



DVPDNET-SL

DeviceNet Network Scanner

Operation Manual



<http://www.delta.com.tw/industrialautomation>

DVP-0204520-03

2012-3-27



Warning

- ✓ Please read this instruction carefully before use and follow this instruction to operate the device in order to prevent damages on the device or injuries to staff.
- ✓ Switch off the power before wiring.
- ✓ DVPDNET-SL is an OPEN TYPE device. Therefore it should be installed in an enclosure free of airborne dust, humidity, electric shock and vibration. The enclosure should prevent non-maintenance staff from operating the device (e.g. key or specific tools are required for operating the enclosure) in case danger and damage on the device may occur.
- ✓ DVPDNET-SL is to be used for controlling the operating machine and equipment. In order not to damage it, only qualified professional staff familiar with the structure and operation of DVPDNET-SL can install, operate, wire and maintain it.
- ✓ DO NOT connect AC power supply to any of the I/O terminals; otherwise serious damage may occur. Check all the wirings again before switching on the power and DO NOT touch any terminal when the power is switched on. Make sure the ground terminal ⊕ is correctly grounded in order to prevent electromagnetic interference.



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1 Introduction

- 1) Thank you for choosing Delta DVPDNET-SL. To ensure correct installation and operation of DVPDNET-SL, please read this chapter carefully before using your DVPDNET-SL.
- 2) DVPDNET-SL running on the left side of PLC can serve as the DeviceNet master or slave with PLC MPU together. It can be configured through DeviceNet software.

1.1 Features

- Serves as DeviceNet master by connecting to PLC MPU and Supports standard DeviceNet protocol.
- DeviceNet Builder provides convenient graphic configuration interface; automatically scans and recognizes all slaves in the bus.
- Supports DeviceNet Master mode and Slave mode.
- Supports eight types of baud rates: 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800kbps, 1M kbps

1.2 Basic Functions of DVPDNET-SL

- DVPDNET-SL DeviceNet Network Scanner can be used both as a master or a slave in DeviceNet. When being used as a master, it supports the following functions:
 - Automatically carrying out the data exchange with PLC MPU. User needs only to operate the special register in PLC to realize the monitoring of all slaves.
 - Supports client function of explicit message.
 - Supports slave to establish all kinds of I/O connections: polled, bit-strobed, change of state and cyclic.
 - As the connection medium between DeviceNet Builder configuration software and DeviceNet network. The configuration software is able to directly configure the network through DVPDNET-SL.
 - Sending explicit messages for reading/writing the data in slave through PLC ladder diagrams.
 - Max length for output data and input data are both 380 bytes.
- When being used as a slave, it supports the following functions:
 - Explicit message serve and Group 2 only serve connection mode.
 - Polling
 - Offering 256 bytes for input data and 256 bytes for output data in data exchange with master.
 - Automatically exchanging data with PLC MPU. The user needs only to edit the D register in the PLC without using FROM/TO instruction.
 - Max length for output data and input data are both 255 bytes.

1.3 Specifications

■ PLC that DVPDNET-SL supports

Item	Specification
PLC Model	DVPDNET-SL supports PLC MPU which can be extendable in its left side g. DVP-SV, DVP-EH2_L, DVP-SX2, DVP-SA2, DVP10MC11T etc.)

■ DeviceNet Interface

Item	Specification
Transmission method	CAN
Electrical isolation	500V DC
Interface	Removable connector (5.08mm)
Transmission cable	TAP-CB01 cable and TAP-CB02 cable are recommended. (The shielded wire must be grounded and the cable should be away from power line)
Voltage	DeviceNet network provides direct current: 11~25V, 28mA (typical value) , 125mA impulse current (24 VDC)

■ DeviceNet Communication

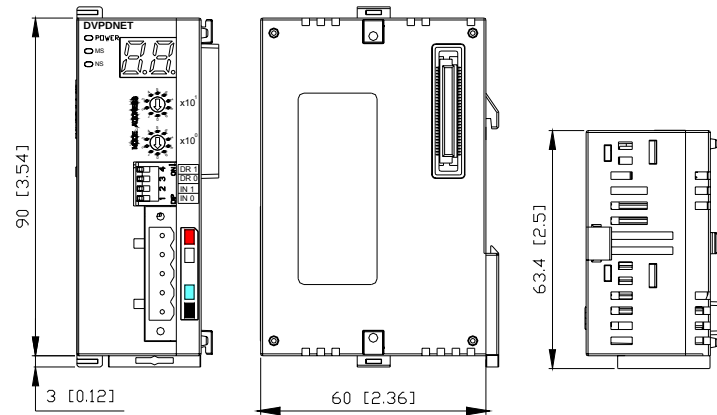
Item	Specification
Message type	Explicit connection, IO polled connection, bit-strobe connection, COS/CC connection
Baud rate	Standard mode: 125 kbps; 250 kbps; 500 kbps Extended mode: 10 kbps; 20 kbps; 50 kbps; 125 kbps; 250 kbps; 500 kbps; 800kbps; 1M kbps

■ Environment

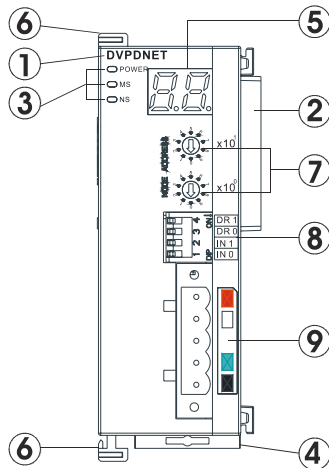
Item	Specification
Noise immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8KV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2KV, Digital I/O: 1KV Analog & Communication I/O: 1KV Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV RS (IEC 61131-2, IEC 61000-4-3): 26MHz ~ 1GHz, 10V/m
Operation	0°C ~ 55°C (temperature); 50 ~ 95% (humidity); pollution degree 2
Storage	-25°C ~ 70°C (temperature); 5 ~ 95% (humidity)
Vibration/shock resistance	Standard: IEC 61131-2、IEC 68-2-6 (TEST Fc)/IEC 61131-2 & IEC 68-2-27 (TEST Ea)
Certificates	IEC 61131-2, UL508

2 Product Profile & Outline

2.1 Dimension



2.2 Product Profiles

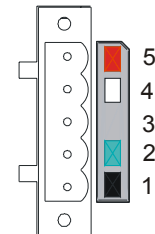


1. Model name
2. Extension port
3. Power, MS, NS LED
4. DIN rail clip
5. Digital indicator
6. Extension clip
7. Address switch
8. Function switch
9. DeviceNet connection port

2.3 DeviceNet Connection Port

The connector is used on the connection to DeviceNet. Wire by using the connector enclosed with DVPDNET-SL.

PIN	Signal	Color	Content
1	V-	Black	0V DC
2	CAN_L	Blue	Signal-
3	SHIELD	-	Shielded
4	CAN_H	White	Signal+
5	V+	Red	24V DC

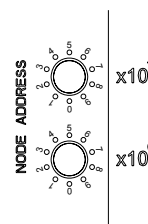


Note: Either end of the communication cable should be connected with the terminal resistor of 121Ω and the resistors should be connected between “Signal+” and “Signal-”.

2.4 Address Switch

The switch is used on setting up the node address of DVPDNET-SL on DeviceNet. Range: 00 ~ 63 (64 ~ 99 are forbidden).

Switch setting	Content
0 ... 63	Valid DeviceNet node address
64...99	Invalid DeviceNet node address



Example: If you need to set the node address of DVPDNET-SL to 26, simply switch the corresponding switch of $x10^1$ to 2 and the corresponding switch of $x10^0$ to 6.

Note:

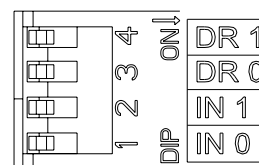
- Please set up the node address when the power is switched off. After the setup is completed, re-power DVPDNET-SL.
- When DVPDNET-SL is operating, changing the setting of node address will be invalid.
- Use slotted screwdriver to rotate the switch carefully in case you scratch the switch.

