of DVPDNET-SL in the DeviceNet Builder interface and then the following dialog box appears for configuring the scan module.



Parameter	Explanation
Available nodes	All already scanned slaves appear in “Available list”. After the configuration data is downloaded to DVPDNET-SL, the slave in “Available nodes” will not conduct the real-time data exchange with DVPDNET-SL.
Scan list	After the configuration data is downloaded to DVPDNET-SL, the slave in “Scan list” will conduct the real-time data exchange with DVPDNET-SL.
Address	The station No. for the slave on the DeviceNet bus.
Node name	The node name that the node address corresponds to.

13.2.6.4 Input Table and Output Table

Select the device in “Scan list” and then the data length of input and output of the device will be displayed respectively in the lower part of the following dialog box.



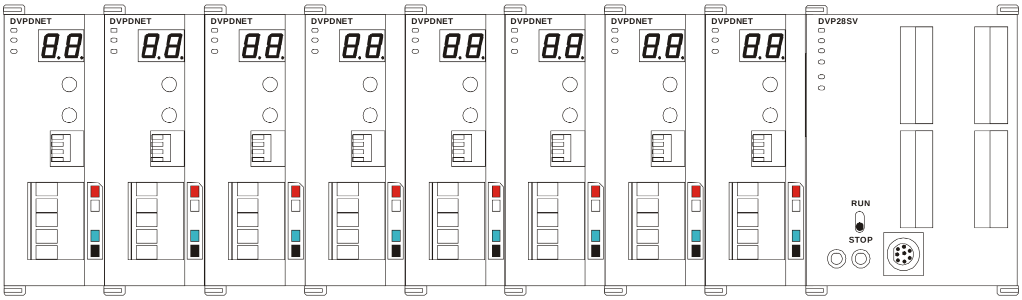
Parameter	Explanation
Output Table	PLC’s registers and the corresponding output data are shown in “Output table”. The values in PLC’s registers will be sent to slave in real time as the control data of the slave.
Input Table	PLC’s registers and the corresponding input data are shown in “input table”. The data that slave sends to master will be updated in PLC’s registers in real time.
Register	The number of the registers in PLC; “D6289_H” indicates the high byte of register D6289; “D6289_L” indicates the low byte of register D6289.
Device image	For displaying the data type and the name of current slave; “Poll” means the polled data.

13.2.7 Input and Output Mapping Areas

13.2.7.1 Data Mapping Areas

The input and output data mapping introduced here is the data mapping between the PLC and DVPDNET-SL. The mapping relation keeps unchanged, and users are not allowed to revise the areas.

Max. 8 units of DVPDNET-SL modules can be connected on PLC's left side. After all DVPDNET-SL modules are connected to the PLC, the PLC will assign data mapping areas to each DVPDNET-SL.



1. When DVPDNET-SL is used with different PLC, the input and output mapping areas for it are different. The details are as follows:

- When the PLC is DVP-SV3 or DVP-SX3, registers D16000~D19999 are occupied. The number of the first DVPDNET-SL on the left side of the PLC is 1 and the number of the DVPDNET-SL module close to the left side of the first DVPDNET-SL is 2, and subsequent DVPDNET-SL modules are No. 3, No. 4 and so on.

Unit No.	Mapping devices	
	Output mapping	Input mapping
1	D16250~D16497	D16000~D16247
2	D16750~D16997	D16500~D16747
3	D17250~D17497	D17000~D17247
4	D17750~D17997	D17500~D17747
5	D18250~D18497	D18000~D18247
6	D18750~D18997	D18500~D18747
7	D19250~D19497	D19000~D19247
8	D19750~D19997	D19500~D19747

- When the PLC is another model in the DVP series (that is, not DVP-SV3 or DVP-SX3), registers D6000–D9999 are occupied. The number of the first DVPDNET-SL on the left side of the PLC is 1 and the number of the DVPDNET-SL module close to the left side of the first DVPDNET-SL is 2, and subsequent DVPDNET-SL modules are No. 3, No. 4 and so on.

Unit No.	Mapping devices	
	Output mapping	Input mapping
1	D6250~D6497	D6000~D6247
2	D6750~D6997	D6500~D6747
3	D7250~D7497	D7000~D7247
4	D7750~D7997	D7500~D7747
5	D8250~D8497	D8000~D8247
6	D8750~D8997	D8500~D8747
7	D9250~D9497	D9000~D9247
8	D9750~D9997	D9500~D9747

13.2.7.2 I/O Mapping Area Assignment (in Master Mode)

- When the PLC is DVP-SV3 and DVP-SX3, and the DVPDNET-SL of number 1 is in master mode, the data mapping areas are assigned as shown in the following table.

Input mapping area			Output mapping area		
Devices in PLC	Function	Data length	Devices in PLC	Function	Data length
D16000–D16031	Explicit response message program	32 words	D16250–D16281	Explicit request message program	32 words
D16032–D16035	Status of nodes in the scan list	4 words	D16282–D16285	Bit-strobe command	4 words
D16036	DVPDNET-SL status	1 word	D16286	Reserved	1word
D16037–D16226	DeviceNet input data	190 words	D16287–D16476	DeviceNet output data	190 words
D16227–D16247	Reserved	21 words	D16477–D16497	Reserved	21 words

- When the PLC is another model in the DVP series (that is, not DVP-SV3 or DVP-SX3), and the DVPDNET-SL of number 1 is in master mode, the data mapping areas are assigned as shown in the following table.

Input mapping area			Output mapping area		
Devices in PLC	Function	Data length	Register No. in PLC	Function	Data length
D6000–D6031	Explicit response message program	32 words	D6250–D6281	Explicit request message program	32 words
D6032–D6035	Status of nodes in the scan list	4 words	D6282–D6285	Bit-strobe command	4 words
D6036	DVPDNET-SL status	1 word	D6286	Reserved	1word
D6037–D6226	DeviceNet input data	190 words	D6287–D6476	DeviceNet output data	190 words
D6227–D6247	Reserved	21 words	D6477–D6497	Reserved	21 words

Note:

If the number of the DVPDNET-SL is 2, the numbers of the registers in the two tables above will all be added by 500 respectively; if the number of the DVPDNET-SL is 3, the numbers of the registers in the two tables above will all be added by 1000 respectively; if the number of the DVPDNET-SL is 4, the numbers of the registers in the two tables above will all be added by 1500 respectively and so on.

13.2.7.3 I/O Mapping Area Assignment (in Slave Mode)

- When the PLC is DVP-SV3 or DVP-SX3, and the DVPDNET-SL is in slave mode, the data mapping areas are assigned as shown in the following table and these devices are for the real-time data exchange.

Unit No	Input mapping area		Output mapping area	
	Initial device	Max data length	Initial device	Max data length
1	D16000	255Bytes	D16250	255Bytes
2	D16500	255Bytes	D16750	255Bytes
3	D17000	255Bytes	D17250	255Bytes
4	D17500	255Bytes	D17750	255Bytes
5	D18000	255Bytes	D18250	255Bytes
6	D18500	255Bytes	D18750	255Bytes
7	D19000	255Bytes	D19250	255Bytes
8	D19500	255Bytes	D19750	255Bytes

When the unit No. of the DVPDNET_SL is 1, the control data which DeviceNet master sends out will be updated in real time in PLC's devices among which D16000 is the initial device. In the meanwhile, the values in PLC's devices among which D16250 is the initial device will be automatically sent back to DeviceNet master. In this way, the real-time data exchange is realized.

- When the PLC is another model in the DVP series (that is, not DVP-SV3 or DVP-SX3) and the DVPDNET-SL is in slave mode, the data mapping areas are assigned as shown in the following table and these devices are for the real-time data exchange.

Unit No	Input mapping area		Output mapping area	
	Initial device	Max data length	Initial device	Max data length
1	D6000	255 Bytes	D6250	255 Bytes
2	D6500	255 Bytes	D6750	255 Bytes
3	D7000	255 Bytes	D7250	255 Bytes
4	D7500	255 Bytes	D7750	255 Bytes
5	D8000	255 Bytes	D8250	255 Bytes
6	D8500	255 Bytes	D8750	255 Bytes
7	D9000	255 Bytes	D9250	255 Bytes
8	D9500	255 Bytes	D9750	255 Bytes

When the unit No. of the DVPDNET_SL is 1, the control data which DeviceNet master sends out will be updated in real time in PLC's devices among which D6000 is the initial device. In the meanwhile, the values in PLC's devices among which D6250 is the initial device will be automatically sent back to DeviceNet master. In this way, the real-time data exchange is realized.

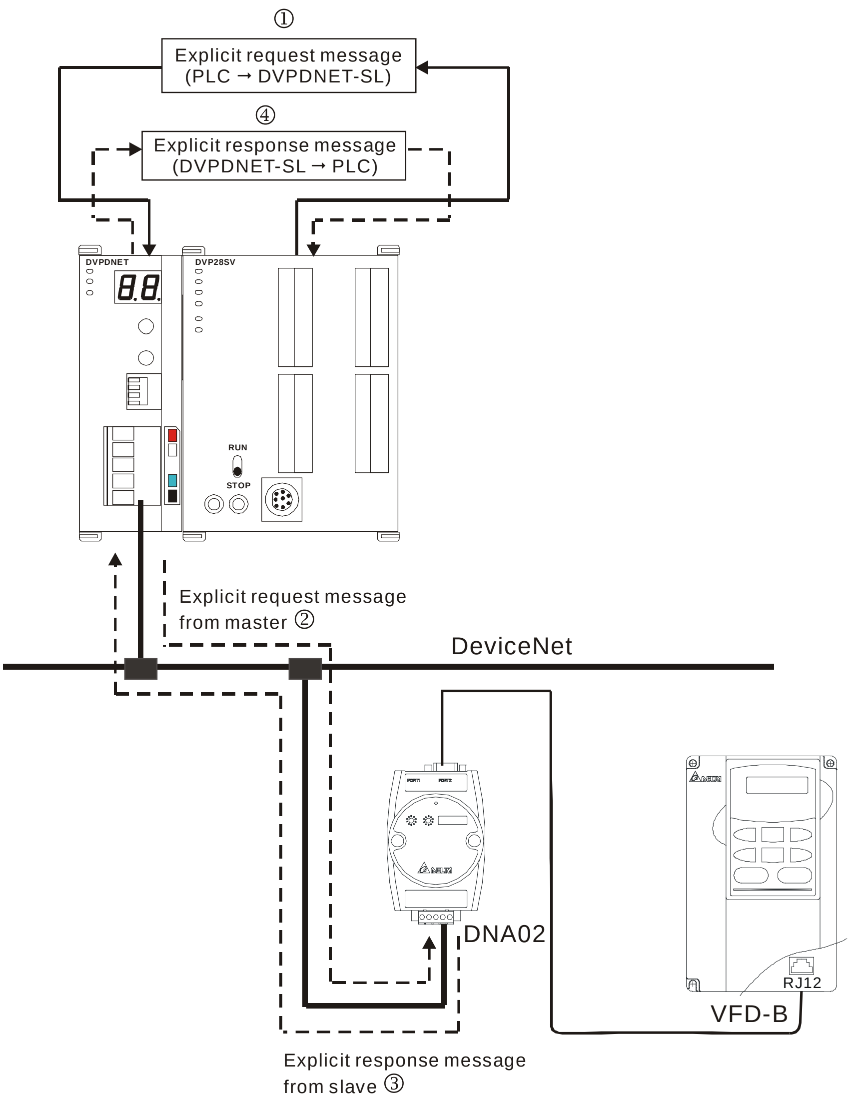
13

13.2.8 Sending Explicit Message from Ladder Diagram

DVPDNET-SL supports the sending of explicit messages through WPL programs.

Note: Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas in Section 4.2. We take DVP-SV as the PLC for description below.

13.2.8.1 Principle of Explicit Message Sending



①: The PLC sends the explicit request message based on WPL program to DVPDNET-SL.

②: Then DVPDNET-SL transfers the request message to the target equipment.

③: The target equipment processes the request message and replies with a response message to DVPDNET-SL.

④: The PLC stores the response message from DVPDNET-SL to D register to finish one explicit message transmission.

13.2.8.2 Structure of Explicit Message

You can edit explicit messages in "explicit request message editing area" and "explicit response message editing area". See the table below for the corresponding relation between the two areas and PLC devices. If you send the requested message to D6250 – D6281, DVPDNET-SL will write the response message data to D6000 – D6031.

PLC device	Mapping area	Mapping length
D6000 – D6031	Explicit response message editing area	64 bytes
D6250 – D6281	Explicit request message editing area	64 bytes

1. Structure of request message. See the table below:

PLC device	Requested message																	
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
D6250	Message Header	ReqID)								Command							
D6251		Port)								Size							
D6252		Service code)								MAC ID							
D6253	Message Data	High byte of Class ID								Low byte of Class ID							
D6254		High byte of Instance ID								Low byte of Instance ID							
D6255		reserved								Attribute ID (optional)							
D6256~D6281		Service data															

- Command: Fixed to "01Hex".
- ReqID: The request ID. Whenever an explicit message is sent out, the message will be given a ReqID for DVPDNET-SL to identify every message. For the next explicit message to be sent out, you have to change the ID. ReqID = 0 indicates that DVPDNET-SL will not send out any explicit message. Range of ReqID: 00Hex – FFHex.
- Size: The length of the message, starting from D6253. The high bytes of D6255 are reserved. When the data length is being calculated, D6255 is counted as 1 byte. The maximum data length is 58 bytes. Errors will occur when the length is longer than 58 bytes. Unit: byte.
- Port: The communication port. Fixed to "00Hex".
- MAC ID: The node address of the target equipment on DeviceNet.
- Service Code: The service code of the explicit message. See the meanings of the codes in the table below:

Service Code	Explanation
01Hex	Read all attributes (Get_Attribute_All)
02Hex	Set up all attributes (Set_Attribute_All)
0EHex	Read a single attribute (Get_Attribute_Single)
10Hex	Set up a single attribute (Set_Attribute_Single)

2. Structure of response message. See the table below:

<table>
<tr><td rowspan="2">PLC device</td><td colspan="17">Response Message</td></tr>
<tr><td></td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>D6000</td><td rowspan="3">Message Header</td><td colspan="8">ReqID</td><td colspan="8">Status</td></tr>
<tr><td>D6001</td><td colspan="8">Port</td><td colspan="8">Size</td></tr>
<tr><td>D6002</td><td colspan="8">Service Code</td><td colspan="8">MAC ID</td></tr>
<tr><td>D6003 – 6031</td><td>Message Data</td><td colspan="16">Service Response Data</td></tr>
</table>

- The definitions of ReqID, Port, Service Code and MAC ID are the same as their definitions in request message.
- Size: The length of the message, starting from D6003. Max. 58 bytes. Errors will occur when the length is longer than 58 bytes. Unit: byte.
- See the table below for the meanings of Status (status codes):

Status code	Explanation
0	No explicit message is sent out.
1	The communication of explicit message is successful.
2	The explicit message is being sent out.
3	Error: No response from the target equipment.
4	Error: Command is invalid.
5	Error: Size of request message is invalid.
6	Error: Size of response message is invalid.
7	Error: Failing to establish a connection to the target equipment.
8 – 255	Reserved

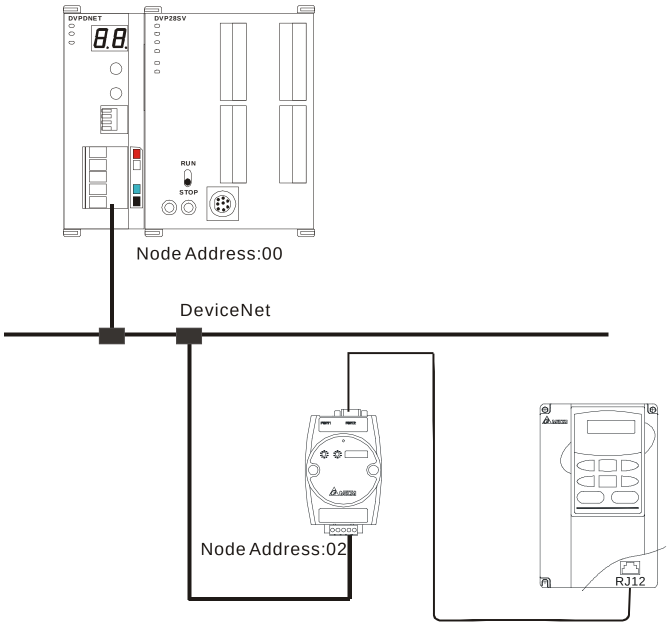
3. Notes:

- DVPDNET-SL can only send out one explicit message at a time.
- Before sending the explicit message by using WPL program, we suggest you clear the request message editing area and response message editing area.
- If the slave responds with a standard error code, and DVPDNET-SL consider the communication successful, “The communication of the explicit message is successful.” indicates that the communication has been completed successfully.

4. Application example(I)

Control requirement	When M0 = On, read Class 1>>Instance 1>>Attribute 1 of IDF9502

A. Connection Figure



Note:

Delta DeviceNet slave module, IFD9502 can connect VFD AC motor drive to the DeviceNet network.

B. Parameters setting and devices explanation

- Setting of DVPDNET-SL

Parameter	Setting value	Explanation
Node address	00	Set the node address of the DVPDNET-SL to “00”.
Baud rate	500kbps	Set the communication speed of the DVPDNET-SL and the bus to “500kbps”.

- Setting of IFD9502

Parameter	Setting value	Explanation
Node address	02	Set the node address of the IFD9502 to “02".
Baud rate	500kbps	Set the communication speed of the IFD9502 and the bus to “500kbps”.

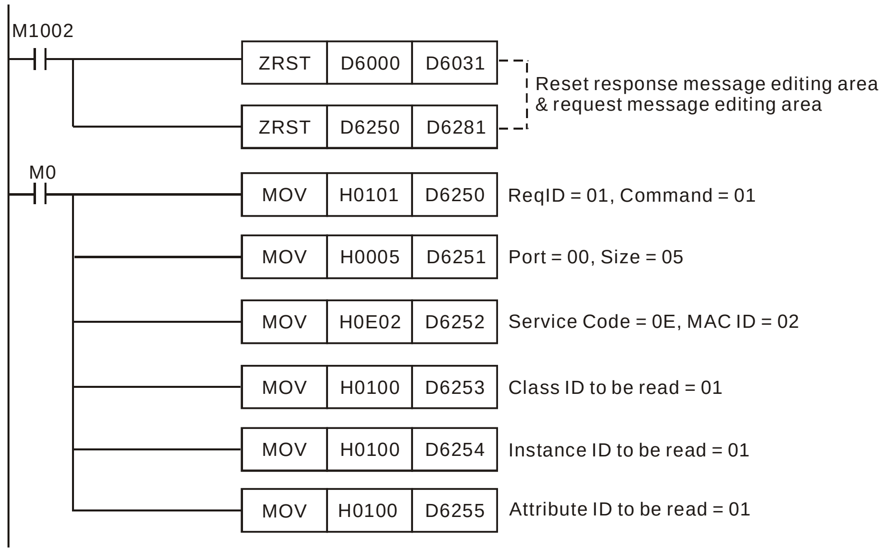
- Settings of VFD-B

Parameter	Setting value	Explanation
02-00	04	The main frequency is operated on RS-485 interface.
02-01	03	The operation commands are operated on the communication interface. Operation by keys is valid.
09-00	01	Communication address of the VFD-B: 01
09-01	03	Baud rate: 38,400
09-04	03	Modbus RTU mode, data format <8, N, 2>

- Explanations on devices

<table>
<tr><th colspan="2" rowspan="2">PLC device</th><th rowspan="2">Content</th><th colspan="16">Explanation</th></tr>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td rowspan="6">Request message editing area</td><td>D6250</td><td>0101 Hex</td><td colspan="8">ReqID= 01 Hex</td><td colspan="8">Command= 01 Hex</td></tr>
<tr><td>D6251</td><td>0005 Hex</td><td colspan="8">Port= 00 Hex</td><td colspan="8">Size= 05 Hex</td></tr>
<tr><td>D6252</td><td>0E02 Hex</td><td colspan="8">Service Code= 0E Hex</td><td colspan="8">MAC ID= 02 Hex</td></tr>
<tr><td>D6253</td><td>0001 Hex</td><td colspan="8">High bye of Class ID=00 Hex</td><td colspan="8">Low byte of Class ID= 01 Hex</td></tr>
<tr><td>D6254</td><td>0001 Hex</td><td colspan="8">High byte of Instance ID= 00Hex</td><td colspan="8">Low byte of Instance ID= 01 Hex</td></tr>
<tr><td>D6255</td><td>0001 Hex</td><td colspan="8">N/A</td><td colspan="8">Attribute ID= 01 Hex</td></tr>
<tr><td rowspan="4">Response message editing area</td><td>D6000</td><td>0101 Hex</td><td colspan="8">ReqID= 01 Hex</td><td colspan="8">Status= 01 Hex</td></tr>
<tr><td>D6001</td><td>0002 Hex</td><td colspan="8">Port= 00 Hex</td><td colspan="8">Size= 02 Hex</td></tr>
<tr><td>D6002</td><td>8E02 Hex</td><td colspan="8">Service Code= 8E Hex</td><td colspan="8">MAC ID= 02 Hex</td></tr>
<tr><td>D6003</td><td>031F Hex</td><td colspan="8">High byte of Service Data= 03 Hex</td><td colspan="8">Low byte of Service Data= 1F Hex</td></tr>
</table>

C. PLC program



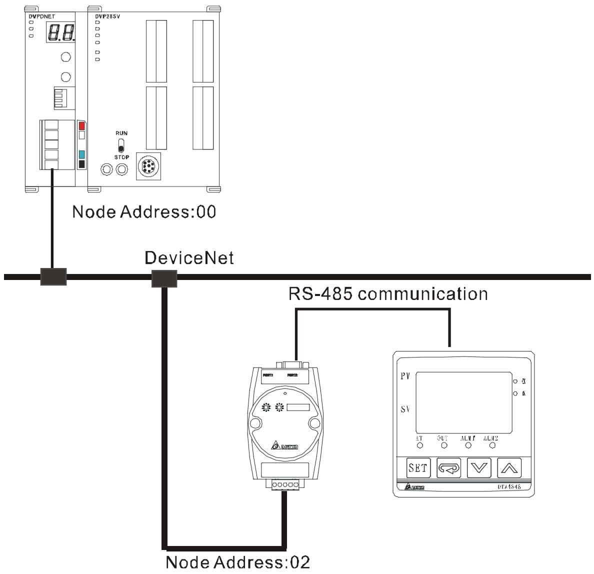
D. Program explanation

- In the beginning of the program, clear the contents in the response message editing area and request message editing area to 0.
- When M0 is On, DVPDNET-SL sends out the request message to read Class 1>>Instance 1>> Attribute 1 of the target equipment (node address: 02). If the communication of the explicit message is successful, the slave will send back a response message.
- When M0 is On, DVPDNET-SL only sends out the request message once. To send out the request message again, you will have to change the value of ReqID.
- The reading is successful and the data back from the target equipment are stored in D6000 – D6003.
- If the reading is successful, the contents of Class 1 > > Instance 1 > > Attribute 1 of IFD9502 will be stored in D6003. In this example, the content in D6003 should be 031F Hex.

5. Application example (II)

Control requirement	M1 = On, set 0x99>>Instance 1>>Attribute 2 of IFD9502 to “0004Hex”.

A. Connection Figure



Note:

Delta DeviceNet slave module, IFD9502 can connect the temperature controller to the DeviceNet network.

B. Parameters setting and devices explanation

- Setting of DVPDNET-SL

Parameter	Setting value	Explanation
Node address	00	Set the node address of the DVPDNET-SL to “00”.
Baud rate	500kbps	Set the communication speed of the DVPDNET-SL and bus to “500kbps”.

- Setting of IFD9502

Parameter	Setting value	Explanation
Node address	02	Set the node address of the IFD9502 to “02”.
Baud rate	500kbps	Set the communication speed of the IFD9502 and the bus to “500kbps”.

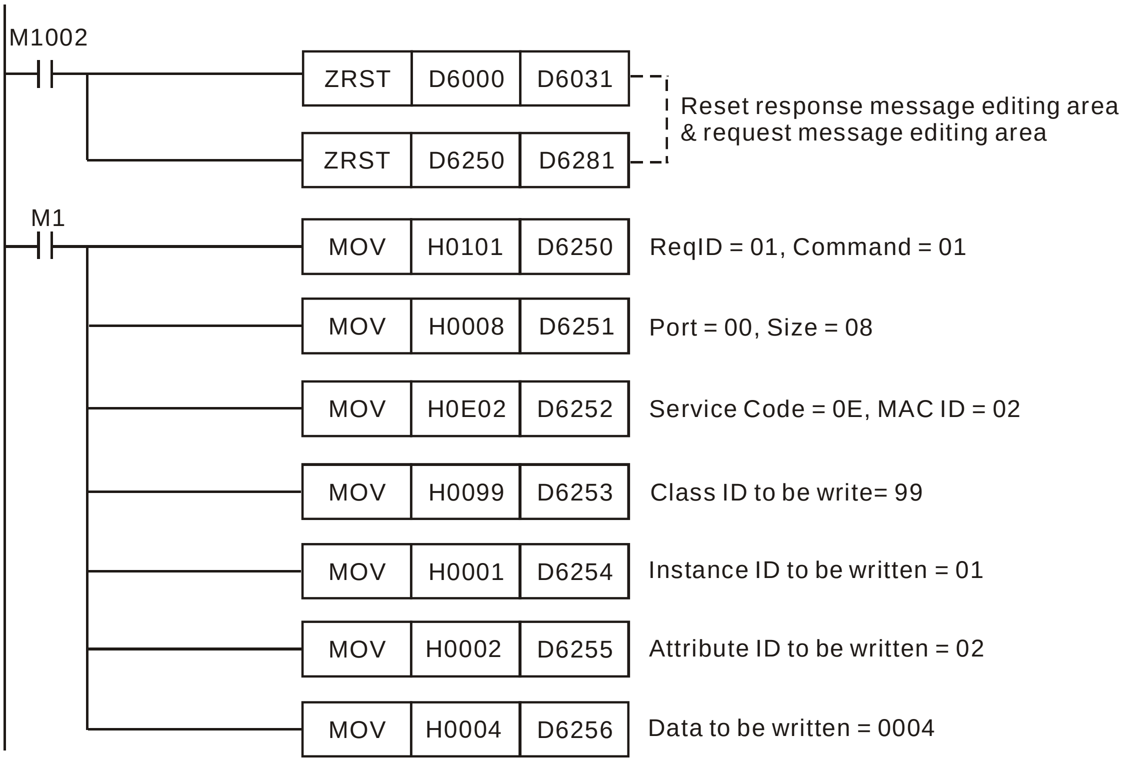
- Setting of VFD-B

Parameter	Setting value	Explanation
02-00	04	The main frequency is operated on RS-485 interface.
02-01	03	The operation commands are operated on the communication interface. Operation by keys is valid.
09-00	01	Communication address of the VFD-B: 01
09-01	03	Baud rate: 38,400
09-04	03	Modbus RTU mode, data format <8, N, 2>

- Explanations on devices

PLC device		Content	Explanation	
			15 14 13 12 11 10 9 8	7 6 5 4 3 2 1 0
Request message editing area	D6250	0101 Hex	ReqID= 01 Hex	Command= 01 Hex
	D6251	0005 Hex	Port= 00 Hex	Size= 07 Hex
	D6252	0E02 Hex	Service Code= 10 Hex	MAC ID= 02 Hex
	D6253	0099 Hex	High byte of Class ID= 00 Hex	Low byte of Class ID= 99 Hex
	D6254	0001 Hex	High byte of Instance ID= 00 Hex	Low byte of Instance ID= 01 Hex
	D6255	0002 Hex	N/A	Attribute ID= 02 Hex
	D6256	0004 Hex	High byte of data= 00 Hex	Low byte of data= 04 Hex
Response message editing area	D6000	0101 Hex	ReqID = 01 Hex	Status= 01 Hex
	D6001	0002 Hex	Port = 00Hex	Size= 02 Hex
	D6002	9002 Hex	Service Code = 90E Hex	MAC ID= 02Hex
	D6003	0004 Hex	High byte of Service Data= 00 Hex	Low byte of Service Data= 04 Hex

C. PLC program



D. Program explanation

- In the beginning of the program, clear the contents in the response message editing area and request message editing area to 0.
- When M1 is On, DVPDNET-SL sends out the request message. Write 0004 Hex into Class 99 >> Instance 1 >> Attribute 2 of the target equipment (node address: 02). If the communication of the explicit message is successful, the slave will send back a response message.
- When M1 is On, DVPDNET-SL only sends out the request message once. To send out the request message again, you will have to change the value of ReqID.
- If the writing is successful, the message back from the target equipment will be stored in D6000 – D6003.

13.2.9 Bit-Strobe Command

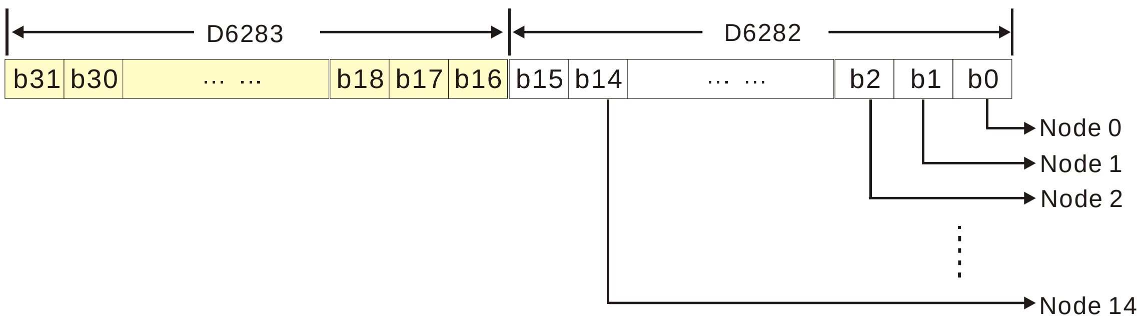
Bit-strobe is one of the standard I/O transmission methods for DeviceNet. The size of the command is fixed to 8 bytes (i.e. 64 bits), and every bit corresponds to a slave.

Note: Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas. We take DVP-SV as the PLC for description below.

PLC device	Corresponding nodes on the network					
	b15	b14	b13	…	b1	b0
D6282	Node 15	Node 14	Node 13	…	Node 1	Node 0
D6283	Node 31	Node 30	Node 29	…	Node 17	Node 16
D6284	Node 47	Node 46	Node 45	…	Node 33	Node 32
D6285	Node 63	Node 62	Node 61	…	Node 49	Node 48

When b0 of D6282 is 0, the node 0 equipment will be selected, and it will need to respond with a message to the master.

When both b0 and b1 of D6282 are 0, node 0 and node 1 are selected and they need to send back the response message to the master.



In the bit-strobe mode, the master will not send control data to slave nodes.

However, when its corresponding bit is set to 0, the slave node will have to respond with I/O data to the master.

When its corresponding bit is set to 1, the slave node will not have to respond with I/O data to the master.

13.2.10 Display of Node Status on Network

13.2.10.1 Display of Status of Nodes in Scan List

This function is available for monitoring whether some DeviceNet slave is offline or not. DVPDNET-SL can conduct the real-time monitoring of the nodes in the scan list and map the status of every node to a bit. Different PLCs on the right of the DVPDNET-SL module correspond to different devices. The details are as follows.

- When the PLC is DVP-SV3 or DVP-SX3 on the right of the DVPDNET-SL module, you can acquire the status of nodes by monitoring D16032–D16035.
- See the table below for the corresponding relation between PLC devices and the nodes on the network:

PLC device	Corresponding nodes on the network					
	b15	b14	b13	… …	b1	b0
D16032	Node 15	Node 14	Node 13	… …	Node 1	Node 0
D16033	Node 31	Node 30	Node 29	… …	Node 17	Node 16
D16034	Node 47	Node 46	Node 45	… …	Node 33	Node 32
D16035	Node 63	Node 62	Node 61	… …	Node 49	Node 48

- When the PLC on the right side of DVPDNET-SL module is another model in the DVP series, you can acquire the status of nodes by monitoring D6032 – D6035.
- See the table below for the corresponding relation between PLC devices and the nodes on the network.

PLC device	Corresponding nodes on the network					
	b15	b14	b13	…	b1	b0
D6032	Node 15	Node 14	Node 13	…	Node 1	Node 0
D6033	Node 31	Node 30	Node 29	…	Node 17	Node 16
D6034	Node 47	Node 46	Node 45	…	Node 33	Node 32
D6035	Node 63	Node 62	Node 61	…	Node 49	Node 48

When the node in the scan list is normal, the corresponding bit is OFF. If the node occurs with abnormality, its corresponding bit will become ON.

13.2.10.2 Status of DVPDNET-SL

You can acquire the real-time status of DVPDNET-SL by monitoring D6036/D16036. When DVPDNET-SL runs normally, the content in D6036/D16036 is 0. While DVPDNET-SL is being initialized, the value in the high byte of D6036/D16036 is 1 and the low byte is 0. When an error occurs in DVPDNET-SL, the value in the high byte of D6036/D16036 is 2 and the low byte contains an error code. For detains on error codes, please refer to Digital Display Diagnosis.

(**Note:** Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas. We take DVP-SV as the PLC for description below)

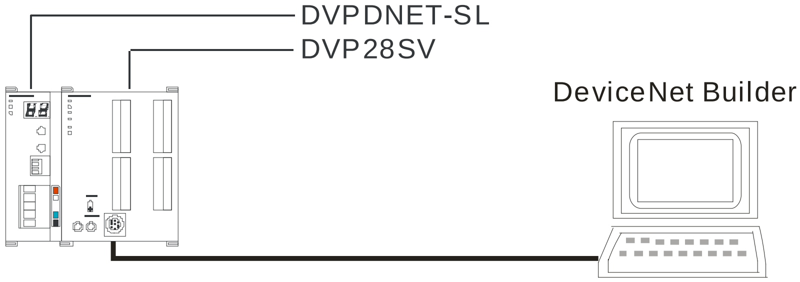
PLC device	Explanation															
	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
D6036	Status of DVPDNET-SL (0: normal, 1: initializing, 2: in error)								Error codes of DVPDNET-SL (Refer to Digital Display Diagnosis)							

13.2.11 Setup of Slave Mode

DVPDNET-SL can serve as slave through modifying the mode in the software. As DVPDNET-SL serves as slave, the default input / output data length is 8 bytes and max input / output data length is 255 bytes.

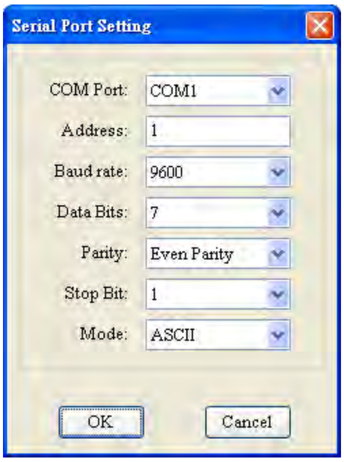
DVPDNET-SL can work in slave mode by using the following method.

1. Connect the devices according to the figure below. The PC accesses the PLC via RS232 or RS485.



Note: Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas. We take DVP-SV as the PLC for description below.

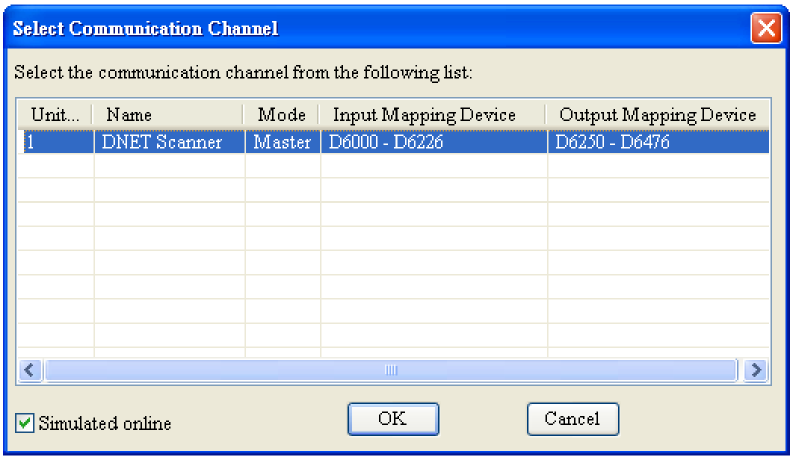
2. Open DeviceNet Builder software, select “Setup” => “Communication Setting” => “System Channel”, and the “Serial Port Setting” dialog box will appear as below.



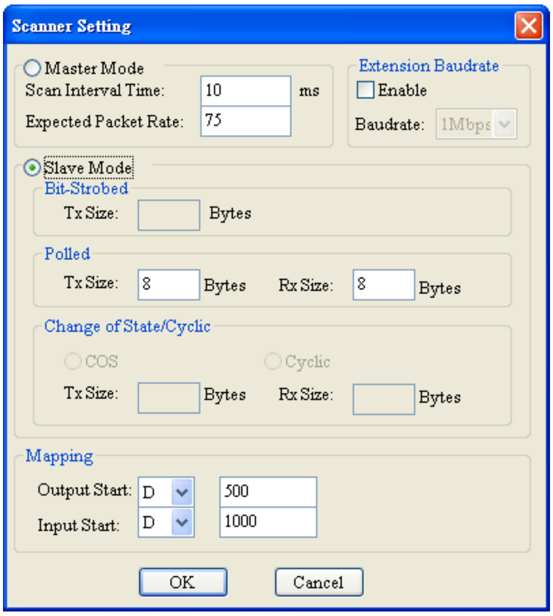
3. Set up the communication parameters for the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after the configuration is finished.

Item	Function	Default
COM Port	COM port on the PC to be used to communicate with DVP-SV	COM1
Address	Communication address of DVP-SV	01
Baud rate	Communication speed between the PC and DVP-SV	9,600 (bps)
Data Bits	Communication protocol between the PC and DVP-SV	7
Parity		Even Parity
Stop Bit		1
Mode	Communication mode between the PC and DVP-SV	ASCII

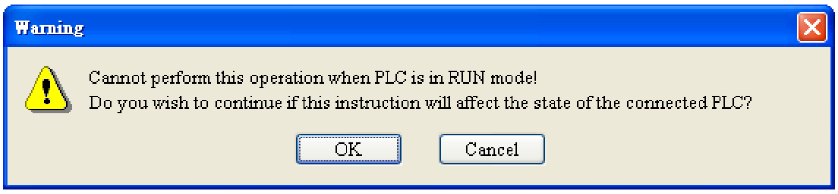
4. Select “Network” => "Online” and the “Select Communication Channel” dialog box will appear. Click on “OK” to start scanning the DeviceNet network after selecting “analog online” in the following window.



5. Select “Network” >> “Scan module” and then “Scan module setting” dialog box appears. After “Slave mode” is selected there, fill the appropriate slave data length. Finally click on “OK” to finish the setting.



6. Select “Network” >> “Download” and then below dialog box appears. Click on “Y” to download the configuration data to DVPDNET-SL.

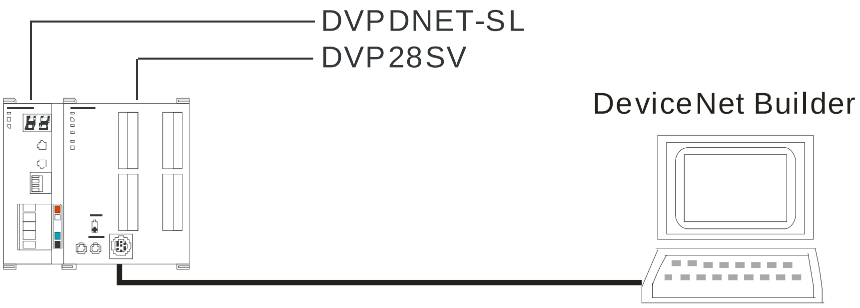


7. After download is finished, power PLC off and then repower it. At this time, DVPDNET-SL has been set as slave mode.

13.2.12 Extended Baud Rate Setup

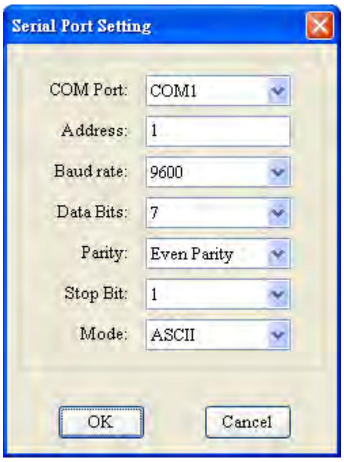
13.2.12.1 Extended Baud Rate Setup (in Master Mode)

1. Connect the device to the Devicenet network according to the following figure. The PC accesses the PLC via RS232 or RS485.



Note: Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas. We take DVP-SV as the PLC for description below.

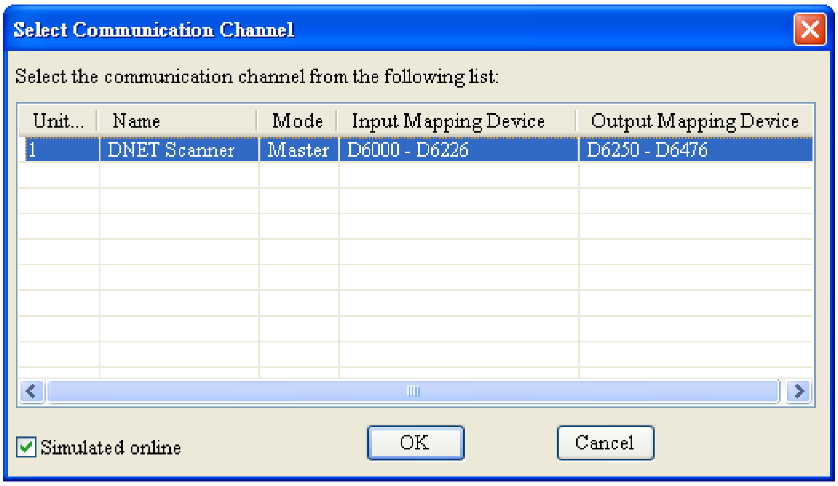
2. Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel”. And then the following dialog box appears.



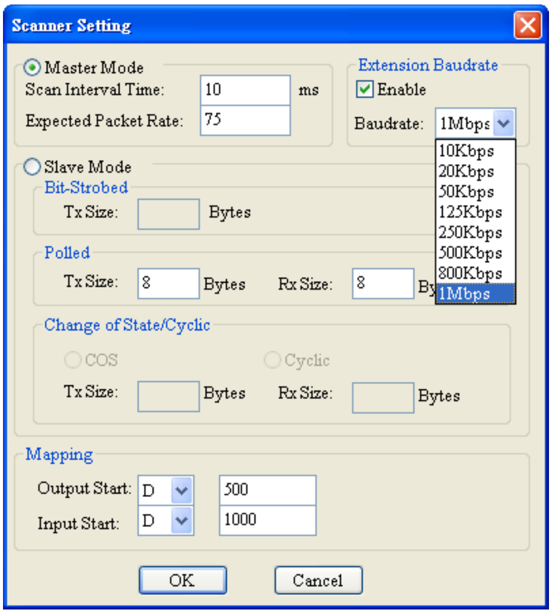
3. Set up the communication parameters for the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after the configuration is finished.

Item	Function	Default
COM Port	COM port on the PC to be used to communicate with DVP-SV	COM1
Address	Communication address of DVP-SV	01
Baud rate	Communication speed between the PC and DVP-SV	9,600 (bps)
Data Bits		7
Parity	Communication protocol between the PC and DVP-SV	Even Parity
Stop Bit		1
Mode	Communication mode between the PC and DVP-SV	ASCII

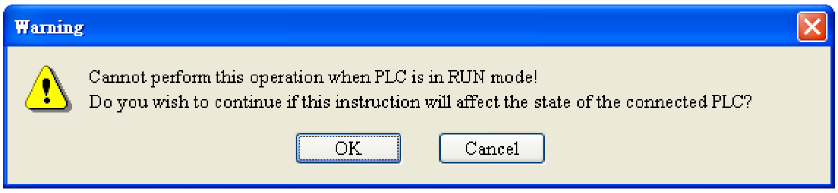
4. Select “Network” => "Online” and the following “Select Communication Channel” dialog box will appear. Click on “OK”.



5. Select “Network” => "Setup of scan module” and the following "Setup of scan module” dialog box appears. Select “Master mode” and “Startup” to activate the function of extended baud rate. In the meanwhile, select the appropriate baud rate according to the actual demand. Click “OK” to finish setting.



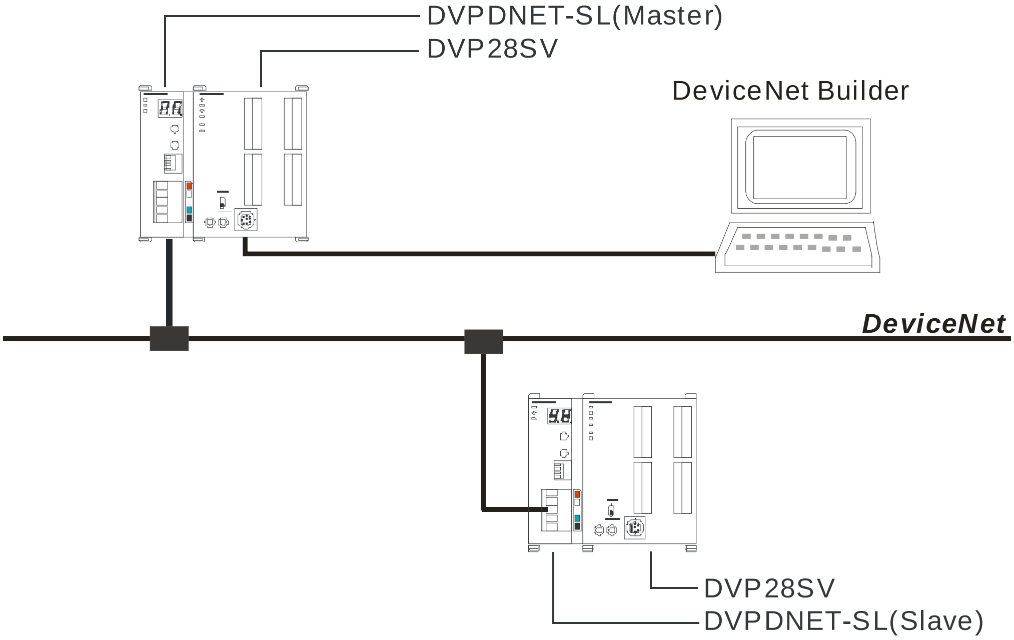
6. Select “Network” => “Download” and the following dialog box appears. Click “OK” to download the configuration data to DVPDNET-SL.



7. After download is completed, set DVPDNET-SL’s function switch DR0 and DR1 as ON and then repower PLC to finish the setting of the extended baud rate.

13.2.12.2 Extended Baud Rate Setup (in Slave Mode)

1. Connect relevant devices to the DeviceNet network according to the following figure.



Note:

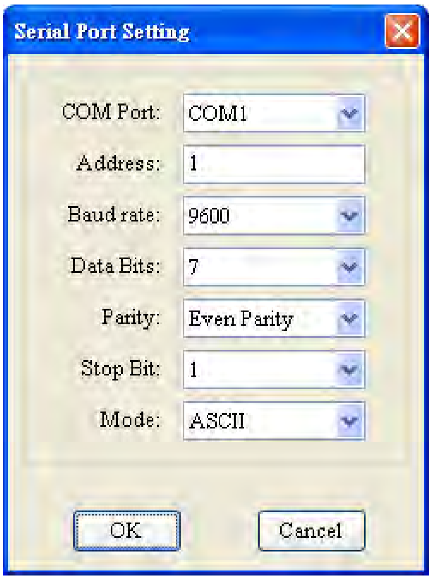
The DVPDNET-SL at the bottom of the figure above has been set to work in slave mode. (See Section 13.2.11).

The node addresses of the two DVPDNET-SLs must not be identical.

The baud rates of the two DVPDNET-SLs are both 500K bps.

Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas. We take DVP-SV as the PLC for description below.

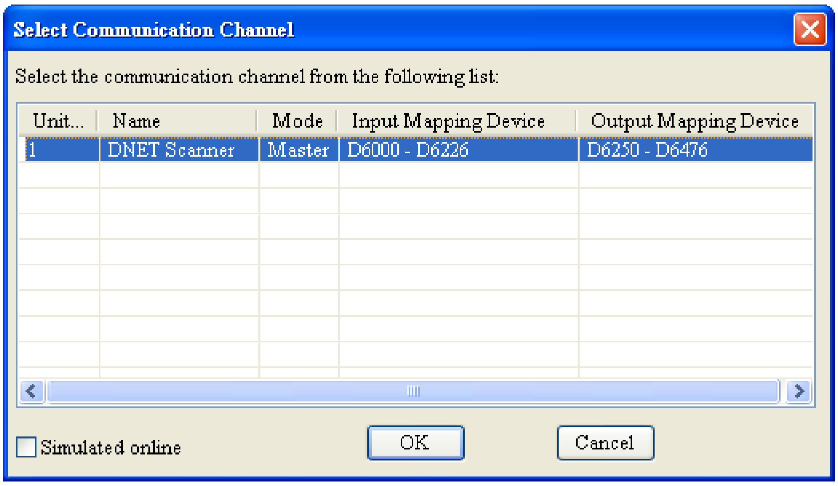
2. Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel” to see the following dialog box.

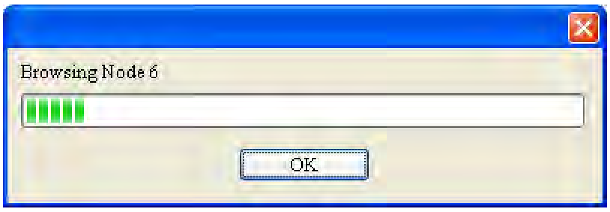


3. Set up the communication parameters for the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after the configuration is finished.

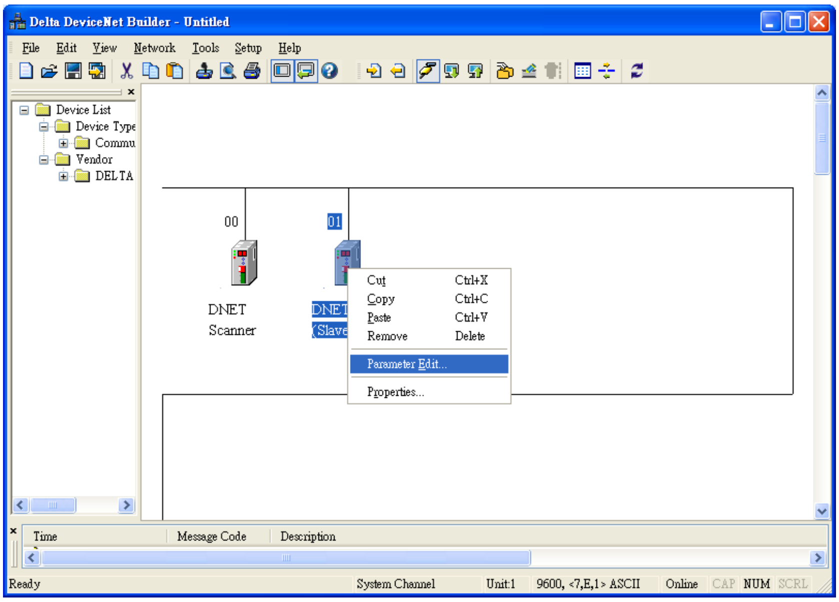
Item	Function	Default
COM Port	COM port on the PC to be used to communicate with DVP-SV	COM1
Address	Communication address of DVP-SV	01
Baud rate	Communication speed between the PC and DVP-SV	9,600 (bps)
Data Bits		7
Parity	Communication protocol between the PC and DVP-SV	Even Parity
Stop Bit		1
Mode	Communication mode between the PC and DVP-SV	ASCII

4. Select “Network” => "Online” and the “Select Communication Channel” dialog box will appear. Click on “OK” to start scanning the entire DeviceNet network.

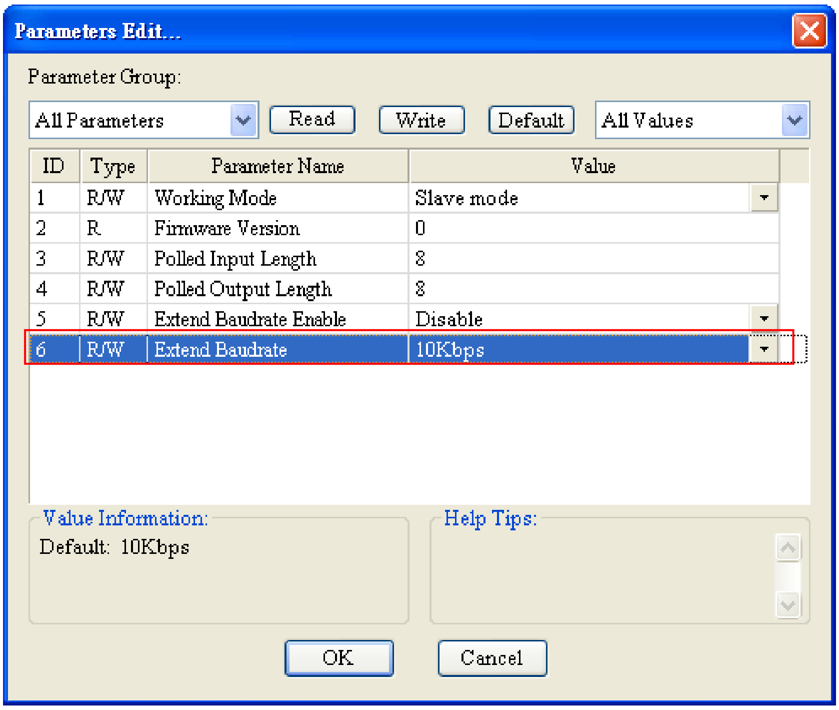




5. After scanning is successful, right click DNET (Slave) to select “Parameter editing”.



6. Set parameter 5 as “Enable” and select the baud rate in parameter 6 in the following page. Click on “Download” to download the newly set parameter value to DVPDNET-SL (Slave).



7. After the download is completed, set DVPDNET-SL (Slave)’s function switch: DR0 and DR1 as ON. And then repower PLC to finish the setting of the extended baud rate.

13.2.13 Application Example

This section provides an example on how to construct and configure the DeviceNet network.

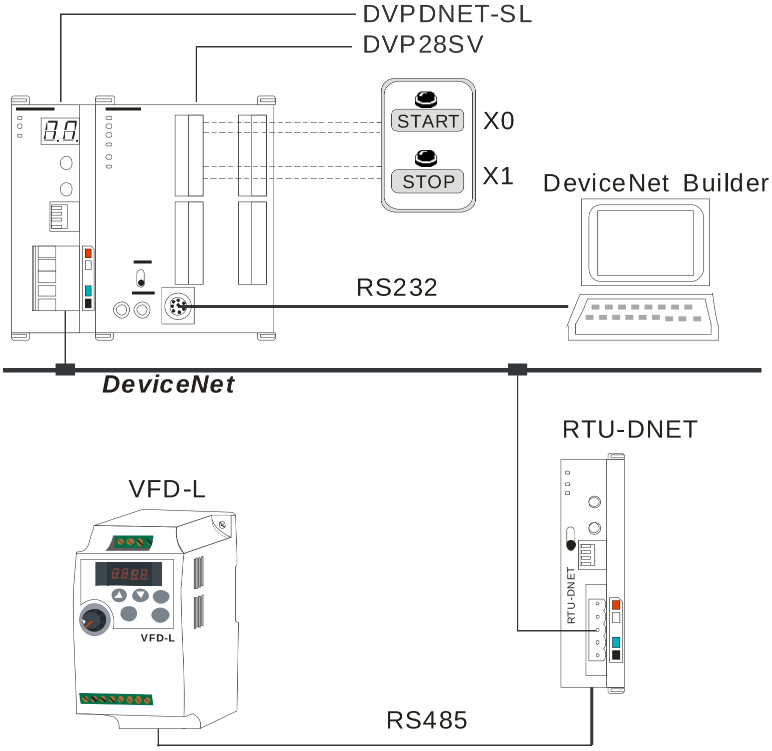
Control requirement	Using X points of DVP28SV to control RUN/STOP of the remote AC motor drive VFD-L.

Note:

Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas. We take DVP-SV as the PLC for description below.

13.2.13.1 Construct DeviceNet Network

1. Connection Figure



Note:

Delta DeviceNet remote IO communication module, RTU-DNET supports the MODBUS communication function.

2. Set up DVPDNET-SL, RTU-DNET and VFD-L according to the table below.

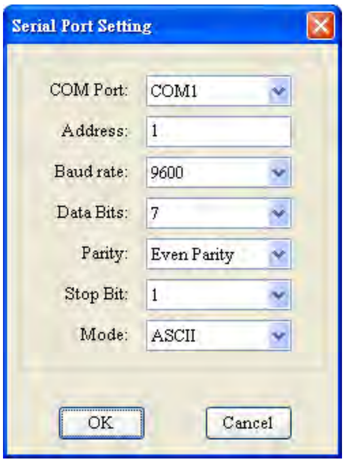
DeviceNet Module	Node address	Baud rate
DVPDNET-SL	01	500kbps
RTU-DNET	02	500kbps

VFD-L parameter	Setting	Description
02-00	4	Transmit the frequency of VFD-L via RS485.
02-01	3	Control the operation of VFD-L via RS485.
09-00	1	Set the node address of VFD-L in Modbus to 1.
09-01	1	Set the baud rate of VFD-L in Modbus to 9600
09-04	1	Set the communication format of VFD-L in Modbus to 7, E, 1, ASCII.

13.2.13.2 Configure DeviceNet Network

- Configuring DeviceNet slave

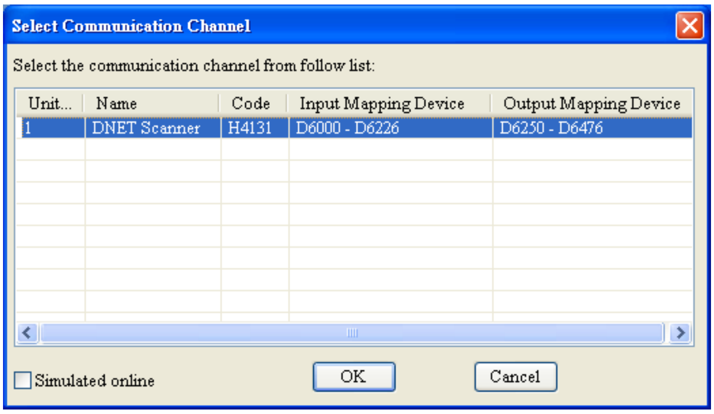
1. Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel”, and then the “Serial Port Setting” dialog box will appear as below.

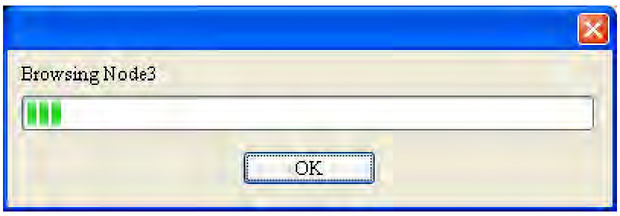


2. Set up the communication parameters for the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after the configuration is finished.

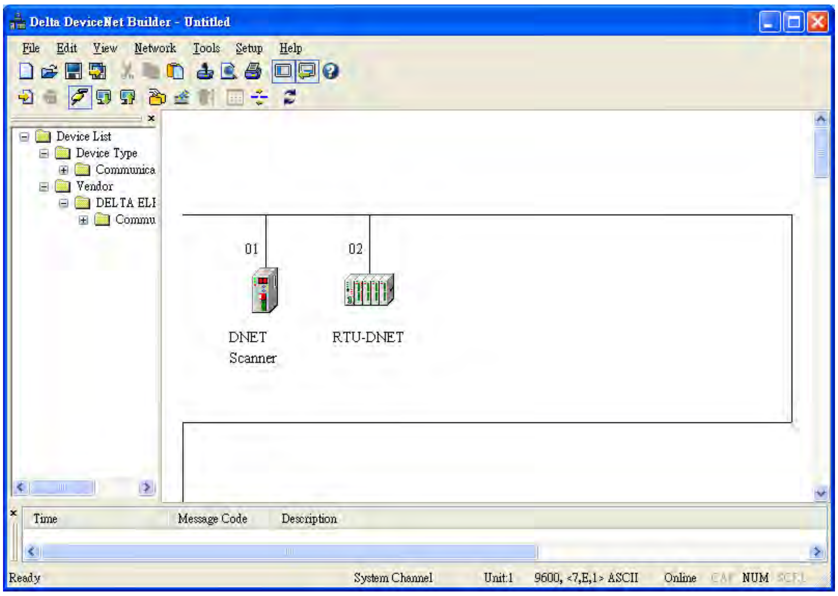
Item	Function	Default
COM Port	COM port on the PC to be used to communicate with DVP-SV	COM1
Address	Communication address of DVP-SV	01
Baud rate	Communication speed between the PC and DVP-SV	9,600 (bps)
Data Bits		7
Parity	Communication protocol between the PC and DVP-SV	Even Parity
Stop Bit		1
Mode	Communication mode between the PC and DVP-SV	ASCII

3. Select “Network” => "Online", and the “Select Communication Channel” dialog box will appear. Click on “OK” to start scanning the DeviceNet network.

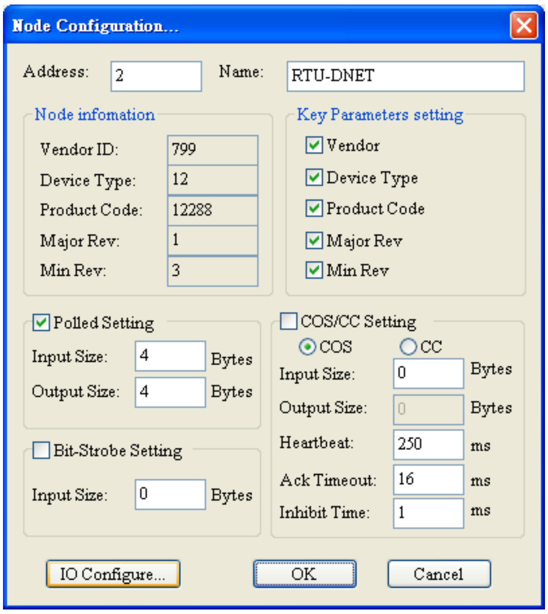




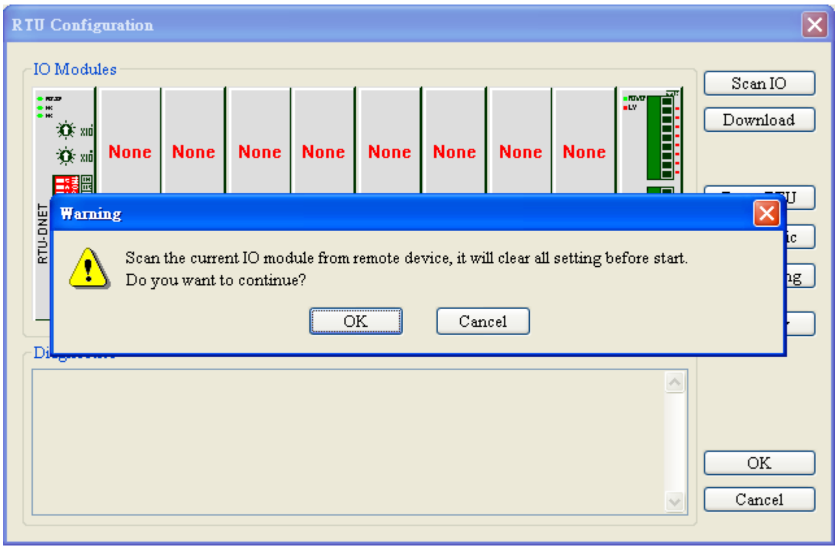
4. If there is no progress in the bar on the dialog box, it means the connection between the PC and DVP-SV is abnormal, or there are other programs also using the COM port on the PC. After the scan is completed, the dialog box will tell you that the scan is completed, and the icons and device names of all the nodes scanned on the network will be shown on the screen. See the figure below, in which the node addresses of DVPDNET-SL and RTU-DNET are 01 and 02 respectively.



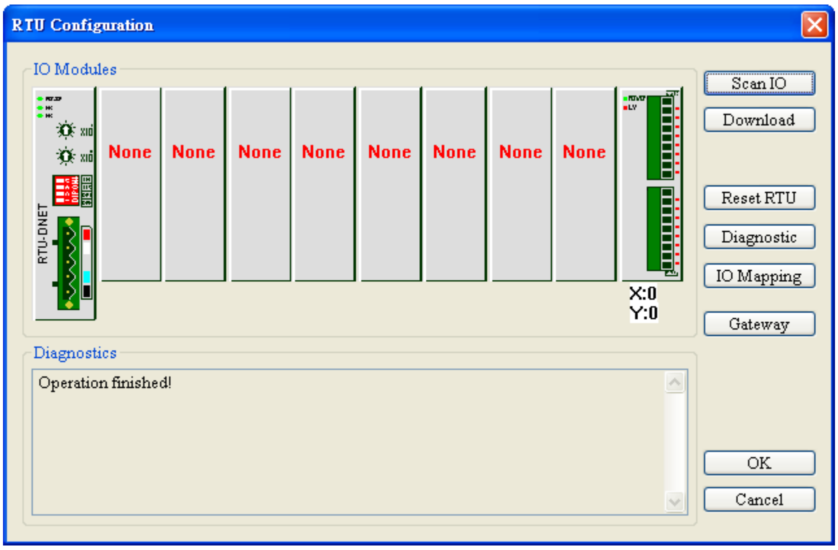
5. Double click on RTU-DNET (node 02), and the "Node Configuration…" dialog box will appear.



6. Clicking on "IO Configure…" button in "Node Configuration" dialog box, you will see "RTU Configuration" page where you click on "Scan IO" button and "Warning" dialog box will appear. With a click on "OK", DeviceNet Builder will detect the devices connected to RTU-DNET as below.



7. Because no special module is connected to the right side of RTU-DNET, "None" word will show up in the locations of the special modules in the following window. The number of points for X and Y are both 0. Then click on "Gateway setting".



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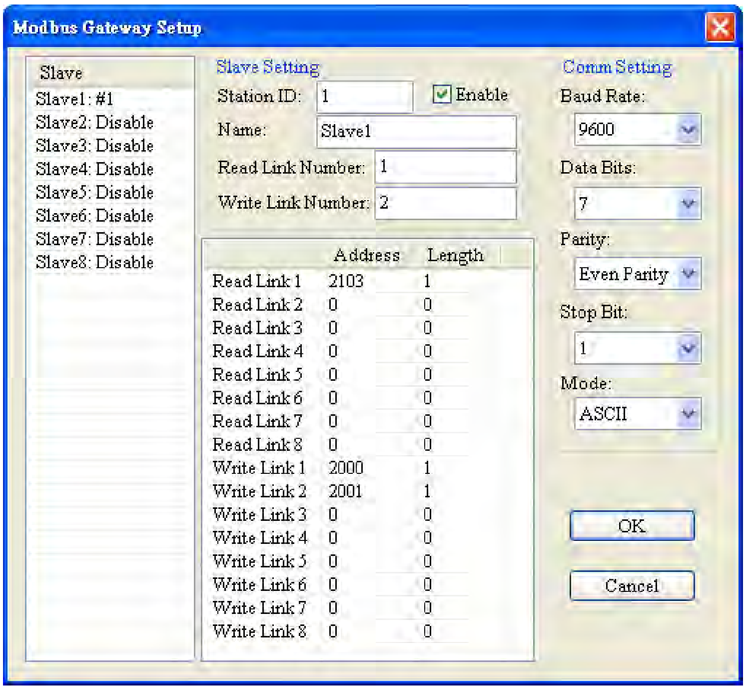
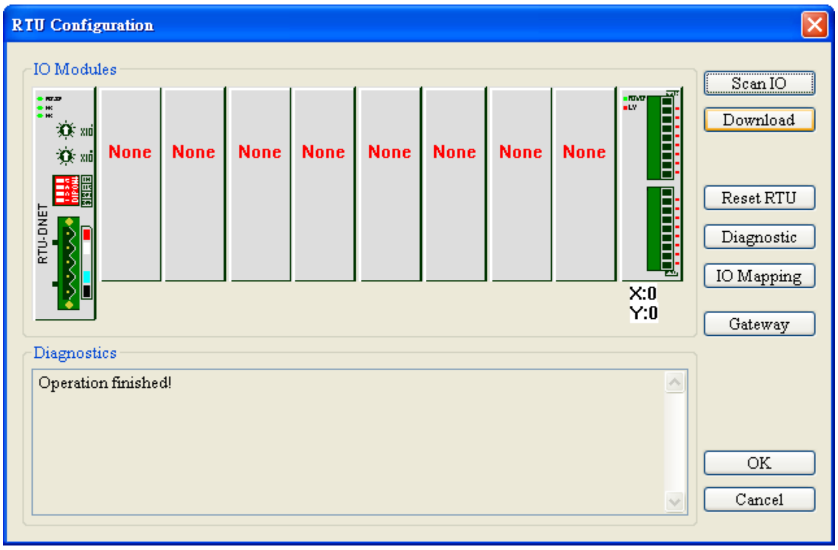
8. In the interface of “Modbus gateway setting”, use the parameters of one slave and fill in relevant values there. You can refer to the user manual of RTU-DNET.



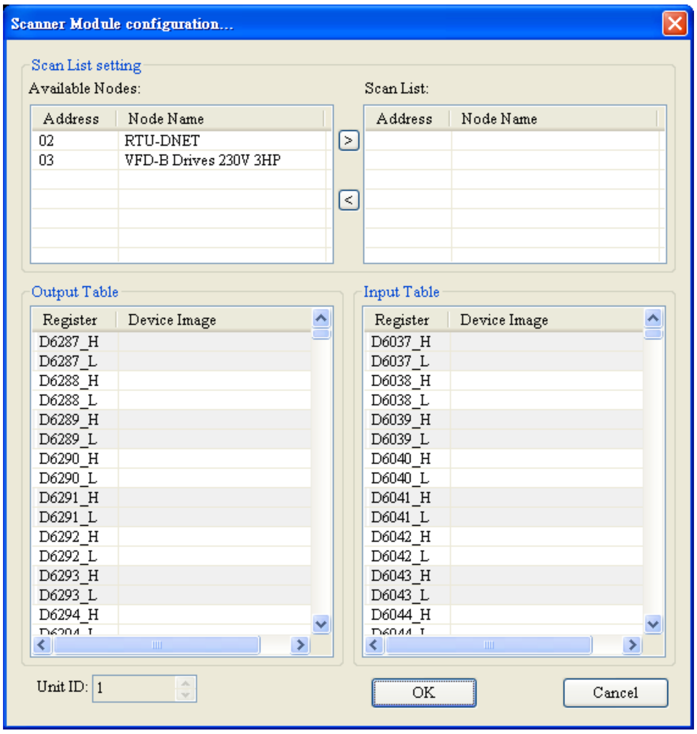
Note: The slave mentioned here is the slave on the Modbus network and has nothing directly to do with the DeviceNet network.

9. Click on “OK” in the window above and then click on “Download” in the following window to download the configuration data to RTU-DNET. After the download is finished, the configuration of RTU-DNET is finished.

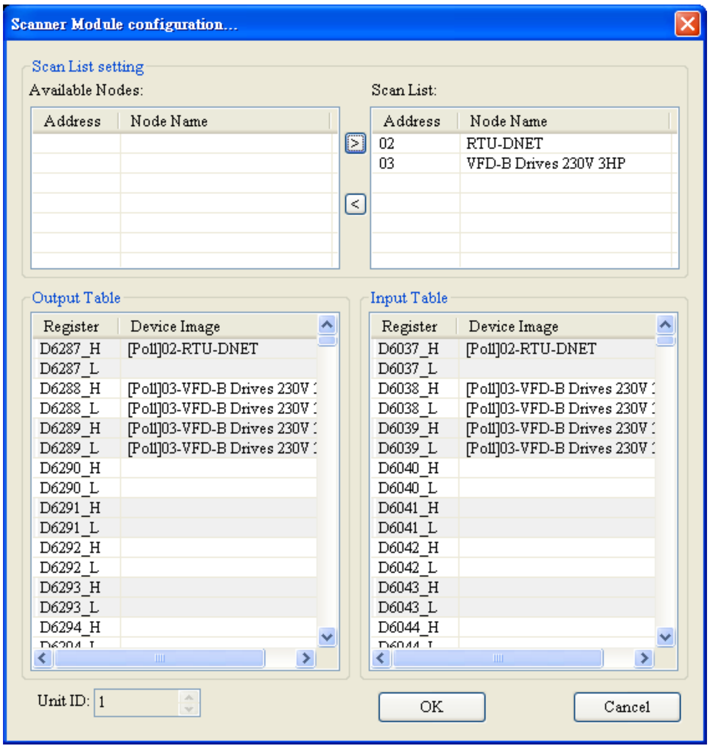


- Configuration of DeviceNet Master

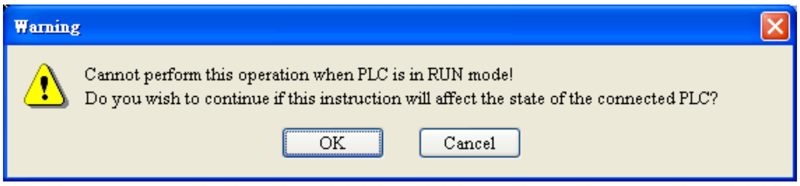
1. Double click on DNET Scanner (node 01), and the “Scan Module Configuration..." dialog box will pop up. You can find the currently available nodes, RTU-DNET and VFD-B Drives 230V 3HP, in the list on the left side. On the right side, there is an empty “Scan List”.



2. Move the DeviceNet slave devices in the "Available Nodes” list on the left side to the "Scan List” on the right side. Select one node and click on >. In this way, move all the nodes to the scan list.



3. Confirm all the settings and click on "OK". Next, download the configuration to DVPDNET-SL. If DVP-SV is in RUN mode while you are downloading the configuration, a "Warning" dialog box will appear.



4. Click on "OK" to continue the download. Make sure DVP-SV is in RUN mode.

- Configure the DeviceNet network in the steps above. The mapping relation between DVPDNET-SL and slave device is shown as below.

DVP28SV → DVPDNET-SL → slave device

DVP28SV	DVPDNET-SL	RTU-DNET & VFD-L
D6287	⇨	Control word of VFD-L (2000H)
D6288		Control frequency of VFD-L (2001H)

DVP28SV ← DVPDNET-SL ← slave device

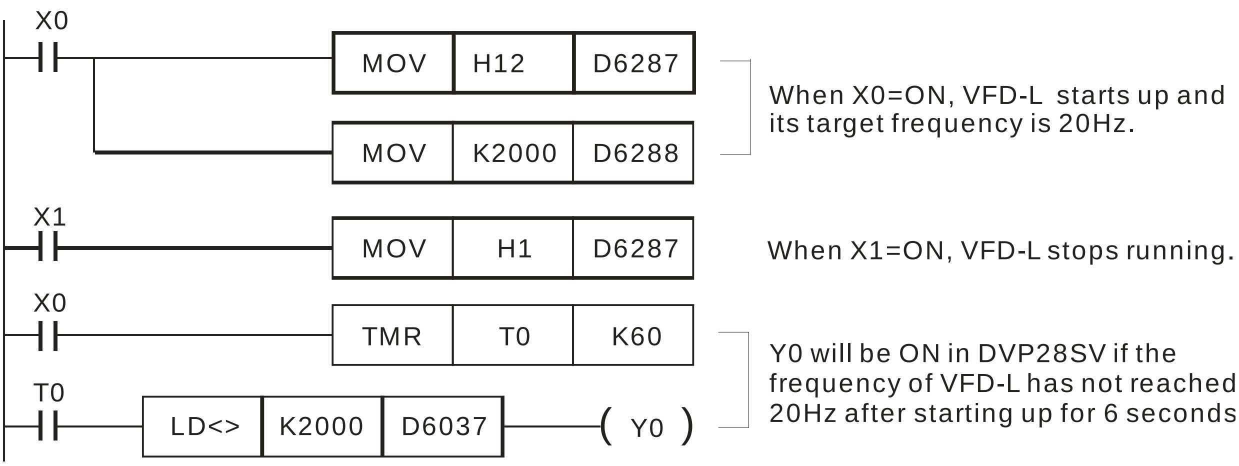
DVP28SV	DVPDNET-SL	RTU-DNET & VFD-L
D6037	⇦	Output frequency of VFD-L (2103H)

13.2.13.3 Ladder Diagram Program

This section introduces how to edit the ladder diagram program to meet the requirement of controlling the DeviceNet network.

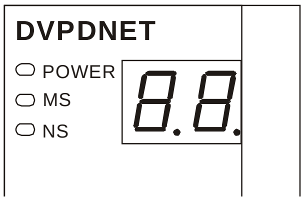
Control requirement	When X0=ON, VFD-L AC motor drive runs; When X1=ON, VFD-L AC motor drive stops; After VFD-L has been operating for 6 seconds, Y0 of DVP28SV is ON if the specified frequency of VFD-L is not reached yet.

Explanation of PLC Program



13.2.14 Error Diagnosis & Troubleshooting

DVPDNET-SL supports two diagnostic methods: indicator diagnosis and digital display diagnosis.



13.2.14.1 LED Indicator Diagnosis

- **Power LED**

LED status	Indication	How to correct
Off	The power supply is abnormal.	Make sure that the power supply to DVPDNET-SL is normal.
Green light on	The power supply is normal.	--

- **NS LED**

LED status	Indication	How to correct
Off	No power; or duplicated ID checking has not completed	1. Make sure that the power supply and connection to DVPDNET-SL is fine. 2. Make sure that there is at least 1 node that is able to communicate on the network.
Green light blinking	No communication	No correction is needed; refer to the digital display diagnosis and eliminate the error.
Green light on	Normal operation	--
Red light blinking	Error in communication	Refer to the digital display diagnosis and eliminate the error.
Red light on	Network error; duplicated ID; bus-off or no power supply	1. Make sure that all the devices have a unique node address. 2. Check the network connection is proper. 3. Check if the node address of RTU-DNET is valid. 4. Check if the network power is normal.

- **MS LED**

LED status	Indication	How to correct
Off	No power	Make sure that the power supply and connection to DVPDNET-SL is fine.
Green light blinking	The master is not configured.	Configure the scan list and re-download it to DVPDNET-SL.
Green light on	Normal operation	--
Red light blinking	DNET as the master: Abnormal operation of slave tasks in the scan list. DNET as the slave: Configuration issues.	Check the digital indicator and make sure the configuration data of the salve in the scan list is consistent with the salve actually connected.
Red light on	Internal error	1. Check if the configuration is valid. 2. Re-power it. If the error still exists, send it back to the factory.

- **MS LED & NS LED**

LED status		Indication	How to correct
NS LED	MS LED		
OFF	OFF	No power	Make sure that the power supply to DVPDNET-SL is normal.
OFF	Green light ON	Duplicated ID check has not completed.	Make sure that there is at least one node which can communicate with DVPDNET-SL normally, at the same baud rate as DVPDNET-SL on the network.
Red light ON	Green light on	MAC ID detection failure or bus-off	1. Ensure that the node address of DVPDNET-SL is unique. 2. Re-power DVPDNET-SL.
Red light ON	Red light blinking	No 24V DC power from DeviceNet network	1. Check if the network cable is correctly connected to DVPDNET-SL. 2. Check the 24V DC network power.
Red light ON	Red light ON	Hardware error	Return to your factory or distributor for repair.

13.2.14.2 Digital Display Diagnosis

Code	Indication	How to correct
0 – 63	Node address of DVPDNET-SL (in normal operation)	--
80	DVPDNET-SL is in STOP status.	Turn the PLC to RUN to start I/O data exchange.
F0	Duplicated MAC ID check failure	1. Ensure that the node address of DVPDNET-SL is unique. 2. Re-power DVPDNET-SL.
F1	No slave device in the scan list.	Configure the scan list and download it to DVPDNET-SL.
F2	Low voltage is detected.	Check if the power supply to the DVPDNET-SL and PLC is normal.
F3	Entering test mode	Change IN1of the function switch from On to Off and re-power the DVPDNET-SL.
F4	Bus-off	1. Check if the network cable connection is proper. 2. Check if the baud rates of the nodes on the network are consistent. 3. Re-power DVPDNET-SL.
F5	No network power	1. Make sure that the cable is correctly connected. 2. Ensure that the power supply to the network is normal.
F6	Internal error; Flash or RAM check error	If the error still exists after re-power, send your DVPDNET-SL back to the factory for repair.
F7	Internal error; GPIO check error	If the error still exists after re-power, send your DVPDNET-SL back to the factory for repair.
F8	Error produced in factory manufacturing	If the error still exists after re-power, send your DVPDNET-SL back to the factory for repair.
F9	Internal error; EEPROM access failure	If the error still exists after re-power, send your DVPDNET-SL back to the factory for repair.
FA	Invalid configuration data	1. Configure the network correctly and re-download it to DVPDNET-SL. 2. Check if the node address of the slave in the scan list is the same as the node address of DVPDNET-SL.

Code	Indication	How to correct
E0	Device key parameter does not match the scan list table.	Make sure that the device parameter in the scan list matches the desired key parameter, including vendor ID, product code, device type and version.
E1	Data size returned does not match the scan list.	Re-configure the scan list using correct data size.
E2	Slave device in the scan list does not exist or is offline.	1. Check if there is any change for the node address of the slave. 2. Check if the communication cable is disconnected or connected loosely.
E3	DVPDNET-SL fails to transmit a message.	Make sure that the connection is valid and check if the baud rate is correct.
E4	Error detected in sequence of fragmented I/O messages from device	Check if the slave is operating normally.
E5	Slave device returns error when DVPDNET-SL attempts to communicate with it.	Check if the slave is operating normally.
E6	Data size returned is bigger than expected.	Ensure that the size of the IO data of the slave is the same as that configured in scan list.
E7	DVPDNET-SL is checking MAC ID.	If the code is displayed long, do the troubleshooting according to the following steps. 1. Make sure that at least two nodes work normally on the network. 2. Check if both ends of the network are connected with a terminal resistor of 121Ω respectively. 3. Check if the baud rates of the node devices on the network are identical. 4. Check if the communication cable is normal so as to avoid that the cable is disconnected or connected loosely. 5. Re-power the DVPDNET-SL module.

13.3 DVPCOPM-SL

13.3.1 Introduction

DVPCOPM-SL is a CANopen module operating on the left side of the PLC. The PLC can have a maximum of 8 DVPCOPM-SL modules connected to its left side. DVPCOPM-SL master module is responsible for the data exchange between the PLC and other slaves on the bus when the PLC is connected to the CANopen network via DVPCOPM-SL. To achieve data exchange, DVPCOPM-SL master module is used for transmitting the data in the PLC to slaves on the bus and meanwhile returns the data in slaves to the PLC.

The PLC connected to the right side of DVPCOPM-SL includes DVP-28SV, DVP-SX2, DVP-EH2-L, DVP-SV3 DVP-SX3 and more.

13.3.1.1 Features

DVPCOPM-SL can be used as the master in CANopen network, as well as the slave for other masters.

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1. As a master, DVPCOPM-SL features:

- Complying with CANopen standard protocol DS301 V4.02
- Supporting NMT Master Service
- Error control: Supporting Heartbeat/Node Guarding Protocol
- Supporting PDO Service:

  Max. 200 RxPDOs and 390 bytes of data

  Max. 200 TxPDOs and 390 bytes of data

  Each slave can be allocated a maximum of 8 TxPDOs and 8 RxPDOs.

  PDO transmission type: Supporting event trigger, time trigger, synchronous cycle, and synchronous non-cycle.

  PDO mapping: Every PDO can be configured with a maximum of 32 parameters.

  Type of mapping data supported:

Storage space	Data type
1 bit	BOOL
8 bits	SINT USINT BYTE
16 bits	INT UINT WORD
32 bits	DINT UDINT REAL DWORD
64 bits	LINT ULINT LREAL LWORD

- Supporting SDO Service

  Number of Server: 0

  Number of Client: 3

  Supporting standard expedited SDO transfer.

  Supporting Auto SDO function. Able to execute up to 20 Auto SDOs to each slave.

  Supporting reading/writing of data in slaves by using SDO Service in the ladder diagram in PLC.

- Supporting Emergency Protocol：

  Able to store 5 latest Emergency messages for each slave.

Able to indicate Emergency messages in a slave through a digital display.

Able to read Emergency messages through the ladder diagram in PLC.

- SYNC producer, range: 0 ~ 65,535 ms.
- As the interface between Delta CANopen Builder software and CANopen network. The software can configure the network directly through DVPCOPM-SL.
- Automatically exchanges data with the PLC. Users only need to edit a program for D registers mapped in the PLC without using FROM and TO instructions when programming. When DVPCOPM-SL is connected to the PLC which is DVP-SV3 or DVP-SX3, the registers D16000~D19999 are occupied. When DVPCOPM-SL is connected to other DVP series PLC which is not DVP-SV3 or DVP-SX3, the registers D6000~D9999 are occupied.

2. As a slave, DVPCOPM-SL features:

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- Complying with CANopen standard protocol DS301 V4.02
- Supporting NMT Slave Service
- Error control: Supporting Heartbeat Protocol
- Supporting PDO Service: Each slave can be configured with a maximum of 8 TxPDOs and 8 RxPDOs.
- PDO transmission type: Supporting event trigger, time trigger, synchronous cycle, synchronous non-cycle.
- Supporting SDO Service.

  Number of Server: 1

  Number of Client: 0

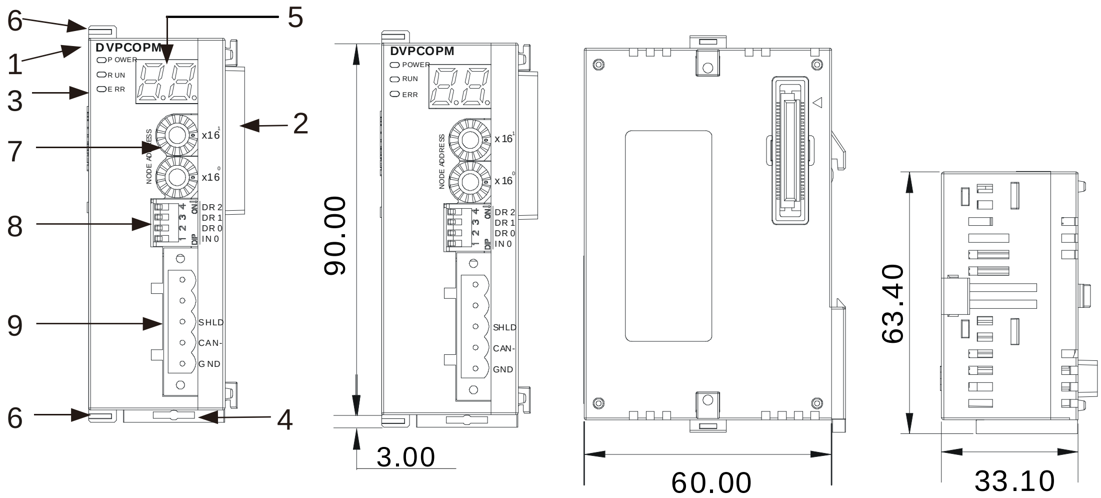
  Supporting standard expedited SDO transfer.
- Supporting Emergency Protocol.

  Able to indicate Emergency event in the slave through a digital display.

13.3.1.2 Specification

Model name	DVPCOPM-SL
Power supply	Supplied by internal bus from PLC CPU
Power consumption	1.7W
CANopenconnector	Removable connector（5.08mm）
Transmission method	CAN
Transmission cable	Contains two communication wires, one shielded wire and one ground wire
Message type	PDO、SDO、SYNC(synchronous object)、Emergency(Emergency object)、NMT
Baud rate	10k、20k、50k、125k、250k、500k、800k、1M bps(bits/sec)
Product code	82
Device type	0（Non-Profile）
Manufacturer ID	477（Delta Electronics Inc.）
Connect to DVP-PLC CPU	Connectable to the left side of CPU, numbered from 100 to 107 according to the position of module from the closest to farthest to MPU
Weight	115g

13.3.2 Module Profiles and Dimension



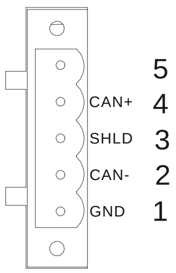
Unit: mm

No.	Name	Description
1	Model name	Model number
2	Extension port	Connect the PLC or the modules
3	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	RUNLED indicator	OFF: No power supply Green light flashing once: DVPCOPM-SL is in stopped state Green light flashing: DVPCOPM-SL is in a pre-operation state Red light ON: DVPCOPM-SL is in a normal state
	ERRORLED indicator	OFF: Normal Red light flashing once: Bus error exceeds the warning level Red light flashing twice: Slave station disconnected Red light steady on: Bus off
4	DIN rail clip	Secure the module on the set.
5	Digital display	Displaying Node Address of DVPCOPM-SL Module Displaying Error Information from Slave Station
6	Fixing clip for I/O module	For securing the extension module.
7	Address switch	CANopen communication address setting
8	Function switch	Baud rate and I/O data action settings
9	CANopen port	Connect CANopen network.

13.3.3 Terminals

13.3.3.1 CANopen Port

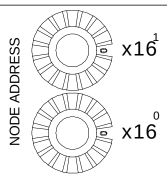
The port is used for the connection to CANopen network. Wire by using the connector enclosed with DVPCOPM-SL.



PIN	Signal	Content
1	GND	GND
2	CAN_L	Signal-
3	Shield	Shield
4	CAN_H	Signal+
5	-	reserved

13.3.3.2 Address Switch

The switch is used for setting up the node address of DVPCOPM-SL on CANopen network. Range: 1 ~ 7F (0, 88 ~ FF are forbidden).



Switch setting	Content
1~7F	Valid CANopen node address
0、80~FF	Invalid CANopen node address

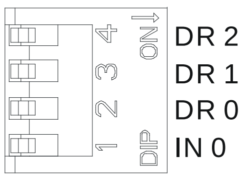
Example: If you need to set the node address of DVPCOPM-SL to 26 (1AH), simply switch the corresponding switch of $x16^1$ to 1 and the corresponding switch of $x16^0$ to A.

Note:

1. Use a slotted screwdriver to rotate the switch carefully in case you scratch the switch.
2. Please set up the node address when the power is switched off. After the setup is completed, repower DVPCOPM-SL.

13.3.3.3 Function Switch

The switch is used for setting up the baud rate for the communication between DVPCOPM-SL and CANopen network (DR0 ~ DR2). See the table below for the baud rates and maximum communication distances.



DR2	DR1	DR0	IN0	Baud rate
OFF	OFF	OFF	reserved	10kbps
OFF	OFF	ON		20kbps
OFF	ON	OFF		50kbps
OFF	ON	ON		125kbps
ON	OFF	OFF		250kbps
ON	OFF	ON		500kbps
ON	ON	OFF		800kbps
ON	ON	ON		1Mbps

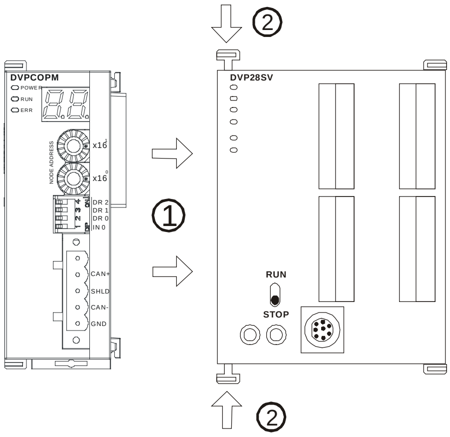
Note:

- Please use a slotted screwdriver to turn the DIP switch carefully.
- Please set up the function switch when the module is powered off. After setting is over, power on the module again.

13.3.4 Installation

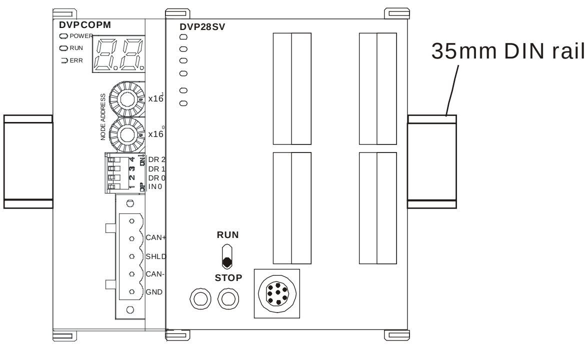
1. Connecting DVPCOPM-SL to PLC

- Open the fixing clip on top and bottom of PLC. Meet the extension port of DVPCOPM-SL with PLC, as shown in number①.
- Press the fixing clips on top and bottom of PLC and check if the connection is fine, as shown in number②.



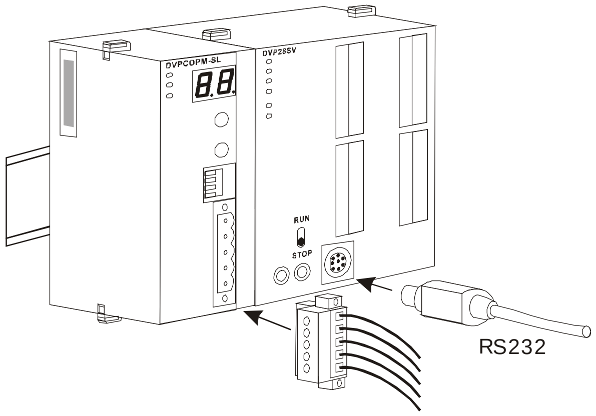
2. Installing DVPCOPM-SL and PLC on DIN Rail.

- Use 35mm DIN rail.
- Open the DIN rail clip on PLC and DVPCOPM-SL. Insert PLC and DVPCOPM-SL onto the DIN rail.
- Clip up the DIN rail clips on PLC and DVPCOPM-SL to fix PLC and DVPCOPM-SL on the DIN rail, as shown below.



3. Connecting to CANopen Port

- Please wire according to the PIN definition of the connection port.
- Plug the communication connector to the CANopen port of DVPCOPM-SL as follows.



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13.3.5 Construct a CANopen Network

In this section, we will introduce how to build a complete CANopen network by using DVPCOPM-SL and other slaves.

Before constructing a network, you have to first know clearly what the network is for and start a preliminary planning for the data to be exchanged. The plan shall include the slaves to be used, type of transmission and the data to be exchanged, total length of data to be exchanged, requirement on the response time for data exchange, and so on. The information will decide whether the network you build is a sensible one, or whether it satisfies your needs, and even affects the later-on network sustainability and flexibility of network capacity upgrade.

In the example below, we will illustrate how to control RUN/STOP and speed of a Delta ASD-B servo drive by a Delta digital I/O module DVP-08ST.

13.3.5.1 Construct CANopen Network

Equipment and software required:

Equipment & software	Function
DVP-PS02	24V power supply module, supplying power to CANopen.
DVP-PS01	24V power supply module, supplying power to remote I/O DVP-08ST and DVP-SA PLC.
DVP-28SV	DVP-SV PLC
DVPCOPM-SL	CANopen master
DVP-12SA	DVP-SA PLC
DVP-08ST	Digital I/O module
IFD9503	CANopen bus adapter
ASD-B	Delta B series servo drive
WPLSoft	DVP series PLC programming software
Delta CANopen Builder	CANopen configuration software for DVPCOM-SL master

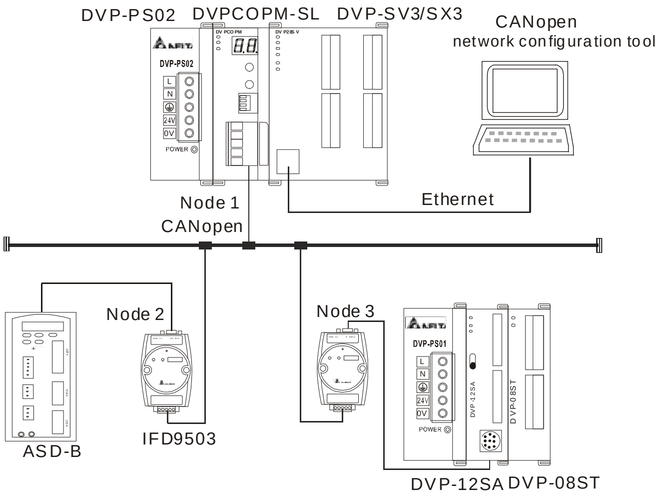
Set up DVPCOPM-SL and IFD9503 according to the table below. For how to operate IFD9503, please refer to the operation manual of IFD9503.

Module	Node address	Baud rate (bps)
DVPCOPM-SL	01	1M
IFD9503	02 (connected to server)	1M
IFD9503	03 (connected to SA)	1M

Set up ASD-B as follows:

Parameter	Setting value	Explanation
P1-01	02	Control mode: speed mode
P1-09	100 (rpm)	Internal speed command 1 (SP1)
P1-10	300 (rpm)	Internal speed command 2 (SP2)
P1-11	500 (rpm)	Internal speed command 3 (SP3)
P2-10	101	Function of DI1: Servo on
P2-11	114	Function of DI2: SPD0
P2-12	115	Function of DI3: SPD1
P2-18	102	Function of DO1: Output when servo on
P3-00	1	Modbus communication address
P3-01	5 (115,200 bps)	Modbus baud rate
P3-02	1 (7,E,1)	Modbus data format
P3-06	3F	DI1 ~ DI6 controlled by communication

Constructing a CANopen network following the figure below.



For the connection between IFD9503 and PLC, IFD9503 and ASD-B, or IFD9503 and other equipment, please refer to IFD9503 operation manual. For the electrical specifications and wiring of ASD-B, please refer to ASD-B operation manual.

13.3.5.2 Data Mapping in CANopen Network

- Data mapping in DVP-12SA

DVP-08ST provides 8 channels of digital inputs and 1 byte of input data in total. In this example, we will use X0 of DVP-08ST to run/stop ASD-B and use X1 and X2 to select a speed for the servo drive. Y0 is for the output signal of ASD-B status. See the table below for details.

Channel	Function
X0	Controlling RUN/STOP of ASD-B
X1, X2	Selecting the speed of ASD-B: X1 = 0, X2 = 1, selecting SP1 X1 = 1, X2 = 0, selecting SP2 X1 = 1, X2 = 1, selecting SP3
Y0	Status of ASD-B: On: RUN OFF: STOP

When IFD9503 is connected to DVP-12SA, the default length of input data is 8 bytes and output data is 8 bytes for the data exchange with DVPCOPM-SL master. D256 in DVP-12SA is the start device for input data, and D0 is the start device for output data. To realize the control function of X0, X1 and X2, we place the statuses of X0 ~ X2 to bit 0 ~ bit 2 of D256. That is, when X0 = On, bit 0 of D256 will become 1. When X1 = On, bit 1 of D256 will become 1. In this way, we can realize the control of RUN, STOP and speed of ASD-B by the changes in D256 through WPLSoft. The status word data in ASD-B will then be sent to D0. That is, when bit 0 of D0 becomes 1, there will be signals at Y0.

Mapping between DVPCOPM-SL master and DVP-12SA:

Mapping register in Master	Transmission direction	Mapping register in Slave
D6032	←	D256
D6033		D257
D6034		D258
D6035		D259
D6282	→	D0
D6283		D1
D6284		D2
D6285		D3

- Data mapping in ASD-B

In this example, IFD9503 is the interface for the connection between ASD-B and CANopen network. In default setting, IFD9503 provides 1 word of input data and 1 word of output data to exchange with DVPCOPM-SL master.

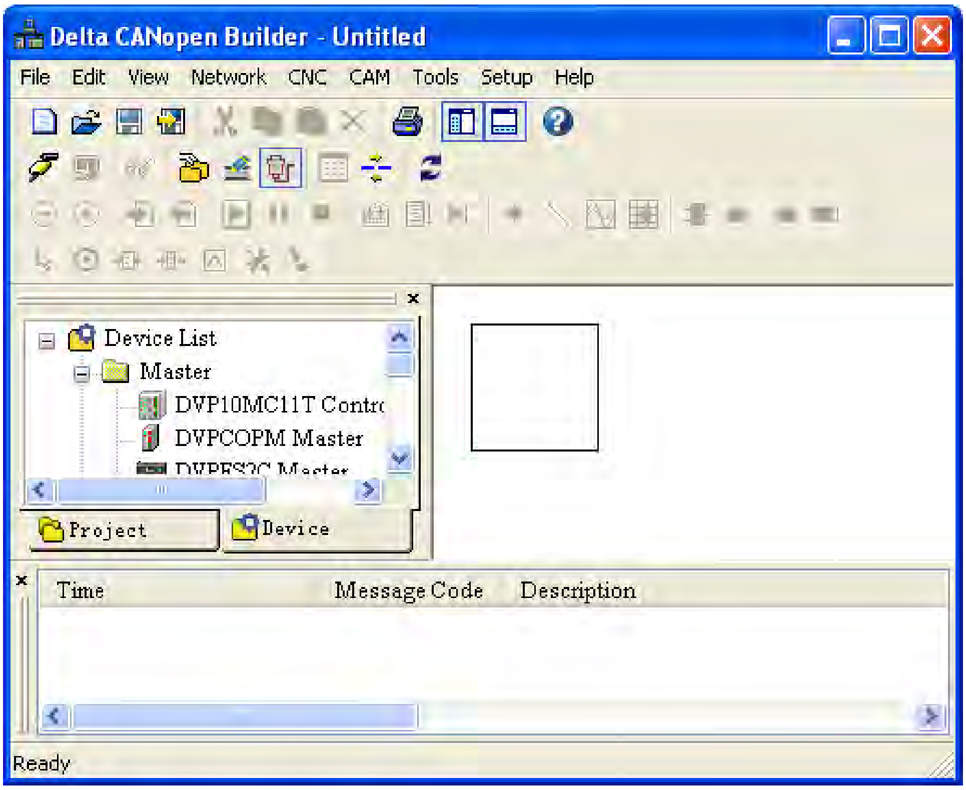
Mapping between DVPCOPM-SL master and ASD-B:

Mapping register in Master	Transmission direction	Mapping parameter in Slave
D6036	←	P4-09 (Digital output status)
D6286	→	P4-07 (Multi-function digital input)

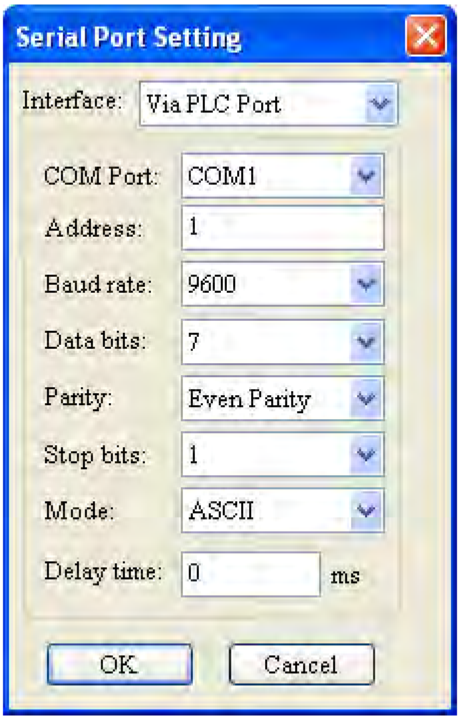
13.3.5.3 Configure Network by Delta CANopenBuilder Software

- Using CANopenBuilder to scan the network

1. Open CANopenBuilder software, as below:



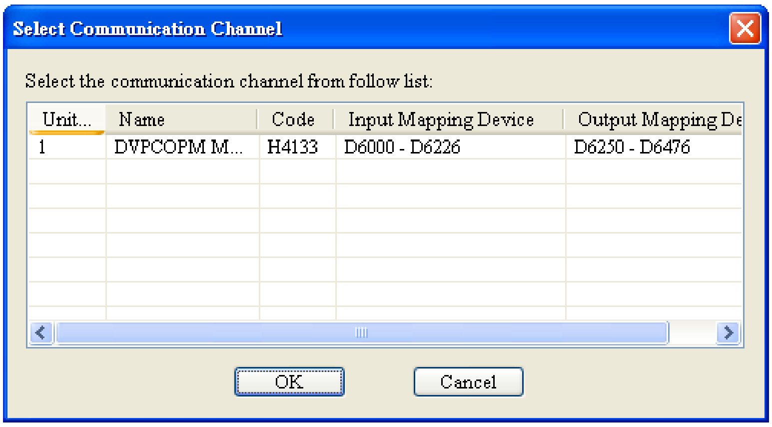
2. Select “Setup” => “Communication Setting” => “System Channel”, and the "Serial Port Setting” dialog box will appear.



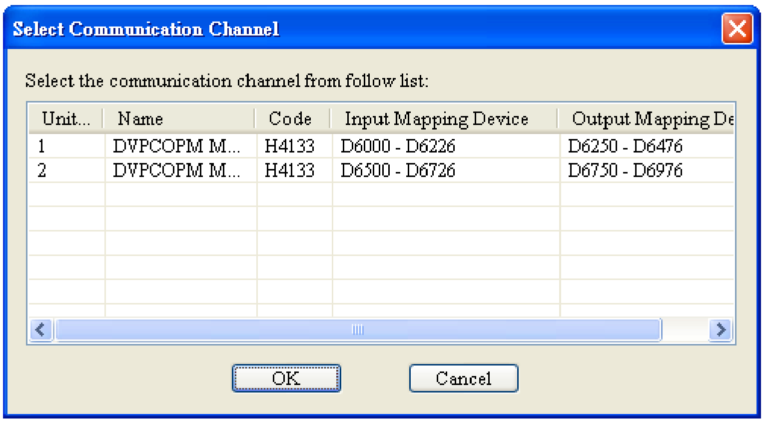
3. Set up the parameters for communication between the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format.

Item	Function	Default
COM Port	COM port on the PC to be used to communicate with DVP-SV	COM1
Address	Communication address of DVP-SV	01
Baud rate	Communication speed between the PC and DVP-SV	9,600 (bps)
Data Bits	Communication protocol between the PC and DVP-SV	7
Parity		Even Parity
Stop Bit		1
Mode	Communication mode between the PC and DVP-SV	ASCII

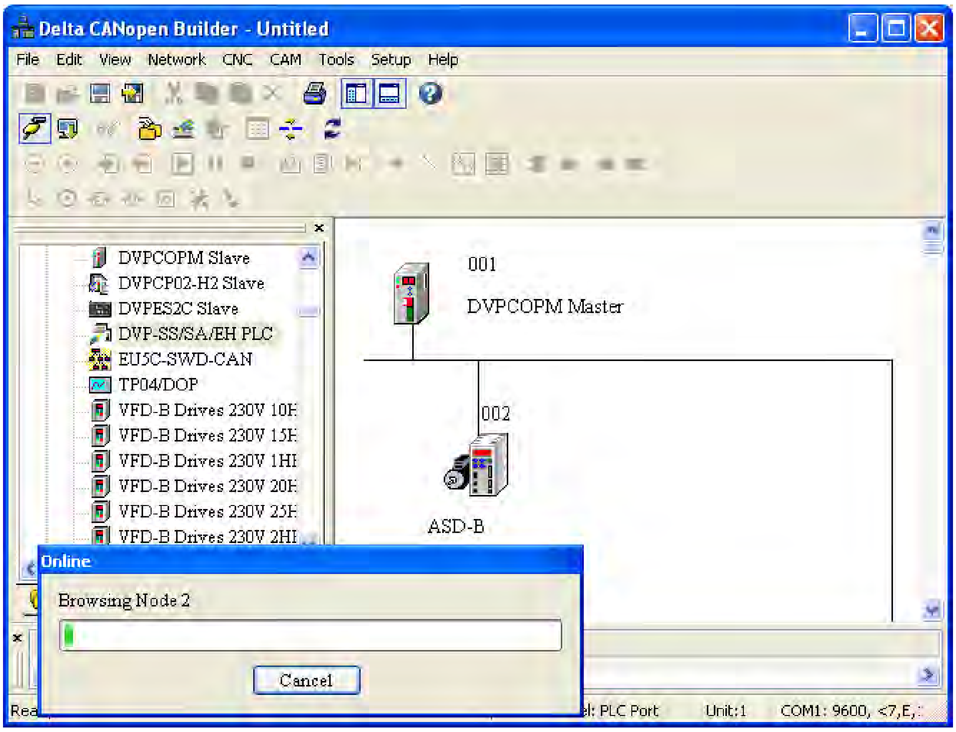
4. Select "Network" => "Online", and the "Select Communication Channel" dialog box will appear. In this example, if the connection with DVP-SV is in normal status, you will see the screen as below.



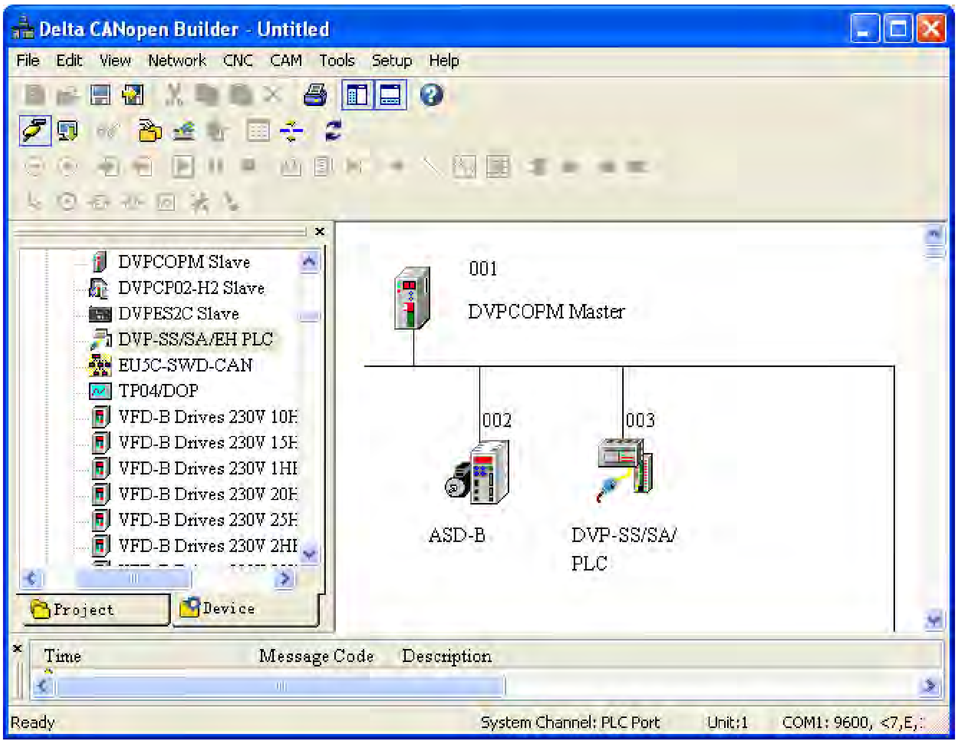
If there are more than one DVPCOPM-SL module (less than 8) connected to the left side of DVP-SV and suppose there are two connected in this example, you will see the screen as below after clicking on "Online". The DVPCOPM-SL which is closest to DVP-SV is regarded as the first module, and so on.