2.5 Function Switch

The function switches are for:

- Setting up the work mode (IN0)
- Setting up the baud rate of DeviceNet (DR0 ~ DR1)

DR1	DR0	Baud rate
OFF	OFF	125kbps
OFF	ON	250kbps
ON	OFF	500kbps
ON	ON	Entering the mode of extended baud rate (see Chapter 9)
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	

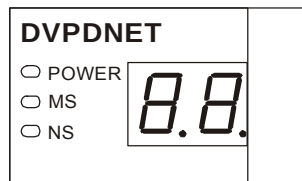


Note:

- Please set up the function switch when the power is switched off. After the setup is completed, re-power DVPDNET-SL.
- When DVPDNET-SL is operating, changing the setting of the function switch will be invalid.
- Use slotted screwdriver to adjust the DIP switch carefully in case you scratch the switch.

2.6 Digital Indicator

The digital indicator provides the following two functions:



- 1) Displaying the node address and error messages of DVPDNET-SL .
- 2) Displaying the error message of slave.

Note:

- When the module works normally, the digital display will show its own node ID.
- When "E1" and "03" are on display continuously, it indicates that the error that "E1" refers to occurs in the slave of node 03.
- When the error codes such as "E7" and "E1" are on display, please refer to section 11.2 for the correction.

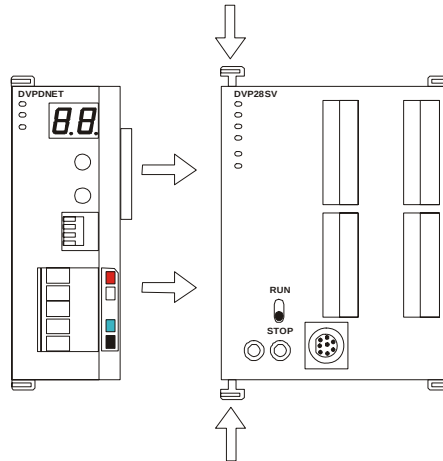
2.7 Extension Port

The extension port is mainly used on connecting DVPDNET-SL to the left-side extension port on DVP-SV PLC MPU.

3 Installation

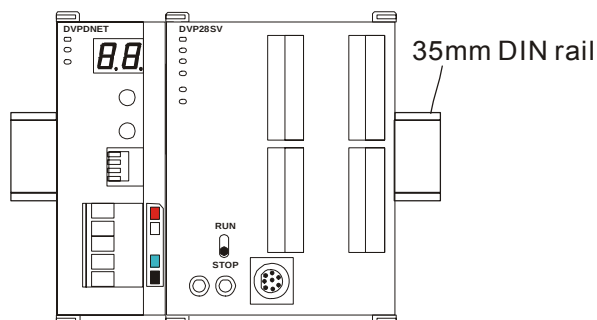
3.1 Connecting DVPDNET-SL to DVP-SV MPU

- Adjust the extension clip on the left side of DVP-SV.
- Meet the extension port of the MPU with DVPDNET-SL as shown in the figure below.
- Fasten the extension clip.



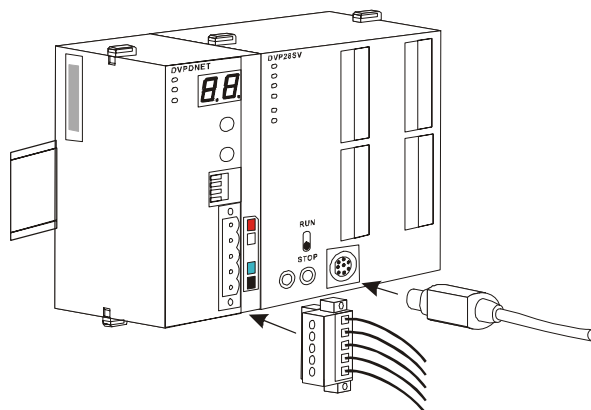
3.2 Installing DVPDNET-SL and DVP-SV MPU on DIN Rail

- Use 35mm DIN rail.
- Open the DIN rail clip on DVP-SV and DVPDNET-SL. Insert DVP-SV and DVPDNET-SL onto the DIN rail.
- Clip up the DIN rail clips on DVP-SV and DVPDNET-SL to fix DVP-SV and DVPDNET-SL on the DIN rail, as shown below.



3.3 Connecting 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.



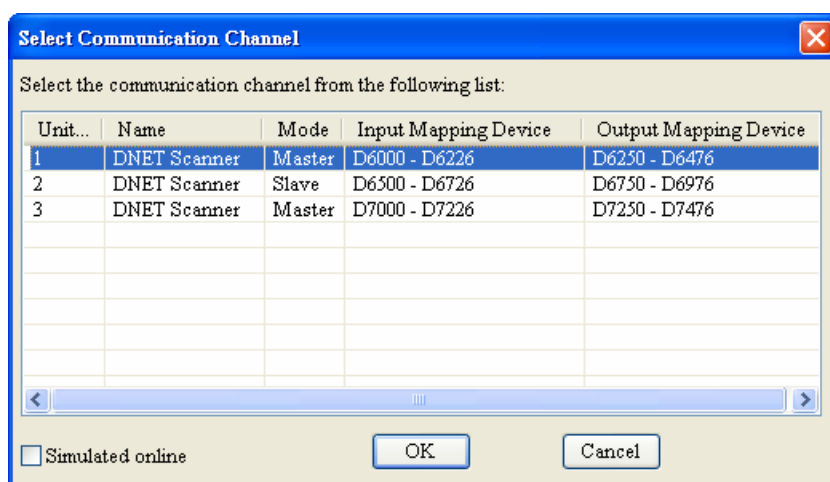
4 Configuration of DVPDNET-SL

4.1 Configuration through DeviceNet Builder Software

Before DVPDNET-SL starts to work normally, it must be configured through DeviceNet Builder software.

4.1.1 Selection of Communication Channel

Max 8 DVPDNET-SL modules can be connected to the left side of 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 on line, the following dialog box will pop up for selecting 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 PLC MPU, the larger its unit No is.
Name	DVPDNET-SL's name in DeviceNet Builder 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 Slave and the data from slave in the bus will be automatically updated to these registers.
Output mapping	The register areas which PLC MPU distributes 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.

4.1.2 Setup of Scan Module

The following dialog is for setting DVPDNET-SL's current mode: master mode or slave mode.

The 'Scanner Setting' dialog box is shown with the 'Master Mode' radio button selected. The 'Scan Interval Time' is set to 10 ms and the 'Expected Packet Rate' is 75. The 'Extension Baudrate' is enabled, and the 'Baudrate' dropdown menu is open, showing options from 10Kbps to 1Mbps. The 'Slave Mode' section is disabled. The 'Polled' section shows 'Tx Size' and 'Rx Size' both set to 8 Bytes. The 'Change of State/Cyclic' section has 'COS' selected. The 'Mapping' section shows 'Output Start' at D500 and 'Input Start' at D1000. 'OK' and 'Cancel' buttons are at the bottom.

Parameter	Explanation
Master mode	For setting DVPDNET-SL as master mode.
Scan interval time	The cycle time for master to send and receive the real time data after real-time data connection is successful.
Timeouts (EPR)	The result value of the parameter multiplied by 4. (Unit:ms) Master assumes that the slave is offline if it receives no response from slave after timeout.
Extended baud rate	The parameter gets effective only in master mode. Selecting "Startup" activates the function of extended baud rate. Select the appropriate baud rate according to actual demand then.
Slave mode	For setting DVPDNET-SL as slave mode
Bit-strobe	Reserved; no actual purpose now.
Polled	The parameters get effective only in slave mode. The filled byte number corresponds to the data length for output and input as DVPDNET-S is taken as slave. "Sending data length" corresponds to "Output length" and "Receiving data length" corresponds to "Input length".
COS/CC	Reserved; no actual purpose now.
Device mapping address	For AH modes specially; no actual purpose now.

Note: These parameters and the configuration information are downloaded to DVPDNET-SL together.

4.1.3 Setup of Scan List

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.