Select the DVPCOPM-SL which needs to establish the communication. Click on “OK” and start to scan all the slaves in the network. If the network installation and power supply are normal, you will see the screen as below.

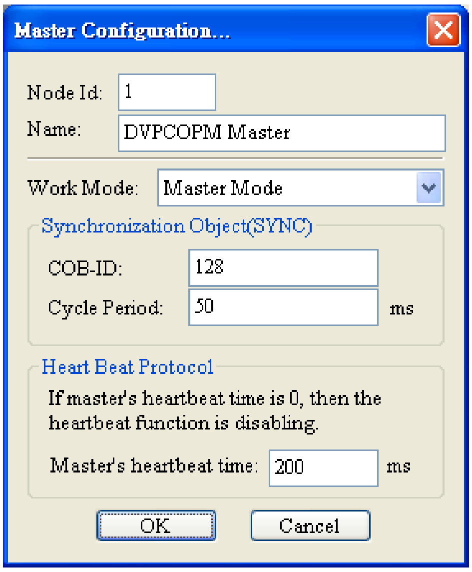


5. In normal condition, after the scan is over, you will find the master and all the slaves displayed in CANopen network, as below.



- Setting up parameters in CANopen master

Select “Network” => ”Master Parameter”, and you will see the dialog box as below.



Work Mode: The work mode of DVPCOPM-SL. You can select either “Master Mode” or “Slave Mode”.

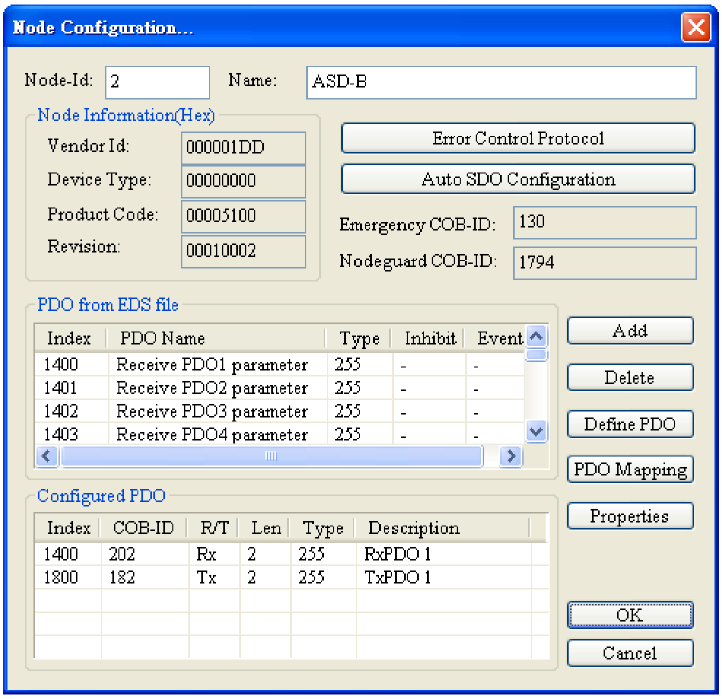
Cycle Period: The regular interval at which synchronous messages are sent

Master’s heartbeat time: The cycle time for DVPCOPM-SL to send out the heartbeat message.

After all the parameters are set up, click on “OK".

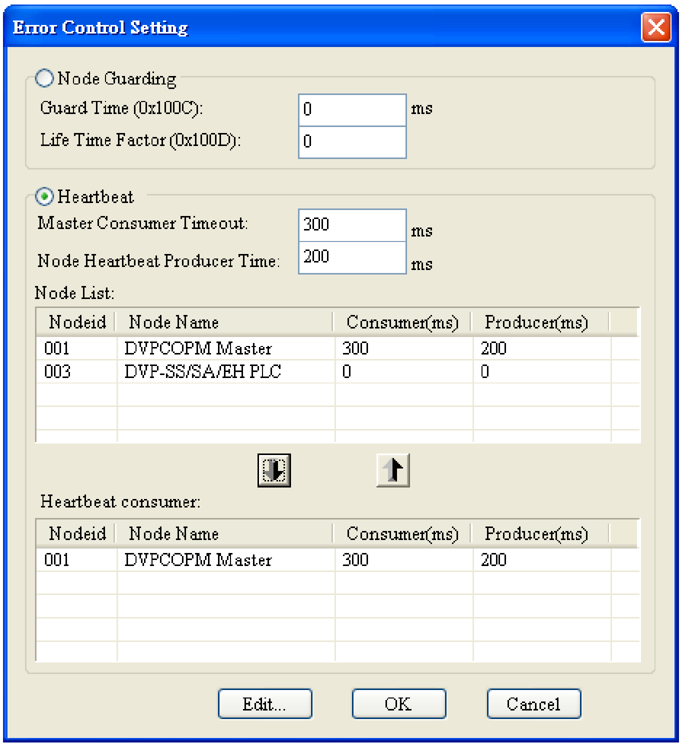
- Setting up parameters in CANopen slave, take the parameter settings in ASD-B for example.

1. Double-click on ASD-B, and you will see the dialog box as below.

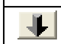


2. Relevant parameter settings

- **Error Control Protocol:** In the “Node Configuration…” page, click on “Error Control Protocol”, and you will see the dialog box appearing as below.



Explanation of the parameters above:

Parameter Name		Explanation	Remark
Node Guarding	Guard time	The master sends the guard message to the slave based on the time interval specified by “Guard Time”.	When “Heartbeat” is selected, “Node Guarding” cannot be selected.
	Life Time Factor	Life time=Guard Time x Life Time Factor. The slave does not respond to the polling from the master within the period of Life Time and then master assumes the slave is offline.	
Heartbeat	Node heartbeat producer time	The slave sends the heartbeat message to the master within the cycle of “Node heartbeat producer time”	The time for “Master consumer timeout” should be longer than that for “slave heartbeat producer time”.
	Master consumer time-out	If the master failed to receive the heartbeat message from the slave within the period of “master consumer timeout”, the master would assume the slave is offline.	
Node list		All nodes configured in CANopen network are all displayed in the node list.	--
Heartbeat consumer		The node configured with “error control setting” can monitor whether the nodes in the window of “Heartbeat consumer” are offline.	Only one node can be configured in “Heartbeat consumer”.
 Icon		Select some node in “Node list” and add it to	--

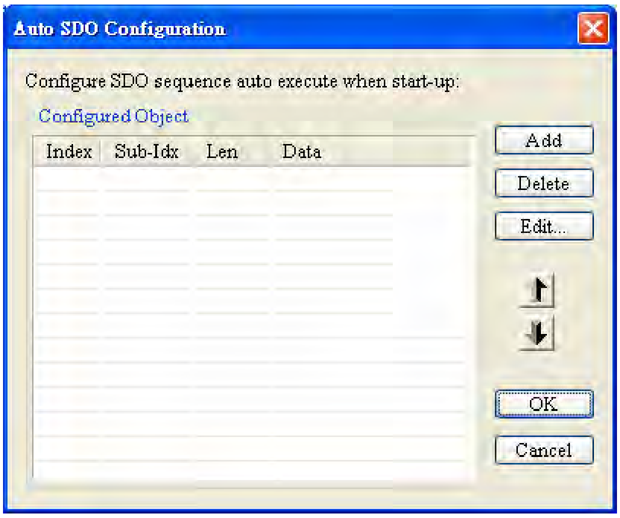
Parameter Name	Explanation	Remark
	the window of "heartbeat monitoring" by clicking the icon .	
Icon	Select one node in "Heartbeat" and then delete the selected node by clicking the icon .	--
"Edit" Button	Select one node in "Heartbeat monitoring" and revise the monitoring time clicking "Edit…"	--
"OK" Button	By clicking "OK" return to the dialogue box of "Node configuration" and the parameters set in "Error control setting" are saved	--
"Cancel" Button	By clicking "Cancel" return to the dialogue box of "Node configuration" and the parameters set in "Error control setting" are invalid.	--

- **Auto SDO Configuration**

In the "Node Configuration" page, click on "Auto SDO Configuration", and you will see the page as below.

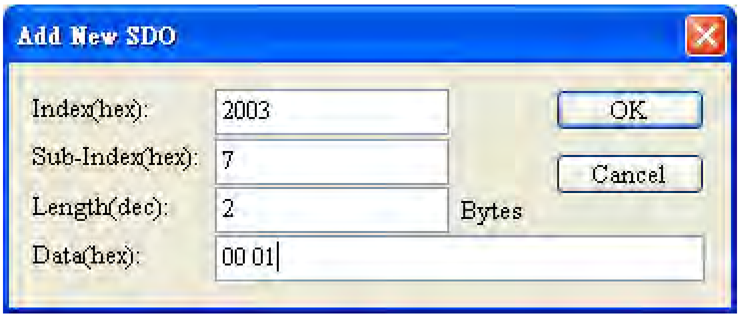
Click on "Add" to edit an auto SDO. Click on "Edit" to modify the selected auto SDO. Each slave can be configured with 20 auto SDOs at most.

The auto SDO can only be used for writing parameter values, rather than reading parameters and can only write to a slave once before the slave enters the operational state from the pre-operational state.



The following window pops up by clicking on "Add" button in the window above. "Index (hex)" and "Sub-Index (hex)" are the index and sub-index of the parameters to be accessed; "Length (dec)" is determined by the data type of the parameter to be accessed with the unit: byte.

The value in “Length (dec)” is 2 for the word-type parameter. “Data (hex)” is the data in hex format to be written into the parameter, the low byte in the left, high byte in the right and space between two bytes. For data type: double words, the low word is in the left and high word is in the right.

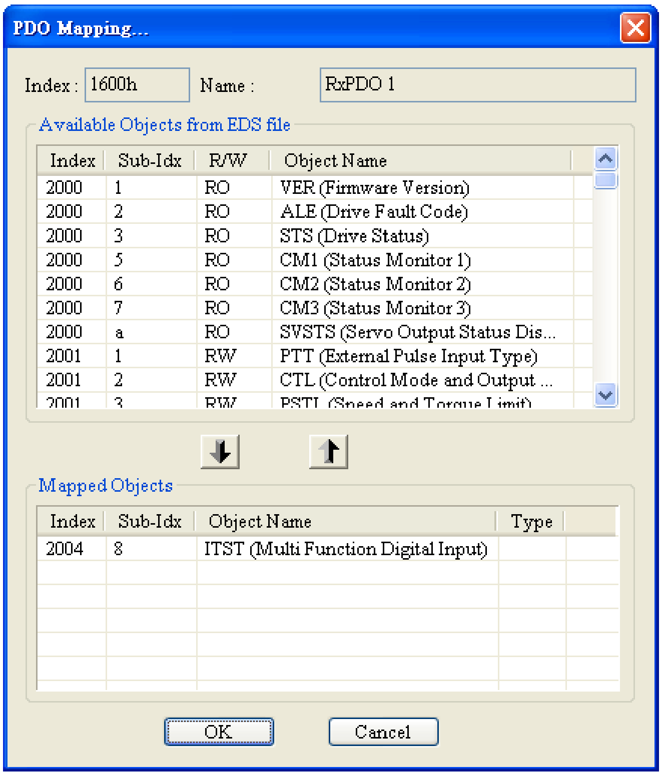


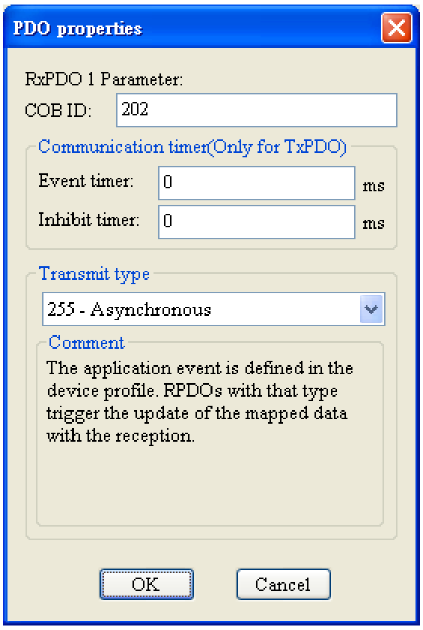
- **PDO mapping**

In the “Node Configuration…” page, select a TxPDO or RxPDO in “Configured PDO” and click on “PDO Mapping”, and you will come to the “PDO Mapping…” page as below. You can add the parameters in “Available Objects from EDS file” into “Mapped Objects”. The total length of the parameters added in each PDO CAN’T exceed 8 bytes. After the configuration is completed, click on “OK”.

In the “Node Configuration…” page, click on “Properties” to enter the "PDO Properties” page and modify COB-ID and Transmit type. After the configuration is completed, click on “OK”. In the “Node Configuration…” page, click on “Define PDO” to define RxPDO or TxPDO.

In this example, we adopt the default configuration. Finally, click “OK” in the “Node Configuration…” page.





PDO COB-ID setting rule is as follows.

RxPDO Number	COB-ID (HEX)	TxPDO Number	COB-ID (HEX)
RxPDO1	200 + slave node address	TxPDO1	180 + slave node address
RxPDO2	300 + slave node address	TxPDO2	280 + slave node address
RxPDO3	400 + slave node address	TxPDO3	380 + slave node address
RxPDO4	500 + slave node address	TxPDO4	480 + slave node address

Note:

The COB-IDs of RxPDO5~ RxPDO8 and TxPDO5~ TxPDO8 can be those of RxPDO1~ RxPDO4 and TxPDO1~ TxPDO4 of slaves which have not been used on the network yet. COB-ID of every PDO must NOT be identical.

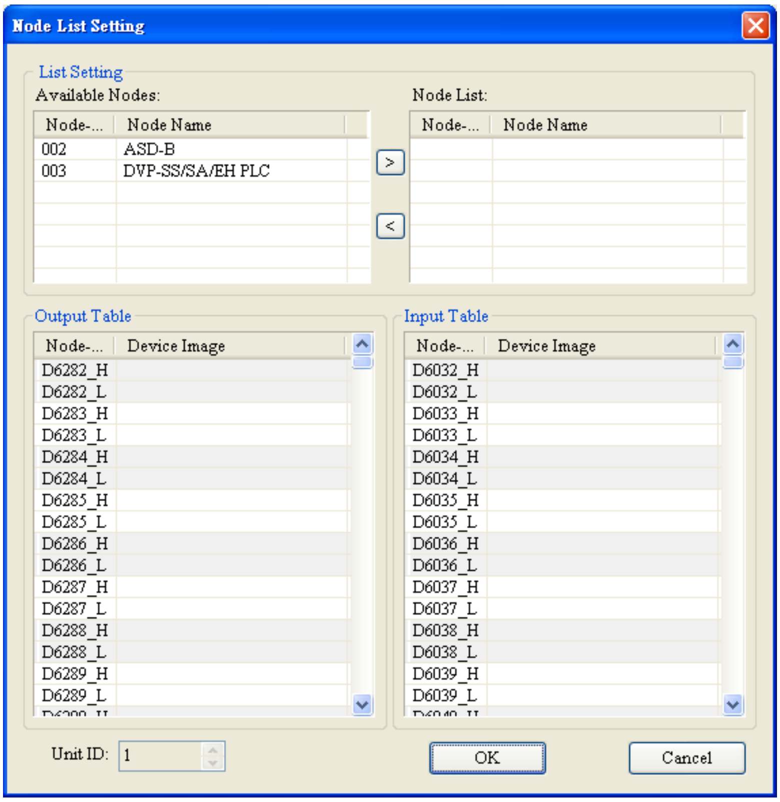
PDO transmission types are listed as below.

Transmission Type		Description	Remark
0	RxPDO	Master transmits a SYNCH message to slave every SYNCH cycle. When there is a change for RxPDO data, RxPDO data is transmitted to slave and the data that slave receives is valid after receiving the next SYNCH message. When there is no change in RxPDO data, master does not transmit RxPDO data to slave.	SYNCH non-cycle
	TxPDO	Master transmits a SYNCH message to slave every SYNCH cycle. When TxPDO data changes, slave sends the TxPDO data to master after receiving SYNCH message, TxPDO data that master receives is valid immediately. When there is no change in TxPDO data, slave does not transmit TxPDO data to master.	
1	RxPDO	Master transmits a SYNCH message to slave every SYNCH cycle. Master sends out RxPDO data to slave once every SYNCH cycle. RxPDO data that slave receives from master is valid after slave receives the next SYNCH message.	SYNCH Cycle

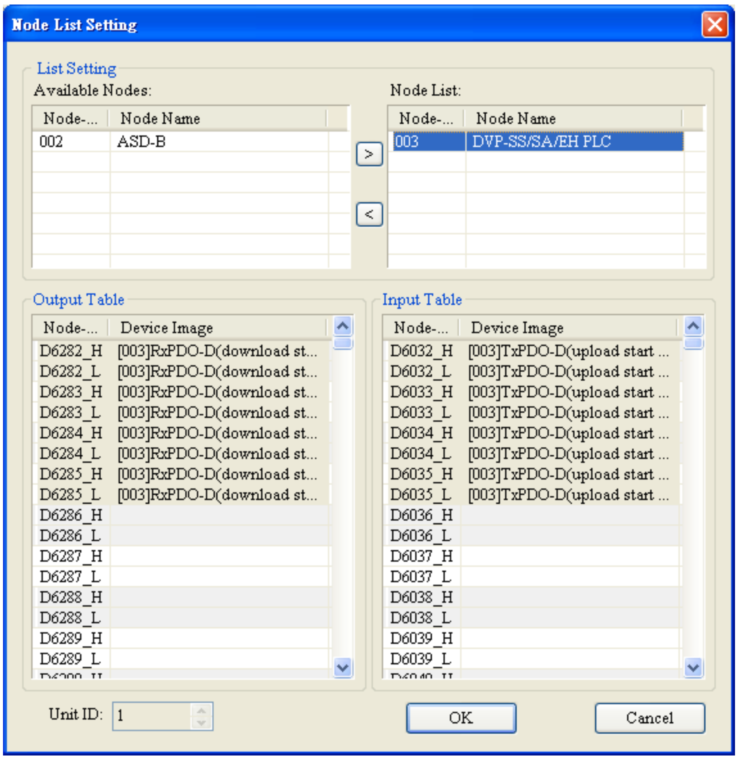
Transmission Type		Description	Remark
	TxPDO	Master transmits a SYNCH message to slave every SYNCH cycle. Slave sends out TXPDO data to master once after receiving one SYNCH message. And then the TxPDO data master receives is valid immediately.	
2	RxPDO	Master transmits a SYNCH message to slave every SYNCH cycle. Master transmits RxPDO data to slave every two SYNCH cycles. The RxPDO data slave receives will be valid after slave receives the next SYNCH message.	SYNCH Cycle
	TxPDO	Master transmits a SYNCH message to slave every SYNCH cycle. Slave sends out TxPDO data to master once after receiving 2 SYNCH messages. And the TxPDO data master receives is valid immediately.	
3～240	RxPDO	Deduce from the transmission types: 1 and 2.	SYNCH Cycle
	TxPDO	Deduce from the transmission types: 1 and 2.	
254	RxPDO	When there is any change in RxPDO, RxPDO data is transmitted to slave and the PxPDO that slave receives is valid immediately. When there is no change in RxPDO, master does not send RxPDO data to slave.	ASYNCH
	TxPDO	When Event timer and inhibit timer are both 0, TxPDO data is transmitted to master after TXPDO data changes and the data that master receives will be valid immediately; when TxPDO data does not change, slave does not send out TxPDO data to master. When neither of Event timer and inhibit timer are 0, slave sends out TxPDO data to master once every a period of Event timer. After TxPDO data is sent out, no TxPDO data is allowed to be sent out again within the period of inhibit timer and when TxPDO data changes, TxPDO data is transmitted to master at once and the data that master receives will be valid immediately.	
255	RxPDO	Same as the transmission type: 254	ASYNCH
	TxPDO	Same as the transmission type: 254	

- Node List Setting

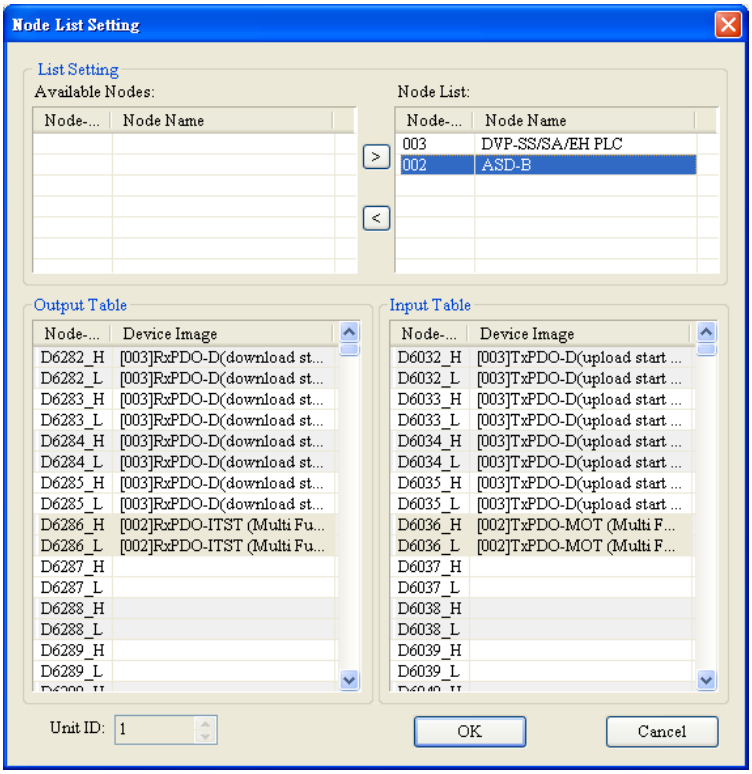
1. Double click on “DVPCOPM Master” icon, and you will see the “Node List Setting” dialog box as below.



2. In this example, first select DVP-SS/SA/EH PLC of Node 003 and click on > to add this node into the node list. After that, select Node 003 in the node list, and you will be able to see how the I/O data correspond to D registers in DVP-SV from the Output Table and Input Table below.

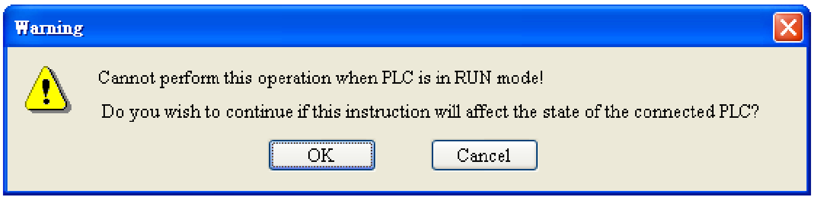


3. Add Node 002 into the node list in the same way, and you will be able to see how the I/O data correspond to D registers in DVP-SV from the Output Table and Input Table below. Click on "OK" to complete setting up the node list.

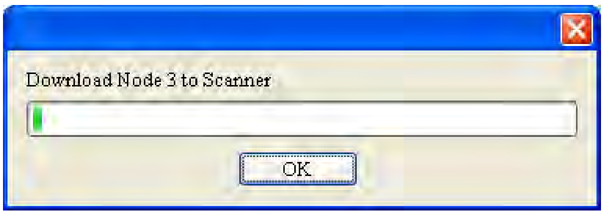


- Download data to the master

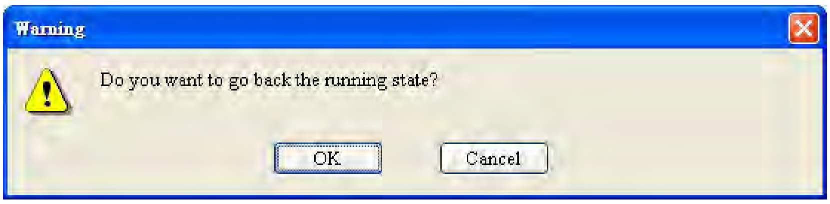
1. Select "Network" => "Download" to download the configuration data to DVPCOPM-SL master. If the PLC is in RUN status at this moment, you will be given a warning saying that you have to stop the operation before the download.



2. Click on "OK" to stop the PLC and start to download the data to the master.



3. After the download is completed, you will be given another warning, asking you if you would like to run the PLC again. Click on "OK" to restart the PLC program, or click on "Cancel" to stop the PLC.



13.3.5.4 Save Configuration Data

Select “File” => "Save” to save current configuration data.

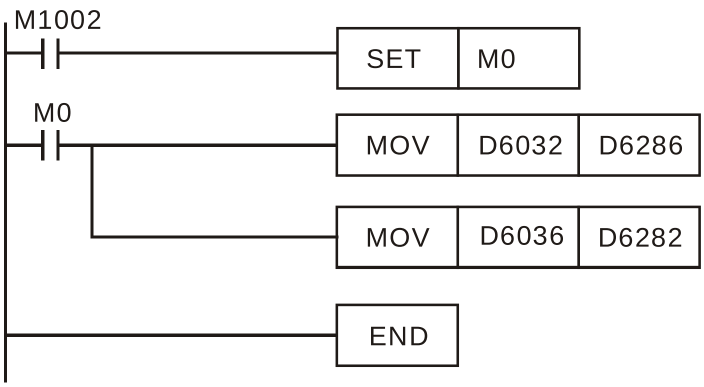
13.3.5.5 CANopen Network Control

In this section, we will introduce how to write WPL program to satisfy the requirement of the control over CANopen network.

1. Target

- When SW0 on Slave 3 is closed, the servo drive on Slave 2 will start to run.
- When SW0 on Slave 3 is open, the servo drive on Slave 2 will stop.
- When the status of SW1 and SW2 on Slave 3 is switched, the running speed of servo drive on Slave 2 can be modified.
- When the servo drive is running, the signal LED of Slave 2 will be On.
- When the servo drive stops, the signal LED of Slave 2 will be Off.

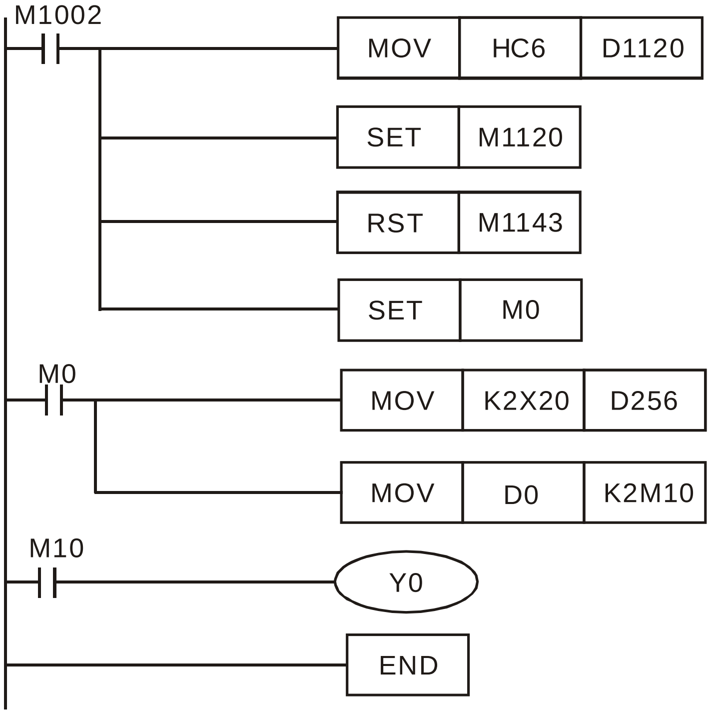
2. The program in DVP-SV CPU(master)



Program explanations:

- The 2nd row of the program indicates sending the content of D256 in DVP-SA (mapped in D6032 of DVP-SV) to the control word (mapped in D6286 of DVP-SV) of the servo drive.
- The 3rd row of the program indicates sending the output status of the servo drive (mapped in D6036 of DVP-SV) to D0 in DVP-SA (mapped in D6282 of DVP-SV).

The program in DVP-SA CPU (slave):



Program explanations:

- The first 3 rows of the program set up the communication format between DVP-SA and IFD9503, which is 115,200bps, 7E1-ASCII, and COM2 communication port.
- When M0 = On, send the input status of X20 ~ X27 of DVP-08ST to D256, and send the data in b0 ~ b15 of D0 to M10 ~ M25.
- When D0 = 1, M10 will be On, and Y0 of DVP-SA will output.

13

13.3.6 Input and Output Mapping Areas

1. When DVPCOPM-SL serves as CANopen master, the input and output mapping areas are described as below.

- When the PLC is DVP-SV3 and DVP-SX3, the input and output mapping areas for different positions on the left side of the PLC are shown in the table below. The position of the first one on the left of the PLC is 1, the second one is 2, and so on.

Mapping Area / Position	Output Mapping Area	Input Mapping Area
1	D16250~D16476	D16000~D16226
2	D16750~D16976	D16500~D16726
3	D17250~D17476	D17000~D17226
4	D17750~D17976	D17500~D17726
5	D18250~D18476	D18000~D18226
6	D18750~D18976	D18500~D18726
7	D19250~D19476	D19000~D19226
8	D19750~D19976	D19500~D19726

- When the PLC is another model in the DVP series (i.e., not DVP-SV3 or DVP-SX3) the input and output mapping areas for different positions on the left side of the PLC are shown in the table below. The position of the first one on the left of the PLC is 1, the second one is 2, and so on.

Mapping Area / Position	Output Mapping Area	Input Mapping Area
1	D6250~D6476	D6000~D6226
2	D6750~D6976	D6500~D6726
3	D7250~D7476	D7000~D7226
4	D7750~D7976	D7500~D7726
5	D8250~D8476	D8000~D8226
6	D8750~D8976	D8500~D8726
7	D9250~D9476	D9000~D9226
8	D9750~D9976	D9500~D9726

2. When DVPCOPM-SL serves as CANopen master, the request message areas and response message areas of SDO, NMT and Emergency, and PDO mapping areas are described as below.

- When the PLC is DVP-SV3 and DVP-SX3, the request message areas and response message areas of SDO, NMT and Emergency, and PDO mapping areas for different positions on the left side of the PLC are shown in the table below. The position of the first one on the left of the PLC is 1, the second one is 2, and so on.

Mapping area / Position	Request Message Area of SDO, NMT, Emergency	Response Message Area of SDO, NMT, Emergency	RxPDO Mapping Area	TxPDO Mapping Area
1	D16250~D16281	D16000~D16031	D16282~D16476	D16032~D16226
2	D16750~D16781	D16500~D16531	D16782~D16976	D16532~D16726
3	D17250~D17281	D17000~D17031	D17282~D17476	D17032~D17226
4	D17750~D17781	D17500~D17531	D17782~D17976	D17532~D17726
5	D18250~D18281	D18000~D18031	D18282~D18476	D18032~D18226
6	D18750~D18781	D18500~D18531	D18782~D18976	D18532~D18726
7	D19250~D19281	D19000~D19031	D19282~D19476	D19032~D19226
8	D19750~D19781	D19500~D19531	D19782~D19976	D19532~D19726

- When the PLC is another main unit in the DVP series (i.e., not DVP-SV3 or DVP-SX3), the request message areas and response message areas of SDO, NMT and Emergency, and PDO mapping areas for different positions on the left side of the PLC are shown in the table below. The position of the first one on the left of the PLC is 1, the second one is 2, and so on.

Mapping area / Position	Request Message Area of SDO, NMT, Emergency	Response Message Area of SDO, NMT, Emergency	RxPDO Mapping Area	TxPDO Mapping Area
1	D6250~D6281	D6000~D6031	D6282~D6476	D6032~D6226
2	D6750~D6781	D6500~D6531	D6782~D6976	D6532~D6726
3	D7250~D7281	D7000~D7031	D7282~D7476	D7032~D7226
4	D7750~D7781	D7500~D7531	D7782~D7976	D7532~D7726
5	D8250~D8281	D8000~D8031	D8282~D8476	D8032~D8226
6	D8750~D8781	D8500~D8531	D8782~D8976	D8532~D8726
7	D9250~D9281	D9000~D9031	D9282~D9476	D9032~D9226
8	D9750~D9781	D9500~D9531	D9782~D9976	D9532~D9726

3. When DVPCOPM-SL serves as CANopen slave, the input and output mapping areas for different positions of the left side of the PLC are as below.

- When the PLC is DVP-SV3 and DVP-SX3, the input and output mapping areas for different positions on the left side of the PLC are shown in the table below. The position of the first one on the left of the PLC is 1, the second one is 2, and so on.

Mapping area / Position	Output Mapping Area	Input Mapping Area
1	D16282~D16476	D16032~D16226
2	D16782~D16976	D16532~D16726
3	D17282~D17476	D17032~D17226
4	D17782~ D17976	D17532~D17726
5	D18282~ D18476	D18032~D18226
6	D18782~D18976	D18532~D18726
7	D19282~D19476	D19032~D19226
8	D19782~D19976	D19532~D19726

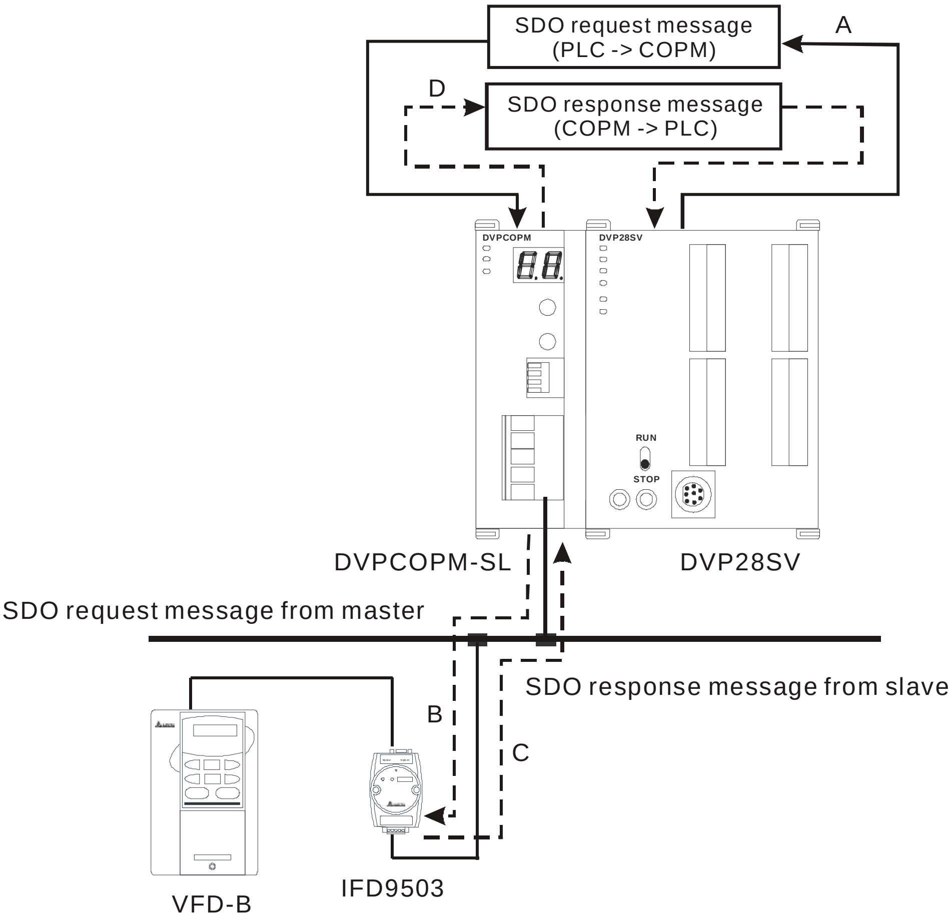
- When the PLC is another model in the DVP series (i.e., not DVP-SV3 or DVP-SX3), the input and output mapping areas for different positions on the left side of the PLC are shown in the table below. The position of the first one on the left of the PLC is 1, the second one is 2, and so on.

Mapping area / Position	Output Mapping Area	Input Mapping Area
1	D6282~D6476	D6032~D6226
2	D6782~D6976	D6532~D6726
3	D7282~D7476	D7032~D7226
4	D7782~D7976	D7532~D7726
5	D8282~D8476	D8032~D8226
6	D8782~D8976	D8532~D8726
7	D9282~D9476	D9032~D9226
8	D9782~D9976	D9532~D9726

13.3.7 Send SDO, NMT and Read Emergency by Ladder Diagram

13.3.7.1 Principle

See the chart below for sending SDO by WPL program:



A: PLC sends out the request message to DVPCOPM-SL (master).

B: DVPCOPM-SL (master) sends out the request message to the target equipment.

C: The target equipment processes the request message and sends the response message to DVPCOPM-SL.

D: PLC receives SDO, NMT and Emergency data.

Note: The corresponding device addresses are different for DVPCOPM-SL with different PLC. Please refer to Input and Output Mapping Areas for DVPCOPM-SL for details. In this case, the PLC is exemplified by DVP-28SV.

13.3.7.2 Structures of SDO Request and Response Message

You can edit SDO, NMT and Emergency in "request message editing area". Take the first DVPCOPM-SL master placed on the left-hand side of DVP-SV for example. See the table below for the corresponding relation between "request message editing area" and "response message editing area" and the devices in PLC.

PLC device	Mapping area	Data length
D6000 ~ D6031	SDO response message and Emergency response message	64 bytes
D6250 ~ D6281	SDO request message, NMT service message and Emergency request message	64 bytes

1. **Structure of SDO request message:**

<table>
<tr><th rowspan="2">PLC device</th><th colspan="17">Request Message</th></tr>
<tr><th></th><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>D6250</td><td rowspan="3">Message Header</td><td colspan="8">ReqID</td><td colspan="8">Command</td></tr>
<tr><td>D6251</td><td colspan="8">Reserved</td><td colspan="8">Size</td></tr>
<tr><td>D6252</td><td colspan="8">Type</td><td colspan="8">MAC ID</td></tr>
<tr><td>D6253</td><td rowspan="5">Message Data</td><td colspan="8">Index high byte</td><td colspan="8">Index low byte</td></tr>
<tr><td>D6254</td><td colspan="8">Reserved</td><td colspan="8">Sub-index</td></tr>
<tr><td>D6255</td><td colspan="8">Datum 1</td><td colspan="8">Datum 0</td></tr>
<tr><td>D6256</td><td colspan="8">Datum 3</td><td colspan="8">Datum 2</td></tr>
<tr><td>D6257 ~ D6281</td><td colspan="16">Reserved</td></tr>
</table>

- Command: Fixed to "01Hex".
- ReqID: Request ID. Whenever an SDO request message is sent out, the message will be given a ReqID for CANopen master to identify. For the next request message to be sent out, you have to change the ID number. Range of ReqID: 00Hex ~ FFHex.
- Size: Data length of the message. Max. 8 bytes. Unit: byte.
- MAC ID: Node address of the target equipment on the CANopen network.
- Type: In SDO request message, 01Hex refers to SDO data read service; 02Hex refers to SDO data write service; In the SDO response messages, 43Hex indicates reading 4 bytes of data, and 4BHex indicates reading 2 bytes of data. 4FHex means to read 1 byte of data; 60Hex means to write 1/2/4 byte(s) of data; 80Hex means to end SDO command. For example, if the type is 02Hex in SDO request message, the type is 60Hex in the SDO response message when writing data is successful.

2. **Structure of SDO response message:**

<table>
<tr><th rowspan="2">PLC device</th><th colspan="17">Response message</th></tr>
<tr><th></th><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>D6000</td><td rowspan="3">Message header</td><td colspan="8">ReqID</td><td colspan="8">Status</td></tr>
<tr><td>D6001</td><td colspan="8">Reserved</td><td colspan="8">Size</td></tr>
<tr><td>D6002</td><td colspan="8">Type</td><td colspan="8">MAC ID</td></tr>
<tr><td>D6003</td><td rowspan="5">Message data</td><td colspan="8">Index high byte</td><td colspan="8">Index low byte</td></tr>
<tr><td>D6004</td><td colspan="8">Reserved</td><td colspan="8">Sub-index</td></tr>
<tr><td>D6005</td><td colspan="8">Datum 1</td><td colspan="8">Datum 0</td></tr>
<tr><td>D6006</td><td colspan="8">Datum 3</td><td colspan="8">Datum 2</td></tr>
<tr><td>D6007 ~ D6031</td><td colspan="16">Reserved</td></tr>
</table>

- Status code:

Status code	Explanation
0	No data transmission request
1	The SDO message transmission is successful.
2	The SDO message is being transmitted.
3	Error: SDO transmission timeout
4	Error: Illegal command
5	Error: Size of the request message is illegal.
6	Error: Size of the response message is illegal.
7	Error: Equipment to be sent messages is busy.
8	Error: Illegal type
9	Error: Incorrect node address
0A	Error information (See the error code for SDO response message)
0B ~ FF	Reserved

- ReqID: Normally, the same as the ReqID in the request message.
- Size: Data length of the message, the maximum length is 20. Unit: Bytes
- MAC ID: Node address of the target equipment on the CANopen network.
- Type: In the SDO response message, 43Hex means that 4-byte data are read; 4BHex means that 2-byte data are read; 4FHex means that 1-byte data are read; 60Hex means that 1/2/4 byte (s) of data are written, 80Hex means ending the SDO command. E.g., if the type is 02Hex in the SDO request message, the type in the SDO response message is 60Hex when writing data is successful.

13.3.7.3 Structure of NMT Service Message

You can send the NMT request message to D6250 ~ D6281, and the slave will not respond with a message.

Note: The corresponding device addresses are different for DVPCOPM-SL with different PLC. Please refer to Input and Output Mapping Areas for DVPCOPM-SL for details. Here the PLC is DVP-28SV.

PLC device	Request Message																
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
D6250	Message Header	ReqID								Command							
D6251		Reserved								Size (fixed to 04Hex)							
D6252		Type (fixed to 03Hex)								MAC ID							
D6253	Message Data	Reserved								NMT service code							
D6254		Reserved								MAC ID							

- Command: Fixed to “01Hex”.
- ReqID: Request ID. Whenever a NMT request message is sent out, the message will be given a ReqID for the CANopen master to identify. For the next NMT request message to be sent out, you have to change the ID number. Range of ReqID: 00Hex ~ FFHex.
- MAC ID: Node address of the target equipment on the CANopen network.
- NMT service code:

  01Hex: Enable remote node; 02Hex: Disable remote node; 80Hex: Enter pre-operational status; 81Hex: Reset application; 82Hex: Reset communication.

Example: If you want to stop node 03 equipment on the CANopen network, you have to set NMT service code to “02Hex” and MAC ID to “03".

13.3.7.4 Structures of Emergency Request and Response Messages

The corresponding device addresses are different for DVPCOPM-SL with different PLC. Please refer to Input and Output Mapping Areas for DVPCOPM-SL for details. The PLC here is DVP-28SV.

1. See the table below for the format of Emergency request message:

PLC device	Request Message																
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
D6250	Message Header	ReqID								Command							
D6251		Reserved								Size (fixed to 0)							
D6252		Type (fixed to 04Hex)								MAC ID							
D6253 ~ D6281	Message Data	Reserved															

2. See the table below for the format of Emergency response message:

<table>
<tr><th rowspan="2">PLC device</th><th colspan="17">Response Message</th></tr>
<tr><th></th><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>D6000</td><td rowspan="3">Message Header</td><td colspan="8">ReqID</td><td colspan="8">Status</td></tr>
<tr><td>D6001</td><td colspan="8">Reserved</td><td colspan="8">Size (2A Hex)</td></tr>
<tr><td>D6002</td><td colspan="8">Type (04Hex)</td><td colspan="8">MAC ID</td></tr>
<tr><td>D6003</td><td rowspan="6">Message Data</td><td colspan="8">Total number of data</td><td colspan="8">Number of data stored</td></tr>
<tr><td>D6004</td><td colspan="8">Datum 1</td><td colspan="8">Datum 0</td></tr>
<tr><td>D6005</td><td colspan="8">Datum 3</td><td colspan="8">Datum 2</td></tr>
<tr><td>D6006</td><td colspan="8">Datum 5</td><td colspan="8">Datum 4</td></tr>
<tr><td>D6007</td><td colspan="8">Datum 7</td><td colspan="8">Datum 6</td></tr>
<tr><td>D6008 ~ D6011</td><td colspan="16">Emergency2</td></tr>
<tr><td>D6012 ~ D6015</td><td rowspan="4">Message Data</td><td colspan="16">Emergency3</td></tr>
<tr><td>D6016 ~ D6019</td><td colspan="16">Emergency4</td></tr>
<tr><td>D6020~ D6023</td><td colspan="16">Emergency5</td></tr>
<tr><td>D6024~ D6031</td><td colspan="16">Reserved</td></tr>
</table>

- Command: Fixed to “01Hex”.
- ReqID: Request ID. Whenever an Emergency message is sent out, the message will be given a ReqID for the CANopen master to identify. For the next Emergency message to be sent out, you have to change the ID number. Range of ReqID: 00Hex ~ FFHex.
- MAC ID: Node address of the target equipment on CANopen network.
- Total number of data: Total number of Emergency messages CANopen master receives.
- Number of data stored: The latest number of Emergency messages CANopen master receives. (Every slave gives less than 5 Emergency messages.)

Note:

- CANopen master can only send out one SDO, NMT or Emergency request message to one piece of equipment every time.
- When you use WPL program to send out SDO, NMT or Emergency request messages, we recommend you clear the “request message editing area” and “response message editing area” to 0.

13.3.7.5 Application Examples

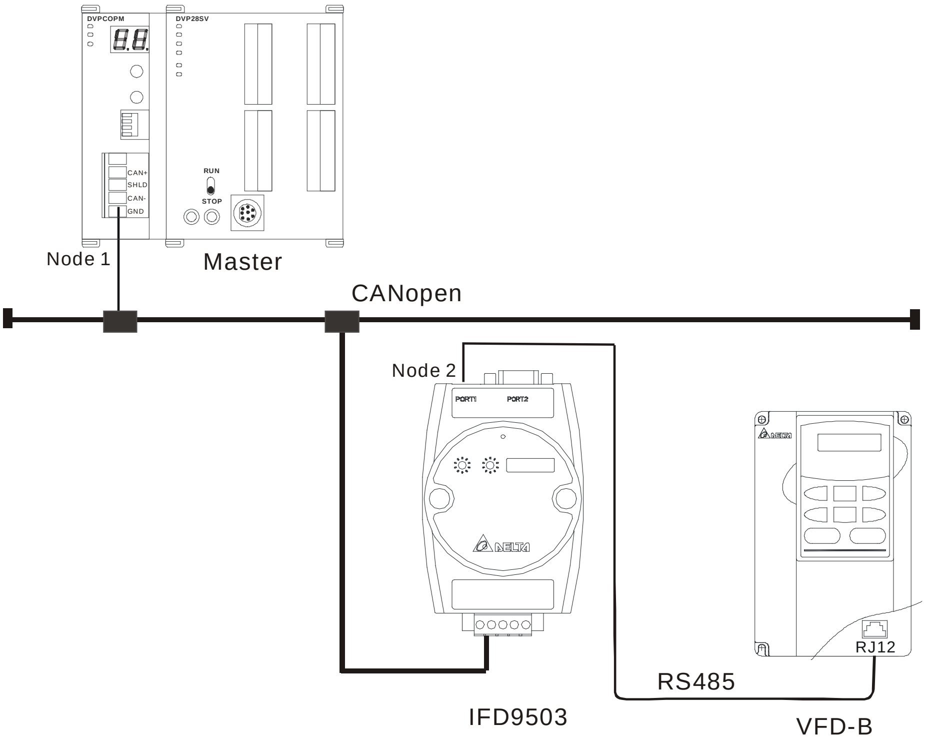
In this section, we will illustrate how to write a WPL program to send out SDO and NMT messages or read Emergency request messages.

(Note: the PLC is DVP-28SV here.)

1. Example I

- Control requirement:

When M0 turns ON, the actual output frequency of the AC motor drive is read via SDO. The corresponding index/ sub-index of the actual output frequency of the AC motor drive is 2021/4.



Required settings in DVPCOPM-SL:

Parameter	Setting	Explanation
Node address	01	Set the node address of DVPCOPM-SL to “01”.
Baud rate	1 Mbps	Set the communication speed between DVPCOPM-SL and bus to “1 Mbps”.

Required settings in IFD9503:

Parameter	Setting	Explanation
Node address	02	Set the node address of IFD9503 to “02”.
Baud rate	1 Mbps	Set the communication speed between IFD9503 and bus to “1 Mbps”.

Required settings in VFD-B AC motor drive

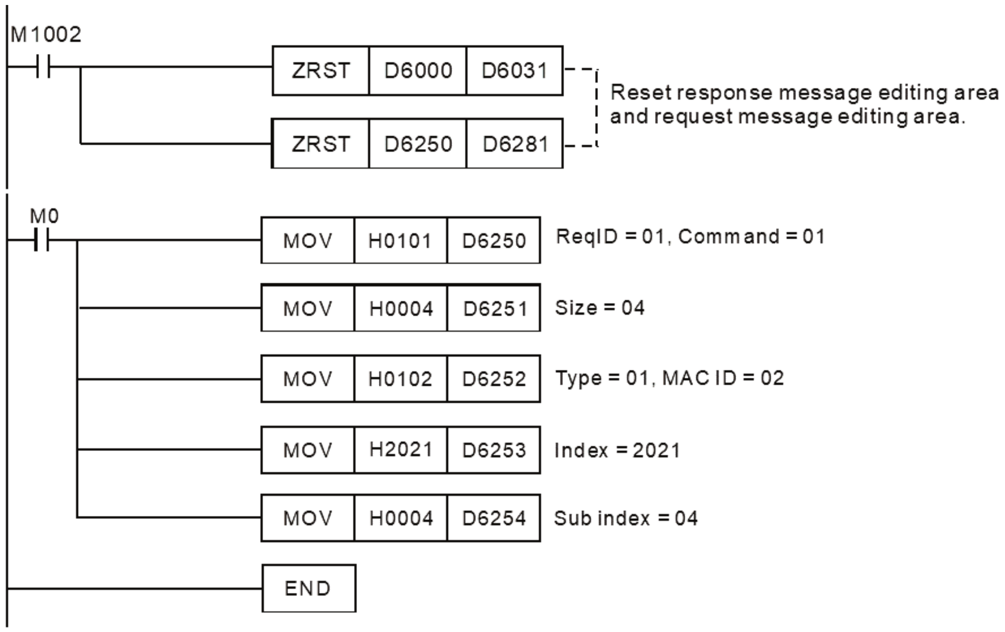
Parameter	Setting	Explanation
02-00	04	The main frequency is operated by RS-485 interface.
02-01	03	The running command is operated by communication interface. Operation by keys is valid.
09-00	01	Communication address of VFD-B: 01
09-01	03	Baud rate: 38,400 bps
09-04	03	Modbus RTU mode, format <8, N, 2>

Devices in PLC:

PLC device		Content	Explanation	
			15 14 13 12 11 10 9 8	7 6 5 4 3 2 1 0
SDO request message editing area	D6250	0101Hex	ReqID = 01Hex	Command = 01Hex
	D6251	0004Hex	Reserved	Size = 04Hex
	D6252	0102Hex	Type = 01Hex	MAC ID = 02Hex
	D6253	2021Hex	High byte of index = 20Hex	Low byte of index = 21Hex
	D6254	0004Hex	Reserved	Sub index = 04Hex
SDO response message editing area	D6000	0101Hex	ReqID = 01Hex	Status = 01Hex
	D6001	0006Hex	Reserved	Size = 06Hex
	D6002	4B02Hex	Type = 4BHex	MAC ID = 02Hex
	D6003	2021Hex	High byte of index = 20Hex	Low byte of index = 21Hex
	D6004	0004Hex	Reserved	Sub index = 04Hex
	D6005	0100Hex	Datum 1= 01Hex	Datum 0 = 00Hex

The value 0100Hex in D6005 indicates that the actual output frequency of the AC motor drive is 2.56 Hz.

- PLC program



Program explanation

At the beginning of the program, the SDO request information mapping area and the SDO response information mapping area are first cleared to zero.

When M0 = On, CANopen master will send out a SDO request message to read the contents in index 2021 and subindex 4 of the target equipment (at node address 02). If the communication is successful, the slave will return a response message.

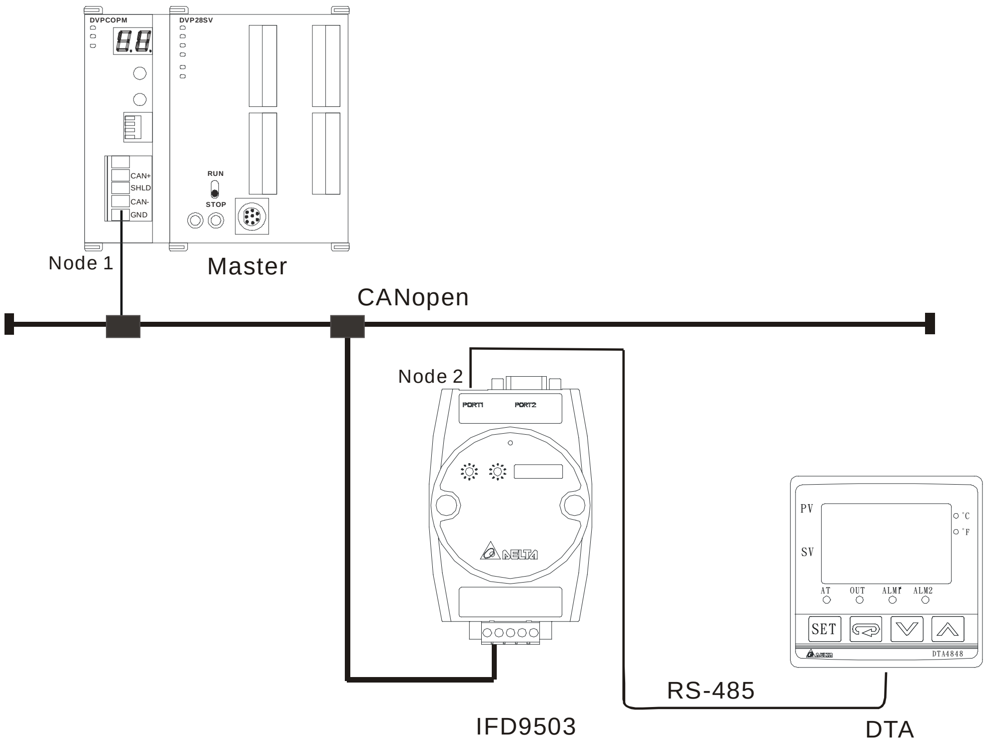
When M0 = On, CANopen master will send out the request message only once. If you would like it to send out one more request message, you will have to change the ReqID.

Upon successful reading, the data returned from the target equipment are stored in D6000 ~ D6005.

2. Example II

- Control requirement:

When M0 turns ON, the target temperature of the DTA temperature controller is set to 26.0℃ via SDO. The corresponding index/ sub-index of the target temperature of the DTA is 2047/2.



Required settings in DVPCOPM-SL

Parameter	Setting	Explanation
Node address	01	Set the node address of DVPCOPM-SL to “01”.
Baud rate	1 Mbps	Set the communication speed between DVPCOPM-SL and the bus to “1 Mbps”.

Required settings in IFD9503

Parameter	Setting	Explanation
Node address	02	Set the node address of IFD9503 to “02”.
Baud rate	1 Mbps	Set the communication speed between IFD9503 and the bus to “1 Mbps”.