The dialog box is titled "Scanner Module configuration...". It contains the following sections:

- Scan List setting**: A sub-header for the configuration area.
- Available Nodes**: A table with columns "Address" and "Node Name". It lists three nodes:

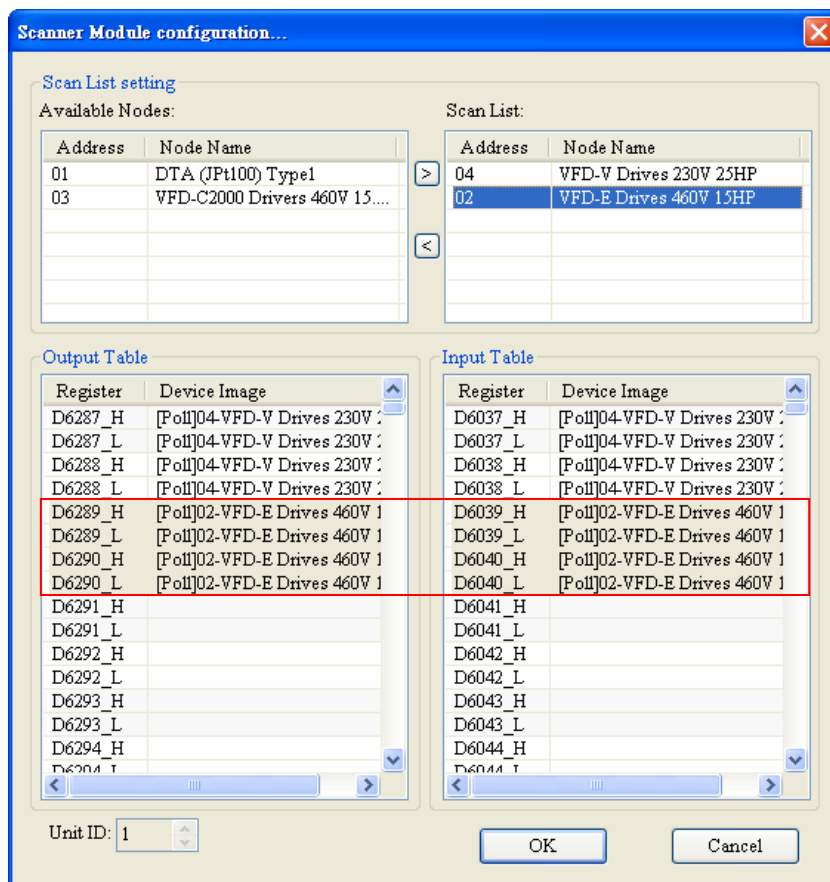
Address	Node Name
01	DTA (JPt100) Type1
02	VFD-E Drives 460V 15HP
03	VFD-C2000 Drivers 460V 15...
- Scan List**: A table with columns "Address" and "Node Name". It lists one node:

Address	Node Name
04	VFD-V Drives 230V 25HP
- Output Table**: A table with columns "Register" and "Device Image". It lists registers from D6287_H to D6294_H, all with the device image "[Pol]04-VFD-V Drives 230V :".
- Input Table**: A table with columns "Register" and "Device Image". It lists registers from D6037_H to D6044_H, all with the device image "[Pol]04-VFD-V Drives 230V :".
- Unit ID**: A dropdown menu set to "1".
- Buttons**: "OK" and "Cancel" buttons at the bottom right.

Parameter	Explanation
Available node	All already scanned slaves appear in "Available list". After the configuration information is downloaded to DVPDNET-SL, the slave in "Available node" will not conduct the real-time data exchange with DVPDNET-SL.
Scan list	After the configuration information is downloaded to DVPDNET-SL, the slave in "Scan list" will conduct the real-time data exchange with DVPDNET-SL.
Node address	The station No. for the slave in DeviceNet bus.
Node name	The name that "Node address" corresponds to.

4.1.4 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.

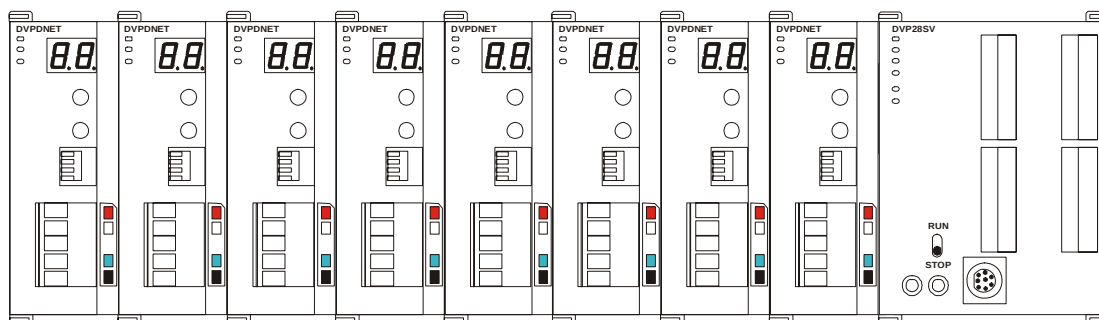


Parameter	Explanation
Output Table	PLC MPU's registers and the corresponding output data are shown in “Output list”. The values in PLC's registers will be sent to slave in real time as the control data of slave.
Input Table	PLC MPU's registers and the corresponding input data are shown in “input list”. The data that slave sends to master will be updated in PLC's registers in real time.
Register	The number of the register of PLC MPU; “D6289_H” indicates the high byte of register D6289; “D6289_L” indicates the low byte of register D6289.
Device mapping	For displaying the data type and the name of current slave; “Poll” means the polled data.

4.2 Data Mapping Areas

The data mapping introduced in this chapter is the data mapping between PLC MPU and DVPDNET-SL. The mapping relation is unchanged and user has no right to revise this area.

Max 8 PLC DVPDNET-SL modules can be connected to PLC's left side. After all DVPDNET-SL are connected to DVP-SV, DVP-SV will distribute data mapping areas to every DVPDNET-SL.



The index of DVPDNET-SL is its unit number. The first DVPDNET-SL on the left hand side of DVP-SV is No. 1, the following DVPDNET-SL modules are No. 2, No. 3, No. 4 and so on.

DVPDNET-SL index	Mapped D registers	
	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

4.3 I/O Mapping Table (as master mode)

As DVPDNET-SL of unit No. 1 serves as master mode, the data mapping areas are distributed as below table.

Output mapping area			Input mapping area		
D register	Mapping area	Data length	D register	Mapping area	Data length
D6250 ~ D6281	Explicit message program request	32 words	D6000 ~ D6031	Explicit message program response	32 words
D6282 ~ D6285	Bit-strobe command	4 words	D6032 ~ D6035	Status of nodes in the scan list	4 words
D6286	Reserved	1word	D6036	DVPDNET-SL status	1 word
D6287 ~ D6476	DeviceNet output data	190 words	D6037 ~ D6226	DeviceNet input data	190 words
D6477 ~ D6497	Reserved	21 words	D6227 ~ D6247	Reserved	21 words

Note: If the unit No. is 2, the number of the registers above will all be added by 500 respectively; if the unit No. is 3, the number of the registers above will all be added by 1000 respectively; if the unit No. is 4, the number of the registers above will all be added by 1500 respectively and so on.

4.4 I/O Mapping Table (as slave mode)

As DVPDNET-SL serves as slave mode, the data mapping areas are distributed as below table and these registers are applied for real-time data exchange.