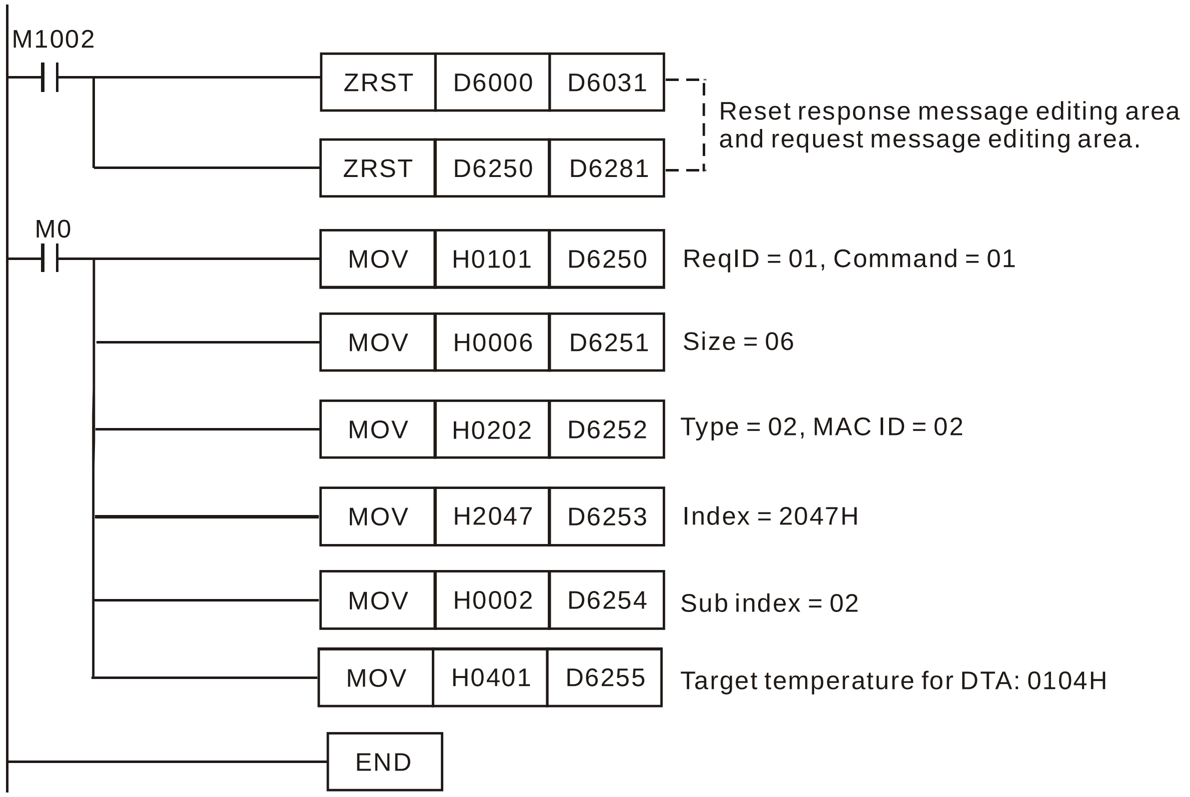
Required settings in DTA temperature controller

Parameter	Setting	Explanation
CoSH	On	C WE: Enable/disable communication write-in
C-SL	ASCII	C-SL: Select ASCII or RTU format
C-no	1	C NO: Set up communication address
bPS	38400	BPS: Set up communication speed
LEn	7	LENGTH: Set up data length
PrtY	E	PARITY:Set up parity bit
StoP	1	STOP BIT:Set up stop bit
tPUn	℃	UNIT: Select temperature unit, °C or °F

- Devices in PLC

<table>
<tr><th colspan="2" rowspan="2">PLC Device</th><th rowspan="2">Content</th><th colspan="16">Explanation</th></tr>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td rowspan="6">SDO request message editing area</td><td>D6250</td><td>0101Hex</td><td colspan="8">ReqID = 01Hex</td><td colspan="8">Command = 01Hex</td></tr>
<tr><td>D6251</td><td>0006Hex</td><td colspan="8">Reserved</td><td colspan="8">Size = 06Hex</td></tr>
<tr><td>D6252</td><td>0202Hex</td><td colspan="8">Type = 02Hex</td><td colspan="8">MAC ID = 02Hex</td></tr>
<tr><td>D6253</td><td>2047Hex</td><td colspan="8">High byte of index = 20Hex</td><td colspan="8">Low byte of index = 47Hex</td></tr>
<tr><td>D6254</td><td>0002Hex</td><td colspan="8">Reserved</td><td colspan="8">Sub index = 02Hex</td></tr>
<tr><td>D6255</td><td>0401 Hex</td><td colspan="8">Datum 1= 04Hex</td><td colspan="8">Datum 0= 01Hex</td></tr>
<tr><td rowspan="5">SDO response message editing area</td><td>D6000</td><td>0101Hex</td><td colspan="8">ReqID = 01Hex</td><td colspan="8">Status = 01Hex</td></tr>
<tr><td>D6001</td><td>0004Hex</td><td colspan="8">Reserved</td><td colspan="8">Size = 04Hex</td></tr>
<tr><td>D6002</td><td>6002Hex</td><td colspan="8">Type = 60Hex</td><td colspan="8">MAC ID = 02Hex</td></tr>
<tr><td>D6003</td><td>2047Hex</td><td colspan="8">High byte of index = 20Hex</td><td colspan="8">Low byte of index = 47Hex</td></tr>
<tr><td>D6004</td><td>0002Hex</td><td colspan="8">Reserved</td><td colspan="8">Sub index = 02Hex</td></tr>
</table>

- PLC program



Program explanation:

- At the beginning of the program, the SDO request message editing area and SDO response message editing area are first cleared to zero.
- When M0= On, CANopen master will send out a SDO request message to write 0104Hex into index 2047, sub index 2 of the target equipment (at node address 02). If the communication is successful, the slave will return a response message.
- When M0 = On, CANopen master will send out the request message only once. If you would like it to send out one more message, you will have to change the ReqID.
- Upon successful reading, the messages returned from the target equipment are stored in D6000 ~ D6004.

13.3.8 Network Node Status Display

The state of all slaves on the CANopen network can be read through reading 5002/1 (index/subindex) value by sending SDO messages via the ladder diagram; the master state of the CANopen network can be read through reading 5003/1 (index/subindex) value by sending SDO messages via the ladder diagram; the CANopen network state can be read through reading 5004/1 (index/subindex) value by sending SDO messages via the ladder diagram.

13.3.8.1 Slave State of CANopen Network

Users can read the content value in H’5002>>H’01 (index>>subindex) to acquire the status of the slaves on the CANopen network by sending SDO.

Index	Subindex	Object Name	Data Type	Attribute	Default
H’5002	H’00	Entry	Unsigned 16 bits	Read-only	---
	H’01	Status word of node 1 ~ node 127	Unsigned 128 bits	Read-only	---

The corresponding relations between index H”5002>> subindex H’01 and network nodes are as follows.

H’5002>>H’01	Corresponding Network Node					
	b15	b14	b13	… …	b1	b0
Word 0	Node 15	Node 14	Node 13	… …	Node 1	Reserved
Word 1	Node 31	Node 30	Node 29	… …	Node 17	Node 16
Word 2	Node 47	Node 46	Node 45	… …	Node 33	Node 32
Word 3	Node 63	Node 62	Node 61	… …	Node 49	Node 48
Word 4	Node 79	Node 78	Node 77	… …	Node 65	Node 64
Word 5	Node 95	Node 94	Node 93	… …	Node 81	Node 80
Word 6	Node 111	Node 110	Node 109	… …	Node 97	Node 96
Word 7	Node 127	Node 126	Node 125	… …	Node 113	Node 112

The corresponding bits are in OFF status when the nodes in the node list of the master module are normal; the corresponding bits are in ON status when the nodes in the node list of the master module are abnormal, e.g. Initializing fails or other abnormality causes slave offline.

13.3.8.2 Master Status of CANopen Network

Users can read the content value in H’5003>>H’01 to acquire the master module status on the CANopen network by sending SDO messages. When the master module is at normal work, the content value in H’5003>>H’01 is 0; when there is any error in the master module, the content value in H’5003>>H’01 is the corresponding error code.

Index	Subindex	Object Name	Data Type	Attribute	Default
H’5003	H’00	Entry	Unsigned 16 bits	Read-only	---
	H’01	Status of the master module	Unsigned 16 bits	Read-only	---

Explanation of the Content value for H’5003>>H’01.

Content Value	Explanation	Actions
F1	No slave has been added to the node list of CANopen Builder.	Add the slave to the node list and redownload configuration to DVPCOPM-SL
F2	In process of downloading configuration to DVPCOPM-SL.	Wait till the configuration download is finished.
F3	DVPCOPM-SL in error status	Redownload configuration. Replace it with a new DVPCOPM-SL if the error still exists.
F4	Bus-off is detected	Check the wiring for all cables of CANopen network is proper; ensure all nodes on the network work at same baud rate and finally repower DVPCOPM-SL.
F5	The setting for DVPCOPM-SL node address is incorrect	The DVPCOPM-SL node address should be set in the range of 1~127.
F9	Low-voltage detection error	Check and ensure the work power for DVPCOPM-SL is normal.
FA	The inner firmware of DVPCOPM-SL is in error state.	Repower DVPCOPM-SL.
FB	The storage space sending data in DVPCOPM-SL is full.	Check and ensure bus cable connection is normal and then repower DVPCOPM-SL.
FC	The storage space receiving data in DVPCOPM-SL is full.	Check and ensure bus cable connection is normal and then repower DVPCOPM-SL.
0	The master is in normal status	--

13

13.3.8.3 CANopen Network Status

Users can read the content value in H’5004>>H’01 to acquire CANopen network status by editing ladder diagram to send SDO. When all nodes on the CANopen network are all at normal work, the content value in H’5004>>H’01 is 0; when any node of CANopen network is abnormal or initializing fails, the content value in H’5004>>H’01 is 1.

Index	Subindex	Object Name	Data Type	Attribute	Default
H’5004	H’00	Entry	Unsigned 16 bits	Read-only	---
	H’01	CANopen network status	Unsigned 16 bits	Read-only	---

13.3.8.4 Data Structures of SDO Request and Response Messages

Here, the SDO request message structure is for 5002/1 (index/ subindex), 5003/1 (index/ subindex), 5004/1 (index/ subindex) only and can be realized by editing the request message mapping area. Take DVPCOPM-SL, the first master module on the left of PLC as an example, the table below shows the corresponding relations between request and response message mapping areas, and PLC devices.

Note: The corresponding device addresses are different for DVPCOPM-SL with different PLC. Please refer to Input and Output Mapping Areas for DVPCOPM-SL for details. The PLC here is DVP-28SV.

PLC Device	Mapping Area	Mapping Length
D6000~D6031	SDO response message area	64 bytes
D6250~D6281	SDO request message area	64 bytes

Structure of SDO Request Message

PLC Device	Request Message		
		15 14 13 12 11 10 9 8	7 6 5 4 3 2 1 0
D6250	Message header	Request ID	Command code
D6251		Reserved	Data length
D6252		Type	MAC ID
D6253	Message data	Main index high byte	Main index low byte
D6254		Reserved	Subindex
D6255		Data1	Data 0
D6256		Data 3	Data 2
D6257 ~ D6281		Reserved	

- Command code: Fixed to 01 (Hex)
- Request ID: Every SDO request message to be sent out should be given a request ID. CANopen master identifies every request message via "Request ID" which must be changed for the next communication after current communication is finished. The value range for Request ID is 00 (Hex) ~ FF (Hex).
- Data length: Data length of the message is fixed to 4 bits.
- MAC ID: Node address of CANopen network master.
- Type: Fixed to 1 in SDO request message which indicates SDO data reading service.

Structure of SDO Response Message

PLC Device	Response Message		
		15 14 13 12 11 10 9 8	7 6 5 4 3 2 1 0
D6000	Message Header	Response ID	Status code
D6001		Reserved	Data Length
D6002		Type	MAC ID
D6003	Message Data	Main index high byte	Main index low byte
D6004		Reserved	Subindex
D6005		Data 1	Data 0
D6006		Data 3	Data 2
D6007		Data 5	Data 4
D6008		Data 7	Data 6
D6009		Data 9	Data 8
D6010		Data 11	Data 10
D6011		Data 13	Data 12
D6012		Data 15	Data 14
D6013 ~ D6031		Reserved	

- Status Code

Status Code	Explanation
0	No data transmission request
1	SDO message transmission succeeds.
2	SDO message is being transmitted.
3	Error – SDO message transmitting is time-out.
4	Error – Command code is invalid.
5	Error – The transmitted data length is invalid.
6	Error – Response data length is invalid.
7	Error – The device which is to be used for transmission is busy.
8	Error – Type code is invalid.
9	Error – Node address is wrong.
0A	Error information (refer to the error code in SDO response message)
0B~FF	Reserved

- Response ID: Normally, the same as Request ID in a request message; in abnormal status, Response ID is 0.
- Data length: Data length of message data; maximum value: 32; Unit: byte.
- MAC ID: Node address of CANopen network master.
- Type: In SDO response message, 43 (Hex) represents that data of 4 bytes are read; 4B (Hex) represents that data of 2 bytes are read; 4F (Hex) represents that data of 1 byte are read and 42(Hex) represents data longer than 4 bytes are read.

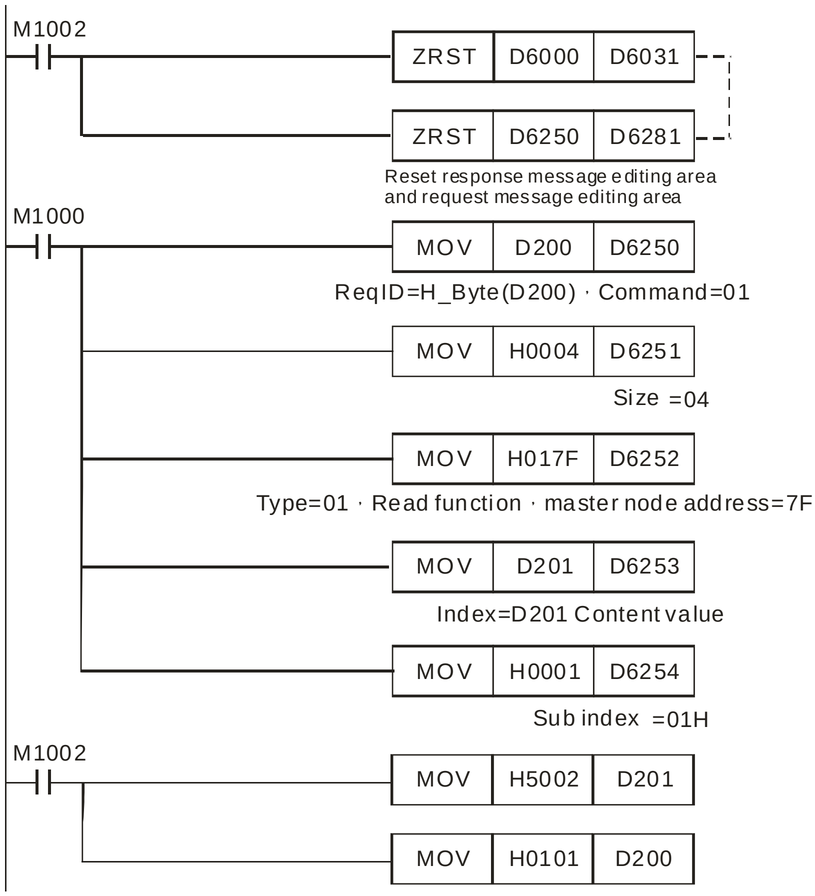
13.3.8.5 Application Examples

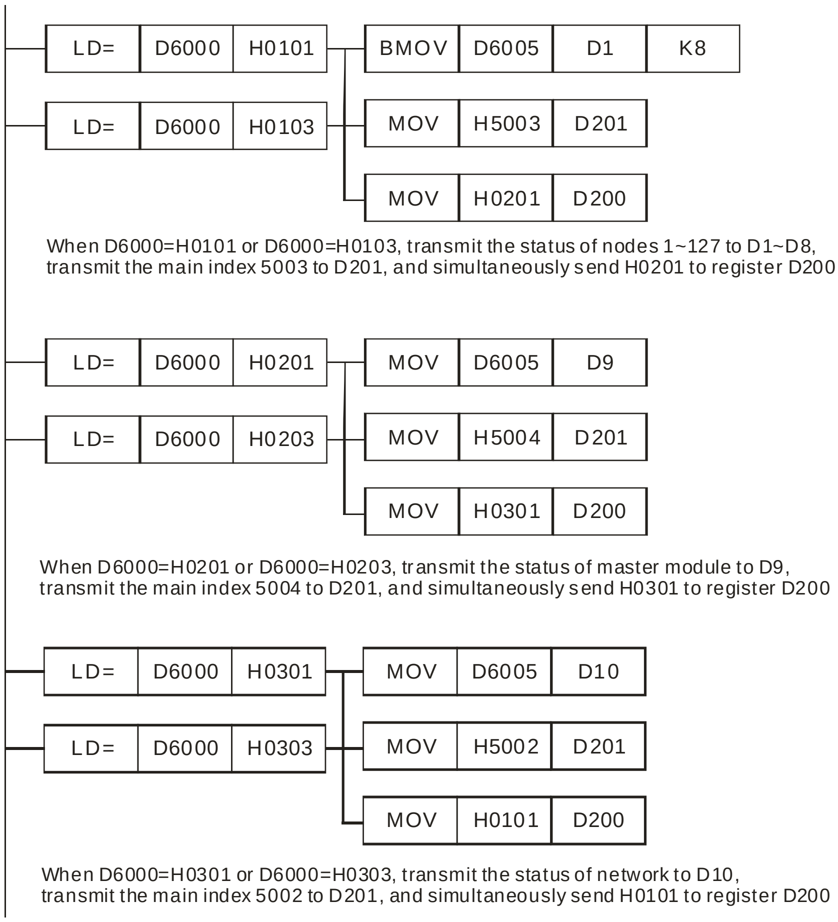
【Control Requirement】

Edit a ladder diagram to achieve the monitor function on a CANopen network as follows.

3. Real-time monitoring of the state of the slaves in the node list of the master module;
4. Real-time monitoring of the state of the master module;
5. Real-time monitoring of the state of the CANopen network.

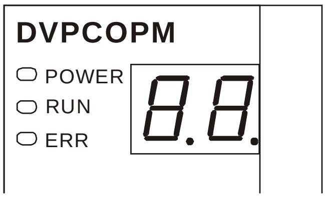
Note: The corresponding device addresses are different for DVPCOPM-SL with different PLC. Please refer to Input and Output Mapping Areas for DVPCOPM-SL for details. Here the PLC is DVP-28SV


M1002
ZRST D6000 D6031
ZRST D6250 D6281
Reset response message editing area
and request message editing area
M1000
MOV D200 D6250
ReqID=H_Byte(D200), Command=01
MOV H0004 D6251
Size =04
MOV H017F D6252
Type=01, Read function, master node address=7F
MOV D201 D6253
Index=D201 Content value
MOV H0001 D6254
Sub index =01H
M1002
MOV H5002 D201
MOV H0101 D200


LD= D6000 H0101
LD= D6000 H0103
BMOV D6005 D1 K8
MOV H5003 D201
MOV H0201 D200
When D6000=H0101 or D6000=H0103, transmit the status of nodes 1~127 to D1~D8,
transmit the main index 5003 to D201, and simultaneously send H0201 to register D200
LD= D6000 H0201
LD= D6000 H0203
MOV D6005 D9
MOV H5004 D201
MOV H0301 D200
When D6000=H0201 or D6000=H0203, transmit the status of master module to D9,
transmit the main index 5004 to D201, and simultaneously send H0301 to register D200
LD= D6000 H0301
LD= D6000 H0303
MOV D6005 D10
MOV H5002 D201
MOV H0101 D200
When D6000=H0301 or D6000=H0303, transmit the status of network to D10,
transmit the main index 5002 to D201, and simultaneously send H0101 to register D200

13.3.9 LED Indicator and Troubleshooting

DVPCOPM-SL has three LED indicators and a digital display on it. POWER LED indicates whether the power supply to DVPCOPM-SL is normal. RUN LED and ERR LED indicate the current status. The digital display shows the node address of DVPCOPM-SL and error information from the slave.



13.3.9.1 LED Indicator

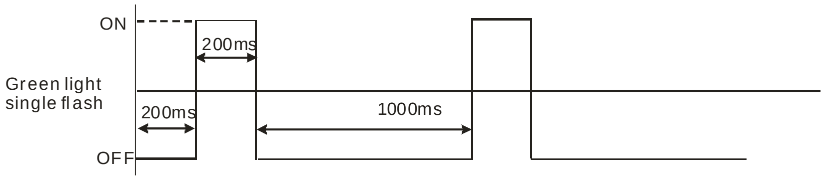
- **POWER LED**

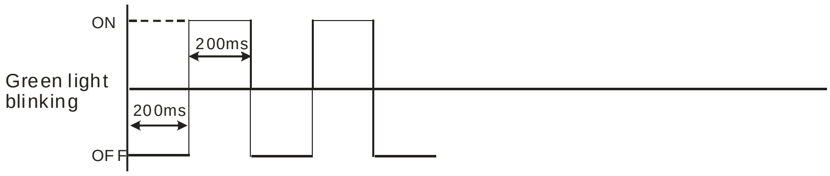
LED status	Indication	Solution
OFF	Power supply is abnormal.	Ensure that the power supply to DVPCOPM-SL is normal.
Green light On	Power supply is normal.	--

- **RUN LED**

LED status	Indication	Solution
Green light single flash	DVPCOPM-SL in STOP status	Upper computer is downloading network configuration and DVPCOPM-SL is waiting till the download is finished.
Green light blinking	DVPCOPM-SL in pre-operational status	1. Ensure that the bus cables wiring on the CANopen network is proper. 2. Ensure that the baud rates of the master and other slaves are identical. 3. Check if the configured slave has been connected to the network. 4. Check if the slave is offline.
Green light On	DVPCOPM-SL is in operational status	--

RUN LED green light single flash versus blinking:

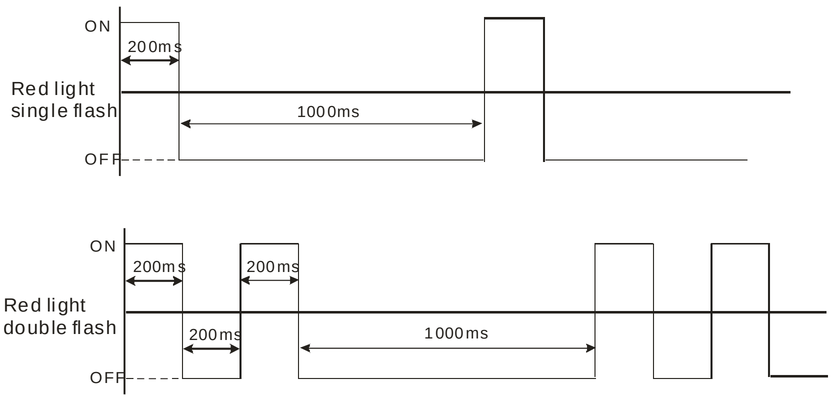




- **ERR LED**

LED status	Indication	Solution
Off	Normal	--
Red light double flash	Slave is offline.	1. Check if CANopen bus is the standard cable. 2. Check if both terminals of CANopen bus are connected with a terminal resistor separately.
Red light single flash	Bus error exceeds the warning level.	1. Check if CANopen bus is the standard cable. 2. Check if both terminals of CANopen bus are connected with a terminal resistor separately. 3. Check if the interference around CANopen bus is too strong.
Red light steady on	Bus-off	1. Check if connection for CANopen network bus cables is proper. 2. Check if DVPCOPM-S and other slaves are identical in baud rate.

Error LED red light single flash versus double flashes:



13.3.9.2 Codes in Digital Display

- DVPCOPM-SL as master

Code	Indication	How to correct
1 ~ 7F	The node address of DVPCOPM-SL when in normal operation.	--
F1	The slave has not been added to the node list of CANopen builder software.	Add the slave into the node list and then redownload it to DVPCOPM-SL.
F2	The data are being downloaded to DVPCOPM-SL.	Wait till configuration download is finished
F3	DVPCOPM-SL in error status	Redownload parameter configuration and change into a new DVPCOPM-SL if the error still exists.
F4	Bus-off is detected.	Check if CANopen network bus cables are properly connected.
F5	Incorrect DVPCOPM-SL's node address setting.	The node address for DVPCOPM-SL should be set in the range of 1~127.
F6	Internal error: manufacturing process	Repower DVPCOPM-SL. If the error still exists, change to

Code	Indication	How to correct
F7	Internal error: GPIO check	a new DVPCOPM-SL.
F8	Internal error: memory check	
F9	Low voltage is detected.	Check and make sure the power of DVPCOPM-SL works normally.
FA	The firmware of DVPCOPM-SL is in error status.	Repower DVPCOPM-SL.
FB	The sending buffer in DVPCOPM-SL is full.	Check and ensure CANopen network bus cables are properly connected and then repower DVPCOPM-SL
FC	The receiving buffer in DVPCOPM-SL is full.	Check and ensure CANopen network bus cables are properly connected and then repower DVPCOPM-SL.
E0	DVPCOPM-SL receives the Emergency message sent by the slave.	Read relevant information through PLC or Delta CANopen Builder software.
E1	PDO data length returned from the slave is not consistent with the length set in the node list.	Reset the PDO data length in the slave and download the new setting to DVPCOPM-SL.
E2	PDO message from the slave has not been received.	Check and make sure the setting is correct.
E3	Auto SDO download failed.	Check and make sure auto SDO is correct.
E4	PDO parameter setting has failed.	Make sure the PDO parameters setting is legal.
E5	Error in key parameters setting.	Make sure all the slaves connected are consistent with the slaves configured.
E6	Slave is offline.	Make sure the power supply to the slave works normally and the CANopen network is connected properly.
E7	Slave error control timeout.	
E8	Master / slave node address repeated.	Reset the node address and make sure the new address is not a repeated one.

- DVPCOPM-SL as slave

Code	Indication	How to correct
1 ~ 7F	The node address of DVPCOPM-SL when in normal operation.	--
A0	The parameters in DVPCOPM-SL are being initialized.	Wait till initializing is finished.
A1	DVPCOPM-SL is in pre-operational status.	Check if the bus cables in CANopen network are connected properly.
A3	The configuration data are being downloaded to DVPCOPM-SL.	Wait till configuration is finished downloading.
B0	Heartbeat message timeout	Check if the bus cables in CANopen network are connected properly.
B1	PDO length returned from the slave is inconsistent with that set in the node list.	Reset the PDO data length in the slave and download the new setting to DVPCOPM-SL.
F4	Bus-off is detected	Check if the bus cables in CANopen network are

Code	Indication	How to correct
		connected properly; ensure all the nodes in the network work are at the same baud rate. Repower DVPCOPM-SL.
FB	The sending buffer in DVPCOPM-SL is full.	Make sure the bus works normally and repower DVPCOPM-SL.
FC	The receiving buffer in DVPCOPM-SL is full.	Check if the bus cables in CANopen network are connected properly and repower DVPCOPM-SL.

13.3.10 Indexes and Sub-indexes for DVPCOPM-SL Working as CANopen Slave

When DVPCOPM-SL serves as CANopen slave, the indexes/sub-indexes for different positions of the module on the left side of the PLC correspond to the registers in the PLC as shown in the following table. The position of the first one on the left of the PLC is 1, the position of the second one is 2, and so on.

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Note: The corresponding device addresses are different for DVPCOPM-SL with different PLC. Please refer to Input and Output Mapping Areas for DVPCOPM-SL for details. Here the PLC is DVP-28SV.

Correspond to / Position	Index	Sub-index range	Input/output mapping area	Register in the PLC
1	H’2000	H’01~ H’20	Output mapping area	D6282~D6313
	H’2001	H’01~ H’20	Input mapping area	D6032~D6063
2	H’2000	H’01~ H’20	Output mapping area	D6782~D6813
	H’2001	H’01~ H’20	Input mapping area	D6532~D6563
3	H’2000	H’01~ H’20	Output mapping area	D7282~D7313
	H’2001	H’01~ H’20	Input mapping area	D7032~D7063
4	H’2000	H’01~ H’20	Output mapping area	D7782~D7813
	H’2001	H’01~ H’20	Input mapping area	D7532~D7563
5	H’2000	H’01~ H’20	Output mapping area	D8282~D8313
	H’2001	H’01~ H’20	Input mapping area	D8032~D8063
6	H’2000	H’01~ H’20	Output mapping area	D8782~D8813
	H’2001	H’01~ H’20	Input mapping area	D8532~D8563
7	H’2000	H’01~ H’20	Output mapping area	D9282~D9313
	H’2001	H’01~ H’20	Input mapping area	D9032~D9063
8	H’2000	H’01~ H’20	Output mapping area	D9782~D9813
	H’2001	H’01~ H’20	Input mapping area	D9532~D9563

Take the first one on the left side of the PLC for example. When DVPCOPM-SL serves as CANopen slave, its indexes and sub-indexes, and attributes correspond to the registers in the PLC as shown in the following table.

- Output mapping area

Index	Sub-index	Object name	Data type	Attribute	Register in the PLC (Output mapping area)
H'2000	H'01	Data_in [0]	Signed 16-bit	Write-only	D6282
	H'02	Data_in [1]	Signed 16-bit	Write-only	D6283
	H'03	Data_in [2]	Signed 16-bit	Write-only	D6284
	H'04	Data_in [3]	Signed 16-bit	Write-only	D6285
	H'05	Data_in [4]	Signed 16-bit	Write-only	D6286
	H'06	Data_in [5]	Signed 16-bit	Write-only	D6287
	H'07	Data_in [6]	Signed 16-bit	Write-only	D6288
	H'08	Data_in [7]	Signed 16-bit	Write-only	D6289
	H'09	Data_in [8]	Signed 16-bit	Write-only	D6290
	H'0A	Data_in [9]	Signed 16-bit	Write-only	D6291
	H'0B	Data_in [10]	Signed 16-bit	Write-only	D6292
	H'0C	Data_in [11]	Signed 16-bit	Write-only	D6293
	H'0D	Data_in [12]	Signed 16-bit	Write-only	D6294
H'2000	H'0E	Data_in [13]	Signed 16-bit	Write-only	D6295
	H'0F	Data_in [14]	Signed 16-bit	Write-only	D6296
	H'10	Data_in [15]	Signed 16-bit	Write-only	D6297
	H'11	Data_in [16]	Signed 16-bit	Write-only	D6298
	H'12	Data_in [17]	Signed 16-bit	Write-only	D6299
	H'13	Data_in [18]	Signed 16-bit	Write-only	D6300
	H'14	Data_in [19]	Signed 16-bit	Write-only	D6301
	H'15	Data_in [20]	Signed 16-bit	Write-only	D6302
	H'16	Data_in [21]	Signed 16-bit	Write-only	D6303
	H'17	Data_in [22]	Signed 16-bit	Write-only	D6304
	H'18	Data_in [23]	Signed 16-bit	Write-only	D6305
	H'19	Data_in [24]	Signed 16-bit	Write-only	D6306
	H'1A	Data_in [25]	Signed 16-bit	Write-only	D6307
	H'1B	Data_in [26]	Signed 16-bit	Write-only	D6308
	H'1C	Data_in [27]	Signed 16-bit	Write-only	D6309
	H'1D	Data_in [28]	Signed 16-bit	Write-only	D6310
	H'1E	Data_in [29]	Signed 16-bit	Write-only	D6311
	H'1F	Data_in [30]	Signed 16-bit	Write-only	D6312
	H'20	Data_in [31]	Signed 16-bit	Write-only	D6313

- Input mapping area

Index	Sub-index	Object name	Data type	Attribute	Register in the PLC (Input mapping area)
H’2001	H’01	Data_out[0]	Signed 16-bit	Read-only	D6032
	H’02	Data_out[1]	Signed 16-bit	Read-only	D6033
	H’03	Data_out[2]	Signed 16-bit	Read-only	D6034
	H’04	Data_out [3]	Signed 16-bit	Read-only	D6035
	H’05	Data_out [4]	Signed 16-bit	Read-only	D6036
	H’06	Data_out [5]	Signed 16-bit	Read-only	D6037
	H’07	Data_out [6]	Signed 16-bit	Read-only	D6038
	H’08	Data_out [7]	Signed 16-bit	Read-only	D6039
	H’09	Data_out [8]	Signed 16-bit	Read-only	D6040
	H’0A	Data_out [9]	Signed 16-bit	Read-only	D6041
	H’0B	Data_out [10]	Signed 16-bit	Read-only	D6042
	H’0C	Data_out [11]	Signed 16-bit	Read-only	D6043
	H’0D	Data_out [12]	Signed 16-bit	Read-only	D6044
	H’0E	Data[_out 13]	Signed 16-bit	Read-only	D6045
	H’0F	Data_out [14]	Signed 16-bit	Read-only	D6046
	H’10	Data_out [15]	Signed 16-bit	Read-only	D6047
	H’11	Data_out [16]	Signed 16-bit	Read-only	D6048
H’2001	H’12	Data_out [17]	Signed 16-bit	Read-only	D6049
	H’13	Data_out [18]	Signed 16-bit	Read-only	D6050
	H’14	Data_out [19]	Signed 16-bit	Read-only	D6051
	H’15	Data_out [20]	Signed 16-bit	Read-only	D6052
	H’16	Data_out [21]	Signed 16-bit	Read-only	D6053
	H’17	Data_out [22]	Signed 16-bit	Read-only	D6054
	H’18	Data_out [23]	Signed 16-bit	Read-only	D6055
	H’19	Data_out [24]	Signed 16-bit	Read-only	D6056
	H’1A	Data_out [25]	Signed 16-bit	Read-only	D6057
	H’1B	Data_out [26]	Signed 16-bit	Read-only	D6058
	H’1C	Data_out [27]	Signed 16-bit	Read-only	D6059
	H’1D	Data_out [28]	Signed 16-bit	Read-only	D6060
	H’1E	Data_out [29]	Signed 16-bit	Read-only	D6061
	H’1F	Data_out [30]	Signed 16-bit	Read-only	D6062
	H’20	Data_out [31]	Signed 16-bit	Read-only	D6063

13.4 DVPPF02-SL

13.4.1 Introduction

DVPPF02-SL is a PROFIBUS DP slave communication module, used for connecting the Delta DVP-SV, DVP-SX2, DVP-SV3, DVP-SX3 series PLC to the PROFIBUS DP network. DVPPF02-SL is a left-side extension module, and no external power supply is required when using it. The power is supplied by the PLC MPU (main processing unit).

13.4.1.1 Features

- Supports the loop data transmission between the PROFIBUS DP master and many slaves.
- Auto-detects baud rate; supports max. 12M bps.
- Self-diagnosis
- A PLC MPU is extendable to max. 8 modules on its left-hand side.
- Supports max. 100 words of I/O output and 100 words of I/O input.

13.4.1.2 Specification

- PROFIBUS DP Port

Interface	DB9 connector
Transmission method	High-speed RS-485
Transmission cable	Shielded twisted pair cable
Electrical isolation	500 VDC

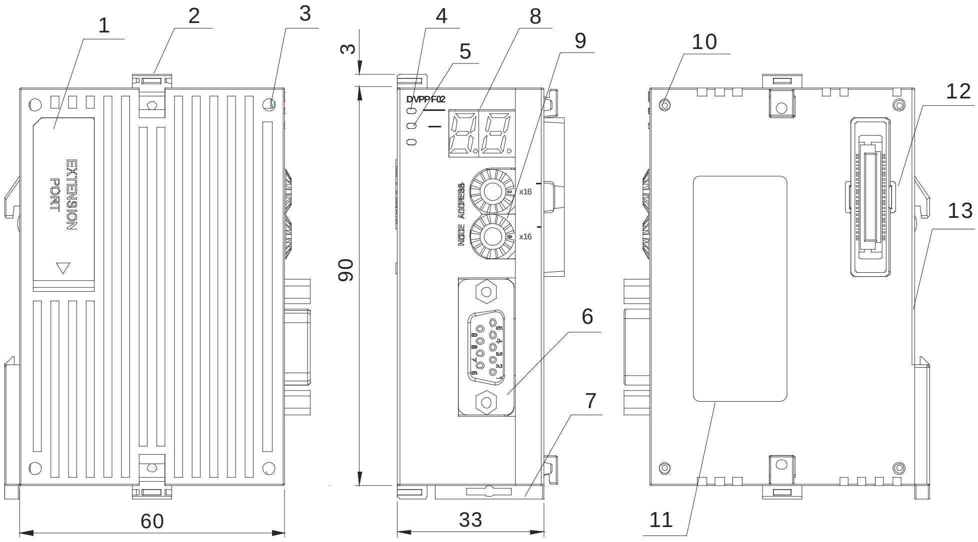
- Communication

Data type	Cyclic data exchange
Module name	DVPPF02-SL
GSD document	DELA0AFE.GSD
Product ID	0AFE
Serial baudrate supported (auto-detection)	9.6k, 19.2k, 93.75k, 187.5k, 500k, 1.5M, 3M, 6M, 12M bps (bits/second)

- Electrical Specification

Power supply voltage	supplied by the PLC MPU
Insulation voltage	500 VDC
Power consumption	2 W
Weight	115 g

13.4.2 Module Profiles and Dimensions



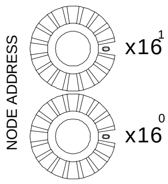
Unit: mm

No.	Name	Description
1	Extension module connection port	Connect the modules
2	Extension unit fixing clip	For securing the extension module
3	Mounting hole	For positioning between modules
4	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
5	NET indicator	Green Light ON: connection established between the master and slave stations. Red Light ON: DVPPF02-SL not connected to the master station.
6	PROFIBUS DP communication connector	Connect to the PROFIBUS DP network
7	DIN rail clip	Secure the module on the set
8	Digital display	Display the status code of DVPPF02-SL
9	Address switch	Set the node address
10	Mounting hole	For positioning between modules
11	Nameplate	Indicate product information such as model, product serial number, etc.
12	Extension module connection port	Connect the PLC or the modules
13	DIN rail slot（35mm）	For the DIN rail

13.4.3 Terminals

13.4.3.1 Address Switch

The address switches on DVPPF02-SL are used for setting up the node address of DVPPF02-SL on the PROFIBUS DP network. The switches are two rotary switches x16^0 and x16^1. Range for each switch: 0 ~ F. See the table below for the setup range for the switches.



Address	Definition
1~7D	Valid PROFIBUS address
0 · 7E~FF	Invalid PROFIBUS address

Example: If you are to set the node address of DVPPF02-SL to 26 (decimal), simply switch x16^1 to 1 and x16^0 to A. 26 (decimal) = 1A (hex) = 1×16^1 + A×16^0.

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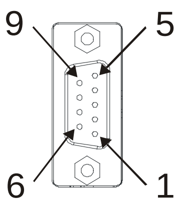
Note:

- Set up the address of DVPPF02-SL when the power is off. Re-power the module after you finish setting up the address.
- Changing the setting of address when DVPPF02-SL is operating is regarded invalid.
- Use slotted screwdriver carefully to adjust the address in case you scrape the module.

13.4.3.2 PROFIBUS DP Connector

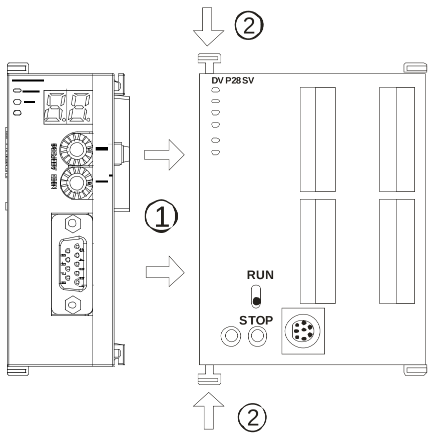


Pin	Definition	Pin	Definition
1	-	6	VP
2	-	7	-
3	Rxd⁄Txd-P	8	Rxd⁄Txd-N
4	-	9	-
5	DGND		

13.4.4 Installation

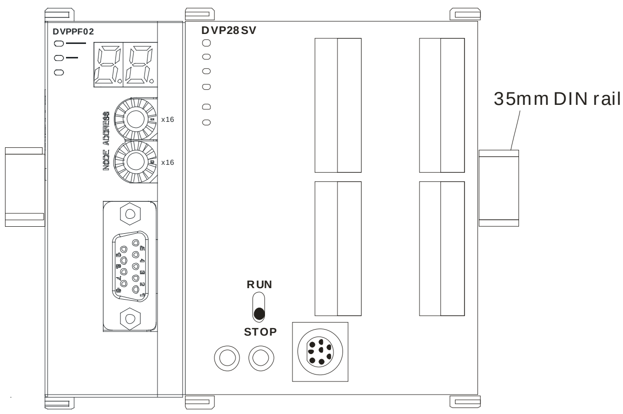
1. Connect DVPPF02-SL to PLC MPU

- Open the fastening ports for the I/O module on the left-hand side of the PLC MPU and insert the DVPPF02-SL alongside the fastening clips, as ①.
- Press the clips to make sure the connection is tight, as ②.



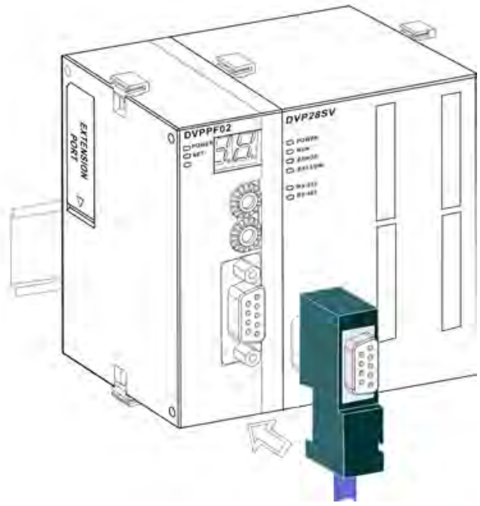
2. Install DVPPF02-SL and PLC MPU on DIN Rail

- Use 35mm DIN rail.
- Open the DIN rail clips on DVPPF02-SL and the PLC MPU. Insert DVPPF02-SL and the PLC MPU onto the DIN rail.
- Clip up the DIN rail clip on DVPPF02-SL and the PLC MPU to fix them on the DIN rail.



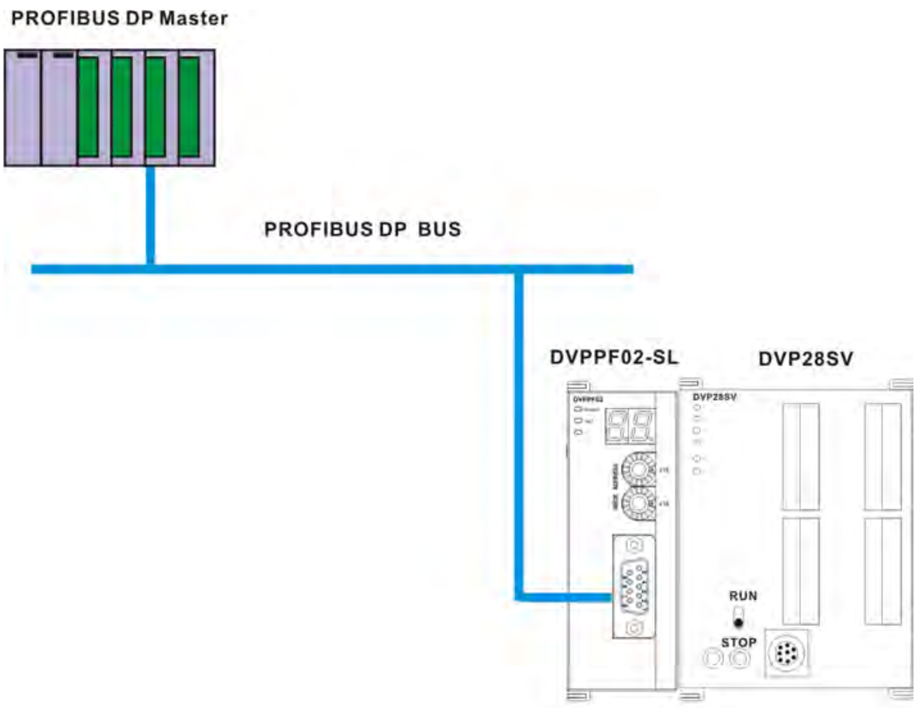
3. Connect to PROFIBUS DP Port

Insert the PROFIBUS DP bus connector into the PROFIBUS DP port on DVPF02-SL. Screw it tight to ensure DVPF02-SL and the PROFIBUS DP bus are properly connected.



13.4.5 Establish PROFIBUS DP Network

DVPPF02-SL is used for connecting SX2/SV/SV3/SX3 series PLC to the PROFIBUS DP network.



13.4.6 Transmission Distance and Baud Rate

The baud rate for PROFIBUS DP communication ranges from 9.6k to12M bits per second (bps). The length of cable is determined by the transmission speed. The transmission distance can be from 100 to 1,200 meters. See the table below for the baudrates DVPPF02-SL support and their corresponding transmission distance.

Baud rate (bps)	9.6k	19.2k	93.75k	187.5k	500k	1.5M	3M	6M	12M
Distance (m)	1200	1200	1200	1000	400	200	100	100	100

13.4.7 GSD File

GSD file is a text file, used for identifying the PROFIBUS DP device (master or slave). A GSD file includes data required for configuring a slave on the PROFIBUS DP master, information on the supplier, baud rates supported and applicable I/O. When using DVPPF02-SL, first import the GSD file to the software for configuring the PROFIBUS DP master, then DVPPF02-SL and items to be configured will be displayed in the software. You can download the GSD file for DVPPF02-SL from Delta's website: http://www.deltaww.com.

13.4.8 Mapping Areas and Status Registers

When the PLC is DVP-SV3 or DVP-SX3, see the table below for the I/O mapping and status registers of DVPPF02-SL at different locations. The number of the first DVPDNET-SL on the left side of the PLC is 1 and the number of the DVPDNET-SL module close to the left side of the first DVPDNET-SL is 2, and subsequent DVPDNET-SL modules are No. 3, No. 4 and so on.

Direction / Location	Output mapping Slave ➔ Master	Input mapping Master ➔ Slave	DVPPF02-SL Status register
1	D16250~D16349	D16000~D16099	D16100
2	D16750~D16849	D16500~D16599	D16600
3	D17250~D17349	D17000~D17099	D17100
4	D17750~D17849	D17500~D17599	D17600
5	D18250~D18349	D18000~D18099	D18100
6	D18750~D18849	D18500~D18599	D18600
7	D19250~D19349	D19000~D19099	D19100
8	D19750~D19849	D19500~D19599	D19600

When the PLC is another model in the DVP series (that is, not DVP-SV3 or DVP-SX3), see the table below for the I/O mapping and status registers of DVPPF02-SL at different locations. The number of the first DVPDNET-SL on the left side of the PLC is 1 and the number of the DVPDNET-SL module close to the left side of the first DVPDNET-SL is 2, and subsequent DVPDNET-SL modules are No. 3, No. 4 and so on.

Direction / Location	Output mapping Slave ➔ Master	Input mapping Master ➔ Slave	DVPPF02-SL Status register
1	D6250~D6349	D6000~D6099	D6100
2	D6750~D6849	D6500~D6599	D6600
3	D7250~D7349	D7000~D7099	D7100
4	D7750~D7849	D7500~D7599	D7600
5	D8250~D8349	D8000~D8099	D8100
6	D8750~D8849	D8500~D8599	D8600
7	D9250~D9349	D9000~D9099	D9100

Direction / Location	Output mapping Slave ➔ Master	Input mapping Master ➔ Slave	DVPPF02-SL Status register
8	D9750~D9849	D9500~D9599	D9600

Explanations on status registers for DVPPF02-SL:

High byte		Low byte	
Code	Definition	Code	Definition
0	Normal status	0	No error
1	Initializing	F1	DVPPF02-SL is initializing.
2	Error	F0	The node address of DVPPF02-SL is out of range.
		F2	Error in low voltage detection
		F3	DVPPF02-SL enters factory test mode.
		F4	DVPPF02-SL is disconnected from the master.
		F5	Error in parameter
		F7	Hardware error
		F9	Configuration error

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13.4.9 DVPPF02-SL Configure

13.4.9.1 DVPPF02-SL Configure

Please refer to Chapter 10 of the SYCON.net software manual for detailed setup instructions.

13.4.9.2 I / O Configuration of DVPPF02-SL

When DVPPF02-SL is configured in the software for the PROFIBUS DP master, it offers many choices for configuration, satisfying all kinds of data length demands. See the table below. The output configuration means the data is sent from the master to the salve; the input configuration means from the salve to the master.

Output configuration	Input configuration	I/O configuration
1 Word Out	1 Word Out	1 Word Out 1 Word In
2 Word Out	2 Word Out	2 Word Out 1 Word In
4 Word Out	4 Word Out	4 Word Out 1 Word In
8 Word Out	8 Word Out	8 Word Out 1 Word In
16 Word Out	16 Word Out	16 Word Out 1 Word In
32 Word Out	32 Word Out	32 Word Out 1 Word In
64 Word Out	64 Word Out	64 Word Out 1 Word In

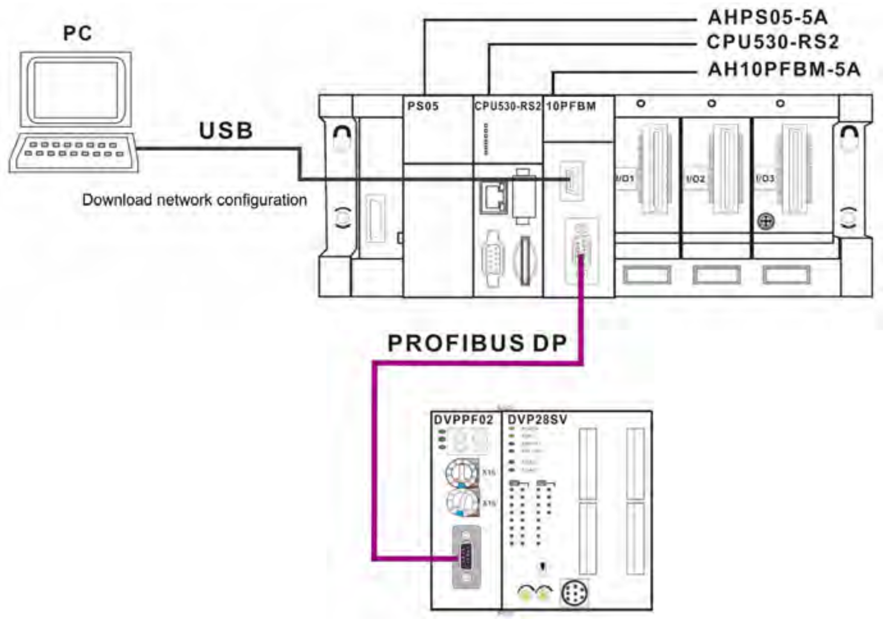
13.4.10 Application Example

13.4.10.1 Control Requirement

Exchange data between the master AH10PFBM-5A and the slave DVPPF02-SL through the PROFIBUS DP network.

13.4.10.2 Connect DVPPF02-SL to the PROFIBUS DP Network

1. The AH10PFBM-5A PLC is the PROFIBUS DP master and DVPPF02-SL the slave. See figure below for the network structure.



2. Set the PROFIBUS address of DVPPF02-SL to “2”
3. Connect a DVP-SV PLC on the right side of DVPPF02-SL and check if the connection is proper.

Note: The corresponding device addresses are different for DVPCOPM-SL with different PLC. Please refer to Input and Output Mapping Areas for DVPCOPM-SL for details. Here the PLC is DVP-28SV.

13.4.10.3 Software Instructions

1. ISPSoft software is Delta's PLC programming software, and it can be downloaded from Delta's official website: http://www.deltaww.com/.
2. In this example, we take AH10PFBM-5A as PROFIBUS DP master, and illustrate with SYCON.net software.

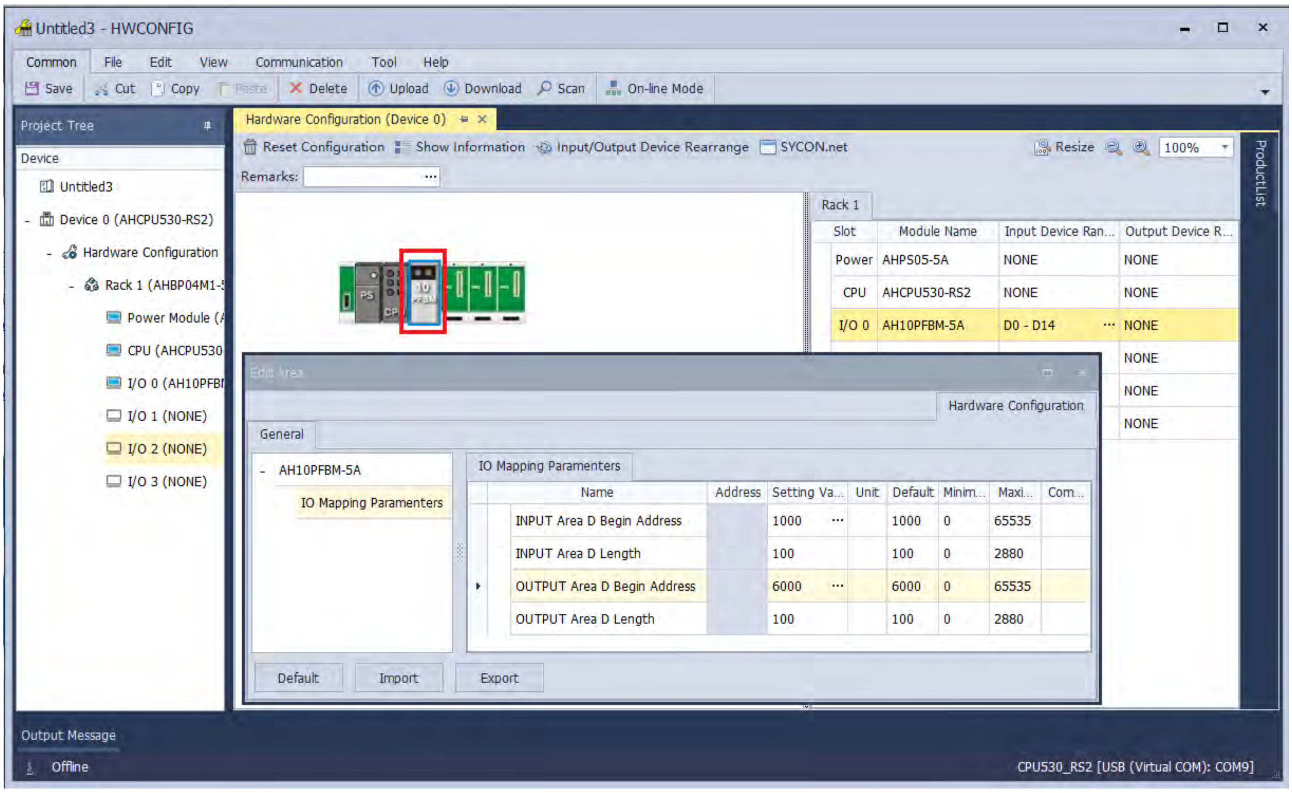
13.4.10.4 Master Station Configuration

Please refer to Chapter 10 of the SYCON.net software manual for details.

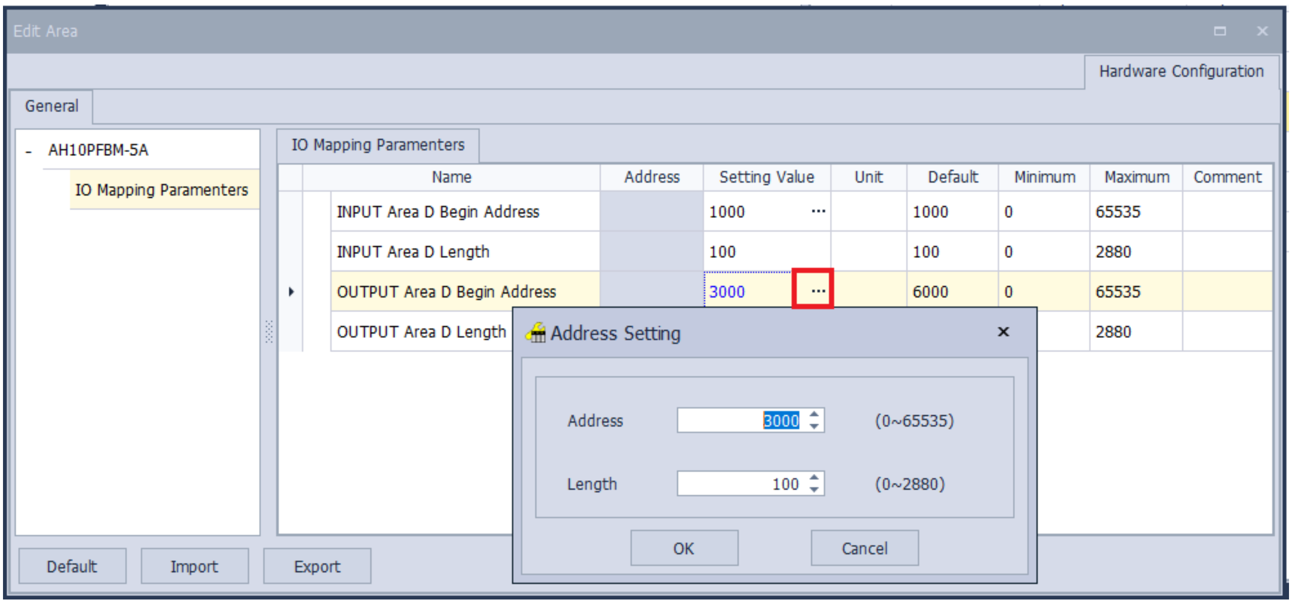
13.4.10.5 I/O Mapping Relationship between Master PLC and Slave PLC

The input and output areas assigned by the master module for the AH master PLC are shown in the diagram below.

(For detailed setup instructions, please refer to Section 15.1 of the SYCON.net software manual.)



The diagram below illustrates the starting addresses and lengths of the OUTPUT and INPUT areas assigned by the master module for the master PLC. Data from the OUTPUT area is transmitted to the slave, while the INPUT area receives data sent from the slave.



The diagram below illustrates the mapping addresses allocated by the master station for the slave configuration module parameters. By the upper and lower diagrams, it can be observed that the slave configuration module corresponds to the starting register numbers of the master PLC's OUTPUT and INPUT areas.

Offset Address: Corresponding to the offset of the starting addresses of the INPUT and OUTPUT areas allocated by the AH master station PLC, unit: Byte

Calculation method for the starting D registers of the slave configuration module corresponding to the master station PLC:

Starting register number of OUTPUT area D registers corresponding to the slave configuration module = Starting address of OUTPUT area + (offset address / 2).

Starting register number of INPUT area D registers corresponding to the slave configuration module = Starting address of INPUT area + (offset address / 2).

The above explain the connection between the master and the DVPPF02-SL slave. The mapping relationship between the master PLC's D registers and the slave configuration module is related to the master station parameter settings. For detailed setup instructions, please refer to Section 10.3.2 of the SYCON.net software manual.

In this example, the starting addresses assigned by the AH master PLC for the INPUT and OUTPUT areas are D1000 and D3000, respectively.

The mapping relationship between the master PLC and the configuration options of the DVPPF02-SL slave is as follows:

Master PLC Register		DVPPF02-SL configuration	Offset
D3000	→	1 Word In	0
D3001		1 Word In · 1 Word Out	2
D1000	←	1 Word Out	0
D1001		1 Word In · 1 Word Out	2

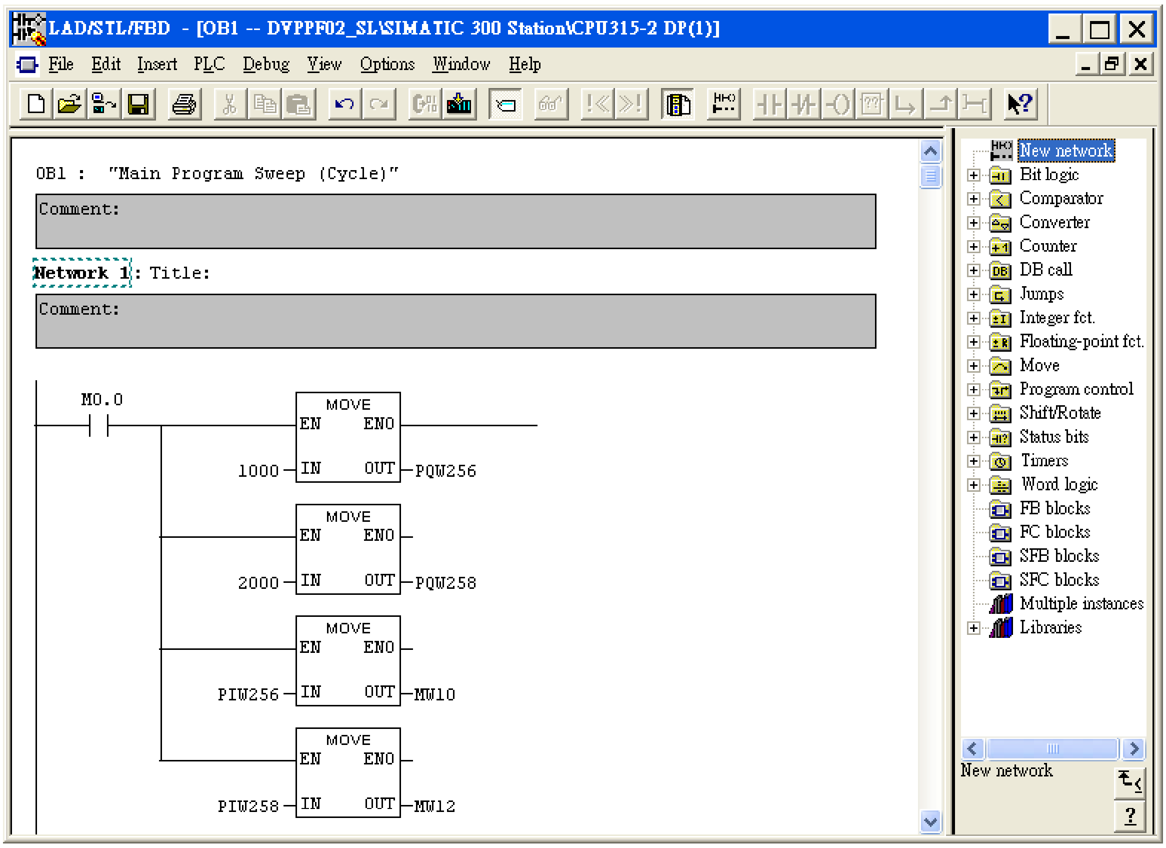
The corresponding registers for data exchange between the master station and slave station are shown in the following table:

AH10PFBM-5A master accesses the registers corresponding to AH PLC	Direction of data transmission in PROFIBUS DP network	DVPPF02-SL slave accesses the registers corresponding to SV PLC
D3000	→	D6000
D3001		D6001
D1000	←	D6250
D1001		D6251

13.4.10.6 PLC Programming

【The program for master PLC】

Using ISPSoft software to write the program for the master station PLC, when the master PLC is running and M0 is ON, it controls the configuration options of the DVPPF02-SL. When M1 is ON, the master PLC reads the corresponding values of the DVPPF02-SL configuration options.

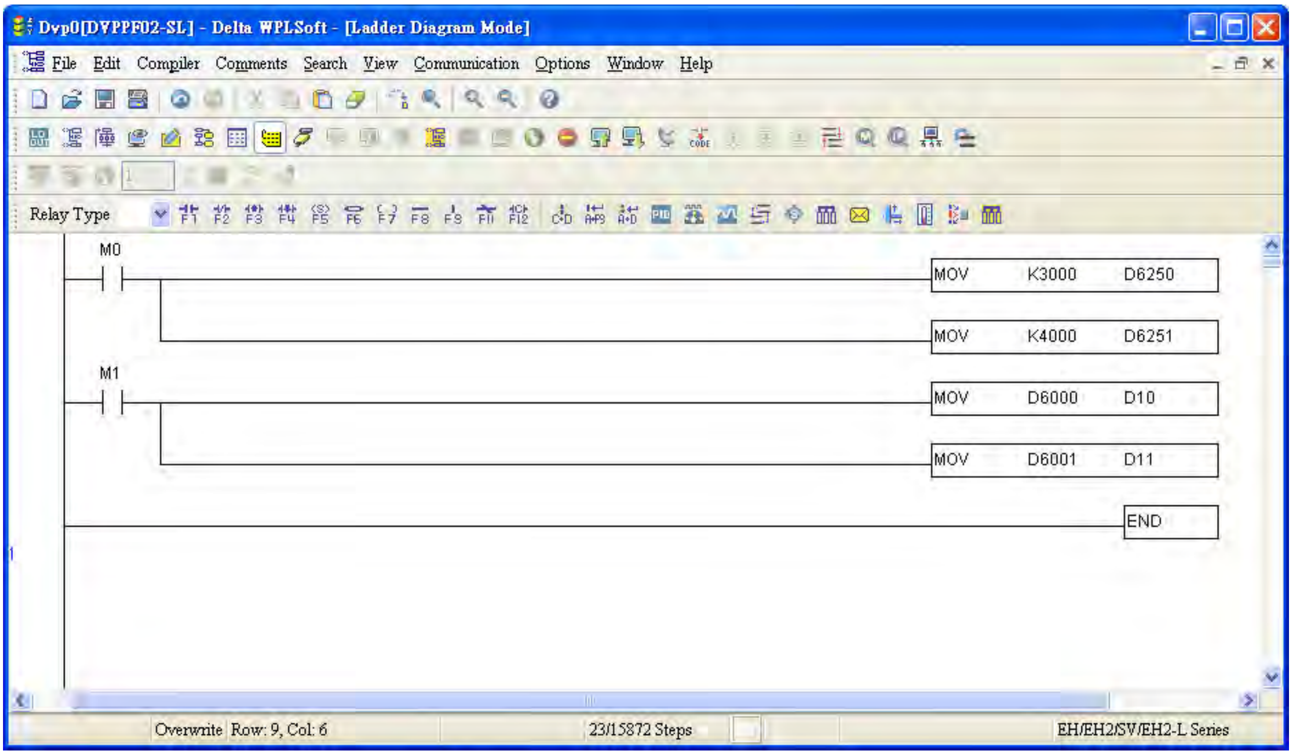


(For illustration purposes only)

- Program introduction of Master PLC:
  1. The master program is written in sections 2 and 3.
  2. When M0 is ON, write 1000 to D3000 and 2000 to D3001. The master station will transmit the data of D3000 and D3001 through the PROFIBUS DP bus to the slave's D6000 and D6001.
  3. When M1 is ON, write the data of D1000 to D100 and the data of D1001 to D110. The data of D1000 and D1001 are transmitted from the slave's D6250 and D6251 to the master through the PROFIBUS DP bus.

【The program for slave PLC】

Using the WPL software to write the program for the slave PLC, when the slave PLC is running and M0 is ON, it controls the configuration options of the DVPPF02-SL. When M1 is ON, the slave PLC reads the corresponding values of the DVPPF02-SL configuration options.



(For illustration purposes only)

- Program introduction of Slave PLC

1. Delta PLC programs can be designed using the Delta WPLSoft software. For details on programming methods, please refer to the software manual.
2. When M0 is ON, write 3000 to D6250 and 4000 to D6251. The DVPPF02-SL will transmit the data of D6250 and D6251 through the PROFIBUS DP bus to the master's D1000 and D1001.
3. When M1 is ON, write the value of D6000 to D10 and the value of D6001 to D11. The data of D6000 and D6001 are transmitted from the master (D3000 and D3001) to the DVPPF02-SL through the PROFIBUS DP bus.

13.4.11 LED Indicator and Troubleshooting

13.4.11.1 LED Indicator

- **POWER LED**

LED status	Indication	How to correct
Green light ON	The power supply is normal.	--
OFF	No power supply	1. Check if the connection between DVPPF02-SL and the PLC MPU is normal. 2. Check if the power supply from the PLC MPU is normal.

- **NET LED**

LED status	Indication	How to correct
Green light ON	A connection is established between the master and slave.	--
Red light ON	DVPPF02-SL has not established a connection with the master.	1. Check if DVPPF02-SL is connected with the PROFIBUS DP bus. 2. Check if the communication cable between DVPPF02-SL and the PROFIBUS DP master is well connected. 3. Check if the actual address of DVPPF02-SL is consistent with the address configured in the software. 4. Check if the GSD file is used correctly.

13.4.11.2 Digital Display

Code	Indication	How to correct
1 ~ 7D	The node address of DVPPF02-SL when it is operating normally.	--
F0	The node address of DVPPF02-SL is out of range.	Set the node address of DVPPF02-SL to be 1 to 125.
F1	DVPPF02-SL is initializing.	--
F2	Error in low voltage detection	1. Check if the connection between DVPPF02-SL and the PLC MPU is normal. 2. Check if the power supply from the PLC MPU is normal.
F3	DVPPF02-SL enters factory test mode.	When PLC is SV and SX2, write 0 to D6350 When PLC is SV3 and SX3, write 0 to D16350
F4	DVPPF02-SL is disconnected from the master.	Check if the communication cable between DVPPF02-SL and the PROFIBUS DP master is well connected.
F5	Error in parameter	Check if the GSD file is used correctly.
F7	Hardware error	Send the module back to factory for repair.
F9	Configuration error	Check if the GSD file is used correctly.
80	The PLC MPU connected to DVPPF02-SL is in STOP status.	Switch the PLC MPU to RUN.

Operation of Digital Display

1. When DVPPF02-SL is in normal operation status and the PLC MPU is in RUN status, the digital display will only show its node address.
2. When DVPPF02-SL is in normal operation status and the PLC MPU is in STOP status, the digital display will show its node address and the STOP status code alternately.
3. When DVPPF02-SL is initializing or in error status and the PLC MPU is in RUN status, the digital display will show its node address, initialization code or error code alternately.
4. When DVPPF02-SL is initializing or in error status and the PLC MPU is in STOP status, the digital display will show its node address, initialization or error code and STOP status code alternately.

13.5 DVPSCM12-SL / DVPSCM52-SL

13.5.1 Introduction

DVPSCM is a serial communication module. It supports MODBUS UD Link (user-defined format of RS-485). Besides, it can be used as a RS-422 communication port or RS-485 communication port, programming, uploading, downloading, and monitoring can be carried out using Delta PLC software. SCMSoft, the setting software of DVPSCM12/52-SL, is built in Delta communication software DCISoft. Please download DCISoft software from Delta website.

DVPSCM52-SL is a slave communication module using a building automation control network communication protocol BACnet MS/TP. It is equipped with all the functions of DVPSCM12-SL and supports the BACnet MS/TP slave communication protocol. It can read/write the BV values or AV values from/into a BACnet MS/TP master. SCMSoft, the setting software of DVPSCM52-SL, is built in Delta communication software DCISoft. Please download DCISoft_v1.08 or above from Delta website.

13.5.1.1 Features

- It provides RS-422 and RS-485 communication ports (COM1 & COM2).
- RS-422/RS-485 communication and the power supply are isolated from each other.
- There are two built-in 120Ω terminal resistors and switches.
- Each communication port can connect to at most 32 devices.
- It has the MODBUS data exchange functions (MODBUS Advance).
- It has the user-defined communication protocol, and the process planning function (UD Link).
- DVPSCM52-SL supports the BACnet MS/TP slave functions, and can connect to a superior device.
- The MPUs supports: DVP-SA2 (V1.0), DVP-SX2 (V1.2), DVP-SV (V2.2), DVP-SE (V1.0)，EH2-L (V2.20), and EH3-L (V1.00) series.
- Firmware version V1.10 and above support DVP-SV3 and DVP-SX3 PLC.

13.5.1.2 Specifications

- RS-485/RS-422 interface

Item	Specifications
Terminal	European terminal blocks with spring plugs
Transmission speed	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200, 230400, and 460800 bps
Communication format	Stop bit: 1, 2; Parity bit: None, Odd, Even; Data bit: 7, 8
Communication protocol	MODBUS ASCII/RTU, UD Link, and BACnet MS/TP slave (supported by DVPSCM52-SL)

- Electrical Specifications

Item	Specifications
Supply voltage	24 V DC (supplied by the internal bus through the MPU)
Power consumption	1.5 W
Insulation voltage	2500 VDC
Weight	95g

- BACnet Protocol Implementation Statement

1. Introduction of the standard BACnet device

Model	Introduction
DVPSCM52-SL	BACnet Application Specific Controller（B-ASC）

2. Supported BIBBs

Model	BIBBs	BIBB name
DVPSCM52-SL	DS-RP-B	Data Sharing-ReadProperty-B
	DS-WP-B	Data Sharing-WriteProperty-B
	DM-DDB-B	Device Management-DynamicDeviceBinding-B
	DM-DOB-B	Device Management-DynamicObjectBinding-B
	DM-DCC-B	Device Management-DeviceCommunicationControl-B
	DS-RPM-B	Data Sharing-ReadPropertyMultiple-B
	DS-WPM-B	Data Sharing-WritePropertyMultiple-B

3. Supported opjects

Model	**Object**	**Creation**	**Deletion**
DVPSCM52-SL	Analog value	Not supported	Not supported
	Binary value	Not supported	Not supported
	Device	Not supported	Not supported

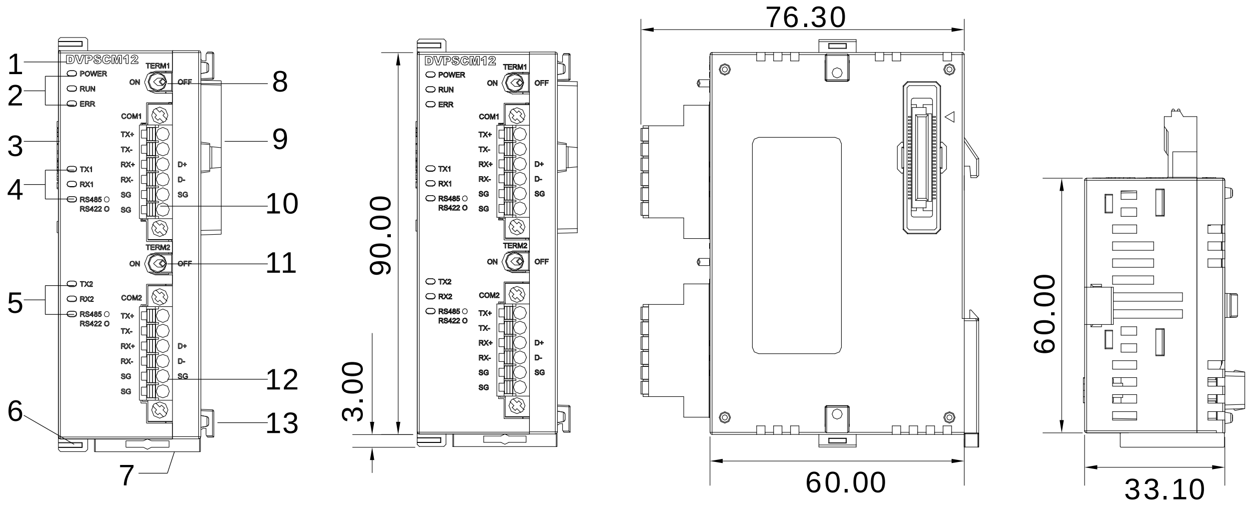
4. Data Link Layer Options

Model	Data Link	Supported Baud Rate
DVPSCM52-SL	MS/TP Slave	9600/1920/38400/76800

5. Supported character set

Model	Character set
DVPSCM52-SL	ANSI X3.4

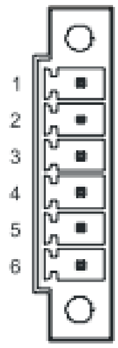
13.5.2 Module Profiles and Dimensions



Unit: mm

No.	Name	Description
1	Model name	Model name of the module
2	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	RUNLED indicator	OFF: SCM module status is STOP ON: SCM module status is RUN
2	ERROR LED indicator	ON: hardware error has occurred Blinking (0.2 seconds ON/OFF): system configuration or communication error. OFF: no error
3	Extension module connection port	Connect the modules.
4	TX1、RX1、RS-485/RS-422indicator	Blinking: RS-485/RS-422 transmission/reception in progress OFF: RS-485/RS-422 no transmission/reception
5	TX2、RX2、RS-485/RS-422indicator	Blinking: RS-485/RS-422 transmission/reception in progress OFF: RS-485/RS-422 no transmission/reception
6	Extension unit fixing clip	For securing the extension module
7	DIN rail securing clip	Secure the module on the set
8	Terminal resistor 1 switch	120Ω termination resistor enhances the system's anti-interference capability
9	Extension port	Connect the PLC or the modules
10	RS-485/RS-422communication port 1	Used for communication wiring
11	Terminal resistor 2 switch	120Ω termination resistor enhances the system's anti-interference capability
12	RS-485/RS-422 communication port 2	Used for communication wiring
13	Extension unit positioning hole	For positioning between modules

13.5.3 Terminals

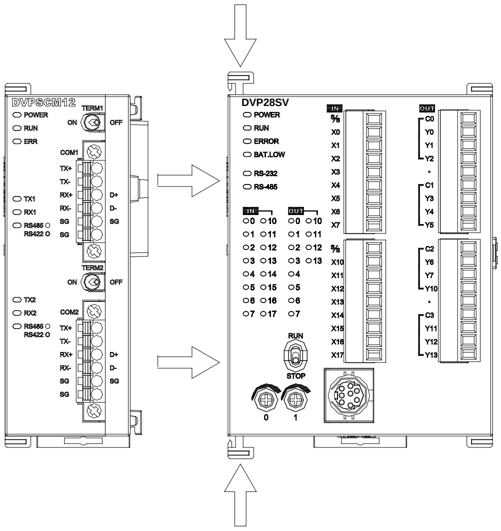
RS-485/RS-422 communication ports definitions			
	Terminal no.	RS-485	RS-422
	1	-	TX+
	2	-	TX-
	3	D+	RX+
	4	D-	RX-
	5	SG	SG
	6	-	SG

13.5.4 Installation and Wiring

13.5.4.1 Installation

1. The MPU of the PLC connects to the SCM module.

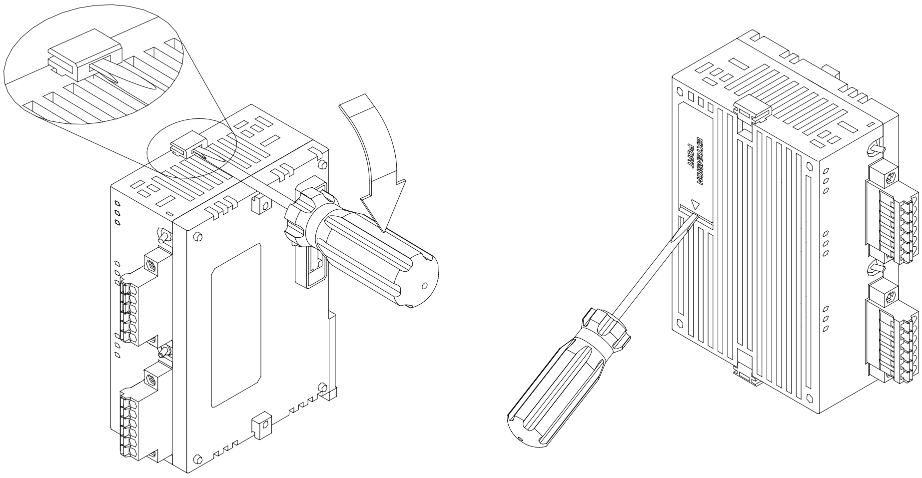
- Adjust the clips connecting to the left-side module on the MPU.
- Direct the I/O module to the interface on the MPU, Combine the I/O module with the MPU as shown in the figure below.
- Tighten the clips connecting to the left-side module on the MPU.



13

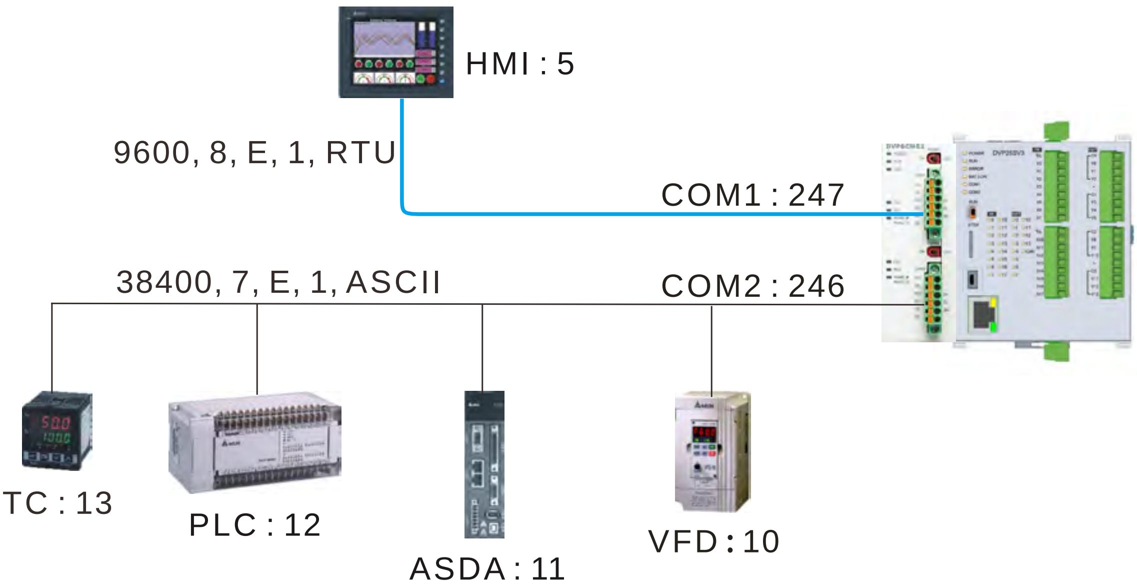
2. SCM module connects to other I/O modules

Before the SCM module connects to the inferior I/O module, the fixing clip for the I/O module has to be loosened by the screwdriver, and the side cover has to be opened.



13.5.4.2 Wiring

SCM module can be connected to other Delta industrial products via standard MODBUS communication, including Touch Panel HMI, Text Panel HMI, programmable logic controllers, inverters and servo motors. The connection examples are as follows:



13.5.5 Control Register

CR#	Attribute	Name of the register	Description
0	R	Model code	The code is set up by the system. Model code of DVPSCM12-SL=H'4041 Model code of DVPSCM52-SL=H'4042
1	R	Firmware version	The firmware version is displayed in a hexadecimal value. For example, H'0100 indicates that the firmware version is V1.00.
2	Reserved		
3	R/W	Group number triggered by COM1 UD Link	The group number triggered by COM1 UD Link
4	R/W	Reference address of the data sent through COM1 in UD Link	It is used when COM1 UD Link chooses "Base+Offset". "Reference data register+Offset" defines the actual source device for the data sending.
5	R/W	Reference address of the data received through COM1 in UD Link	It is used when COM1 UD Link chooses "Base+Offset". "Reference data register+Offset" defines the actual source device for the data receiving.
6	Reserved		
7	R/W	Group number triggered by COM2 UD Link	The Group number triggered by COM2 UD Link
8	R/W	Reference address of the data sent through COM2 in UD Link	It is used when COM2 UD Link chooses "Base+Offset". "Reference data register+Offset" defines the actual source device for the data sending.
9	R/W	Reference address of the data received through COM2 in UD Link	It is used when COM2 UD Link chooses "Base+Offset". "Reference data register+Offset" defines the actual source device for the data receiving.
10	R	Module status	RUN or STOP
11~19	R	Error Flag	The flag for an error in the module, please refer to the following explanation.
20~27	R	UD Link status	The execution status of UD Link
28~29	Reserved		
30	R/W	Triggering the UD Link sequence	0: Not triggered, 1~254: Number of times the UD Link sequence is triggered 255: Always triggered
31	R/W	Triggering the data exchange through COM1 to read bits or words	High byte: bit; Low byte: word 0: Not triggered; 1: Triggered once; 2: Always triggered
32	R/W	Triggering the data exchange through COM2 to read bits or words.	High byte: bit; Low byte: word 0: Not triggered; 1: Triggered once; 2: Always triggered
33	R/W	Triggering the data exchange through COM1 to write bits or words.	High byte: bit; Low byte: word 0: Not triggered; 1: Triggered once; 2: Always triggered
34	R/W	Triggering the data exchange through COM2 to write bits or words.	High byte: bit; Low byte: word 0: Not triggered; 1: Triggered once; 2: Always triggered
35~36	R/W	Selecting the "reading bits through COM1" checkbox	Bit = 0: Disabling the function of reading bits through COM1. Bit = 1: Enabling the function of reading bits through COM1.

CR#	Attribute	Name of the register	Description
37~38	R/W	Selecting the "reading words through COM1" checkbox	Bit = 0: Disabling the function of reading words through COM1. Bit = 1: Enabling the function of reading words through COM1.
39~40	R/W	Selecting the "reading bits through COM2" checkbox	Bit = 0: Disabling the function of reading bits through COM2. Bit = 1: Enabling the function of reading bits through COM2.
41~42	R/W	Selecting the "reading words through COM2" checkbox	Bit = 0: Disabling the function of reading words through COM2. Bit = 1: Enabling the function of reading words through COM1.
43~44	R/W	Selecting the "writing bits through COM1" checkbox	Bit = 0: Disabling the function of writing bits through COM1. Bit = 1: Enabling the function of writing bits through COM1.
45 ~ 46	R/W	Selecting the "writing words through COM1" checkbox	Bit = 0: Disabling the function of writing words through COM1. Bit = 1: Enabling the function of writing words through COM1.
47~48	R/W	Selecting the "writing bits through COM2" checkbox	Bit = 0: Disabling the function of writing bits through COM2. Bit = 1: Enabling the function of writing bits through COM2.
49~50	R/W	Selecting the "writing words through COM2" checkbox	Bit = 0: Disabling the function of writing words through COM2. Bit = 1: Enabling the function of writing words through COM2.
51	R/W	COM1 station number	Range: 1~247
52	R/W	COM1 baud rate	0：1200 1：2400 2：4800 3：9600 4：19200 5：38400 6：57600 7：76800 8：115200 9：230400 10：460800
53	R/W	COM1 format (Data Length，Parity，Stop Bits)	0 : 7，Even，1 1 : 7，Even，2 2 : 7，Odd，1 3 : 7，Odd，2 4 : 7，None，1 5 : 7，None，2 6 : 8，Even，1 7 : 8，Even，2 8 : 8，Odd，1 9 : 8，Odd，2 10 : 8，None，1 11 : 8，None，2

<table>
<tr><th>CR#</th><th>Attribute</th><th>Name of the register</th><th>Description</th></tr>
<tr><td>54</td><td>R/W</td><td>COM1protocol and interface</td><td>High byte: communication protocol
(0：MODBUS；1：UD Link；2：BACnet MS/TP slave)
Low byte: communication interface(0：RS-485；1：RS-422)
<table>
<tr><td colspan="2" rowspan="2">DVPSCM12-SL</td><td colspan="2">interface</td></tr>
<tr><td>RS-485</td><td>RS-422</td></tr>
<tr><td rowspan="2">protocol</td><td>MODBUS</td><td>16#0000</td><td>16#0001</td></tr>
<tr><td>UD Link</td><td>16#0100</td><td>16#0101</td></tr>
</table>
<table>
<tr><td colspan="2" rowspan="2">DVPSCM52-SL</td><td colspan="2">interface</td></tr>
<tr><td>RS-485</td><td>RS-422</td></tr>
<tr><td rowspan="3">protocol</td><td>MODBUS</td><td>16#0000</td><td>16#0001</td></tr>
<tr><td>UD Link</td><td>16#0100</td><td>16#0101</td></tr>
<tr><td>BACnet MS/TP slave</td><td>16#0200</td><td>16#0201</td></tr>
</table></td></tr>
<tr><td>55</td><td>R/W</td><td>COM1 communication timeout</td><td>1~65535ms (65535 indicates no timeout).</td></tr>
<tr><td>56</td><td>R/W</td><td>COM1 transmission delay</td><td>0~65535ms</td></tr>
<tr><td>57</td><td>R/W</td><td>COM1 transmission mode</td><td>0：ASCII；1：RTU</td></tr>
<tr><td>58</td><td>R/W</td><td>Number of COM1 communication retry</td><td>0~255</td></tr>
<tr><td>59~60</td><td colspan="3">Reserved</td></tr>
<tr><td>61</td><td>R/W</td><td>COM2 station number</td><td>Range: 1~247</td></tr>
<tr><td>62</td><td>R/W</td><td>COM2 baud rate</td><td>0：1200
1：2400
2：4800
3：9600
4：19200
5：38400
6：57600
7：76800
8：115200
9：230400
10：460800</td></tr>
<tr><td>63</td><td>R/W</td><td>COM2 format（Data Length，Parity，Stop Bits）</td><td>0：7，Even，1
1：7，Even，2
2：7，Odd，1
3：7，Odd，2
4：7，None，1
5：7，None，2
6：8，Even，1
7：8，Even，2</td></tr>
</table>

<table>
<tr><th>CR#</th><th>Attribute</th><th>Name of the register</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td>8：8，Odd，1
9：8，Odd，2
10：8，None，1
11：8，None，2</td></tr>
<tr><td>64</td><td>R/W</td><td>COM2 protocol and interface</td><td>High byte: communication protocol
(0：MODBUS；1：UD Link；2：BACnet MS/TP slave)
Low byte: interface (0：RS-485；1：RS-422)
<table>
<tr><td colspan="2" rowspan="2">DVPSCM12-SL</td><td colspan="2">interface</td></tr>
<tr><td>RS-485</td><td>RS-422</td></tr>
<tr><td rowspan="2">protocol</td><td>MODBUS</td><td>16#0000</td><td>16#0001</td></tr>
<tr><td>UD Link</td><td>16#0100</td><td>16#0101</td></tr>
</table>
<table>
<tr><td colspan="2" rowspan="2">DVPSCM52-SL</td><td colspan="2">interface</td></tr>
<tr><td>RS-485</td><td>RS-422</td></tr>
<tr><td rowspan="3">protocol</td><td>MODBUS</td><td>16#0000</td><td>16#0001</td></tr>
<tr><td>UD Link</td><td>16#0100</td><td>16#0101</td></tr>
<tr><td>BACnet MS/TP slave</td><td>16#0200</td><td>16#0201</td></tr>
</table></td></tr>
<tr><td>65</td><td>R/W</td><td>COM2 communication timeout</td><td>1~65535ms (65535 indicates no timeout)</td></tr>
<tr><td>66</td><td>R/W</td><td>COM2 transmission delay</td><td>0~65535ms</td></tr>
<tr><td>67</td><td>R/W</td><td>COM2 transmission mode</td><td>0：ASCII；1：RTU</td></tr>
<tr><td>68</td><td>R/W</td><td>Numbers of COM2 communication retry</td><td>0~255</td></tr>
<tr><td>69~70</td><td colspan="3">reserved</td></tr>
<tr><td>71</td><td>R/W</td><td>COM ON/OFF setting</td><td>High byte: COM1, low byte: COM2
<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">COM2</td></tr>
<tr><td>OFF</td><td>ON and latched</td><td>ON and non-latched</td></tr>
<tr><td rowspan="3">COM1</td><td>OFF</td><td>16#0000</td><td>16#0011</td><td>16#0022</td></tr>
<tr><td>ON and latched</td><td>16#1100</td><td>16#1111</td><td>16#1122</td></tr>
<tr><td>ON and non-latched</td><td>16#2200</td><td>16#2211</td><td>16#2222</td></tr>
</table>
0x00: OFF
0x11: setting ON and latched
0x22: setting ON and non-latched
When the CR value is set to the above values, executing the COM1/2 configuration function. CR value will automatically set back to 16#0000 after the configuration trigger.</td></tr>
<tr><td>72</td><td>R</td><td>COM status setting</td><td>High byte: COM1; Low byte: COM2.
Display the execution status of COM1 and COM2 settings. Code explained below:
0x00: Not configured</td></tr>
</table>

CR#	Attribute	Name of the register	Description
			0x01: Configuration successful 0x02: Configuration in progress 0x03: Error - Station number setting out of range 0x04: Error - Baud rate setting out of range 0x05: Error - Format setting out of range 0x06: Error - Communication interface setting out of range 0x07: Error - Communication timeout setting out of range 0x08: Error - Transmission mode setting out of range 0x09: Error - Communication retry count setting out of range 0x0A: Error - Configuration ON/OFF setting out of range
73	R/W	Restore to factory settings	16#55AA: Restore to factory settings. After the setting is triggered, the CR value is automatically set back to 16#0000.
74	R	Restore to factory default status	16#0000: Not configured 16#0001: Configuration successful 16#0002: Configuration in progress
75~115	reserved		
116	R/W	Sending the MODBUS command	1: Enabling the sending After the sending of the MODBUS command is complete, CR#116 is reset to 0.
117	R/W	Processing status of the MODBUS command	0: Not yet received; 1: Processing; 2: Received; 3: Reception failure
118	R/W	Destination of the MODBUS command	1: COM1, 2: COM2
119	R/W	Length of the MODBUS command	Setting the length of the MODBUS command
120~249	R/W	Contents of the MODBUS command	The space for storing the MODBUS command which is sent/received
Symbol: R: data can be read using the FROM instruction; W: data can be written using the TO instruction. The left-side high-speed special module codes are used in the range from K100 to K107.			

※ **Additional remarks**

1. CR#11: Error code

Error code	Description
0x0001	Hardware error
0x0002	UD Link error
0x0004	There is a communication error in the communication port.
0x0008	MODBUS communication error
0x0010	Restore to factory setting

2. CR#12: Hardware error flag

Bit	15 ~ 4	3	2	1	0
Description	Reserved	LV occurs.	SRAM is damaged.	GPIO is damaged.	FLASH is damaged.

3. CR#13：COM1 UD Link error flag
   CR#14：COM2 UD Link error flag

Bit	Description	Bit	Description
0	Group number is not found.	8	UD Link data check error
1	Command number is not found.	9	Unknown processing procedure
2	Packet editing error	10	Unknown Rx packet segment format
3	There is a comparison error in the data received.	11	Unknown Rx packet segment format
4	Checksum error	12	The length read from the register is out of range
5	reserved	13	The length written into the register is out of range
6	The data received is not sufficient for comparing	14	reserved
7	The data received is beyond expectation.	15	reserved

4. CR#15：COM1 MODBUS error flag
   CR#16：COM2 MODBUS error flag

Error code	Name	Description
0x0001	Illegal function	Unsupported function code
0x0002	Illegal data address	Unsupported address
0x0003	Illegal data value	Unsupported data value
0x0004	Slave device failure	The slave fails.
0x0005	Transform failure	Value conversion error

5. CR#17: COM1 communication error flag
   CR#18: COM2 communication error flag
   CR#19: internal communication error flag

Bit	Description	Bit	Description
0	Sending format error	8	Reserved
1	Parity check error	9	Reserved
2	Too late to receive the data.	10	Reserved
3	Communication timeout error	11	Reserved
4	Checksum error	12	Reserved
5	Internal communication timeout	13	Buffer for the sending is full.
6	Internal communication error	14	Buffer for the receiving is full.
7	Reserved	15	Reserved

The modification of communication parameters through CR#51-CR#74 requires firmware version V1.10 or above support.

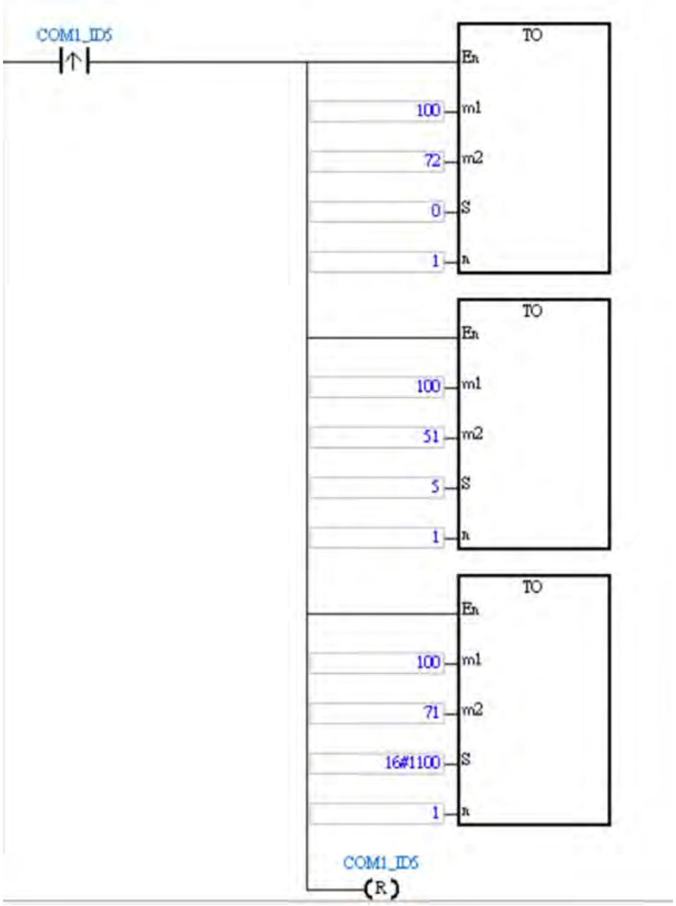
The following example demonstrates the modification of the station number for COM1:

(1) Reset CR#72 for subsequent confirmation of execution status.

(2) Write 5 to CR#51 to set the station number for COM1 to 5.

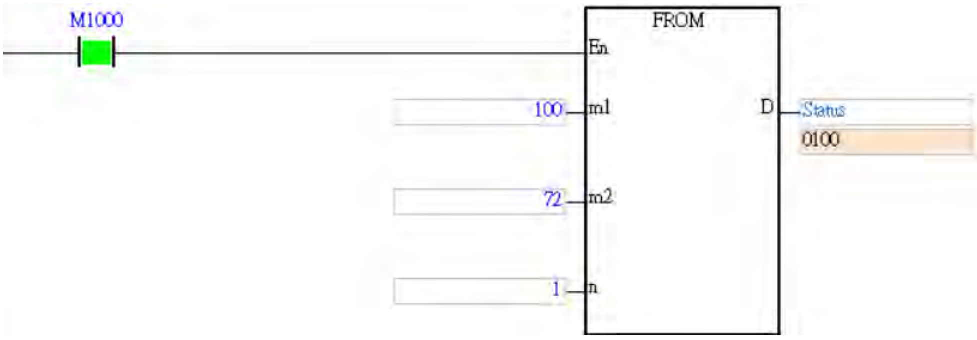
(3) Write 16#1100 to CR#71, indicating the writing of COM1 parameters with latched function.

- If latched function is not required, write 16#2200.
- If setting COM2, write the configuration value to the low byte.



(4) Confirm the setting status

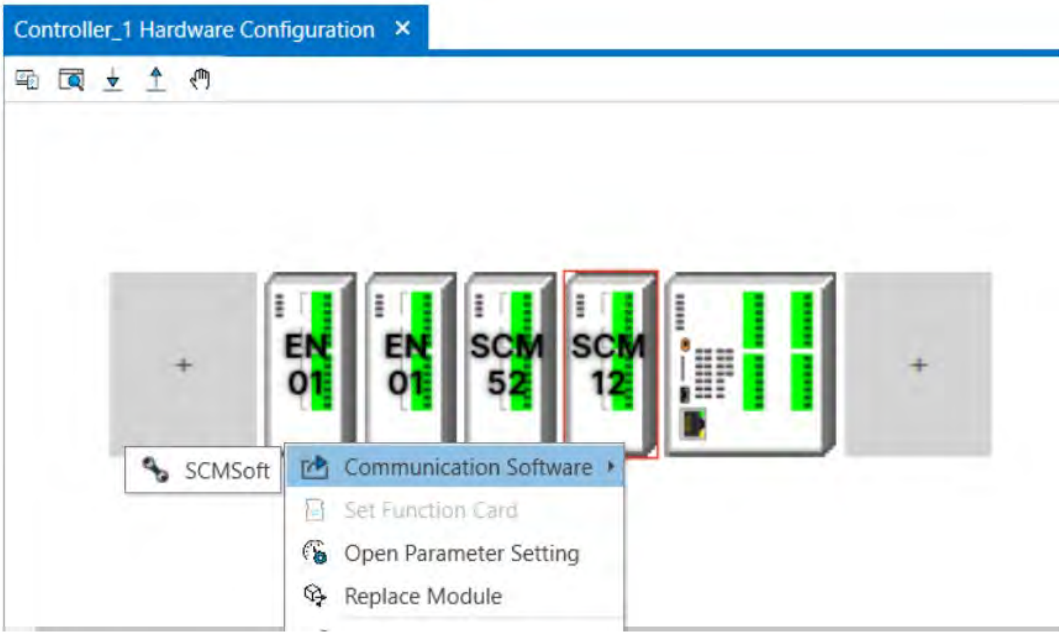
- CR#72 = 16#0100:COM1 is configured correctly.
- If COM2 is configured, the low byte will display the status of COM2.



13.5.6 Rapid Start

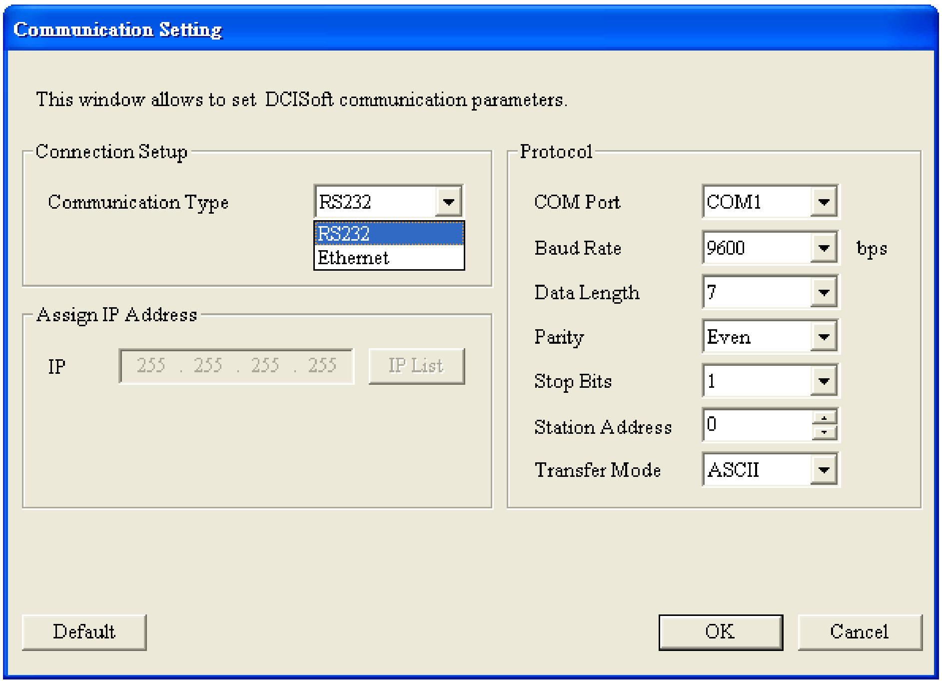
This chapter introduces how to execute MODBUS RS-485/RS-422 communication through the communications ports on the SCM module.

When installed on the left side of the DVP-SV3/SX3 PLC, you can also right-click on the module icon on the DIADesigner hardware configuration page to open SCMSoft.



- **Communication setting**

Open DCISoft, click "Tools" > "Communication Setting". The user can choose the communication port, and set the information related to RS-232. If an Ethernet module (DVPEN01-SL) is used with the SCM module, the user can select "Ethernet" in "Communication Type" box to upload/download the program.

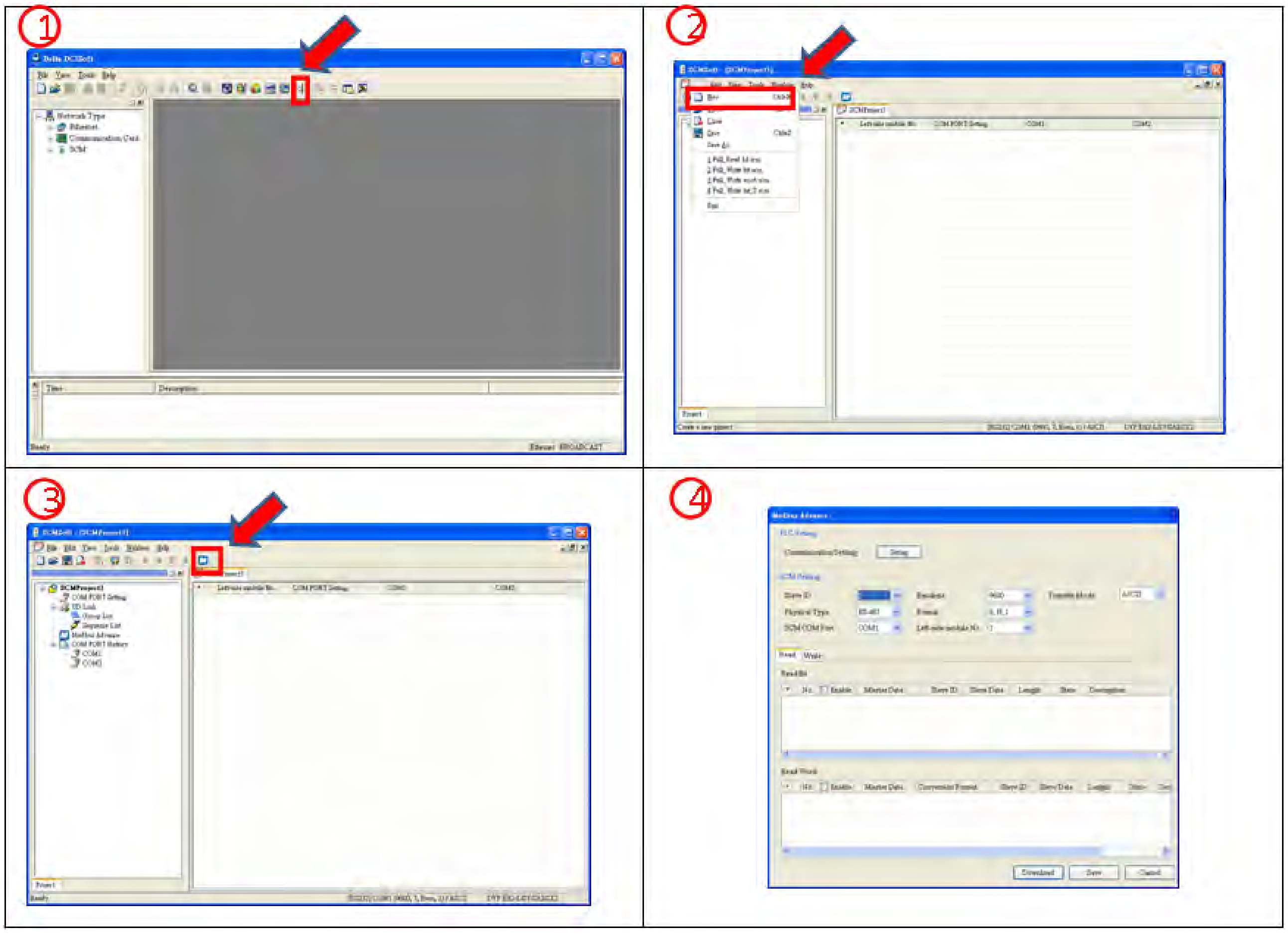


- **Opening a SCM project and MODBUS Advance**

① Click “SCMSoft” in DCISoft to open the setting page.

② Click “New Project” in SCMSoft to establish a SCM project.

③ Finally, click “MODBUS Advance Wizard” to open the setting page for the reading/writing.



- **Setting MODBUS Advance**

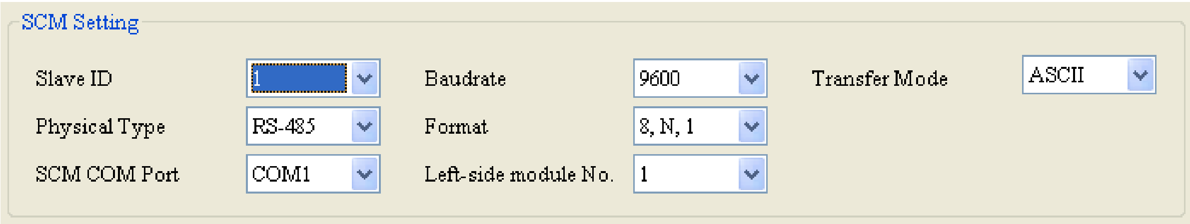
In order to expedite the communication using MODBUS, SCMSoft provides “MODBUS Advance Wizard”. The user only needs to designate the registers for the data sending and receiving, or the absolute positions. The settings will be downloaded to the SCM module through the communication port chosen by the user. After the flag is enabled, the designated reading and writing are complete. The following are the steps of setting the wizard.

1. MODBUS Advance－PLC Setting

   Click “Setup” to set the communication between the MPU of the PLC and SCMSoft. If the setting has been completed at【Communication setting】, the user does not have to set the communication here again.

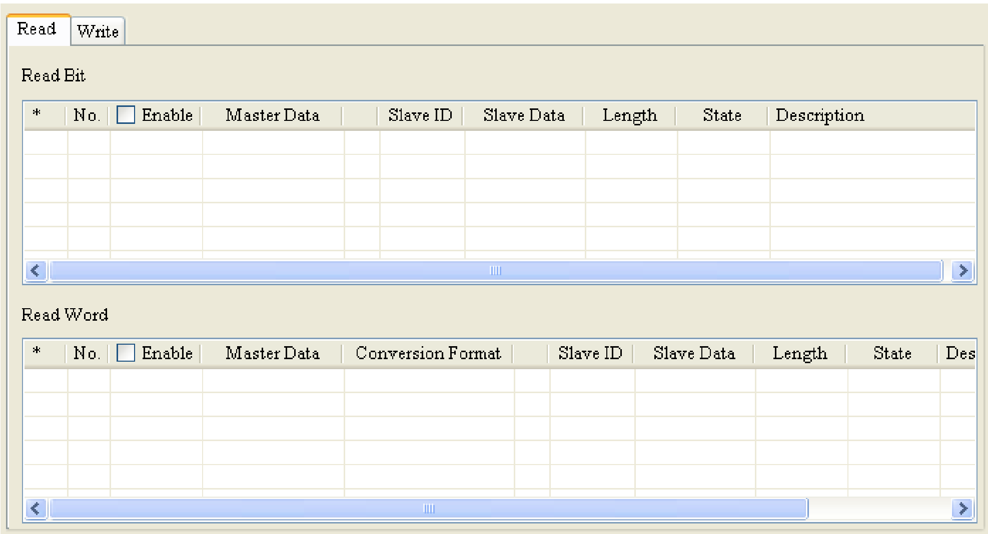
2. SCM Setting

   When setting the communication format of the communication port on the SCM module, the user can designate the left-side module number, and the communication port, and set the station address, the baudrate, the physical type, the transfer mode, and the format.