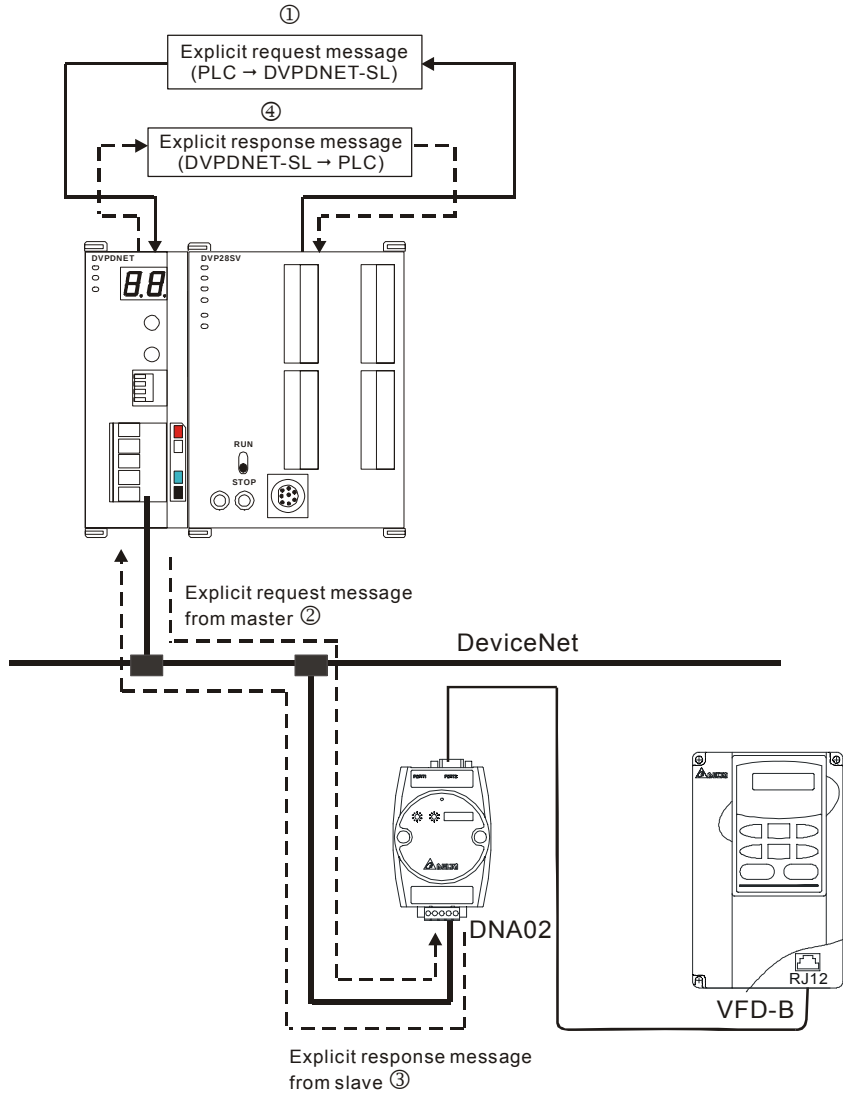
Unit No.	Input mapping area		Output mapping area	
	Initial register	Max data length	Initial register	Max data length
1	D6000	255Bytes	D6250	255Bytes
2	D6500	255Bytes	D6750	255Bytes
3	D7000	255Bytes	D7250	255Bytes
4	D7500	255Bytes	D7750	255Bytes
5	D8000	255Bytes	D8250	255Bytes
6	D8500	255Bytes	D8750	255Bytes
7	D9000	255Bytes	D9250	255Bytes
8	D9500	255Bytes	D9750	255Bytes

When the unit No. of DVPDNET_SL is 1, the control data which DeviceNet sends out will be updated in real time in the registers of PLC MPU with D6000 as the initial register. In the meanwhile, the value in the registers of PLC MPU with D6250 as the initial register will be automatically sent back to DeviceNet master so as to realize the real-time data exchange.

5 Sending Explicit Message from Ladder Diagram

DVPDNET-SL supports the sending of explicit messages through WPL programs.

5.1 The Principle of Explicit Message Sending



- ①: DVP-SV MPU sends out explicit request message to DVPDNET-SL according to WPL program.
- ②: DVPDNET-SL sends out request message to the target equipment.
- ③: The target equipment processes the request message and responds DVPDNET-SL.
- ④: DVP-SV MPU stores the response message from DVPDNET-SL to D register. One explicit message transmission is therefore completed.

5.2 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 transmit the request message to be sent out to D6250 ~ D6281, DVPDNET-SL will fill the response message 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	Request 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. For the next explicit message to be sent out, you have to change the ID number. ReqID = 0 indicates that DVPDNET-SL will not send out 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:

PLC device	Response Message																
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
D6000	Message Header	ReqID								Status							
D6001		Port								Size							
D6002		Service Code								MAC ID							
D6003 ~ 6031	Message Data	Service Response Data															

- 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	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

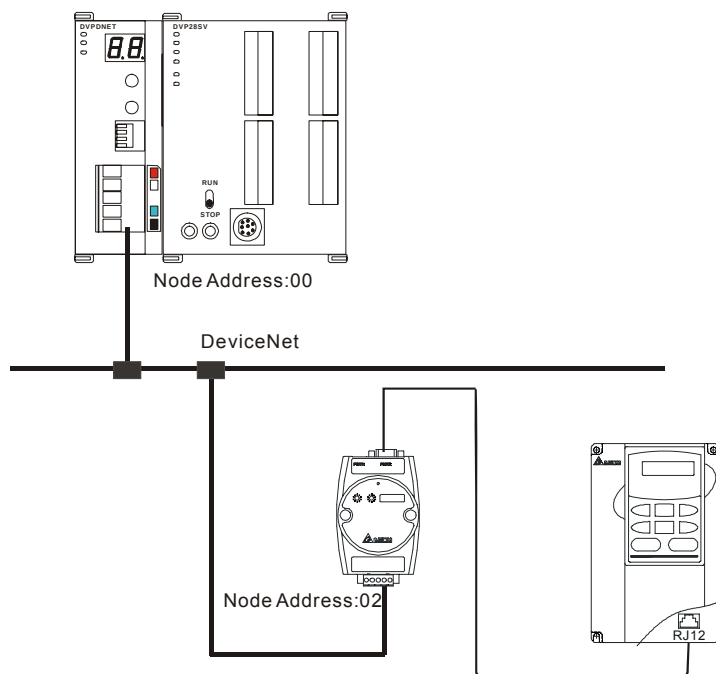
3) Notes:

- DVPDNET-SL can only send out 1 explicit message at a time.
- Before sending explicit message by using WPL program, we suggest you clear the request message editing area and response message editing area to 0.
- If the slave responds with standard error code, and DVPDNET-SL also consider the communication being successful, "The communication of explicit message is successful." will indicate that the communication has been completed successfully.

4) Application example (I)

Target	When M0 = On, read Class 1>>Instance 1>>Attribute 1 of IFD9502
--------	--

1> The connection



Note: IFD9502, a Delta DeviceNet slave module can connect VFD AC motor drive to DeviceNet network.

2> Compulsory settings and explanations on devices

■ Compulsory settings in DVPDNET-SL

Parameter	Set value	Explanation
Node address	00	Set the node address of DVPDNET-SL to "00".
Baud rate	500kbps	Set the communication speed of DVPDNET-SL and bus to "500kbps".

■ Compulsory settings in DNA02

Parameter	Set value	Explanation
Node address	02	Set the node address of DNA02 to "02".
Baud rate	500kbps	Set the communication speed of DNA02 and bus to "500kbps".