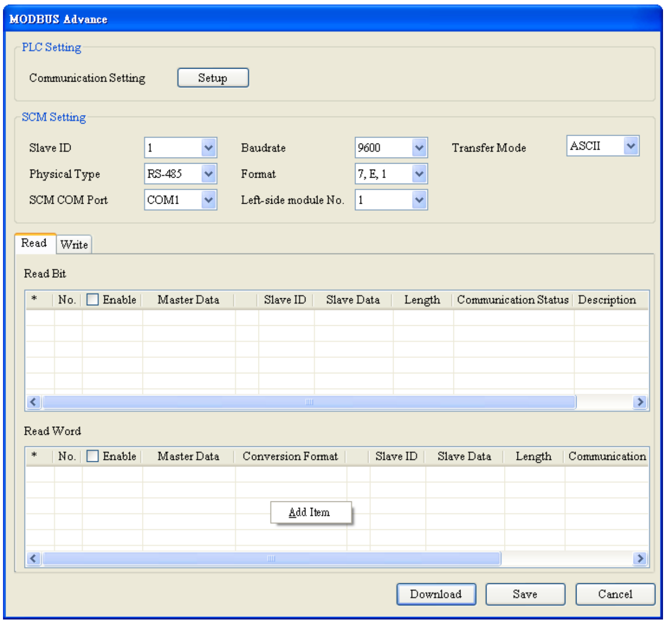


3. MODBUS Advance－Reading/Writing

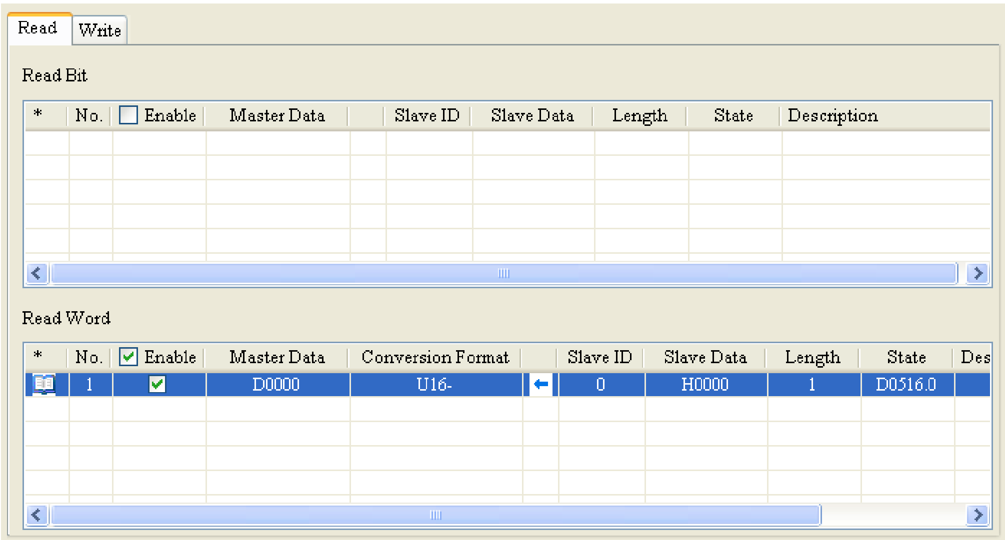
   Set “Read Bit”/“Read Word” and “Write Bit”/ “Write Word”.

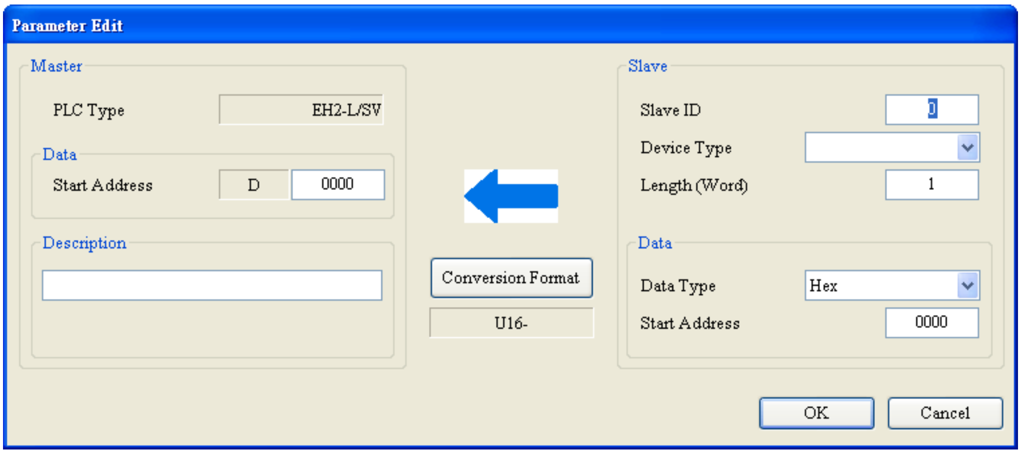


Right click “Add Item” to increase bits and words. The bits are listed in the upper column, and the words are listed in the lower column.



Double-clicking the added item to edit the parameter.





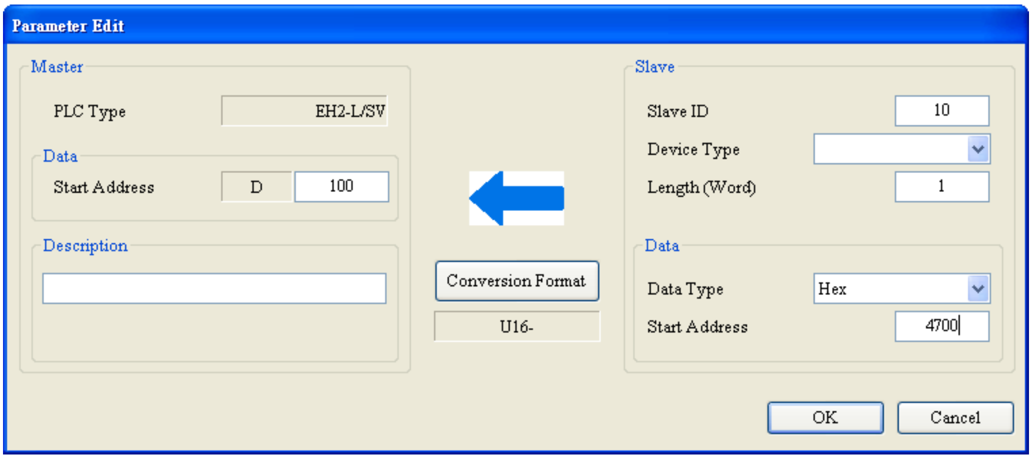
【Master】

PLC Type:	It displays the PLC type. You can click “Tools” in SCMSoft to change the PLC type.
Data:	Enter the address of the data register D in the PLC to store the value read from the slave.
Description:	Enter the description of the device. The maximum length is 30 bytes.

【Slave】

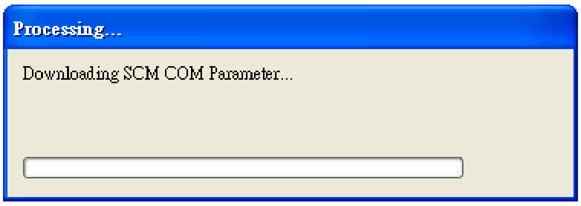
Slave ID:	The number of the salve device from which the data is read
Device Type:	You can choose the Delta PLC type. If PLC used is not a Delta PLC, please leave the column blank.
Length (bit):	Indicates the length of the data being read. The maximum length is 100 bits.
Data Type:	You can choose either “Hex” or “Modbus 6 Digit”. “Hex” represents 6 hexadecimal digits, and “Modbus 6 Digit” represents 6 decimal digits. If the device type is a Delta PLC type, the data type in this column will automatically become the data register D.
Start Address:	The start address of the data.

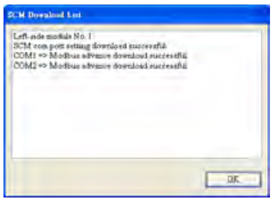
If the absolute position of the present value of the Delta DTA temperature controller is the hexadecimal value, 4700 (H’4700), and the station address is 10, the present value can be read and stored in D100 in the MPU of the PLC through COM1 on the SCM module. The settings are as follows:



- **Download**

After the setting is complete, check whether the other parameter settings conform to the slave setting. Then, click “Download”.





- **Communication status**

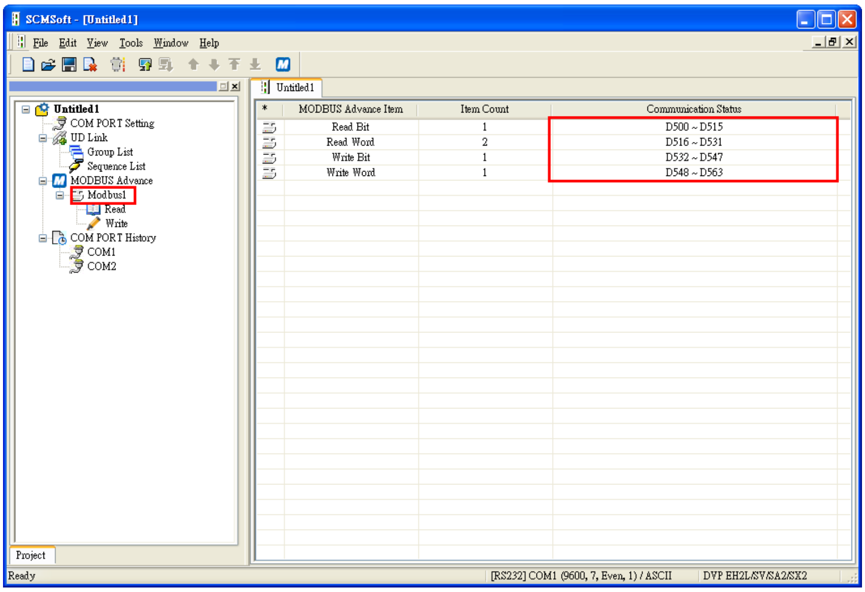
The SCM module provides the communication state of MODBUS Advance. There are four sections – Read Bit, Read Word, Write Bit, and Write Word. The execution status in each line is stored in the bits in the data registers. If D100 is entered into No.1, the execution status of the data exchange in No.1 will be displayed in the first bit (b0) in D100, and by analogy, the execution status of the data exchange in No.2 will be displayed in the second bit (b1) if D100 is entered into N0.2.

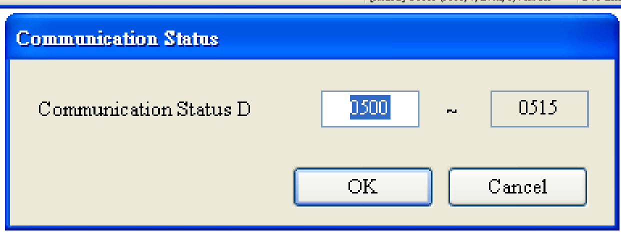
13

Dn																
Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
No.	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

D (n+1)																
Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
No.	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

The default address is D500. You can change the start address in MODBUS Advance.



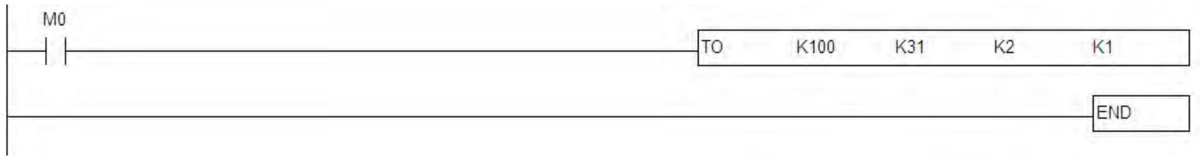


- **Enable**

Control the data exchange through the instruction TO in WPLSoft to read bits/read words/write bits/write words (CR#31~CR#34).

CR#	Attribute	Name of the register	Description
31	R/W	Triggering the data exchange through COM1 to read bits or words.	High byte: bit; Low byte: word 0: Not triggered, 1: Triggered once, 2: Always triggered
32	R/W	Triggering the data exchange through COM2 to read bits or words.	High byte: bit; Low byte: word 0: Not triggered, 1: Triggered once, 2: Always triggered
33	R/W	Triggering the data exchange through COM1 to write bits or words.	High byte: bit; Low byte: word 0: Not triggered, 1: Triggered once, 2: Always triggered
34	R/W	Triggering the data exchange through COM2 to write bits or words.	High byte: bit; Low byte: word 0: Not triggered, 1: Triggered once, 2: Always triggered

If you want to keep executing the word-reading, enter K2 into CR#31. If you want to execute the word-reading once, enter K1 into CR#31.



After M0 is triggered, COM1 on the SCM module will keep reading the present value which will be stored in D100, and the status value of bit0 in D0 is 1.

Device Name	Comment	Status	T/C Set Value	Present Value (16 bits)	Present Value (32 bits)	Floating Point	Format	T/C Set Value Reference
D100				K286	K286	F4.007E-43	Signed Decimal	
D0				K1	K1	F1.401E-45	Signed Decimal	

13.5.7 SCMSoft Introduction

This chapter will introduce the setting software of the SCM module – SCMSoft.

13.5.7.1 SCM Project

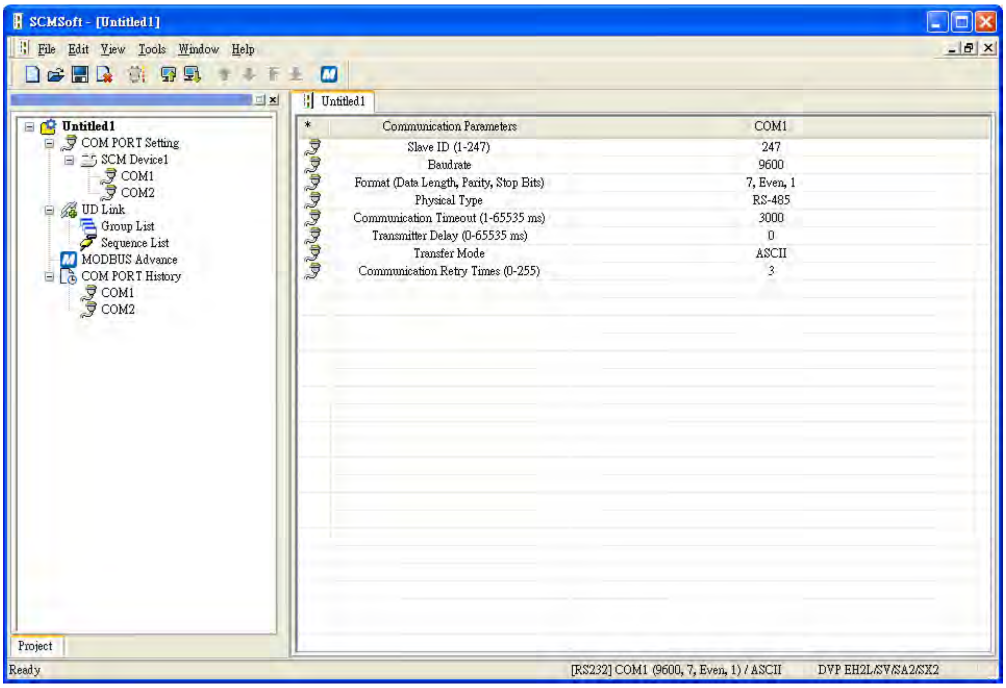
By establishing an SCM project, the SCM module makes the execution plan for COM1 and COM2. SCM project includes four parts – COM PORT Setting, UD Link, MODBUS Advance, and COM port history.

COM PORT Setting:	Set the communication formats and the parameters that COM1 and COM2 execute on the SCM module. (Ch 13.5.7.2).
UD Link:	Define the contents of the RS-485/RS-422 packets. (Ch13.5.7.3).
MODBUS Advance:	Connect to the standard MODBUS RS-485/422 device. If other Delta automation products and other standard MODBUS communication devices are used, you can use this function. (Ch 13.5.7.4).
COM port history:	Set whether to record the history of the communication port on the SCM module. (Ch 13.5.7.5).

13

13.5.7.2 COM PORT Setting

Setting the serial communication format:



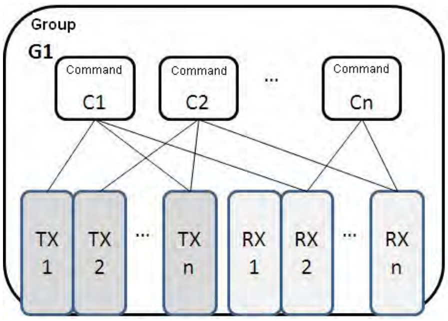
Protocol:	If the standard MODBUS is used, select MODBUS. If the user-defined RS-485/RS-422 format is used, select UD Link.
Slave ID:	Set the slave IDs of COM1 and COM2. The superior device connects to the SCM module through the slave ID. The default slave ID of COM1 is 247, and that of COM2 is 246.
Baud rate:	It supports communication rates 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200, 230400, 460800 bps.
Physical Type:	RS-485 or RS-422
Communication Timeout:	If there has been no response for a certain period of time after the instruction is transmitted through the communication port, that period of time is called the communication timeout. The default communication timeout is 3000 ms.

Transmitter Delay:	The default time interval between the instructions is 0 ms, that is, the next instruction is transmitted immediately after the reply is received.
Transfer Mode:	ASCII or RTU
Communication Retry Times:	It means the number of times the communication has been retried after the communication fails. If there is still no response, the communication stops.

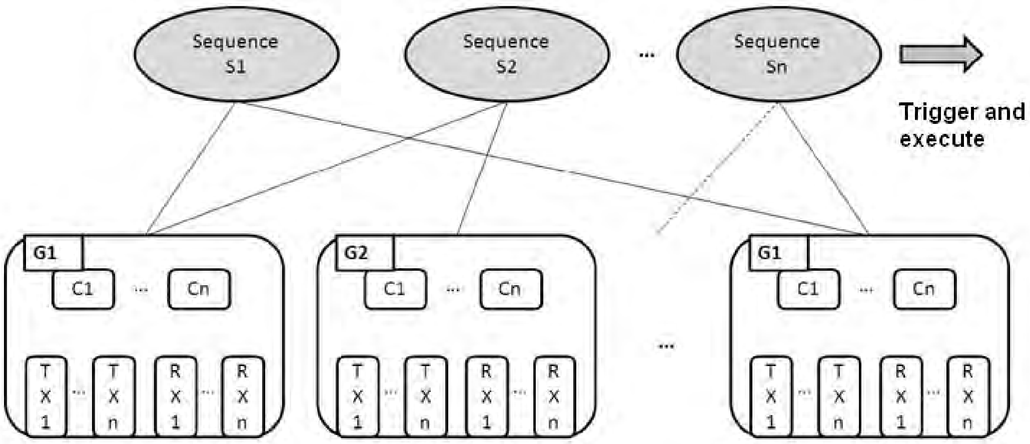
13.5.7.3 UD Link (User-defined Link)

UD Link provides non-Modbus RS-485/RS-422 link function. The packets can be edited according to the communication formats. The steps of establishing UD Link are as follows:

1. Create a group→ Edit TX packets and RX packets→ Create commands→ Trigger and execute the instructions as a group



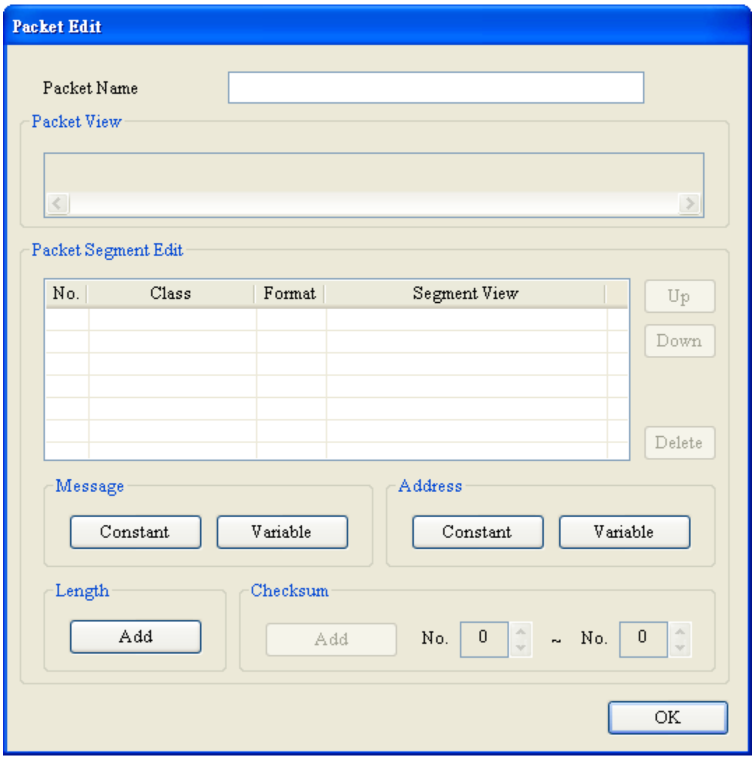
2. Create a group → Edit TX packets and RX packets → Create commands→ Create other groups→ Create sequences→ Trigger and execute the instructions as sequences.



First of all, establish the transmission instructions (TXs) and the reception instructions (RXs) in the group. Then, set the execution sequence and the number of times for TXs and RXs through the commands. Finally, trigger and execute the instructions as a group. In addition, if various groups of group packets are required in a large system, the user can create the groups in the sequences, and set the execution sequence.

13.5.7.3.1 TX Packetand RX Packet

Create various TX packets and RX packets in a group. The contents of TX packets and RX packets may include several messages, one address, one length, and one checksum.



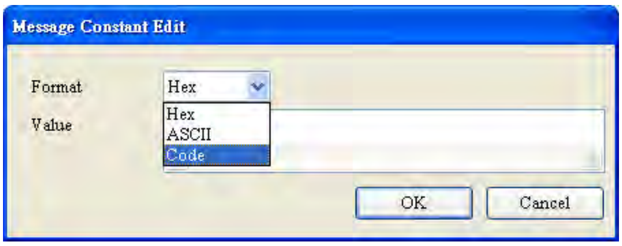
- Packet Name: Edit the name of the packet.
- Packet View: It displays the contents of the packet.
- Packet Segment Edit: Adjust the sequence of the packet segment and add/delete the packet segment.

  No.: It is the packet segment number. You can edit at most 64 segments in a packet.

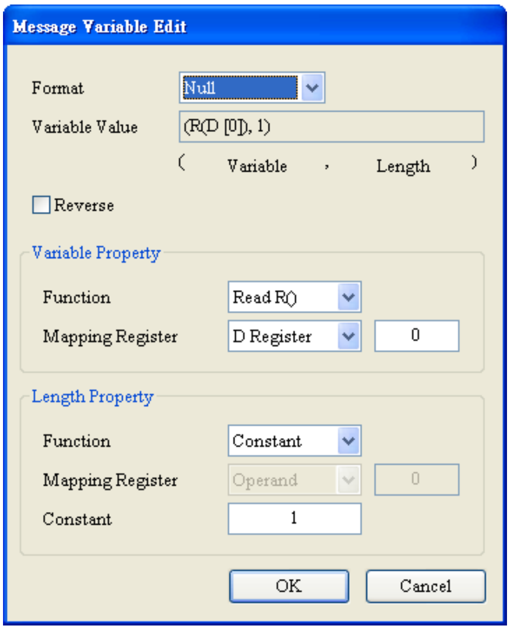
  Class: The class of the segment includes the message, the address, the length and the checksum.

  Format: The format of the segment includes Hex, ASCII, Code, and etc.

  Segment View: The description of the segment.
- Message: Edit the constant message and the variable message. Both the constant message and the variable message can be used with a packet head, a start bit, an end bit, or a data segment. One packet can include many messages.
- Address: Edit either the constant address or the variable address. One packet includes only one address segment.
- Length: Edit the length of the packet. One packet includes only one length segment.
- Checksum: Edit the checksum. One packet includes only one checksum segment.



- Constant: The data is a fixed value.
- Format: The format of the data can be Hex, ASCII, or Code. When the format of the data is Code, it indicates that the data uses the control code.
- Value: Enter the constant value.



- Variable: The data is a variable which mapping register can be the internal register in the SCM module or the register in the PLC.
- Format: Set the format of the data.

  Null: Does NOT make any change to the format of the data.

  Hex: The ASCII data can be converted into the hexadecimal value. The words which cannot be converted will become zeros.

  ASCII: The hexadecimal value can be converted into the ASCII data. The words which cannot be converted will become zeros.
- Variable Property

Function: The variable functions include “Read R ()”, “Write W ()”, and no action “*”. For TX packets, you can choose “Read R ()” .For RX packets, you can choose “Read R ()”, “Write W ()”, or no action “*”.

Mapping register: You can choose the internal register in the SCM module or the register in the MPU of the PLC. The internal registers in the SCM module include I1, I2, O1, and O2. The registers in the PLC include the data registers and “Base+Offset”.

Register	Definition	Register	Definition
D	Internal D register in the PLC	Base+Offset	Used with the control register.
I1	Used to receive/send the data through COM1.	O1	Used to send the data through COM1.
I2	Used to receive/send the data through COM2.	O2	Used to send the data through COM2.

- Length

  Class: The length segment can be either 1 byte or 2 bytes.

  Format: The format of the length segment can be the hexadecimal value or the ASCII data.

  Value: The user can enter the length value according to the format setting.

- Checksum

  Class: The user can choose the class of the checksum segment.

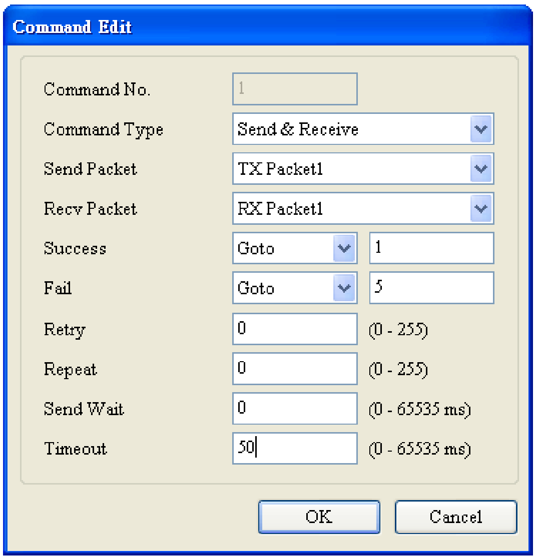
  Format: The user can choose the format of the checksum segment.

  Initial Value: The user can set the initial value of the checksum.

  Reverse: Reverse the checksum (word) in bytes.

13.5.7.3.2 Command

After creating many TX packets and RX packets, you can choose the packets to be sent and received through creating the commands and plan the sequence of executing the commands.



Command No.: Each command has its own number. You can designate the sequence of executing the commands through these numbers.

Command Type: Choose “Send”, “Receive”, or “Send & Receive”.

Send Packet: Choose the group name which has been created in the groups.

Receive Packet: Choose the group name which has been created in the groups.

Success: Designate the action following the execution of a command. Choose “Next”, ”Goto”, or “End”.

Next: Execute the next command. If the number of the command being executed is one, the number of the next command will be executed is two.

Goto: Directly designate the command whose number is much larger.

End: The execution of commands comes to an end.

Fail: Designate the action following the execution of a command. Choose “Next”, ”Goto”, or “End”.

Next: Execute the next command. If the number of the command being executed is one, the number of the next command will be executed is two.

Goto: Directly designate the command whose number is much larger.

End: The execution of commands comes to an end.

Retry: The number of times the sending of a command has been retried after the sending fails.

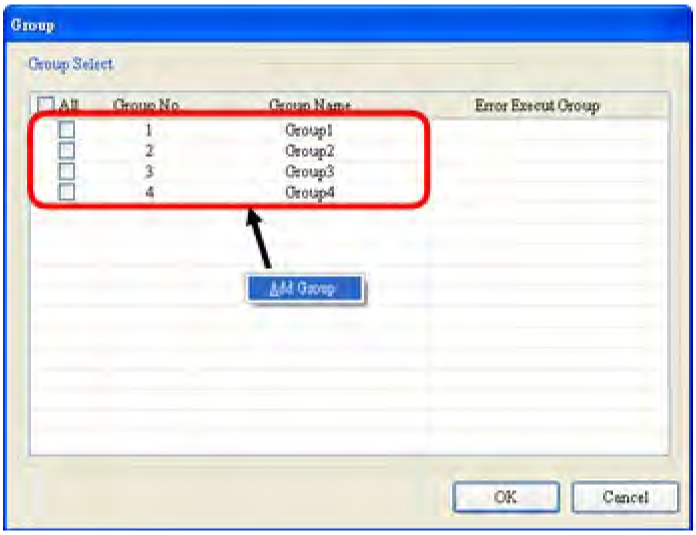
Repeat: The number of times the sending of a command has been repeated after the command has been executed successfully.

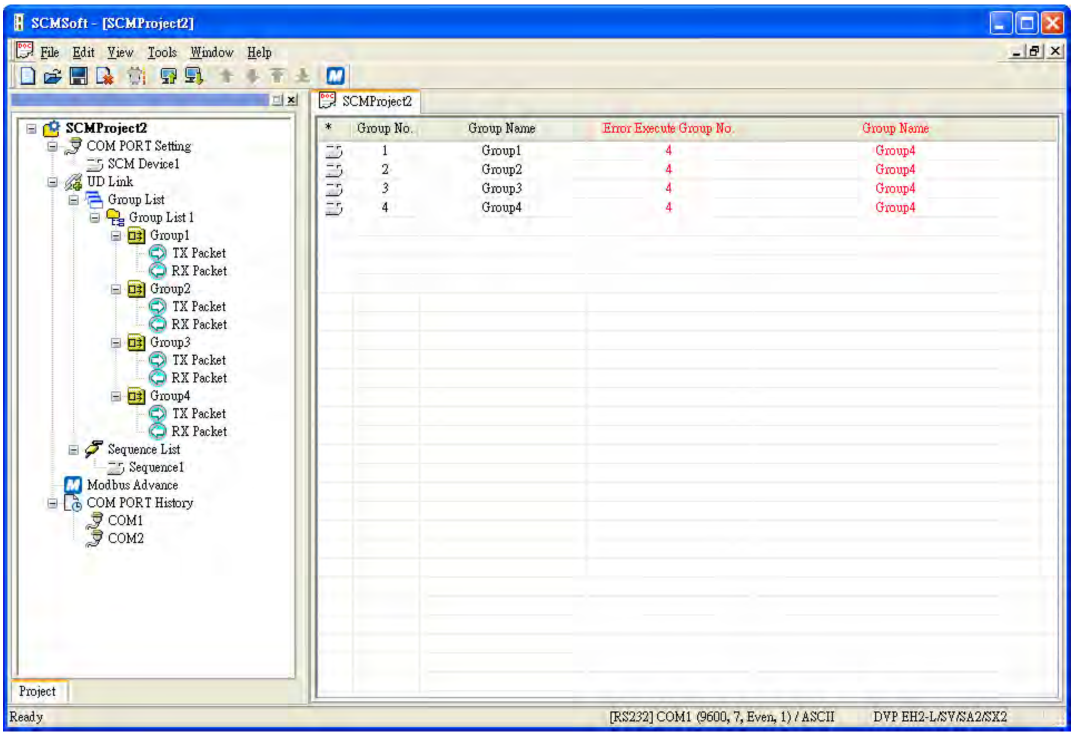
Send Wait: The default time interval between the instructions is 0 ms, that is, the next instruction is transmitted immediately after the reply is received.

Timeout: If there has been no response for a certain period of time after the instruction is transmitted through the communication port, that period of time is called the communication timeout. The default communication timeout is 50 ms.

13.5.7.3.3 Sequence

Click “Add Group” by right-click the mouse in Sequence to check the groups which will be executed. These groups will be downloaded as a sequence and executed through the serial port. In addition, you can click “Error Execute Group No.” twice to set the group which will be executed when an error occurs. When there is an error in executing a group, the group which is set in “Error Execute Group No.” will be executed.





13.5.7.4 MODBUS Advance

Please refer to section 13.5.6 for more related introduction.

13.5.7.5 COM PORT History

The function of the COM PORT historical data is to record all packets during the SCM communication process in the buffer within SCM, providing users with debugging capabilities. The buffer, shared for both transmission and reception, has a size of approximately 2 KBytes and only retains the latest communication data, discarding older information. Additionally, the buffer is non-latched, meaning that data will be lost if there is a power outage. The SCMSoft allows users to activate, deactivate, or upload the buffer data within SCM.

In the COM PORT historical data, three options are available through right-clicking. The functionalities are described as follows: "Start COM PORT Historical Data": Initiates the recording of the communication process for all COM PORTs in SCM. "Stop COM PORT Historical Data": Halts the recording of the communication process for all COM PORTs in SCM. "Upload COM PORT Historical Data": Uploads all communication data recorded internally in SCM to SCMSoft. Please note that recording of all SCM communication data will automatically cease before uploading. To resume recording, it is necessary to reselect "Start COM PORT Historical Data.″

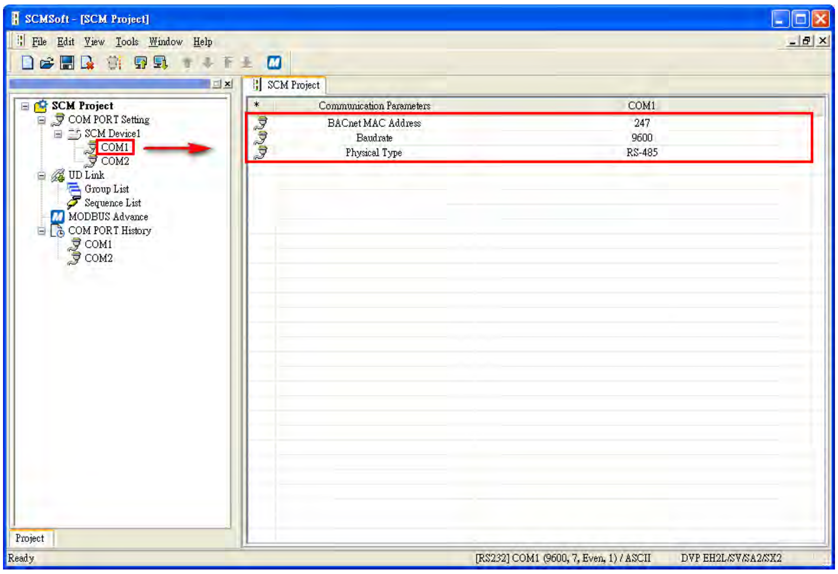
13.5.7.6 BACnet MS/TP Slave Function (Supported by DVPSCM52-SL)

If you want to connect an SCM module to a BACnet MPU, you have to set the BACnet parameters and the BACnet object for the SCM module.

For firmware versions V1.08 and below, the host device needs to write to AV or BV before being able to read them. For versions V1.10 and above, the host device can directly read AV and BV values without the need for prior write operations.

13.5.7.6.1 BACnet Parameters

The BACnet parameters include the BACnet MAC address, the baud rate, and the physical type.



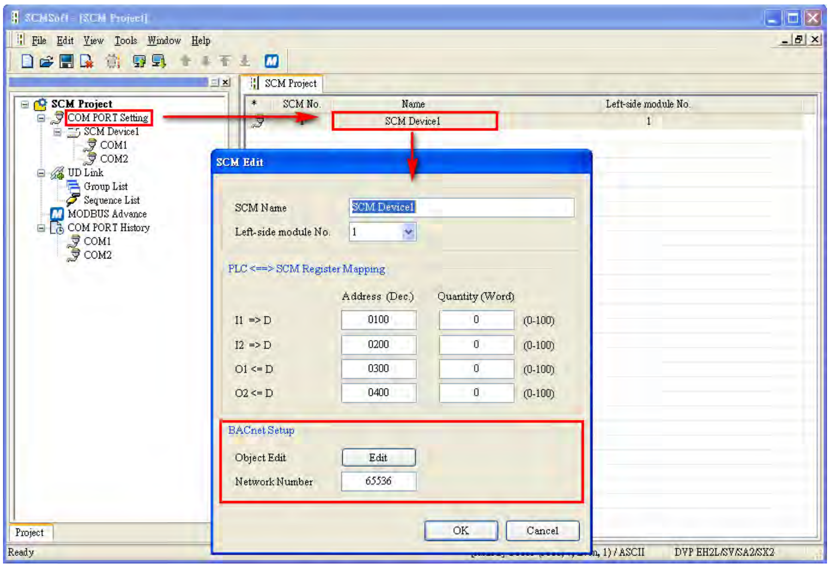
BACnet MAC address: 1 ~ 247 (Default: 247), Please notice that the maximum MAC address that some masters support is 127.

Baud rates supported by BACnet: 9600 (default), 19200, 38400, and 76800 bps

Physical type: options are RS-485 or RS-422.

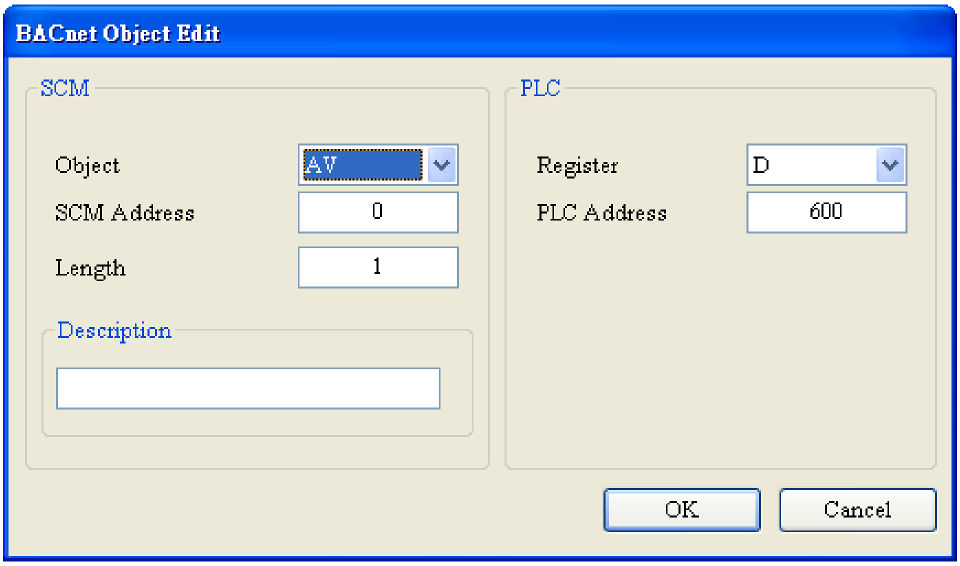
13.5.7.6.2 BACnet Object

Network Number: Th network number on the BACnet network is unique. It cannot be used repeatedly. (Default: 65536).



BACnet object edit: Editing the AV and BV values which correspond to the data registers and coils in the Delta PLC master connecting to the SCM module

The lenghth of tha AV value corresponds to two data registers in the Delta PLC, and the lenghth of the BV value corresponds to one coil in the Delta PLC.



Object: You can select “AV” or “BV”. “AV” corresponds to the data registers in the PLC, and “BV” corresponds the coil in the PLC.

SCM address: Set the address of the AV, or the BV. The setting range is 0~383.

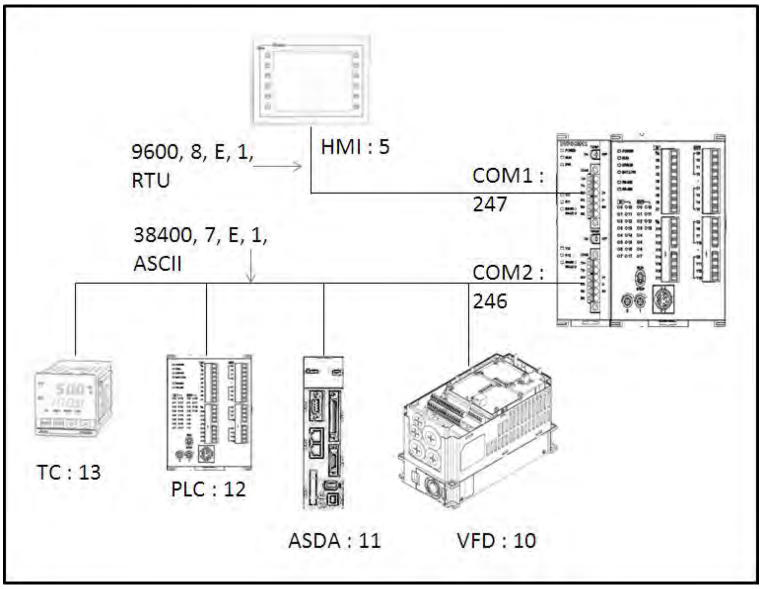
Length: A unit is a double word.

PLC: The start address in the Delta PLC.

13.5.8 Application

13.5.8.1 MODBUS

This chapter introduces how the SCM module connects to other Delta industrial products such as the human-machine interfaces, the text panels, the PLCs, the motor drives, and the servo motors through the standard MODBUS. The connection diagram is as below:

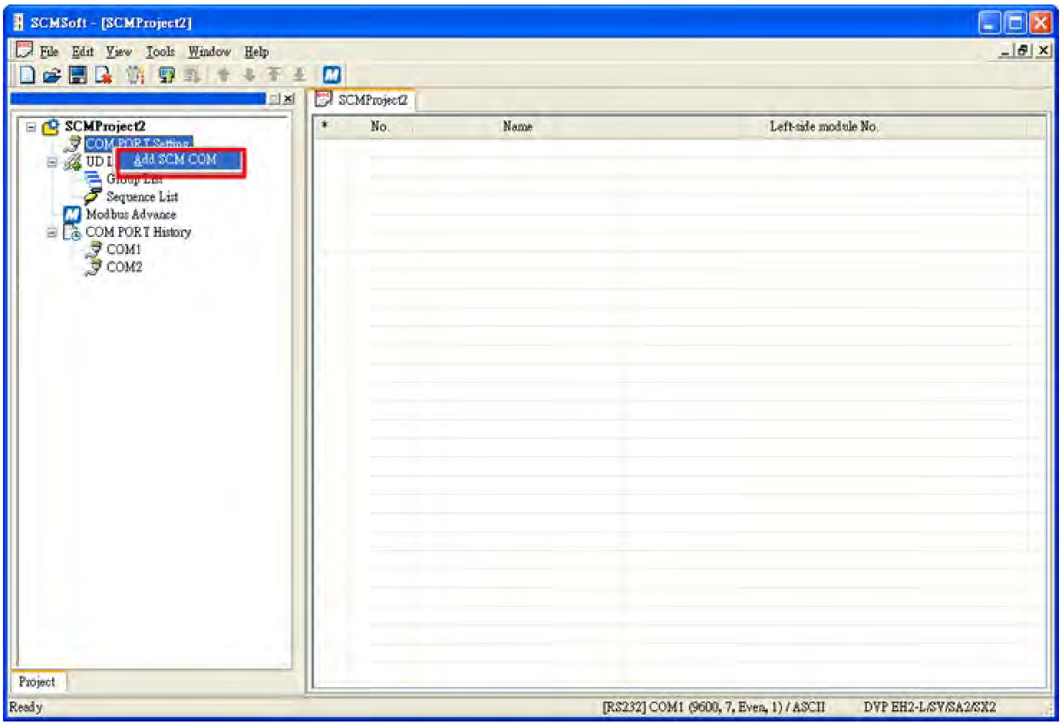


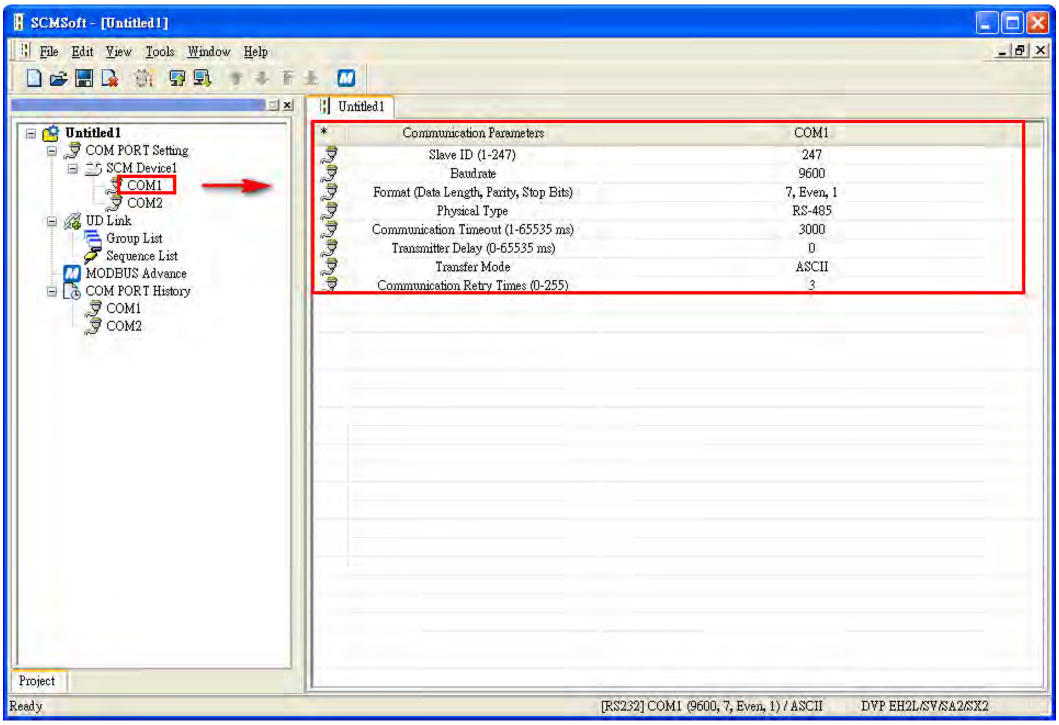
Product	Station address	Communication protocol	Address from which the data is read	Register in the MPU	Address into which the data is written	Register in the MPU
HMI	5	9600, RTU, 8, E, 1	-		-	
VFD	10	38400, ASCII, 7, E, 1	2103H	D100	2000H 2001H	D150~D151
ASDA	11	38400, ASCII, 7, E, 1	0101H 020AH	D200, D201	0101H 020AH	D250, D251
PLC	12	38400, ASCII, 7, E, 1	D100~D109	D300~D309	D200~D204	D350~D354
TC	13	38400, ASCII, 7, E, 1	1000H (PV)	D400	1001H (SV)	D451

13.5.8.1.1 Connection between the MODBUS Slave and the Delta Product

For SCM as the MODBUS slave, you only have to set the parameters such as the station address and the baud rate to allow the connection with the master.

Open **SCMSoft** → 『**New Project**』→ **COM PORT setting**: 『Add SCM COM』→ Set the communication parameters.





Set the communication parameters of COM1: station address 247 (default), Modbus RTU, 9600, 8, Even, 1.

*	Communication Parameters	COM1
	Slave ID (1-247)	247
	Baudrate	9600
	Format (Data Length, Parity, Stop Bits)	8, Even, 1
	Physical Type	RS-485
	Communication Timeout (1-65535 ms)	3000
	Transmitter Delay (0-65535 ms)	0
	Transfer Mode	RTU
	Communication Retry Times (0-255)	3

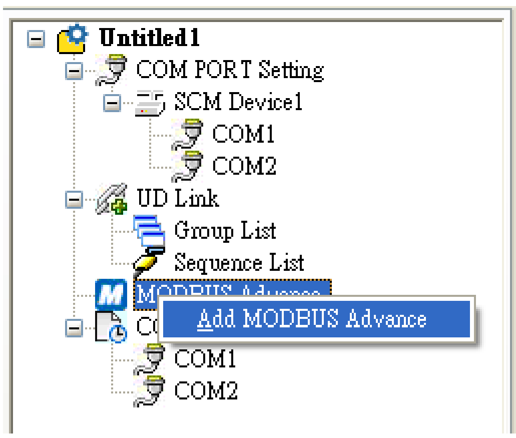
13.5.8.1.2 Connection between the MODBUS Master and the Delta Product

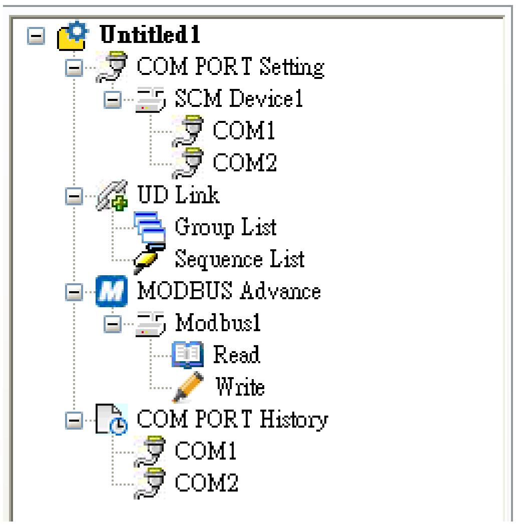
13

1. Set the communication parameters of COM2: station address 246 (default), Modbus ASCII, 38400, 7, Even, 1.

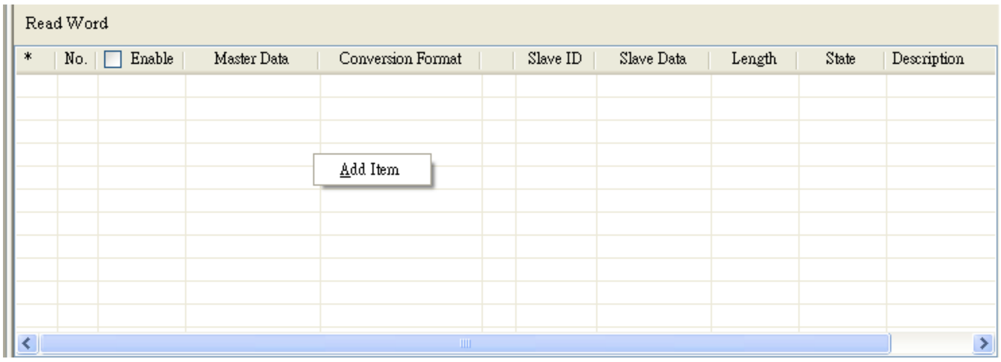
*	Communication Parameters	COM2
	Slave ID (1-247)	246
	Baudrate	38400
	Format (Data Length, Parity, Stop Bits)	7, Even, 1
	Physical Type	RS-485
	Communication Timeout (1-65535 ms)	3000
	Transmitter Delay (0-65535 ms)	0
	Transfer Mode	ASCII
	Communication Retry Times (0-255)	3

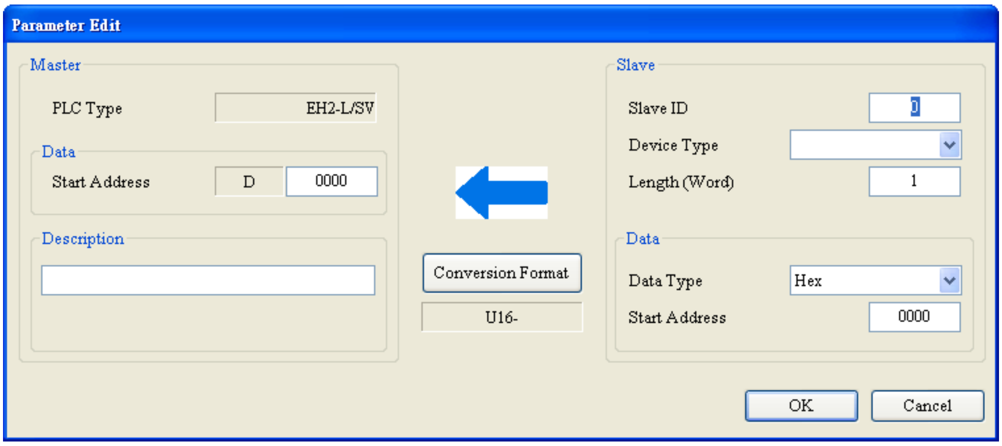
2. Add MODBUS Advance.



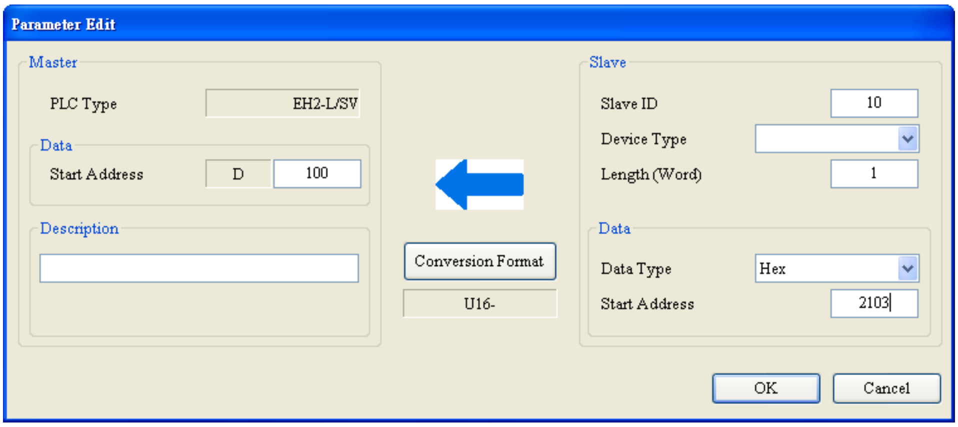


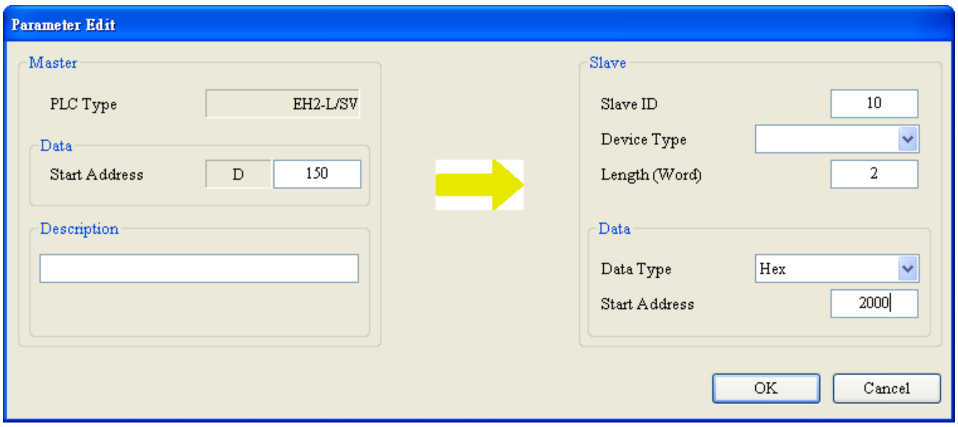
3. Set the data exchange in the slave: Add Item → Click the added item twice to set the reading/writing information in the slave.



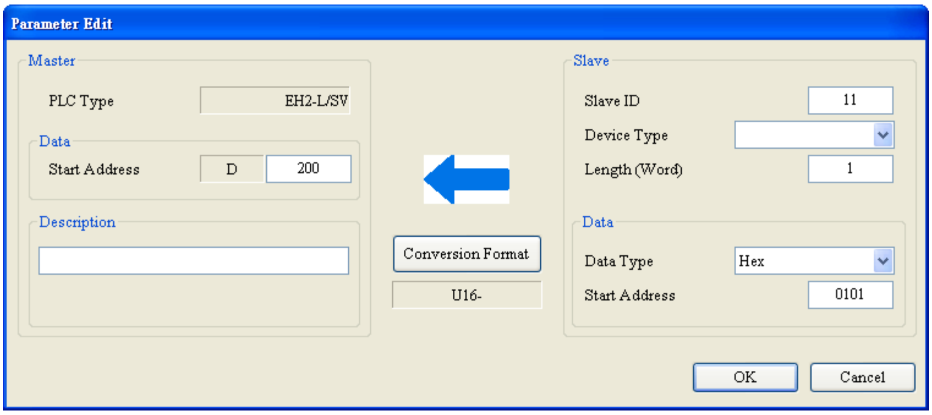


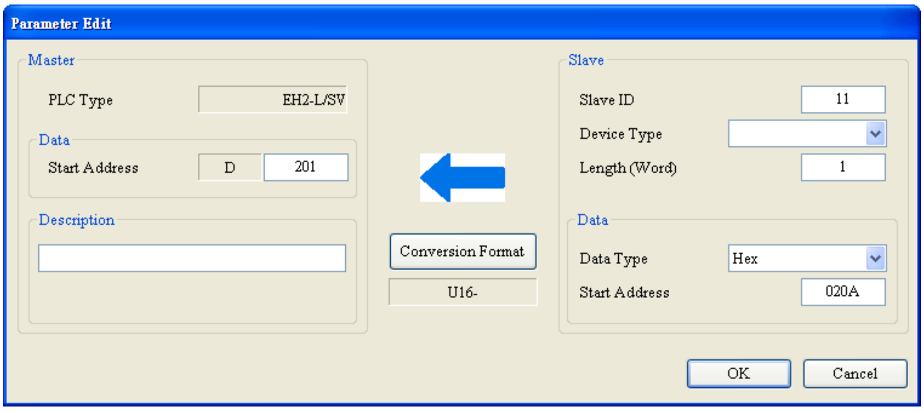
VFD (D100←2103H) · (D150 · D151→H2000 · H2001)



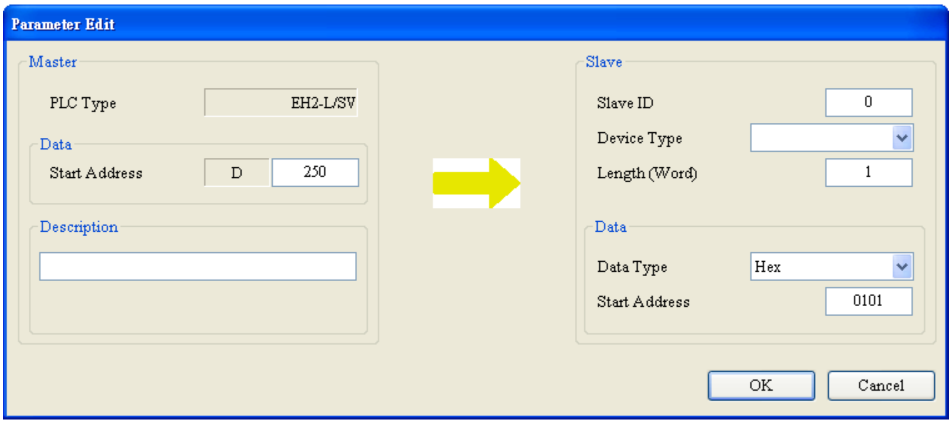


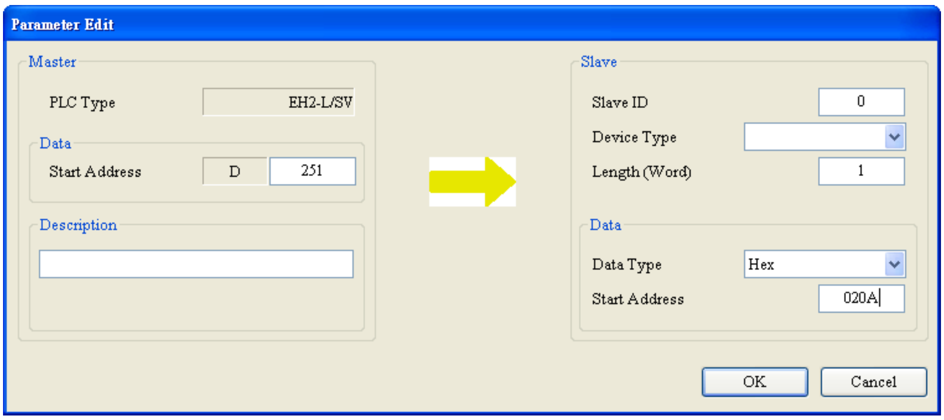
ASDA (D200←0101H，D201←020AH)



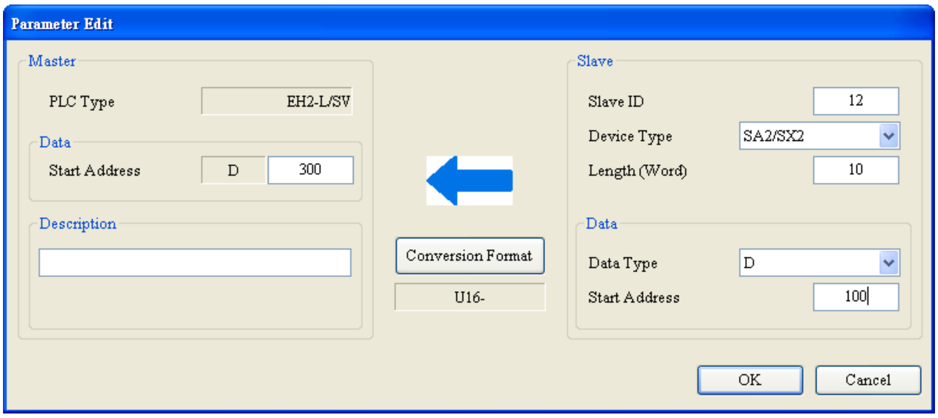


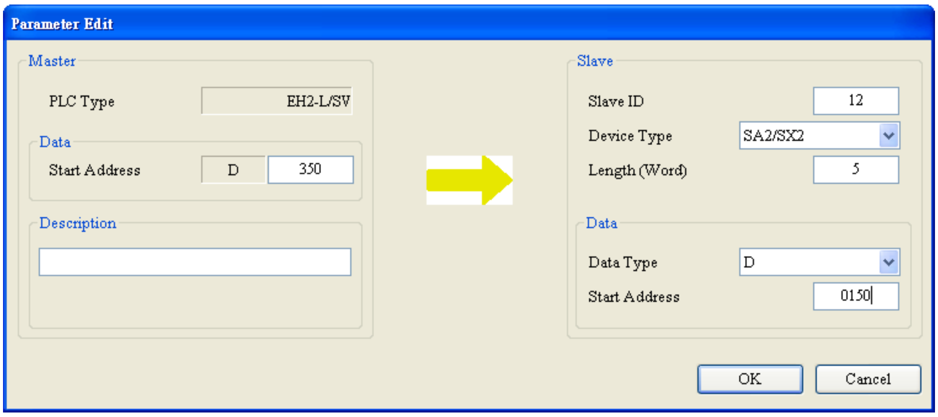
(D250→0101H，D251→020AH)



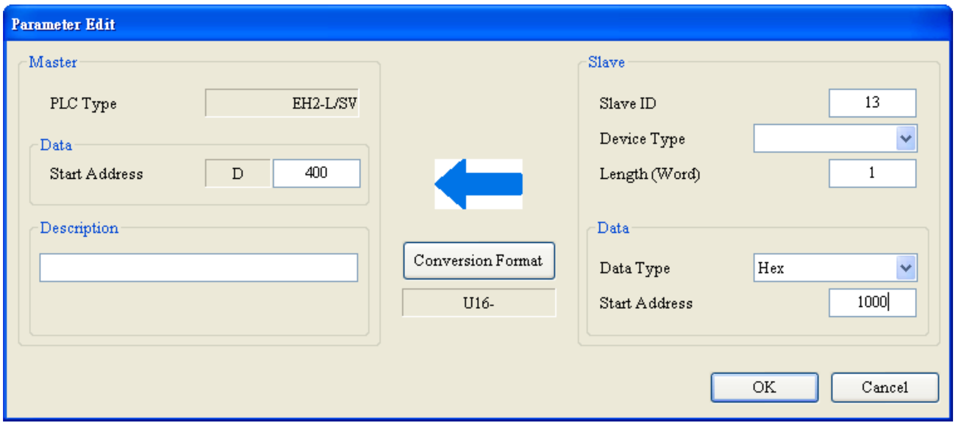


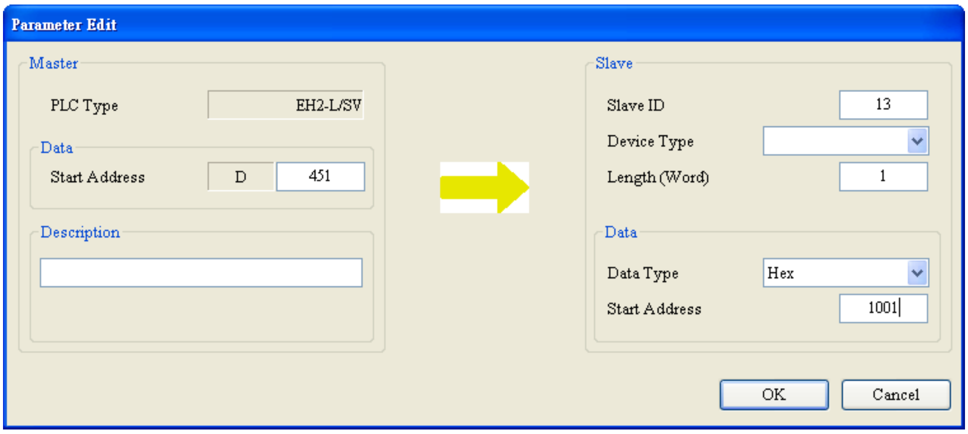
PLC (D300~D309 in the master←D100~D109 in the slave), (D350~D354 in the master→D150~D154 in the slave)



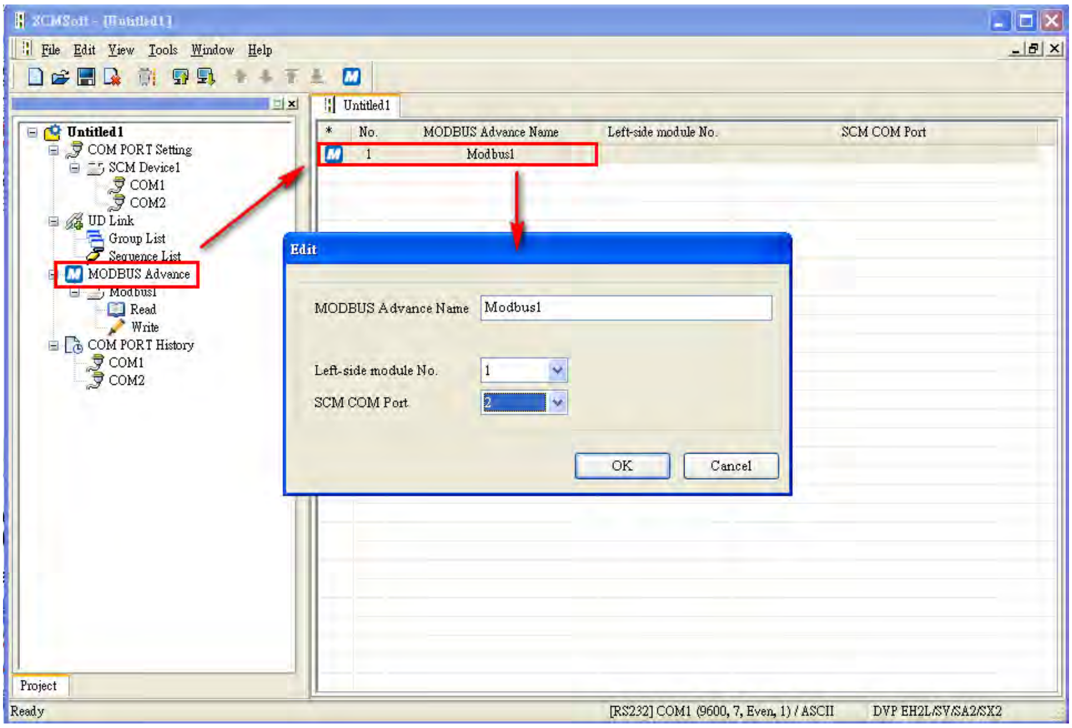


TC (D400←1000H) · (D451→1001H)

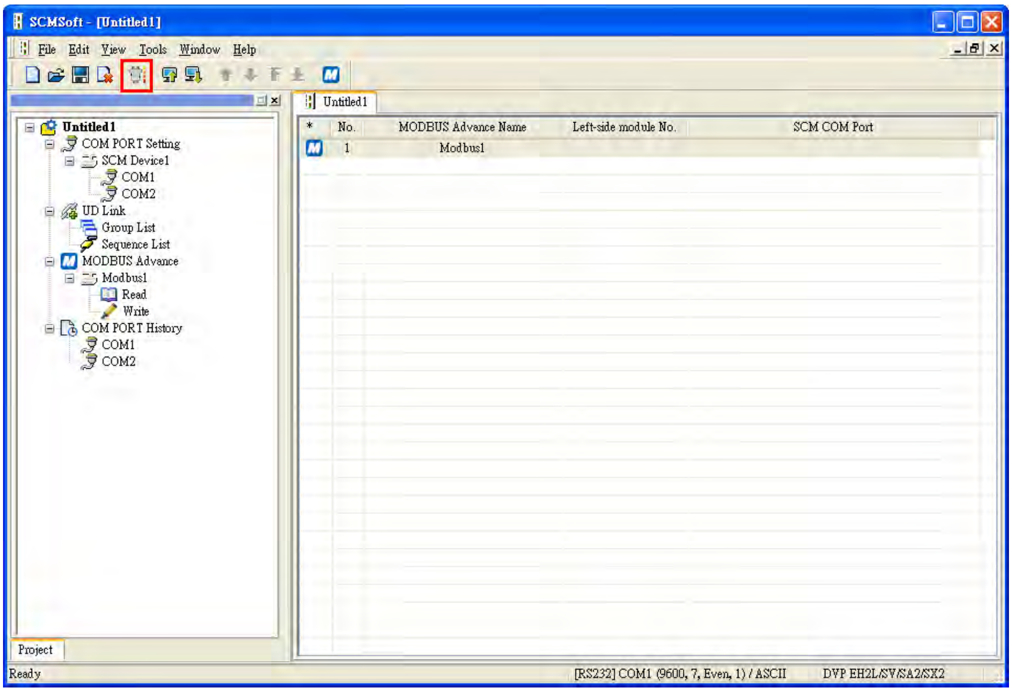


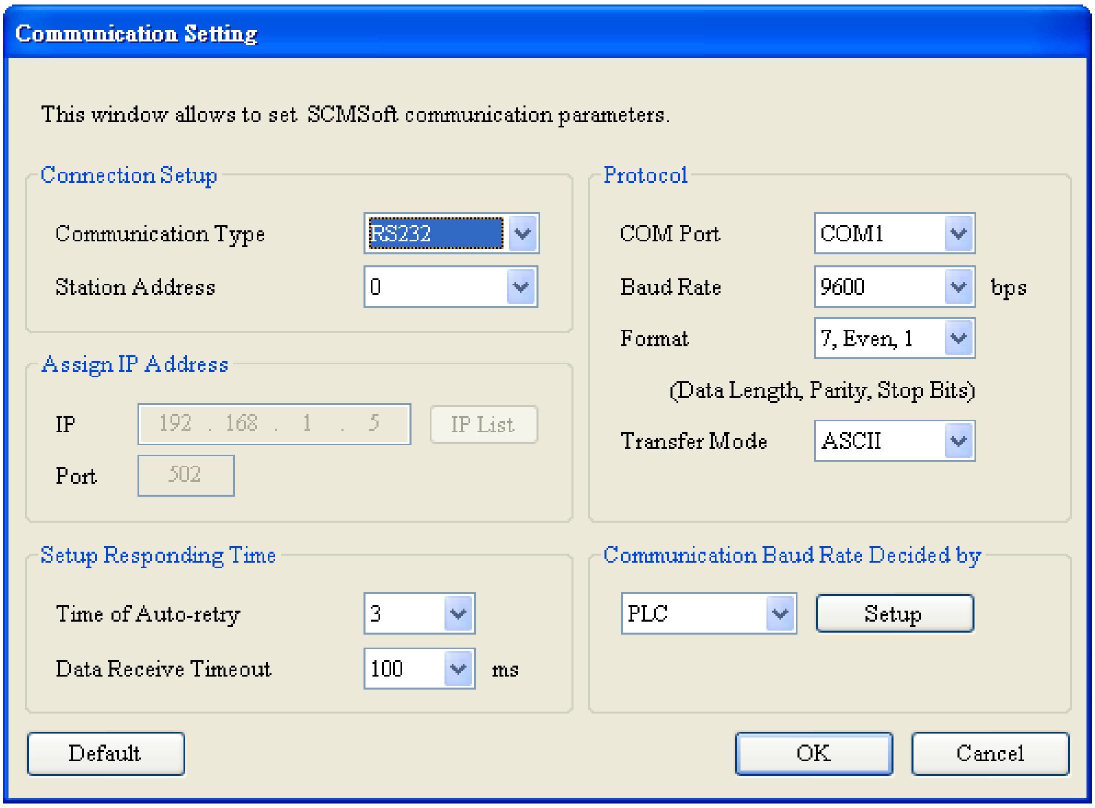


After the setting is complete, the user can designate the communication port using MODBUS Advance – COM port 2 on the first left-side module.

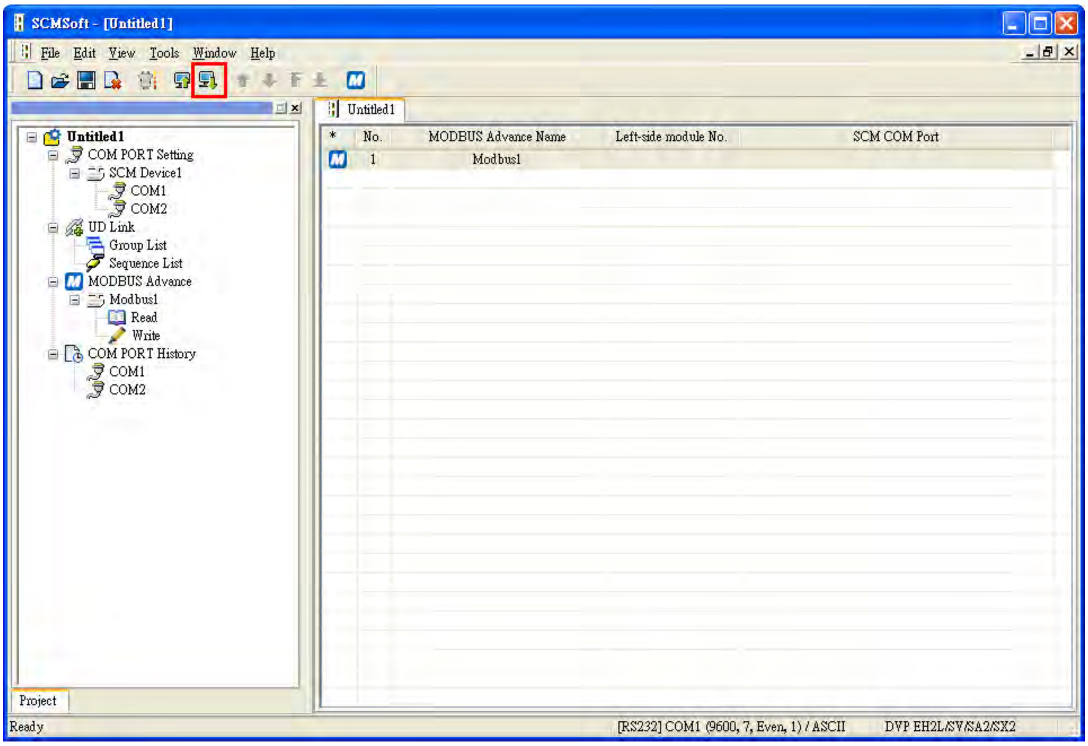


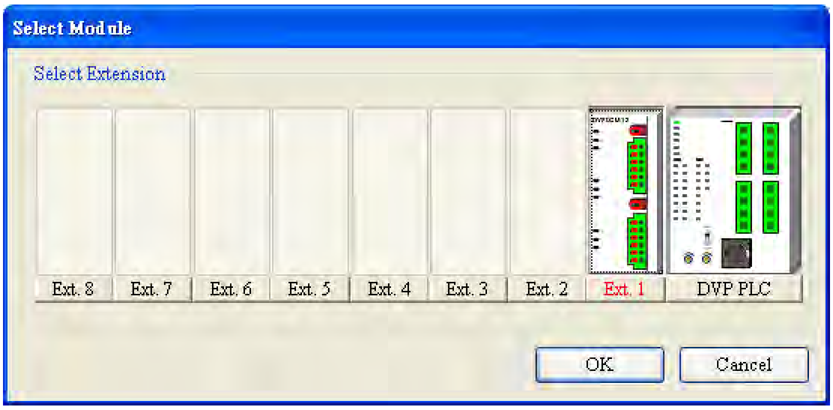
4. Download the parameters: Set the communication. After the setting is complete, click "OK" to exit from the communication setting, and the parameters are set.

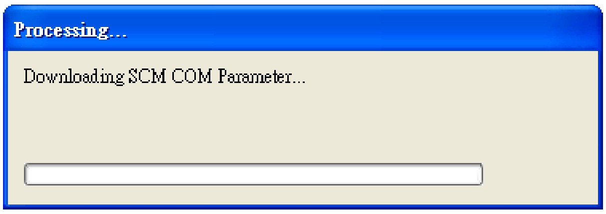


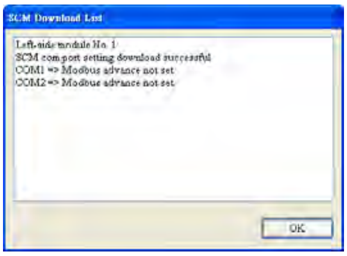


Click “Download”, choose the left-side module which will be downloaded, and click “OK”. If only one device is connected, click “OK” directly.







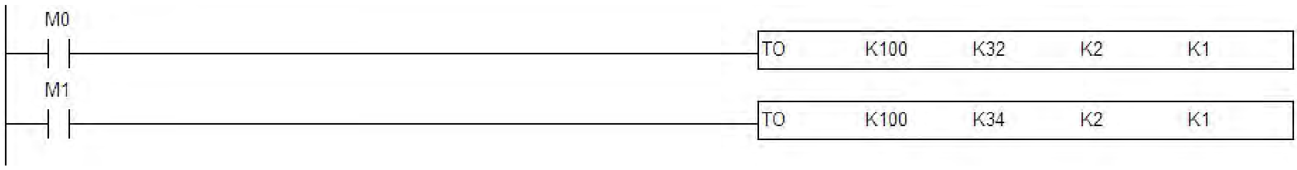


5. Enable the data echange function: Control the data exchange through the instruction TO in WPLSoft to read bits/read words/write bits/write words (CR#31~CR#34).

31	R/W	Triggering the data exchange through COM1 to read bits or words.	High byte: bit; Low byte: word 0: Not triggered, 1: Triggered once, 2: Always triggered
32	R/W	Triggering the data exchange through COM2 to read bits or words.	High byte: bit; Low byte: word 0: Not triggered, 1: Triggered once, 2: Always triggered
33	R/W	Triggering the data exchange through COM1 to write bits or words.	High byte: bit; Low byte: word 0: Not triggered, 1: Triggered once, 2: Always triggered
34	R/W	Triggering the data exchange through COM2 to write bits or words.	High byte: bit; Low byte: word 0: Not triggered, 1: Triggered once, 2: Always triggered

If you want to keep executing the word-reading, enter K2 into CR#32. If want to execute the word-reading once, enter K1 into CR#32.

If you want to keep executing the word-writing, enter K2 into CR#34. If want to execute the word-writing once, enter K1 into CR#34.



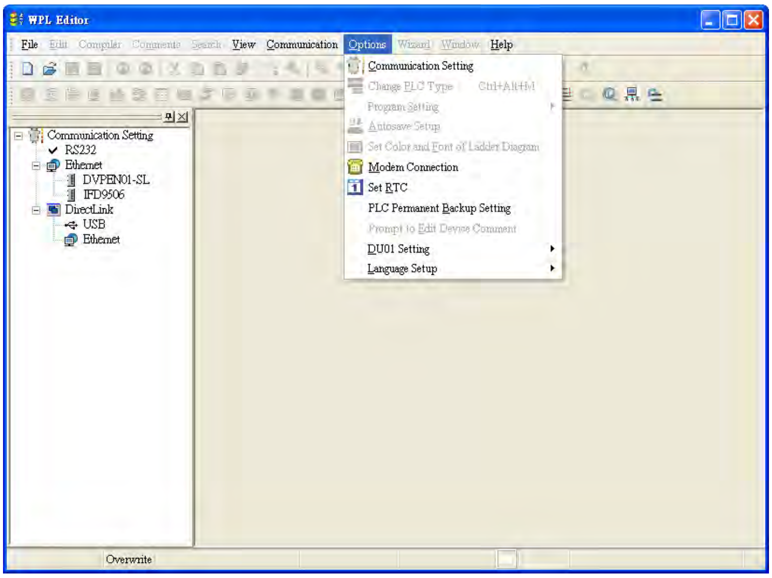
After M0 is triggered, the data will be read from the salve address which has been set through COM2 on the SCM module.

After M1 is triggered, the data will be written into the slave address which has been set through COM2 on the SCM module.

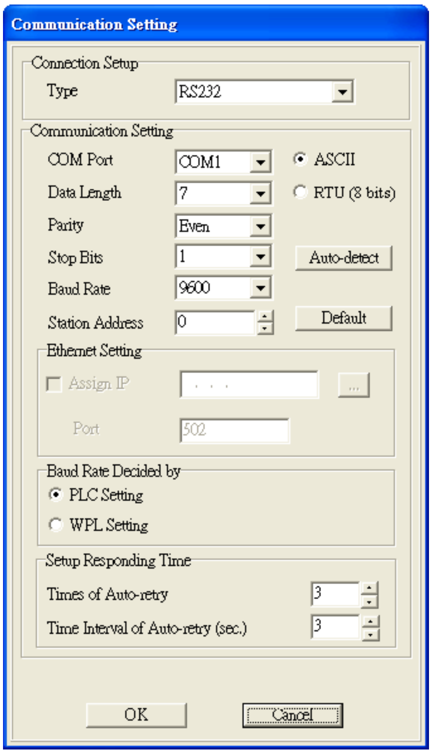
13.5.8.2 Connect to WPLSoft

The SCM module can be used as the additional communication port of the PLC master. When RS-485 communication of the PLC master is executed, you can use WPLSoft to monitor the master through the SCM module. The default communication format of COM1 on the SCM module is 9600, 7, Even, 1, and the station address is 247.

1. Set WPLSoft: Open WPLSoft. Click “Options” and choose “Communication Setting”.



2. Choose RS-232 in Communication Setting, designate “COMP Port”, and enter the communication parameters. The communication parameters here should conform to the default setting of COM1 on the SCM module. If other communication parameters are used, they need to be modified in COM PORT Setting of the SCM module. In addition, the setting of “Station Address” should conform to COM1 on the SCM module rather than the station address of the MPU of the PLC.



3. Click “OK” to upload/download WPLSoft program from/to the MPU of the PLC.

13.5.8.3 RS-485

This section introduces how SCM connects to other Delta industrial products through RS-485 (the non-standard MODBUS).

13.5.8.3.1 Connect to Electricity Meter

There are two common modes of connecting to the electricity meter. One is through the standard MODBUS, the other is through RS-485. This section introduces how the SCM module connects to the electricity meter through RS-485 in UD Link.

1. The record type

   Set the station address of the electricity meter to 5. The electricity meter includes three record types – abbreviated, control and full record types.

(Abbreviated)

Word number	Content	Description
1	10h	Start bit
2	0 … FAh, FFh	Device address (IA)
3		Function code (FF)
4		Checksum (CS) (IA+FF)
5	16h	End marker

(Control)

Word number	Content	Description
1	68h	Start bit
2	03h	Length
3	03h	Length (repeat)
4	68h	Start bit (repeat)
5	0 … FAh, FFh	Device address (IA)
6		Function code (FF)
7		Parameter index (PI)
8		Checksum (CS) (Add from IA to PI.)
9	16h	End marker

(Full)

Word number	Content	Description
1	68h	Start bit
2		Length
3		Length (repeat)
4	68h	Start bit (repeat)
5	0 … FAh, FFh	Device address (IA)
6		Function code (FF)
7		Parameter index (PI)
…		n word, data block
Length+5		Checksum (CS) (Add from IA to the previous item.)
Length+6	16h	End marker

2. The usage

There are nine types of usage in which the SCM module communicates with the electricity meter through the combination of three record types.

Type	Instruction to the electricity meter	Response (through the record type)
1	Reset Abbreviated record	N/A
2	Query about the status of the device: abbreviated record	Abbreviated record
3	Measured value and error (cyclic data) Abbreviated record	Full record
4	Event data analyzed erroneously Abbreviated record	Full record
5	Measured value Control record	Full record
6	Output parameter: control record	Full record
7	Status: control record	Full record
8	Device specifications: control record	Full record
9	Real-time timing data: control record	Full record

3. Edit the UD Link

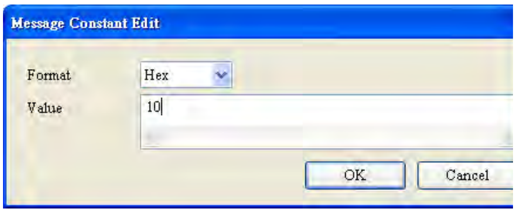
【Type 1】

Only send the abbreviated record (abbreviated record) :

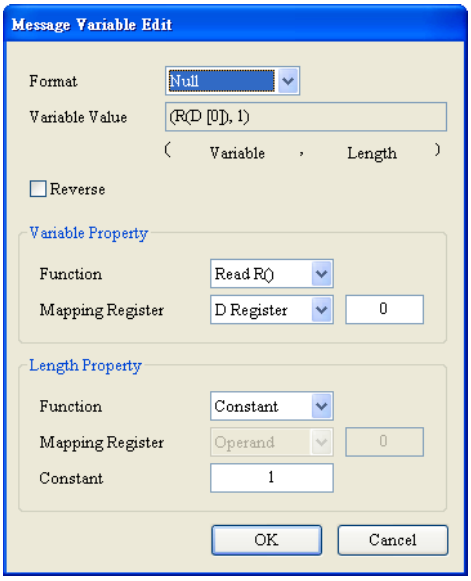
『Start word』 + 『device address (IA)』 + 『Function code (FF)』 + 『Checksum (CS)』 + 『End marker』

→ 10h + D0 + 09h + (IA+FF) + 16h

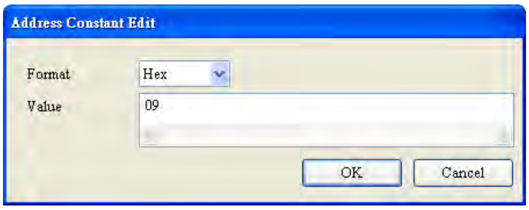
- Start word: 10h



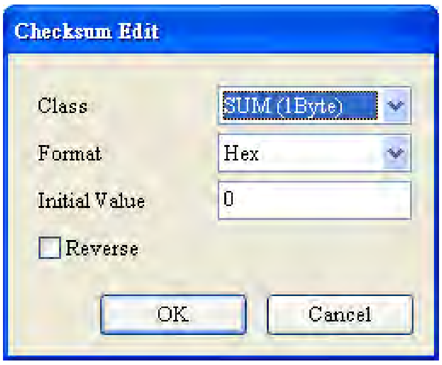
- Read the device address from D0 (IA).

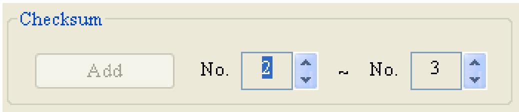


- Function code (FF): 09h

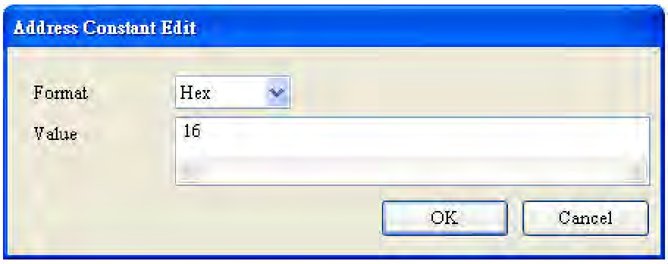


- Checksum (1byte; adding the previous two items up):

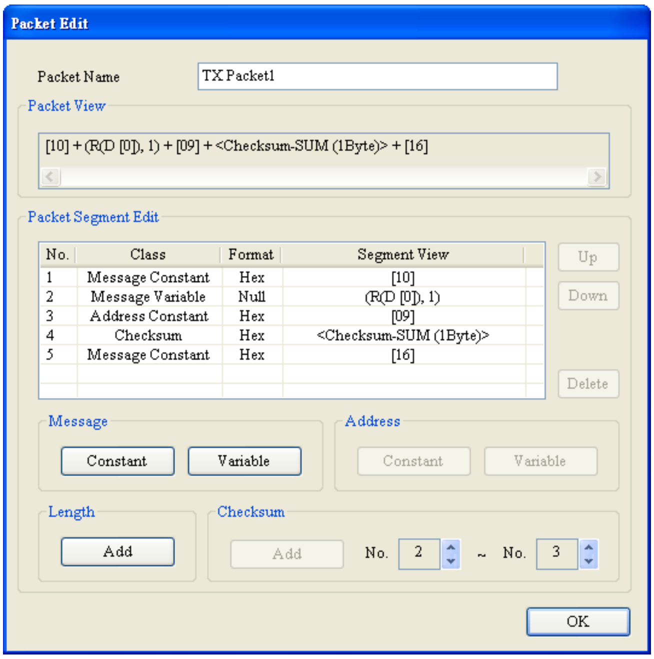




- End word: 16h

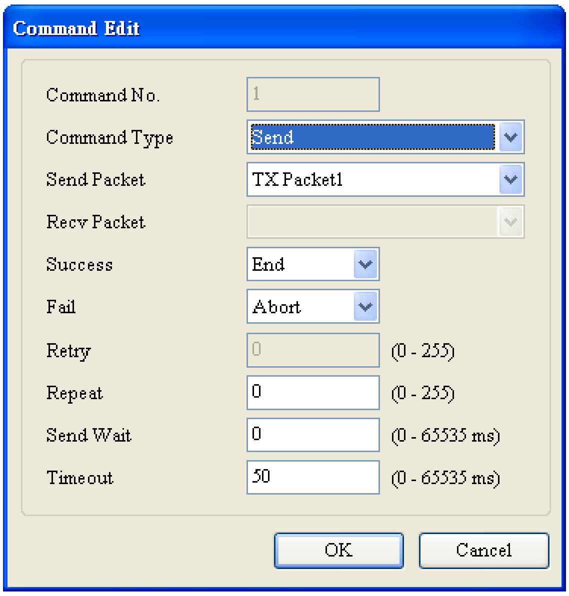


- The editing is complete:



There is no response address for type 1, so do NOT need to edit the function code of the response (Rx).

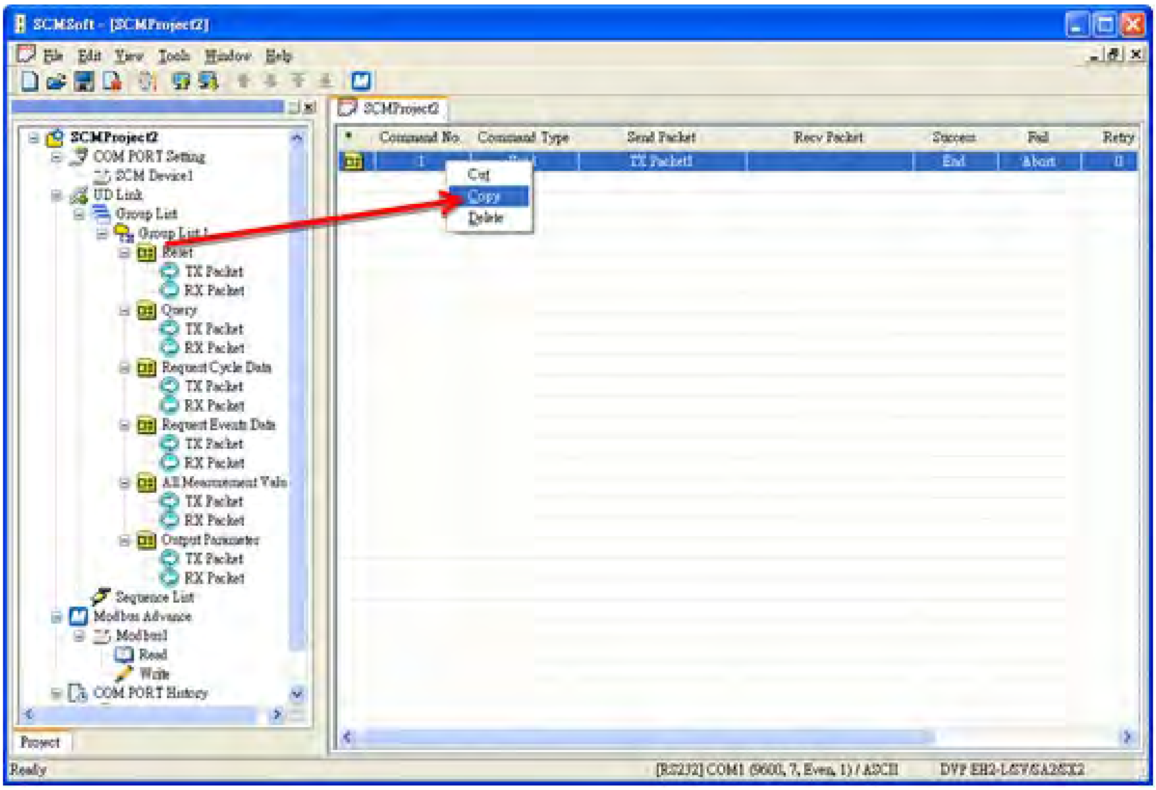
Edit the SCM command: Sending Tx Packet1; no response address.



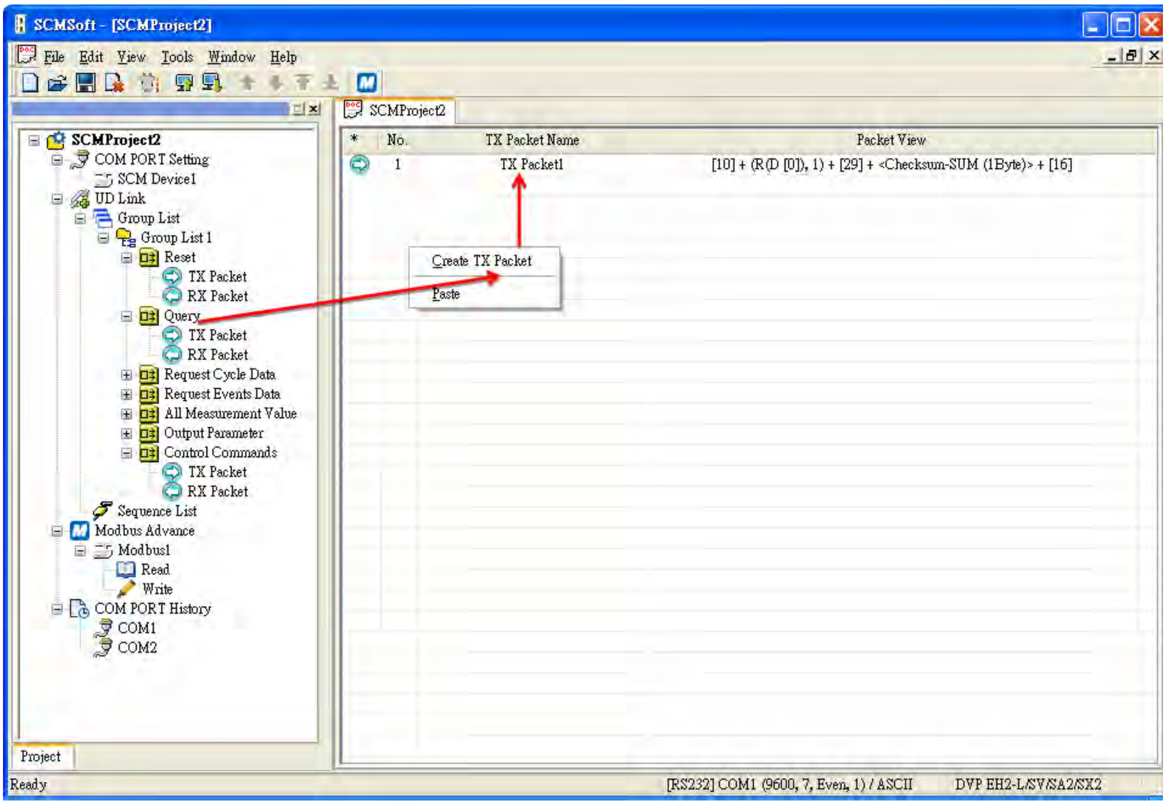
【Type 2】

Send the abbreviated record and respond with the abbreviated record. The setting of the sending is as that in type 1. You can copy the setting directly. Notice that the function code is 29h.

■ Copy the setting in Reset group.



- Paste the setting to TX Packet in Query group.

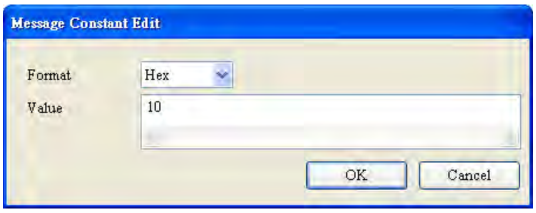


Respond with the abbreviated record.

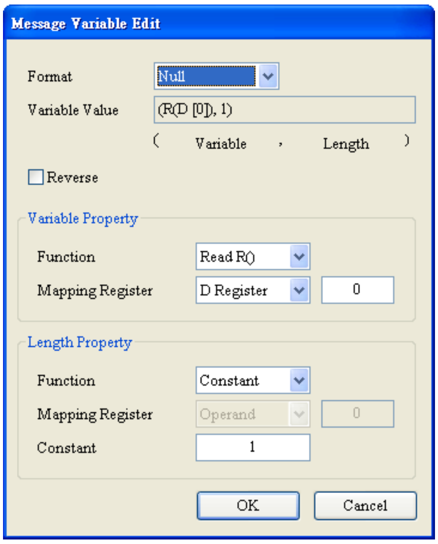
『Start word』+『Device address (IA)』+『Function code (FF)』+『Checksum (CS)』+『End marker』

→ 10h + D0 + 09h + (IA+FF) + 16h

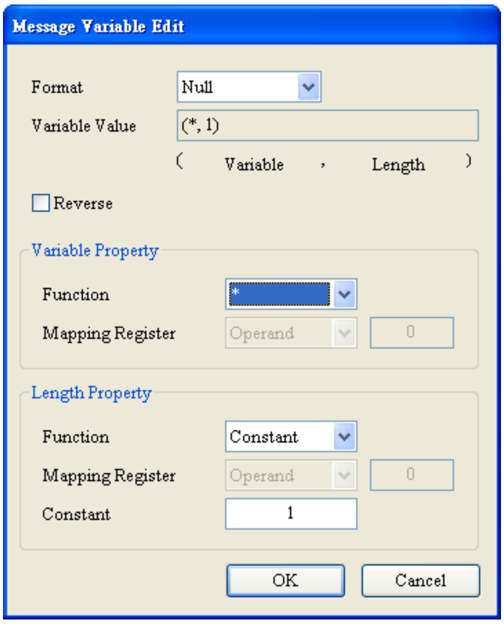
- Start word: 10h



- Check whether the response address and the device address previously read from D0 (IA) are the same.

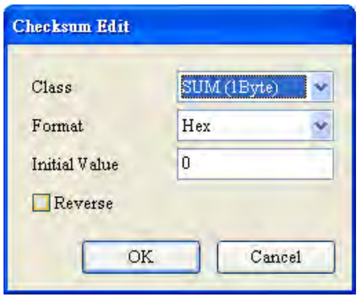


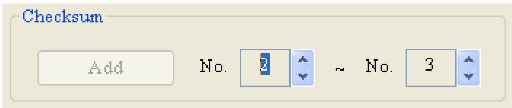
- Ignore the function code (FF) of the response: (*, 1): Ignore the word whose length is 1. If want to store the function code, refer to the setting of the device address (IA) to store the function code in the D register.



- Checksum

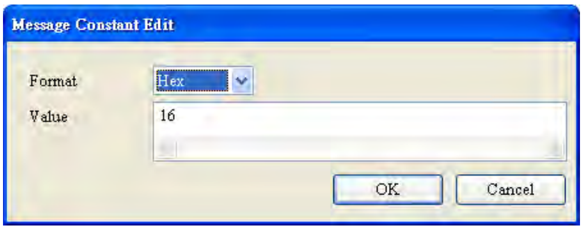
(1byte, adding the previous two items up):



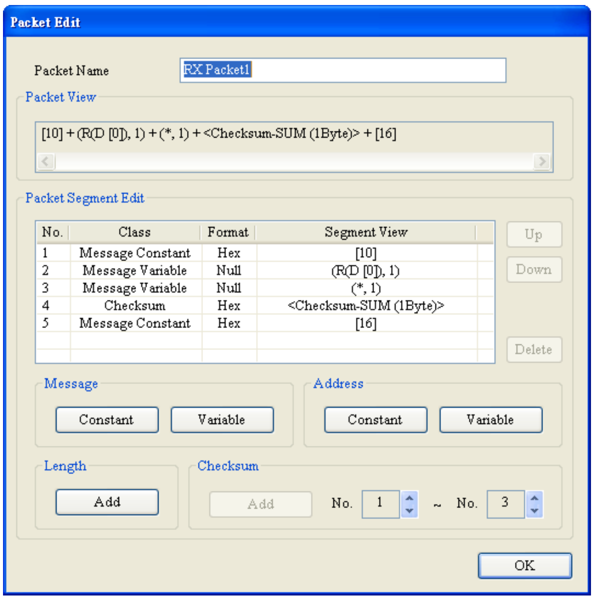


13

- End word: 16h

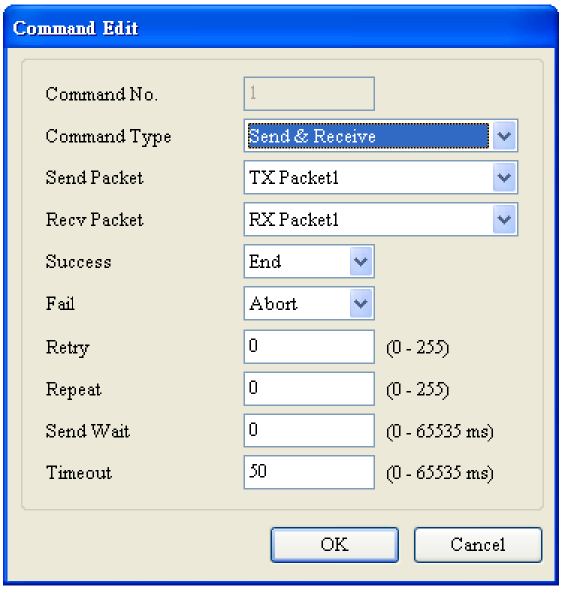


- The editing is complete:



13

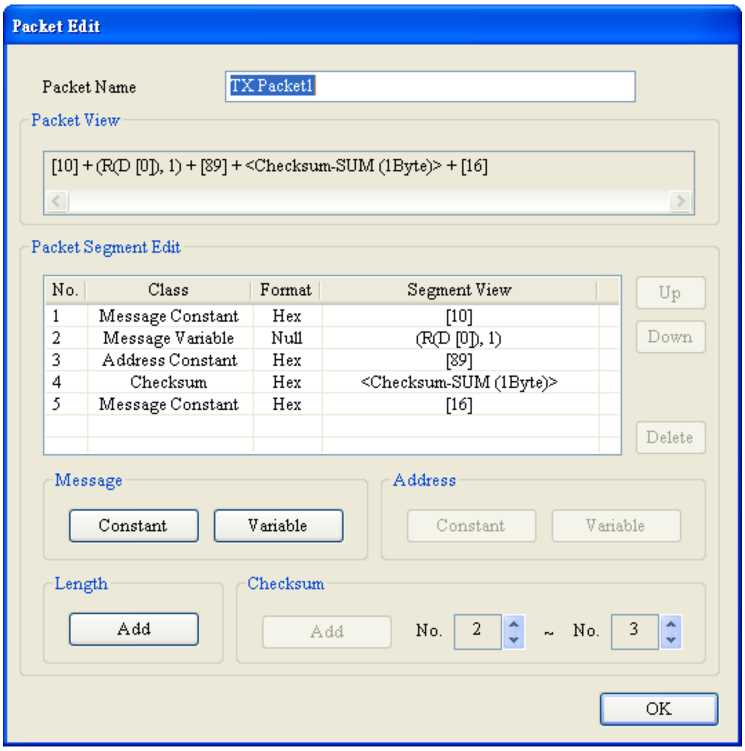
Edit the SCM command: Sending Tx Packet1 and receiving Rx Packet1.



【Type3】

Send the abbreviated record and respond with the full record.

For the sending of the abbreviated record, the user can copy or refer to those in type 1 and type 2. Notice that the function code (FF) is 89h.

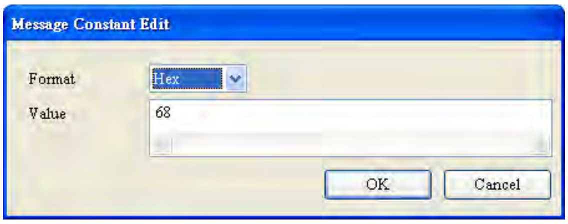


Respond with the full record.

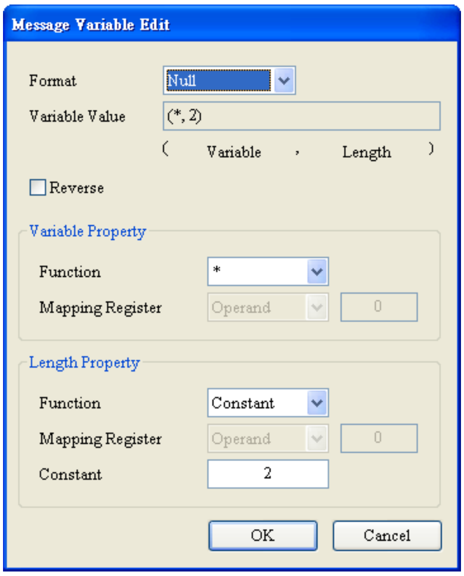
『Start word』+『Length』+『Length (repeat)』+『Start word』+『Device address (IA)』+『Function code (FF)』+『Parameter index (PI)』+『Data block (DB)』+『Checksum (CS)』+『End marker』

→ 68h + (Null) + (Null) + 68h + D0 + (Null) + D100

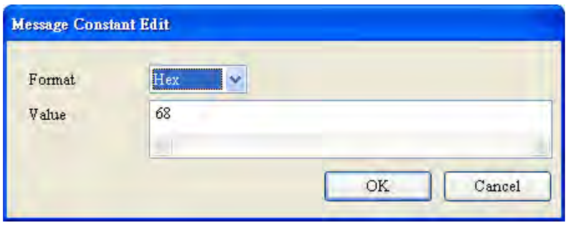
- Start word: 68h



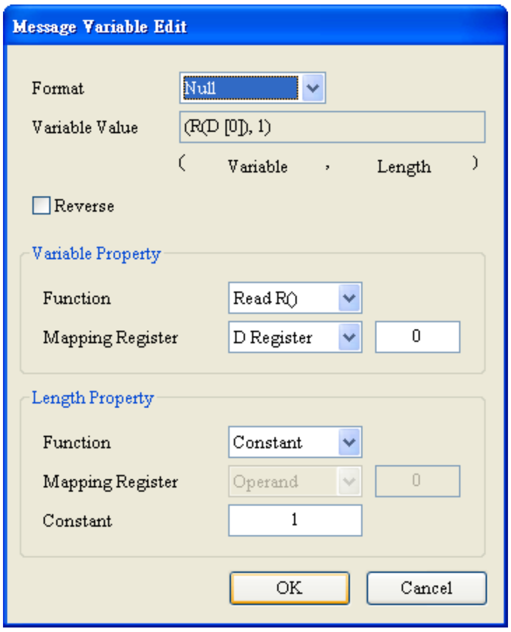
- Length + Length (repeat): Ignore these two words. They can be ignored or stored.



- Start word: 68h

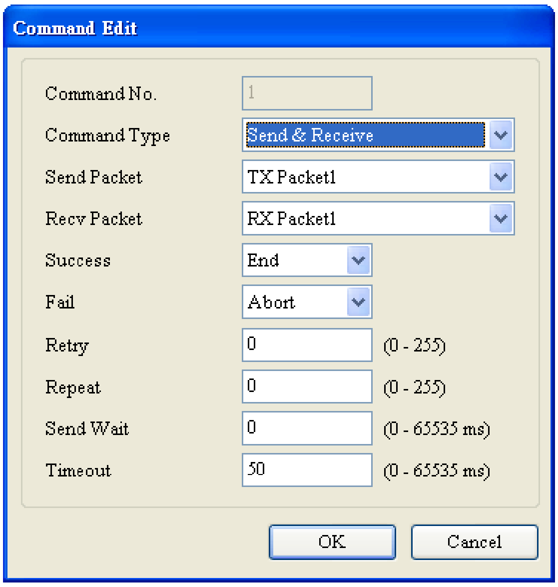


- Device address (IA): Check whether the response address and the device address previously read from D0 (IA) are the same.



Note: Some unimportant words can be ignored. You can just store the data which is needed in the registers (Dx), and the data whose length of the response code is unknown can be stored in the registers by means of this method.

Edit the SCM command: Sending Tx Packet1, and receiving Rx Packet1.



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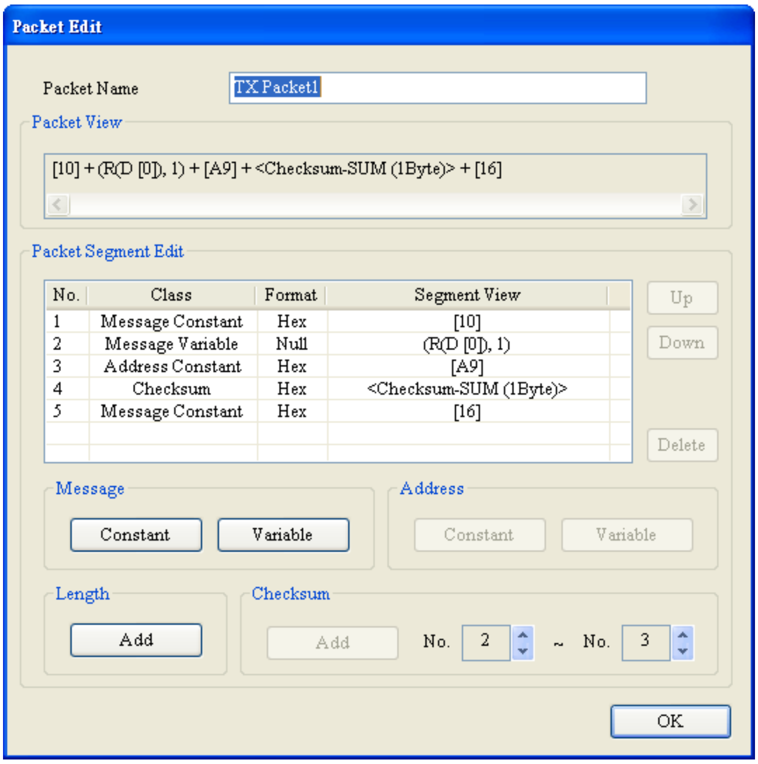
【Type4】

Send the abbreviated record and respond with the full record.

For the sending of the abbreviated record, the user can copy or refer to those in type 1 and type 2. Notice that the function code (FF) is A9h.