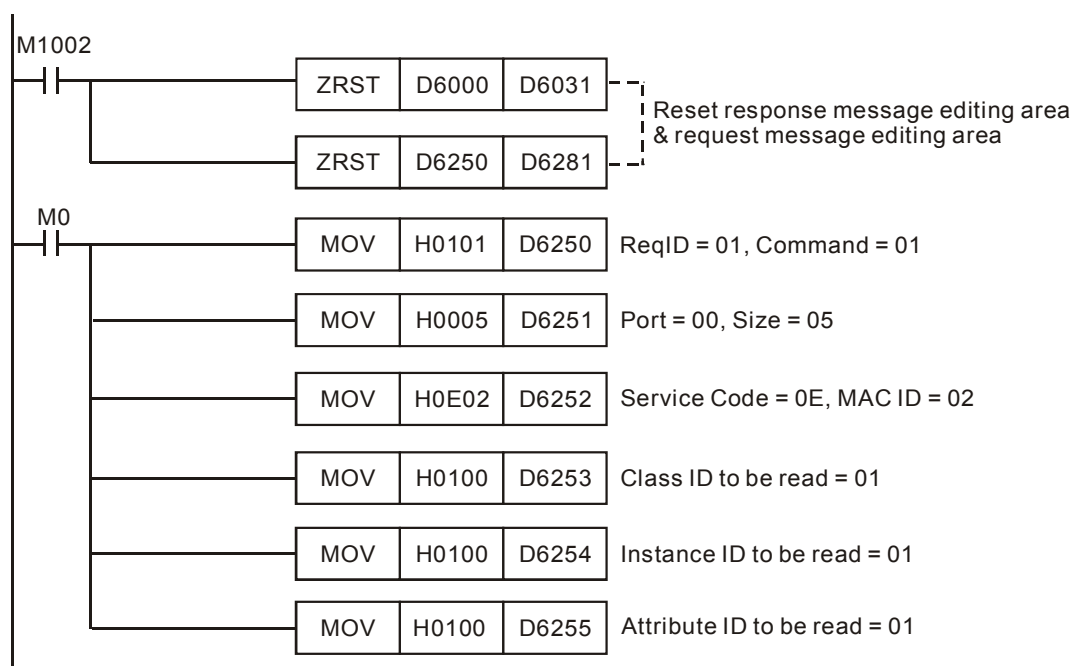
■ Compulsory settings in VFD-B

Parameter	Set 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 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	0101Hex	ReqID = 01Hex								Command = 01Hex							
	D6251	0005Hex	Port = 00Hex								Size = 05Hex							
	D6252	0E02Hex	Service Code = 0EHex								MAC ID = 02Hex							
	D6253	0001Hex	High byte of Class ID = 00Hex								Low byte of Class ID = 01Hex							
	D6254	0001Hex	High byte of Instance ID = 00Hex								Low byte of Instance ID = 01Hex							
	D6255	0001Hex	N/A								Attribute ID = 01Hex							
Response message editing area	D6000	0101Hex	ReqID = 01Hex								Status = 01Hex							
	D6001	0002Hex	Port = 00Hex								Size = 02Hex							
	D6002	8E02Hex	Service Code = 8EHex								MAC ID = 02Hex							
	D6003	031FHex	High byte of Service Data = 03Hex								Low byte of Service Data = 1FHex							

3> PLC program



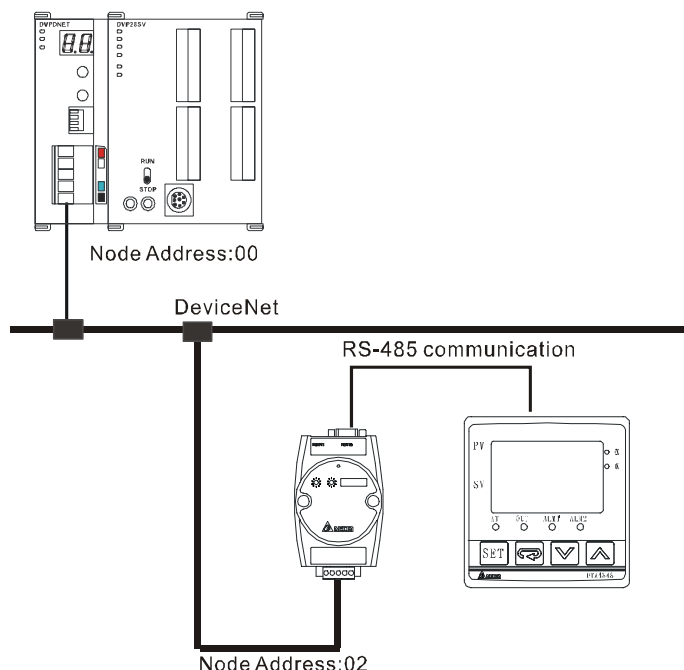
4> Program explanations:

- In the beginning of the program, clear the response message editing area and request message editing area to 0.
- When M0 = On, DVPDNET-SL will send out request message, reading Class 1>>Instance 1>>Attribute 1 of the target equipment (node address: 02). If the communication of explicit message is successful, the slave will return with a response message.
- When M0 = On, DVPDNET-SL will only send out request message once. If you would like it to send out request message again, you will have to change ReqID.
- When the reading is successful, the message responded from the target equipment will be stored in D6000 ~ D6003.

5) Application example (II)

Target	M1 = On, set 0x99>>Instance 1>>Attribute 2 of IFD9502 to "0004Hex".
--------	---

1> The connection



Note: IFD9502, a Delta DeviceNet slave module can connect the temperature controller to DeviceNet network.

2> Compulsory settings and explanations on devices

■ Compulsory settings in DVPDNET-SL

Parameter	Set value	Explanation
Node address	00	Set the node address of DVPDNET-SL to "00".
Baud rate	500kbps	Set the communication speed of DVPDNET-SL and bus to "500kbps".

■ Compulsory settings in DNA02

Parameter	Set value	Explanation
Node address	02	Set the node address of DNA02 to "02".
Baud rate	500kbps	Set the communication speed of DNA02 and bus to "500kbps".

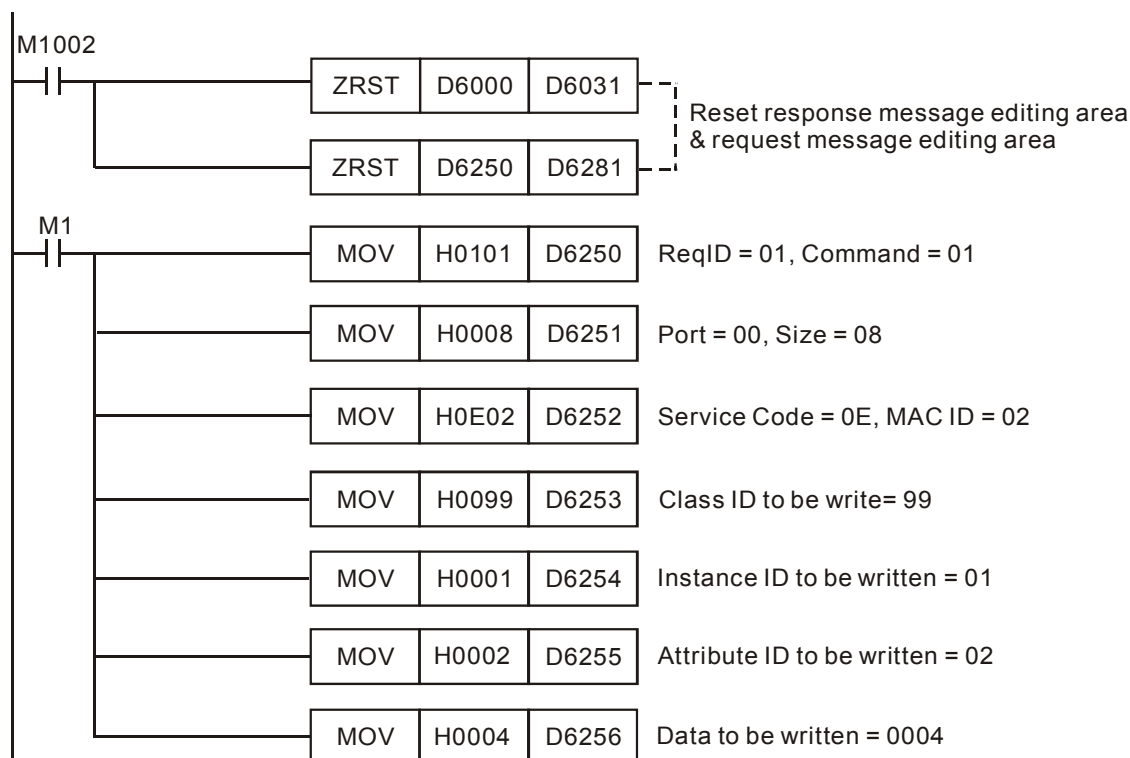
■ Compulsory settings in VFD-B

Parameter	Set 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 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	0101Hex	ReqID = 01Hex								Command = 01Hex							
	D6251	0005Hex	Port = 00Hex								Size = 07Hex							
	D6252	0E02Hex	Service Code = 10Hex								MAC ID = 02Hex							
	D6253	0099Hex	High byte of Class ID = 00Hex								Low byte of Class ID = 99Hex							
	D6254	0001Hex	High byte of Instance ID = 00Hex								Low byte of Instance ID = 01Hex							
	D6255	0002Hex	N/A								Attribute ID = 02Hex							
	D6256	0004Hex	High byte of data = 00Hex								Low byte of data = 04Hex							
Response message editing area	D6000	0101Hex	ReqID = 01Hex								Status = 01Hex							
	D6001	0002Hex	Port = 00Hex								Size = 02Hex							
	D6002	9002Hex	Service Code = 90EHex								MAC ID = 02Hex							
	D6003	0004Hex	High byte of Service Data = 00Hex								Low byte of Service Data = 04Hex							

3> PLC program



4> Program explanations

- In the beginning of the program, clear the response message editing area and request message editing area to 0.
- When M1 = On, DVPDNET-SL will send out request message. Write 0004Hex into Class 99 >> Instance 1 >> Attribute 2 of the target equipment (node address: 02). If the communication of explicit message is successful, the slave will return with a response message.

- When M1 = On, DVPDNET-SL will only send out request message once. If you would like it to send out request message again, you will have to change ReqID.
- When the writing is successfully done, the message responded from the target equipment will be stored in D6000 ~ D6003.

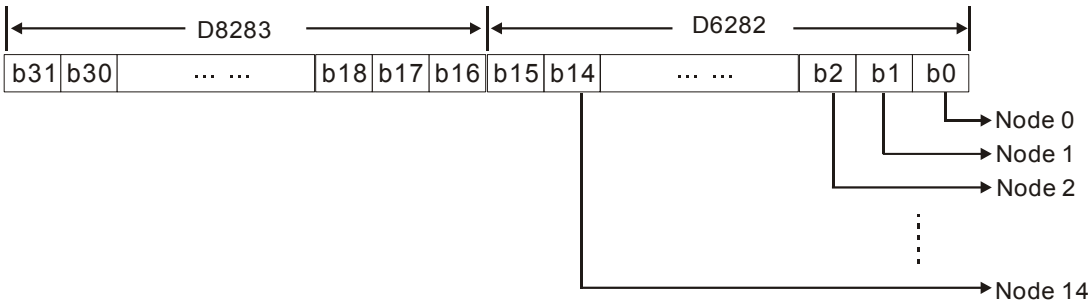
6 Bit-Strobe Command

6.1 Principle of Bit-Strobe

Bit-strobe is one of the standard I/O transmission methods for DeviceNet. The length of command is fixed to 8 bytes (i.e. 64 bits), and every bit corresponds to a slave.

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 = 0, the node 0 equipment will be selected, and it will need to respond with a message to the master. When b0 and b1 of D6282 = 0, the node 0 and node 1 equipment will be selected, and they will be to respond with a message to the master.



In the bit-strobe mode, the master will not send control data to the slave node. 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.

7 Display of Node Status on Network

7.1 Display of Node Status in Scan List

This function is to monitor if DeviceNet slave is offline or not. DVPDNET-SL does read-time monitoring to the nodes in the scan list and maps the status of every node to a bit. You can acquire the node status 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 will be off. If the node occurs with abnormality, its corresponding bit will be On.

7.2 Status of DVPDNET-SL

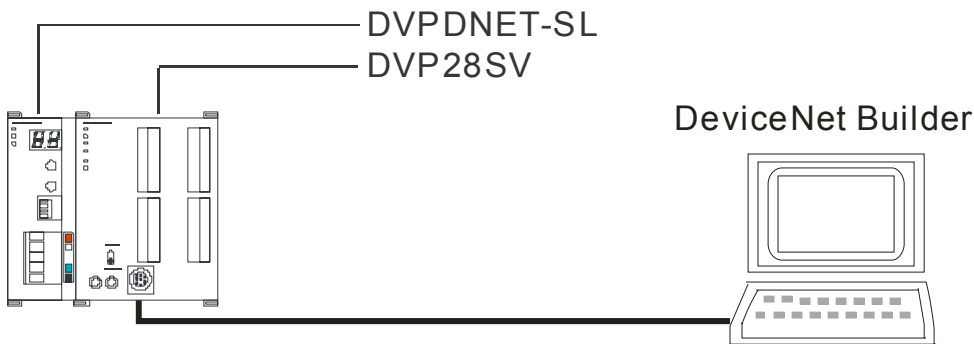
You can acquire the real-time status of DVPDNET-SL by monitoring D6036. When DVPDNET-SL runs normally, D6036 = 0. When DVPDNET-SL is being initialized, the high byte of D6036 = 1 and the low byte = 0. When error occurs in DVPDNET-SL, the high byte of D6036 = 2. For detailed error information, please refer to the error codes, i.e. the low byte of D6036.

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: error)								Error codes of DVPDNET-SL							

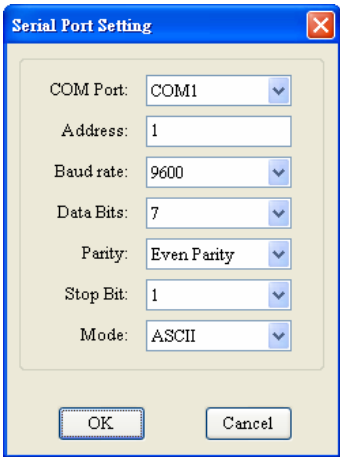
8 Setup of Slave Mode

DVPDNET-SL can serve as slave through modifying of the mode by 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 be set as slave mode in the following method.

- 1) Connect the devices according to below figure. PC accesses PLC MPU via RS232 or RS485.



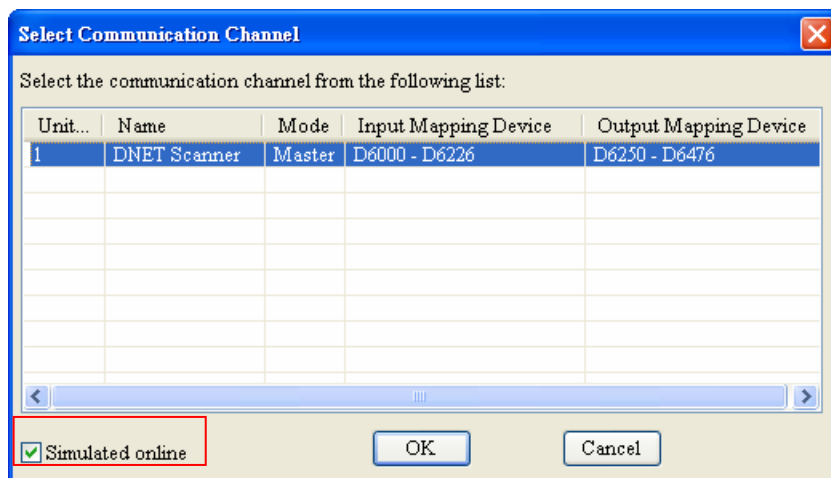
- 2) Open DeviceNet Builder software, and select “Setup” => “Communication Setting” => “System Channel”, and the “Serial Port Setting” dialog box will appear as below.



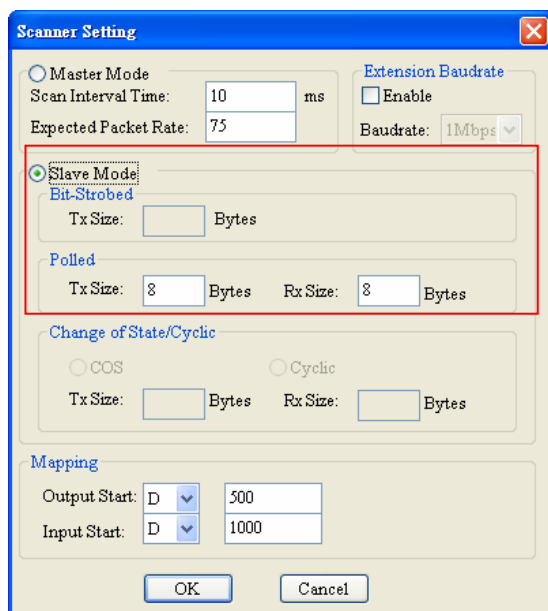
- 3) Set up the communication parameters in the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after configuration is finished.