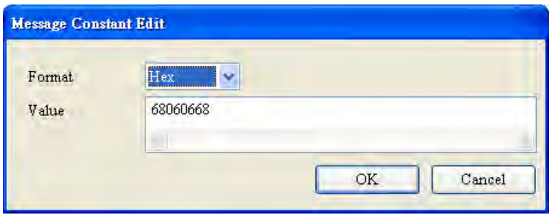


Respond with the full record.

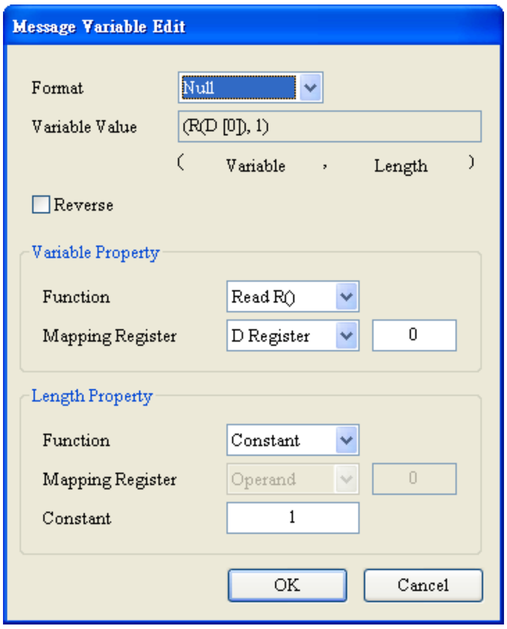
『Start word』+『Length』+『Length (repeat)』+『Start word』+『Device address (IA)』+『Function code (FF)』+『Parameter index (PI)』+『Data block (DB)』+『Checksum (CS)』+『End marker』

→ 68h + 06h + 06h + 68h + D0 + (1 word) + (3 words) + (the content gotten from adding from IA to the end) + 16h

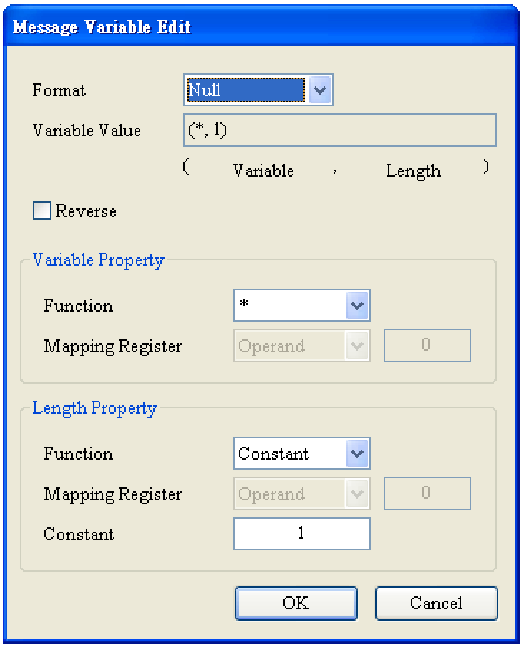
- Star word-Length-Length-Star word



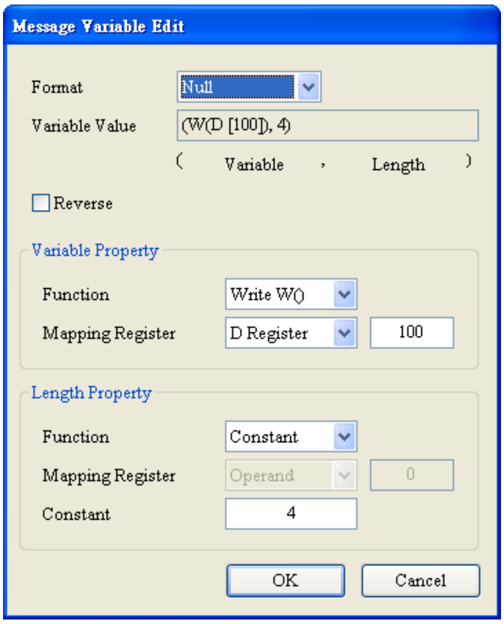
- Check whether the response address and the device address previously read from D0 (IA) are the same.



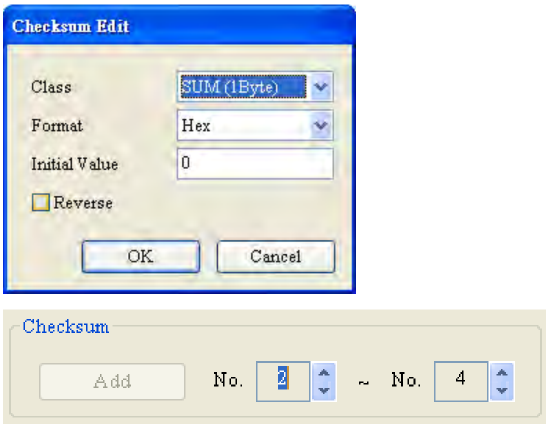
- FF：Ignore the function code.



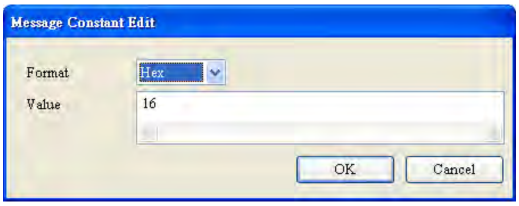
- Store PI+DB in D100.



- Checksum:



- End word:



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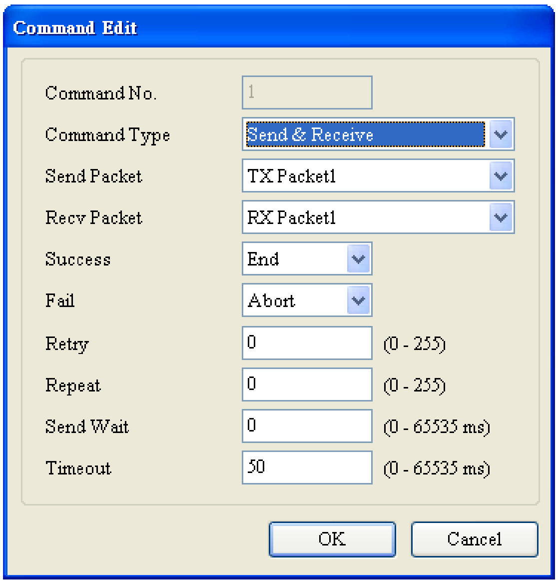
Edit the SCM command: Sending Tx Packet1, and receiving Rx Packet1



【Type 5】

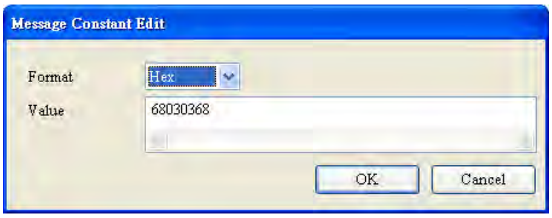
Send the Control record and respond with the full record.

When the control record is sent, the function code (FF) is 89h.

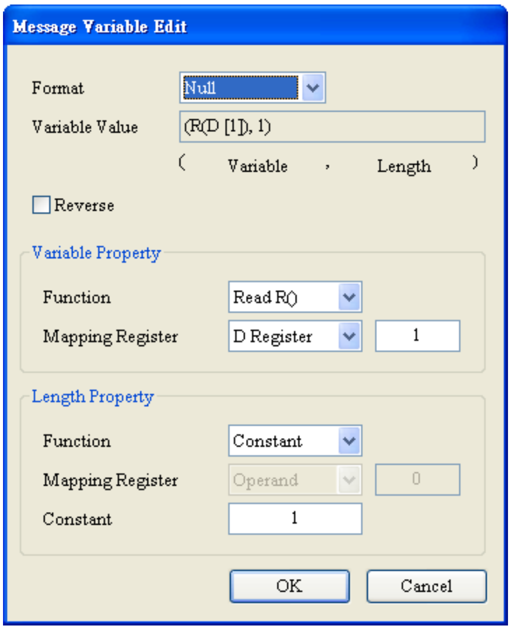
『Start word』+『Length』+『Length (repeat)』+『Start word』+『Device address (IA)』+『Function code (FF)』+『Parameter index (PI)』+『Checksum (CS)』+『End marker』

→ 68h + 03h + 03h + 68h + D0 + 89h + D1 + (the content gotten from adding from IA to the end) + 16h.

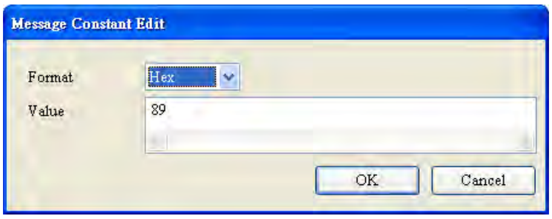
- Start word-Length-Length-Start word



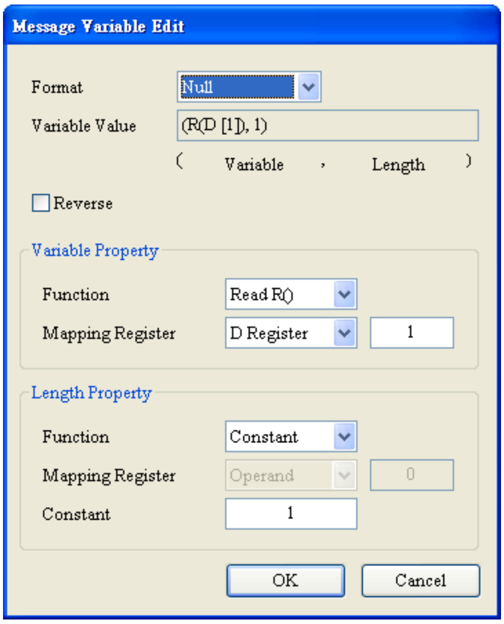
- The device address is read from D0.



- Function code: 89h



- The parameter index is read from D1.

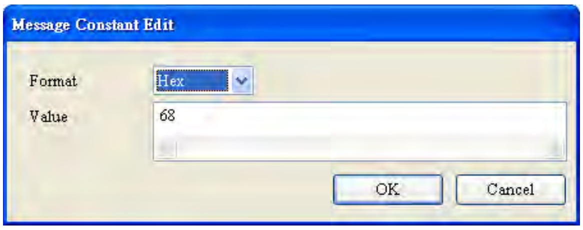


Respond with the full record.

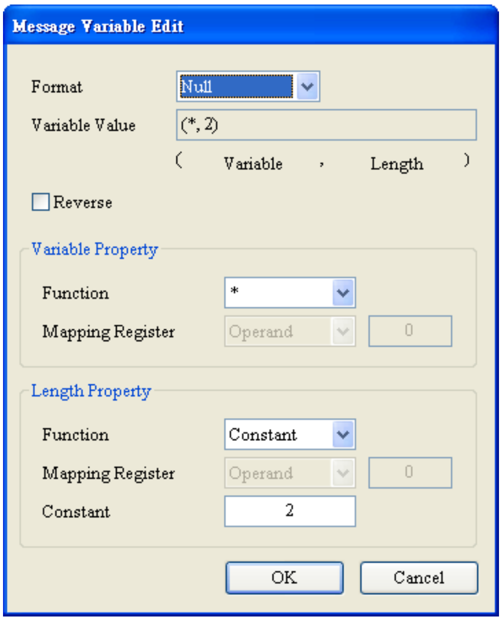
『Start word』+『Length』+『Length (repeat)』+『Start word』+『Device address (IA)』+『Function code (FF)』+『Parameter index (PI)』+『Data block (DB)』+『Checksum (CS)』+『End marker』

→ 68h + (Null) + (Null) + 68h + D0 + (Null) + D1 + D100 + (the content gotten from adding from IA to the end) + 16h

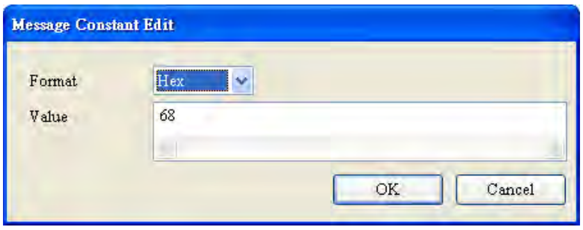
- Start word:



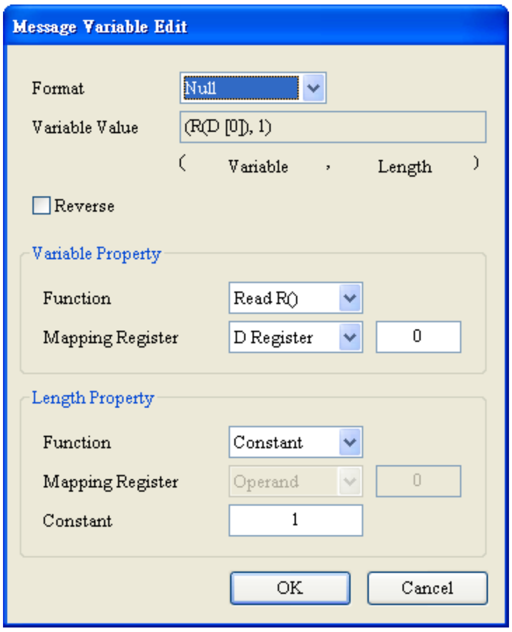
- Length-Length (two words): Ignore the two words.



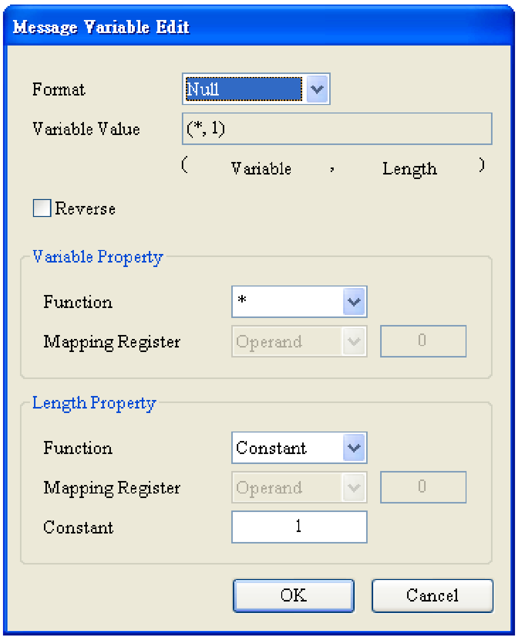
- Start word: 68h



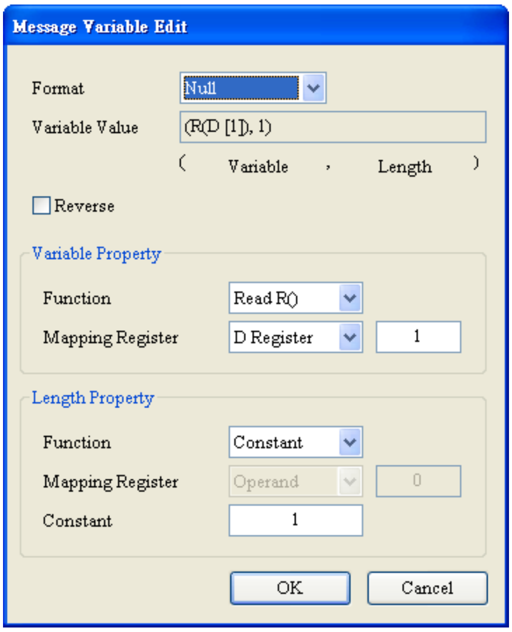
- Check whether the response address and the device address previously read from D0 (IA) are the same.



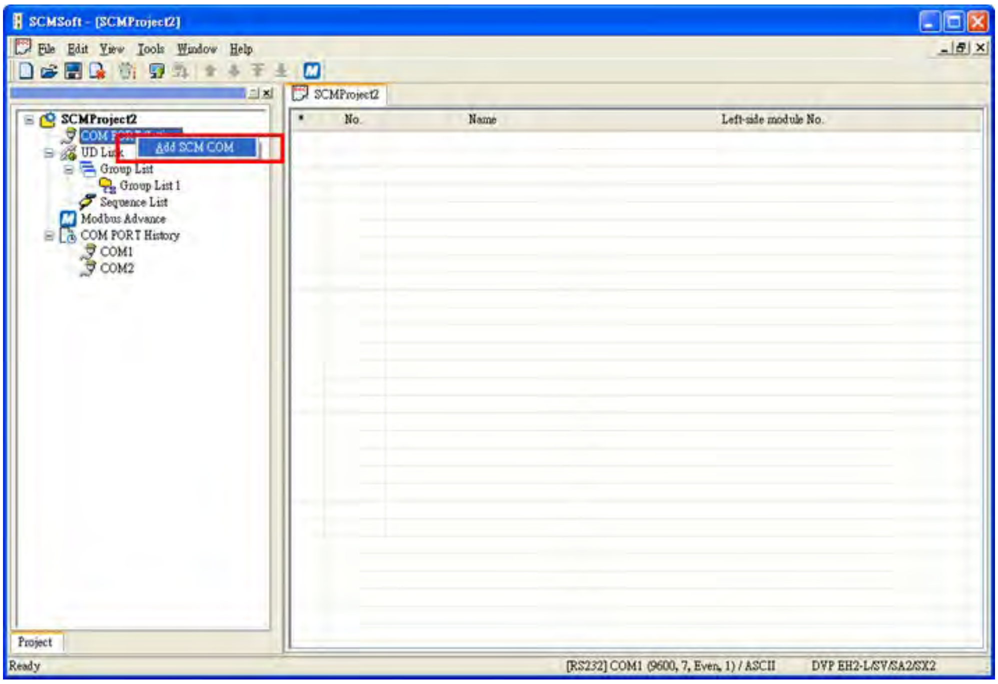
- Function code:

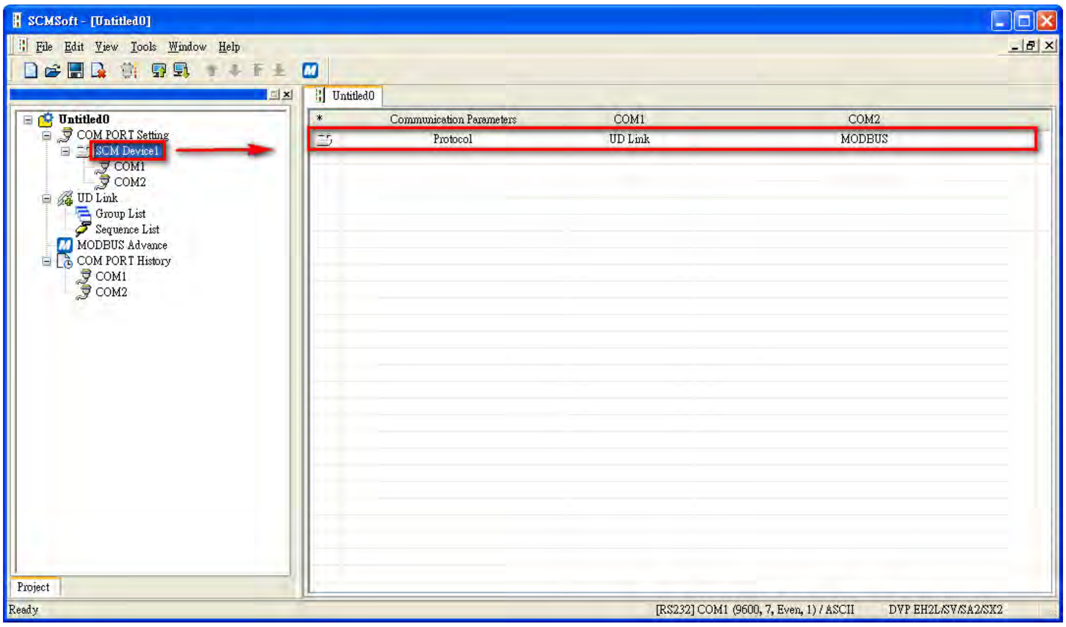


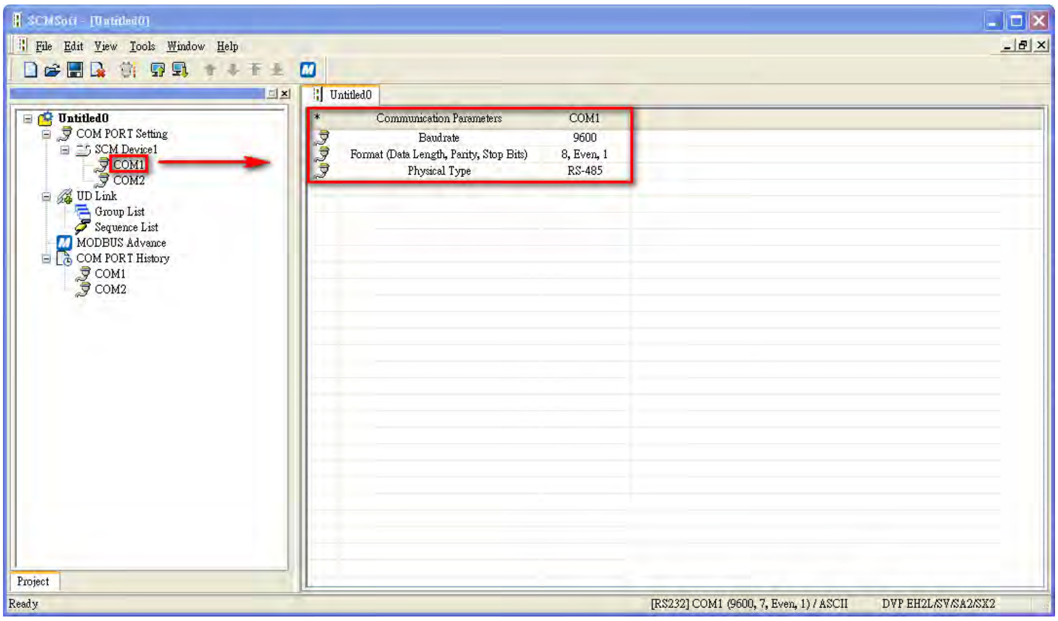
- Check whether the parameter index of the receiving and that of the sending are the same.



4. Download: After setting all types, download the UD Link to the SCM module. Open SCMSoft → 『New Project』 → COM PORT Setting: 『Add SCM COM』 → Set the communication parameters.







Set the communication parameters of COM1: Station address 247 (default), UD Link, 9600, 8, Even, 1.

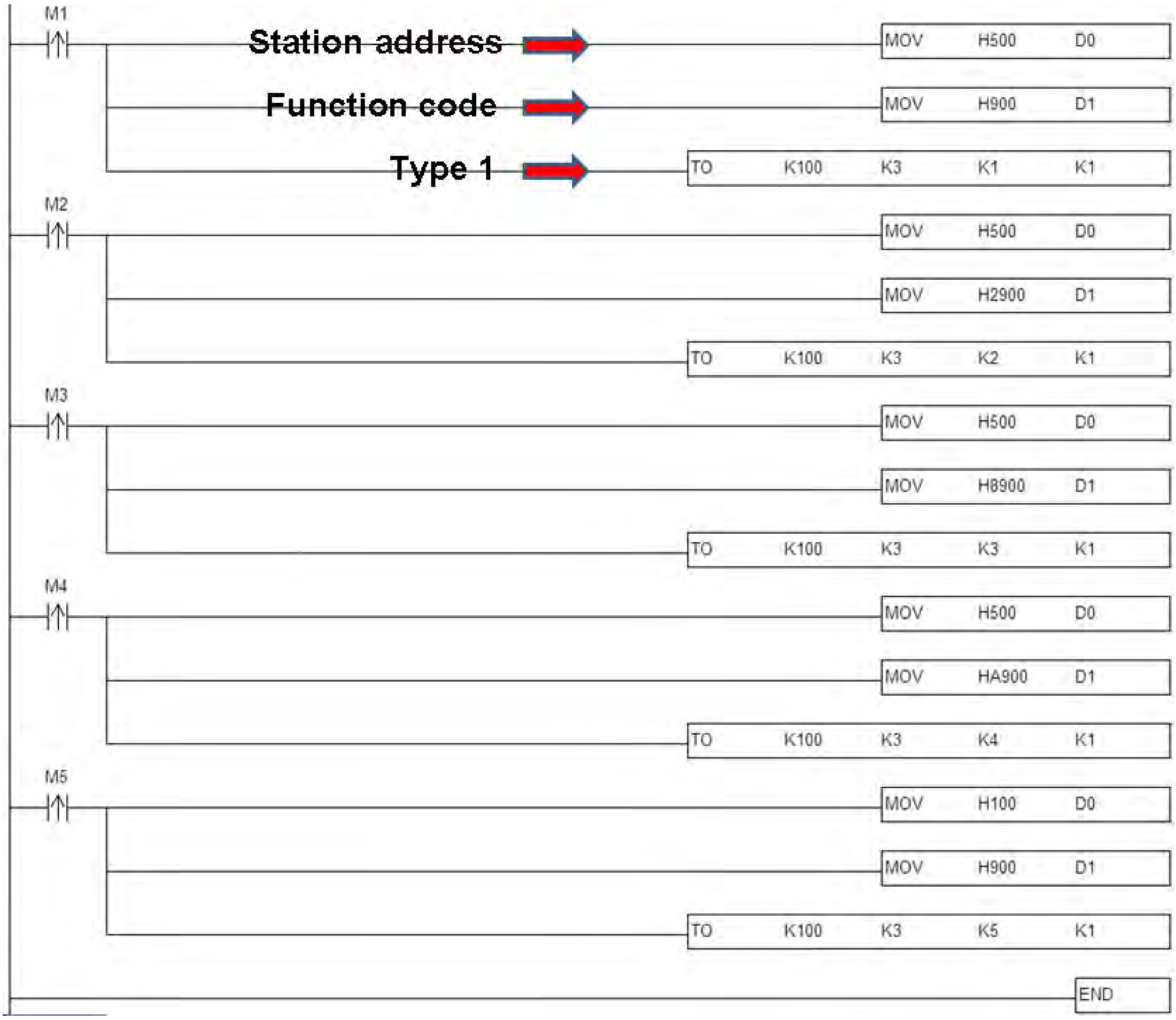
*	Communication Parameters	COM1
	Baudrate	9600
	Format (Data Length, Parity, Stop Bits)	8, Even, 1
	Physical Type	RS-485

5. WPLSoft triggers UD Link

The group number set in each type is triggered by “To instruction” in WPLSoft which triggers the execution of UD Link. K1 is written into CR3 if the group number is 1 and by analogy, K2 is written into CR3 if the group number is 2.

CR#	Attribute	Name of the register	Description
3	R/W	Group number triggered by COM1 UD Link	The Group number triggered by COM1 UD Link

The sending of type 1~5 is controlled by M1~M5. Each triggering includes writing the station address of the electricity meter and the function code into D0 and D1 respectively. When the data is written into the registers, the higher bit precedes the lower bit. For example, the user has to enter H’0555 when the station address is 5, and the same applies to the reading of the response address from D100.

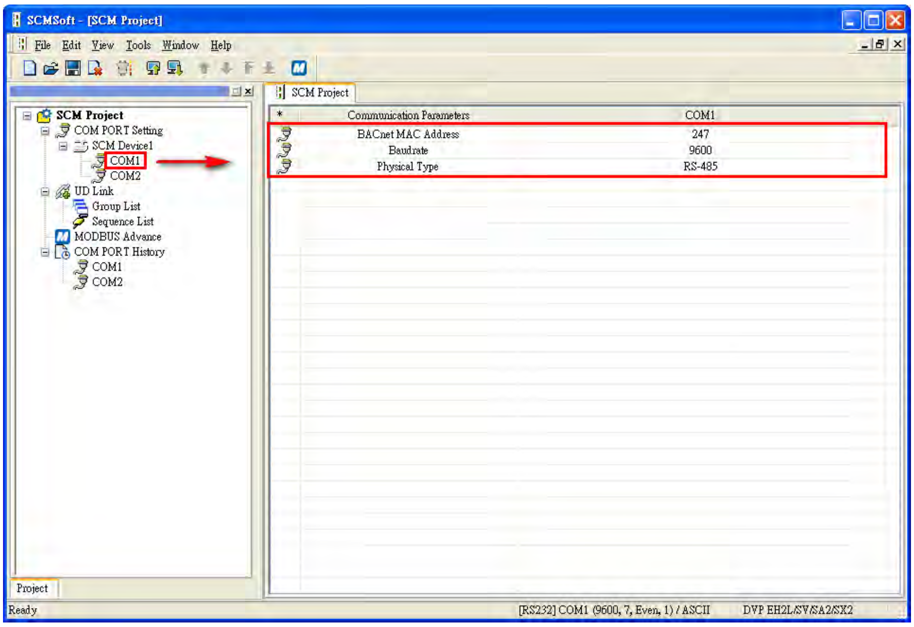


13.5.8.4 BACnet MS/TP Slave Function (Supported by DVPSCM52-SL)

Set the BACnet parameters and the BACnet object for the SCM module, and then download them to the SCM module to connect to the BACnet MS/TP module.

For firmware versions V1.08 and below, the host device needs to write to AV or BV before being able to read them. For versions V1.10 and above, the host device can directly read AV and BV values without the need for prior write operations.

【BACnet parameters】



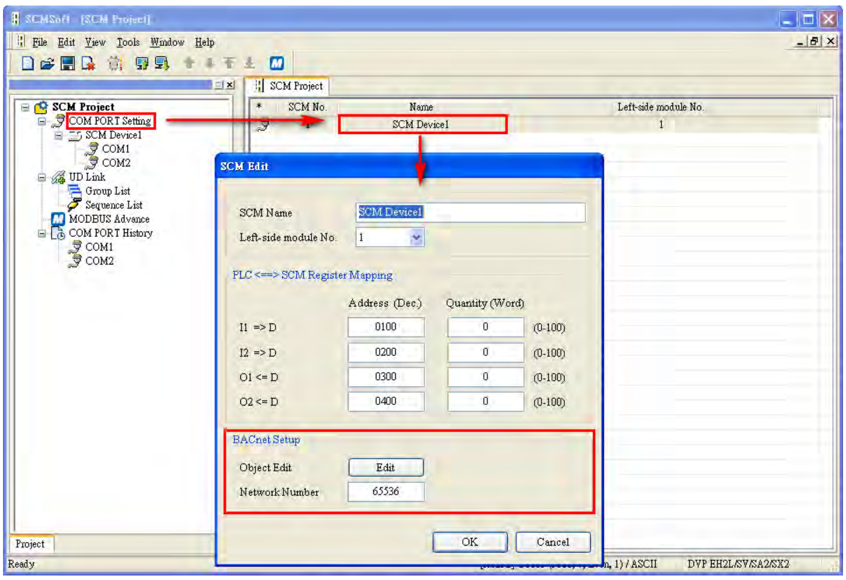
BACnet MAC address: 1~247 (Default: 247). It can NOT be the same as the address of other device on the BACnet network.

Baud rate: 1200 bps~460800 bps (Default: 9600). It MUST be the same as the setting for the BACnet MS/TP MPU.

Physical Type: options are RS-485 or RS-422.

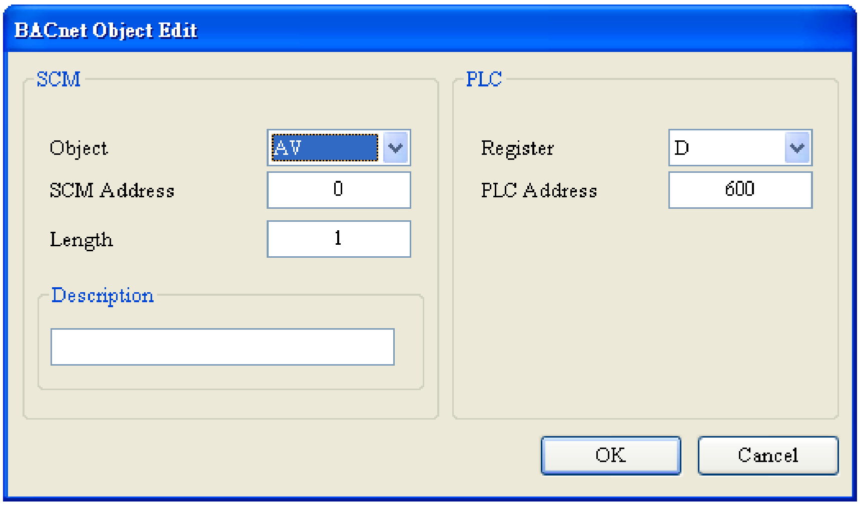
【BACnet object】

Network Number: The network number on the BACnet network is unique. It CAN'T be used repeatedly. (Default: 65536)



BACnet object edit: Editing the AV and BV values which correspond to the data registers and coils in the Delta PLC master connecting to the SCM module

The lenghth of tha AV value corresponds to two data registers in the Delta PLC, and the lenghth of the BV value corresponds to one coil in the Delta PLC.



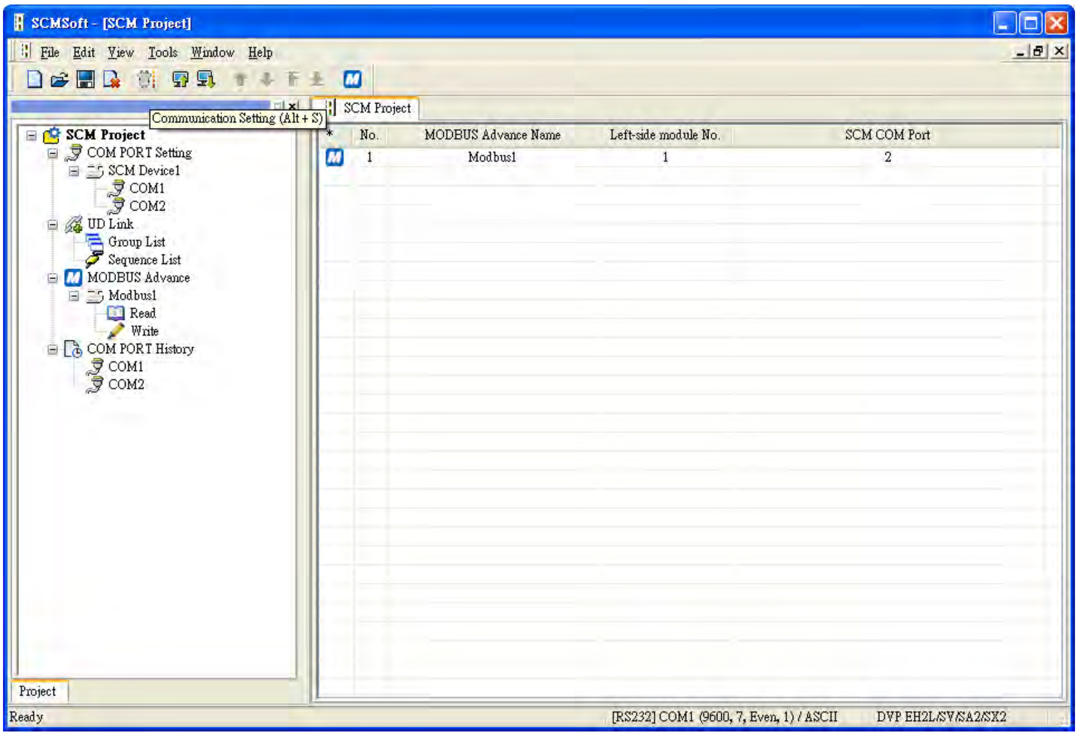
Object: The user can select “AV” or “BV”. “AV” corresponds to data the registers in the PLC, and “BV” corresponds the coil in the PLC.

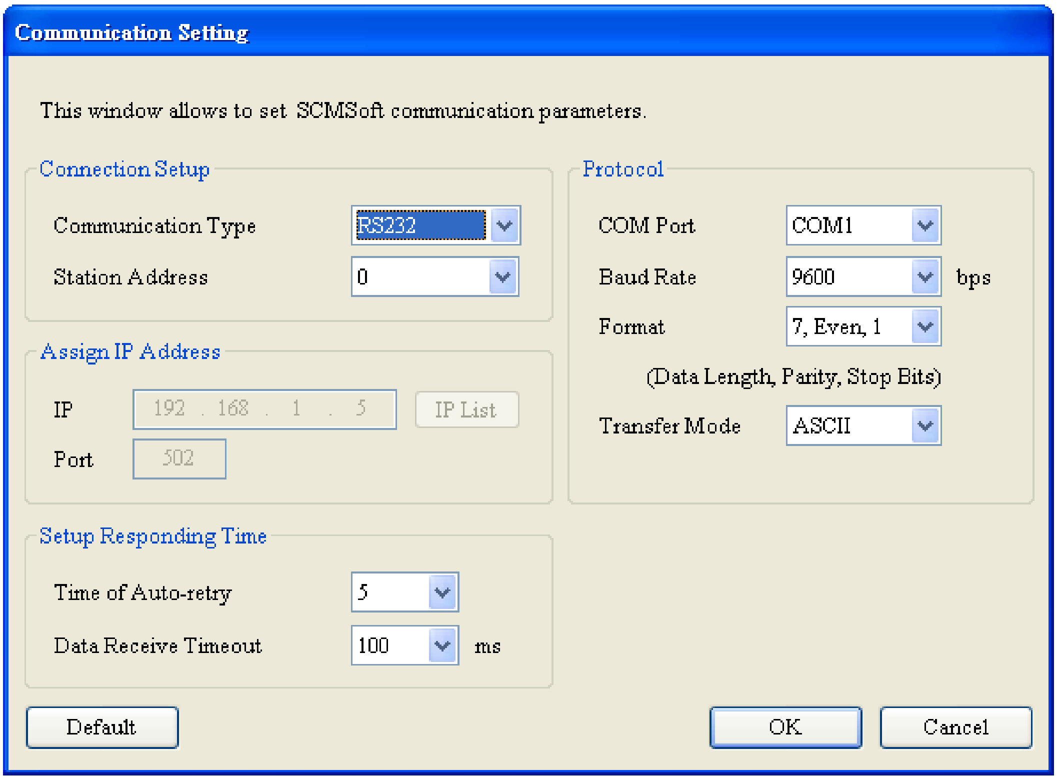
SCM address: The user can set the address of the AV, or the address of the BV. The setting range is 0~383.

Length: A unit is a double word.

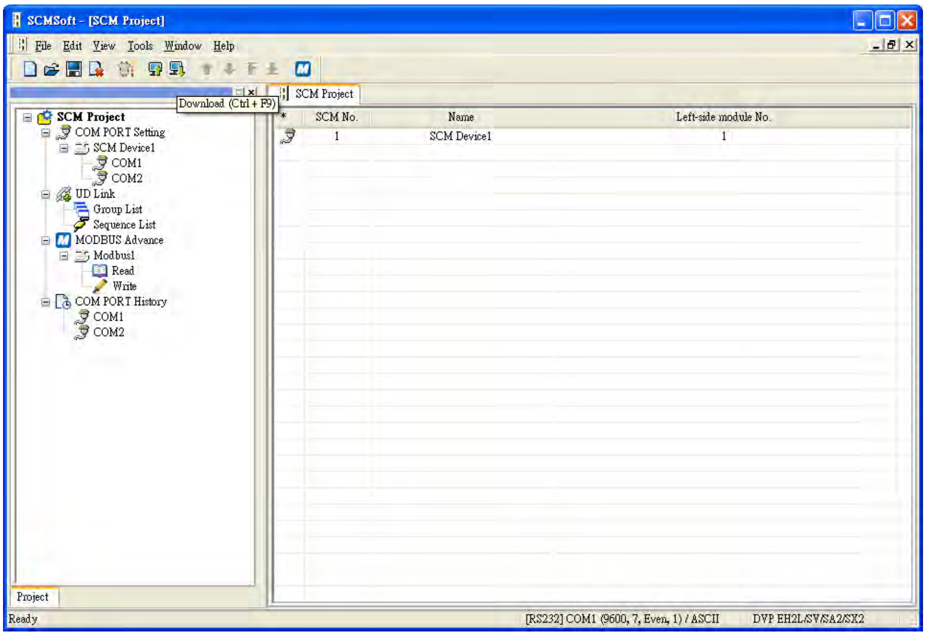
PLC: The start address in the Delta PLC.

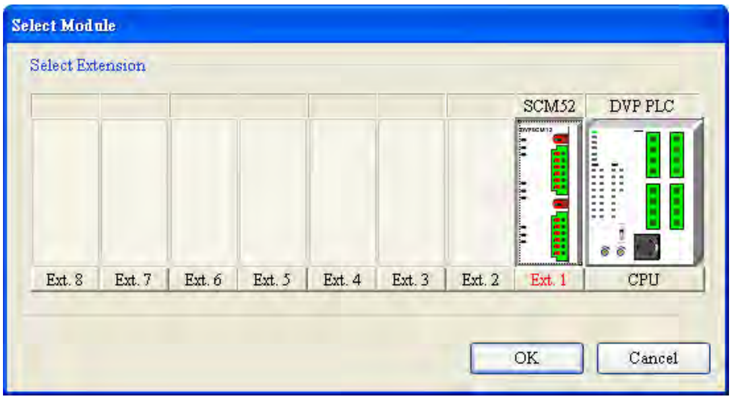
【Download】

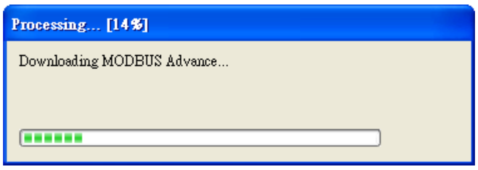


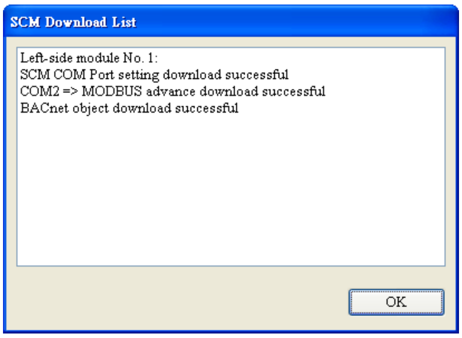


Click “Download”, choose the left-side module which will be downloaded, and click “OK”. If only one device is connected, click “OK” directly.









After the parameters are downloaded, the AV and BV values in the software correspond to the registers and bit in the PLC connected to the SCM module.

13.5.9 LED Indicator and Troubleshooting

13.5.9.1 LED Indicator

LED	Status		Indication	How to correct
POWER	Green light	On	Power supply is normal	--
		Off	No power supply	Check if the power is on
RUN	Green light	On	DVPSCM52-SL in RUN status	--
		Off	DVPSCM52-SL in STOP status	--
ERR	Red light	On	Hardware error	Contact factory
		Flashes	1. Errors in system settings or communication 2. Returning to Factory Setting	Reset to default values
		Off	No errors	--
TX1/TX2	Orange light	Flashes	RS-485/RS-422 in transmission	--
		Off	No RS-485/RS-422 transmission	--
RX1/RX2	Orange light	Flashes	RS-485/RS-422 in reception	--
		Off	No RS-485/RS-422 reception	--
RS-485/ RS-422	Green light	On	RS-485 mode	--
		Off	RS-422 mode	--

13.5.9.2 Troubleshooting

Abnormality	Cause	Solution
POWER LED OFF	PLC MPU not powered	Check the power supply for the PLC MPU
	DVPSCM52-SL not connected with the PLC MPU	Check if DVPSCM52-SL is tightly connected with the PLC MPU
As MODBUS master, no response from the slave	Wiring error	Ensure the use of shielded twisted pair RS-485 communication cables and correct connections.
	Slave communication function error	Please check the TX indicator; if it is flashing normally, confirm whether the communication functionality of the slave device is normal.
	The MODBUS advanced settings were not downloaded, or there is an error in the CR configuration.	Please check the TX indicator; if it is not flashing, re-download the advanced parameters for MODBUS and ensure that CR triggers data exchange correctly.
As MODBUS slave, no response to the master	Wiring error	Ensure the use of shielded twisted pair RS-485 communication cables and correct connections
	Parameters setting error	Please check the RX indicator; if it is flashing normally, confirm whether the historical data and communication format are correct.
UD Linkcommunication error	Wiring error	Ensure the use of shielded twisted pair RS-485 communication cables and correct connections
	The received packet length is set incorrectly	Verify that the length setting for receiving packet variable messages is correct. If there are no specific requirements, it is recommended to set the length attribute function to ' * ' to allow the device to determine it autonomously.
	The variable attributes for receiving packets are set incorrectly.	Confirm that the functionality setting for the variable attributes of receiving packets is 'Write W()', so that the device will write the received variable messages into the registers.

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Chapter 14 DVP-S Series Left-Side Position Module

Table of Contents

14.1 DVP02PU-SL Specification

- **Electrical specification**

Module name	DVP02PU-SL
Number of inputs	High-speed input points: 3; normal input points 5; high-speed output: 4 (2-axis)
Supply voltage	24VDC(1.5W) from PLC CPU
Connector type	Removable terminal block (distance to the terminal is 3.5 mm)
Connect to DVP PLC CPU	Connect to the left side of CPU, numbered from 100 to 107 according to the position of module from the closest to farthest to CPU.
Weight	105g

- **Functional specifications – Input Points**

Item \ Model		High-speed Input	Normal Input
Number of inputs		3（A+/A-，B+/B-，Z+/Z-）	5（X0~X4）
Connector type		Removable terminal blocks	
Input form		Differential input	Direct current (sinking or sourcing)
Input current		5~24VDC，5~15mA	24VDC，5mA
Action level	OFF→ON	>3VDC	>15VDC
	ON→OFF	<1.5VDC	<5VDC
Response time		<1.5us	<0.1ms
Maximum input frequency		200kHz（A+/A-，B+/B-） 20kHz（Z+/Z-）	1kHz
Input impedance		4.7kΩ	
Input isolation		500VAC	
Input display		When the optocoupler is driven, the input LED indicator is ON.	

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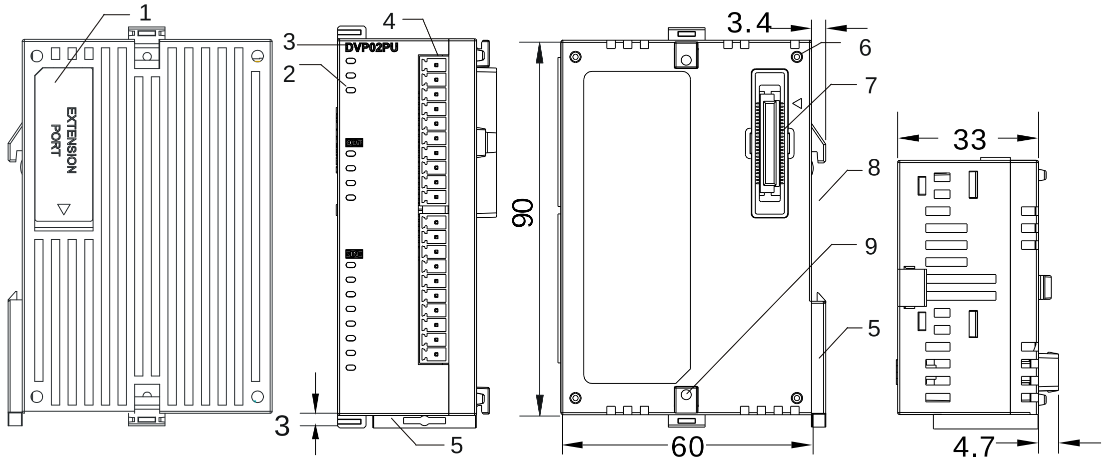
- **Functional specifications – Output Points**

Item \ Model		High-speed Output
Number of outputs		Four (2-axis)
Connector type		Removable terminal blocks
Output form		differential output
Output voltage		5VDC *1
Leakage current		< 10uA
Minimum load		1mA / 5VDC
Maximum load	**Resistance**	20mA
	Inductance	N/A
	Bulb	N/A
Maximum output frequency		200kHz
Maximum Response time	**OFF→ON**	0.15us
	ON→OFF	0.15us
Output isolation		500VAC

Note*1: Actual output 4VDC（No load）~2.66VDC（20mA）

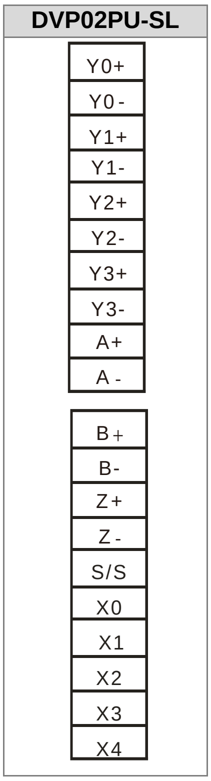
14.2 Module Profiles and Dimensions



Unit: mm

No.	Name	Description
1	Extension module connection port	Connect the modules.
2	POWER LED indicator	Indicates the status of the power supply ON: the power is on OFF: no power
	Error LED indicator (Red)	Error status of the module OFF: the module is normal. Blinking (0.2 seconds ON/OFF): hardware error occurs in the module, can NOT operate normally
	Run LED indicator	Operating status of the module
	Input LED indicator	ON: Receives an input signal OFF: Receives no input signal
3	Model serial	Model serial
4	Terminals	The inputs are connected to sensors. The outputs are connected to loads to be driven.
5	DIN rail clip	Secure the module on the set
6	Mounting hole	For positioning between modules
7	Extension module connection port	Connect the PLC or the modules
8	DIN rail slot (35mm)	For the DIN rail
9	Extension unit fixing clip	For securing the extension module

14.3 Terminals



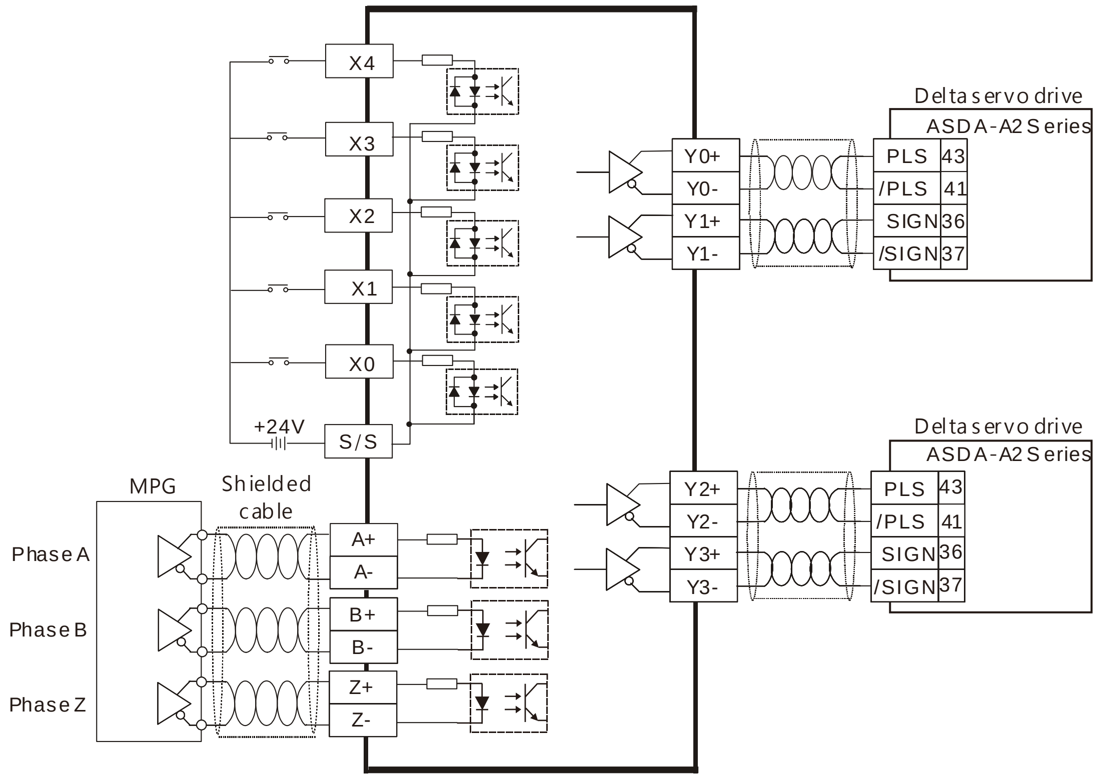
14.3.1 Installation Precautions

- The power supply device shall be compliance with UL 62368-1/UL60950 LPS (Limited Power Source), or UL61010-1 / UL61010-2-201 LE (Limited Energy).
- Le dispositif d'alimentation doit être conforme à la norme UL 62368-1/UL60950 LPS (Source d'alimentation limitée) ou UL61010-1 / UL61010-2-201 LE (Énergie limitée).
- Please be sure to use certified power supply with SELV output or certified power supply providing double insulation evaluated by UL60950, or UL61010-1 and UL61010-2-201 standards.
- Veuillez-vous assurer d'utiliser une alimentation électrique certifiée avec une sortie SELV (Safety Extra Low Voltage) ou une alimentation certifiée fournissant une double isolation évaluée selon les normes UL60950, ou UL61010-1 et UL61010-2-201.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Si l'équipement est utilisé d'une manière non spécifiée par le fabricant, la protection fournie par l'équipement pourrait être compromise.
- The installation that the safety of any system incorporating the equipment is the responsibility of the assembler of the system.
- L'installateur du système est responsable de la sécurité de tout système intégrant l'équipement.
- Clean by dry cloth only.
- Nettoyer uniquement avec un chiffon sec.

14.4 Control Register

Since this module does NOT use control registers to read/write data, you need to use API to perform data reading and writing. You can use API to execute DVP positioning module features, including setting output control parameters of PU module (API1402 PUCONF), reading PU module output state (API1403 PUSTAT), PU module output pulse without acceleration (API1404 DPUPLS), Relative position output of PU module with acceleration and deceleration (API1405 DPUDRI), Absolute addressing output of PU module with acceleration and deceleration (API1406 DPUDRA), PU module homing (API 1407 DPUZRN), PU module jog output (API1408 DPUJOG), PU module MPG output (API1409 DPUMPG), and High-speed counter function of PU module (API1410 DPUCNT). Refer to API14 Module Instruction form DVP-ES3/EX3/SV3/SX3 Programming Manual for more information on operation.

14.5 Wiring



Note:

Refer to Chapter 6 Applied Instruction (Module Instructions API14xx) from DVP-ES3/EX3/SV3/SX3 Series Programming Manual and Delta Servo Drive Manual for more details on output modes.

14.6 Troubleshooting

When an error occurs in PU modules, you can check the state code to identify the causes, error indicator will not display. Please refer to special extension module exchange function (SM228, you can find more detailed information in section 2.2.16 ‘Additional Remarks on SM/SR’ in the DVP-ES3/EX3/SV3/SX3 Series Programming Manual).

For detailed operation and application examples regarding the API instructions, please refter to ‘API14 Module Instructions’ in DVP-ES3/EX3/SV3/SX3 Series Programming Manual.

- **Error indicator and troubleshooting description**

RUN LED	ERROR LED	Description	Solution
OFF	ON	The power supply from PLC CPU to the module is abnormal.	1. Check if the power supply of PLC CPU is normal. 2. Check if the connection between PLC CPU and the module is well-connected. If the above points are ture, change your module.
OFF	Blinking every 0.2 seconds	The previous firmware update is abnormal.	The previous firmware update was failed. Contact your local authorized distributors for another firmware update for the module.
No change	The light is lit for 0.5 seconds and then unlit for 3 seconds.	The postivie limit is reached.	1. Check if the positive and negative is set. 2. Check if the software/hardware positive limit is reached? Leave the positive limit and go towards the negative direction.
No change	The light is blinking every 0.5 seconds for two times and unlit for 3 seconds.	The negative limit is reached.	1. Check if the positive and negative is set. 2. Check if the software/hardware negative limit is reached? Leave the negative limit and go towards the positive direction.
No change	The light is blinking every 0.5 seconds for three times and unlit for 3 seconds.	Current position value overflow	Incorrect position setting may lead to incorrect movement. You can use PUSTAT instruction to clear the current position.

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