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

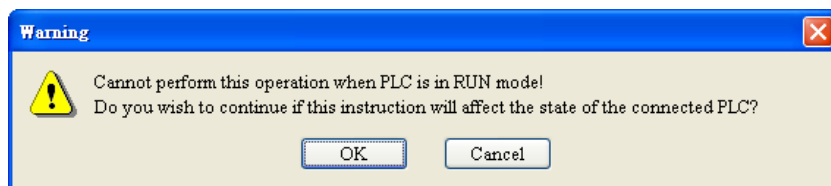
- 4) Select “Network” => “Online” and the “Select Communication Channel” dialog box will appear. Click on “OK” to start scanning the DeviceNet network after selecting “analog online” in the following window.



- 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.

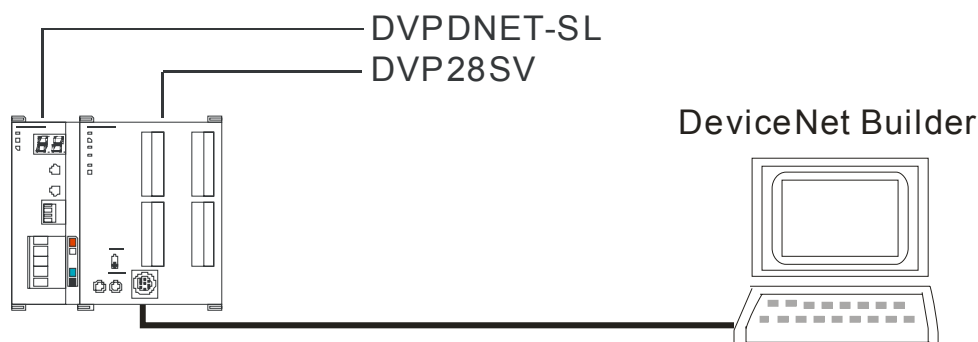


- 7) After download is finished, power PLC off and then repower it. At this time, DVPDNET-SL has been set as slave mode.

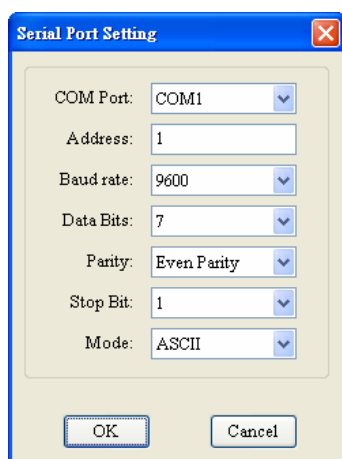
9 Setup of Extended Baud Rate

9.1 Setup of Extended Baud Rate (as master mode)

- 1) Connect the device to the Devicenet network according to the following figure. PC accesses PLC MPU via RS232 or RS485.



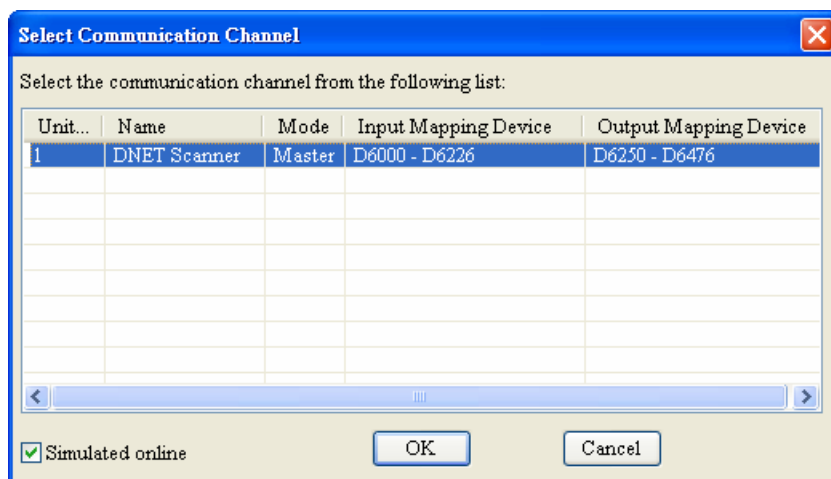
- 2) Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel”. And then the following dialog box appears.



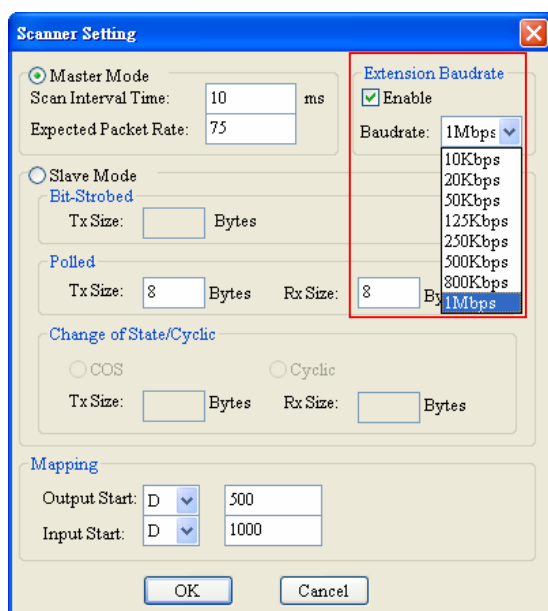
- 3) Set up the communication parameters in the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after configuration is finished.

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

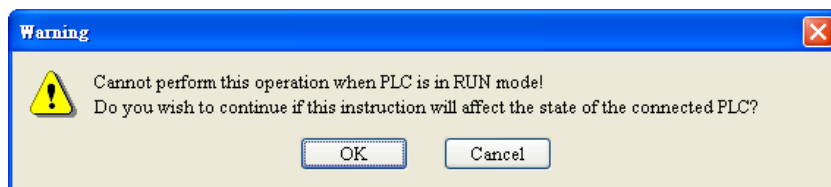
- 4) Select “Network” => “Online” and the following “Select Communication Channel” dialog box will appear. Click on “OK”.



- 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.



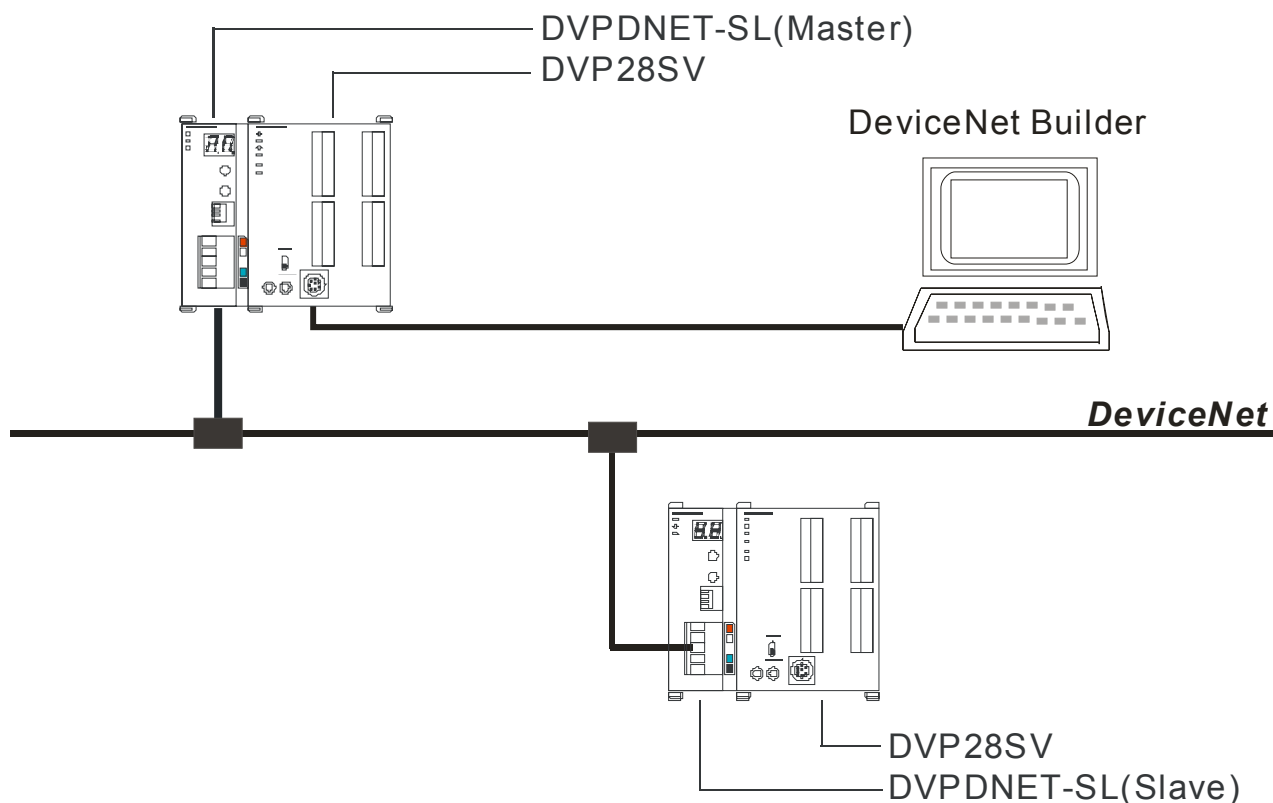
- 6) Select "Network" => "Download" and the following dialog box appears. Click "OK" to download the configuration information to DVPDNET-SL.



- 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.

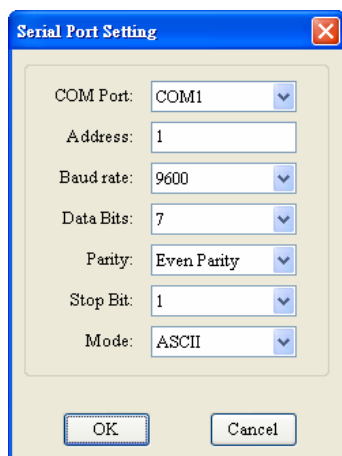
9.2 Setup of Extended Baud Rate (as slave mode)

- 1) Connect the relevant devices to the DeviceNet network according to the following figure.



Note:

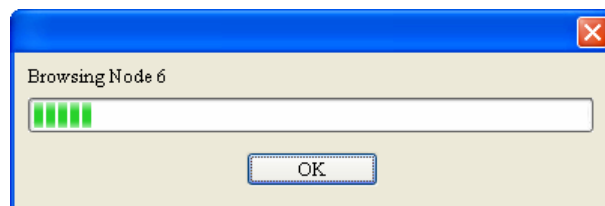
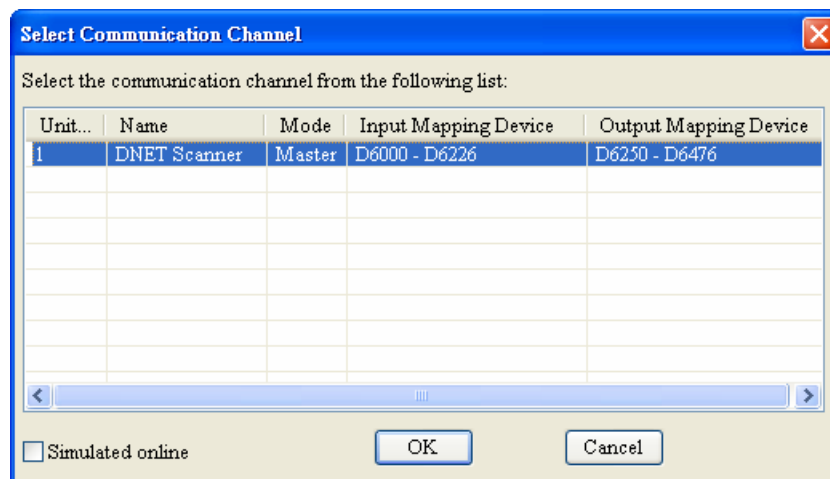
- a. DVPDNET-SL at the bottom of the above figure has been set as slave mode.
 - b. The node addresses of two DVPDNET-SLs must not be repeated. (See section 2.4).
 - c. The baud rates of two DVPDNET-SLs are both 500K bps (See section 2.5) .
- 2) Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel”, In result, you can see the following dialog box.



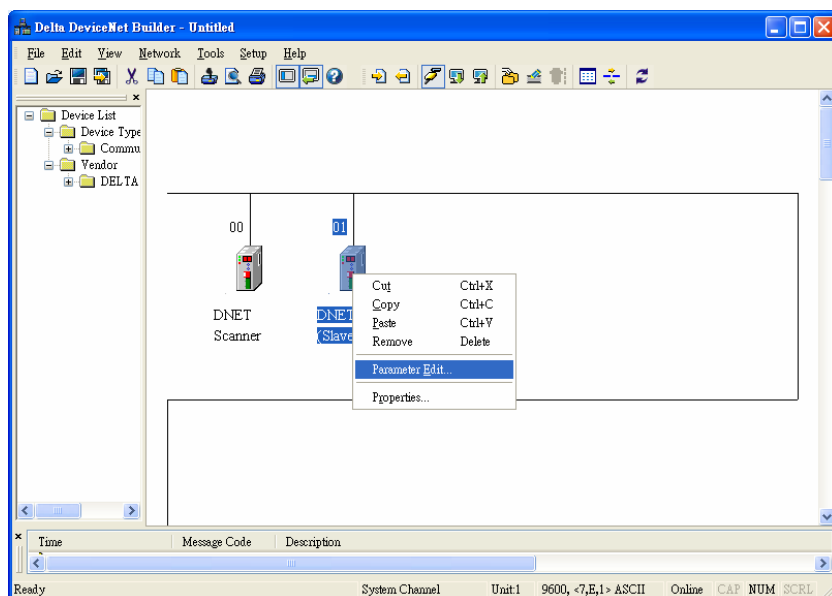
- 3) Set up the communication parameters in the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after configuration is finished.

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

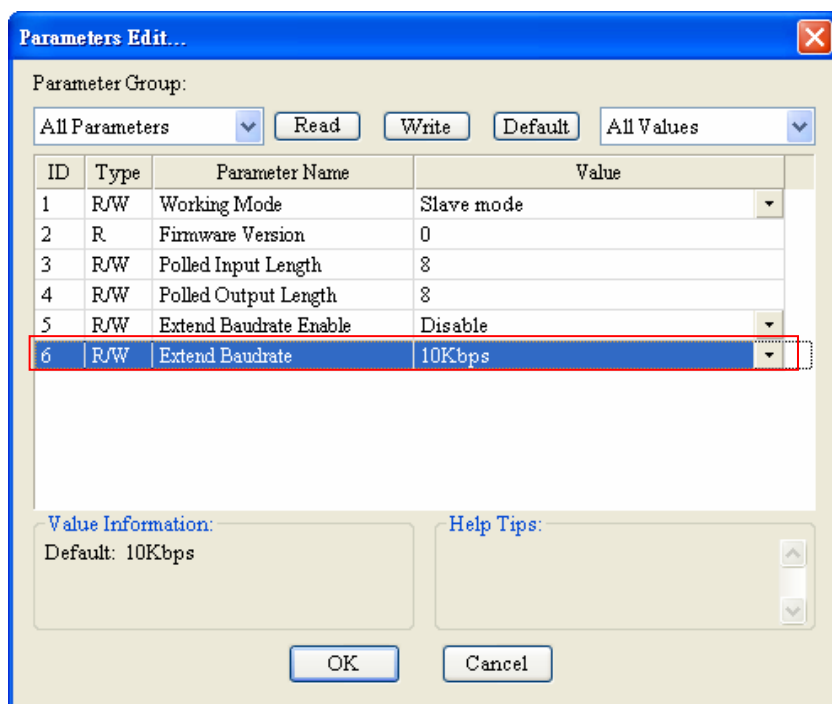
- 4) Select “Network” => “Online” and the “Select Communication Channel” dialog box will appear. Click on “OK” to start scanning the entire DeviceNet network.



- 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 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.

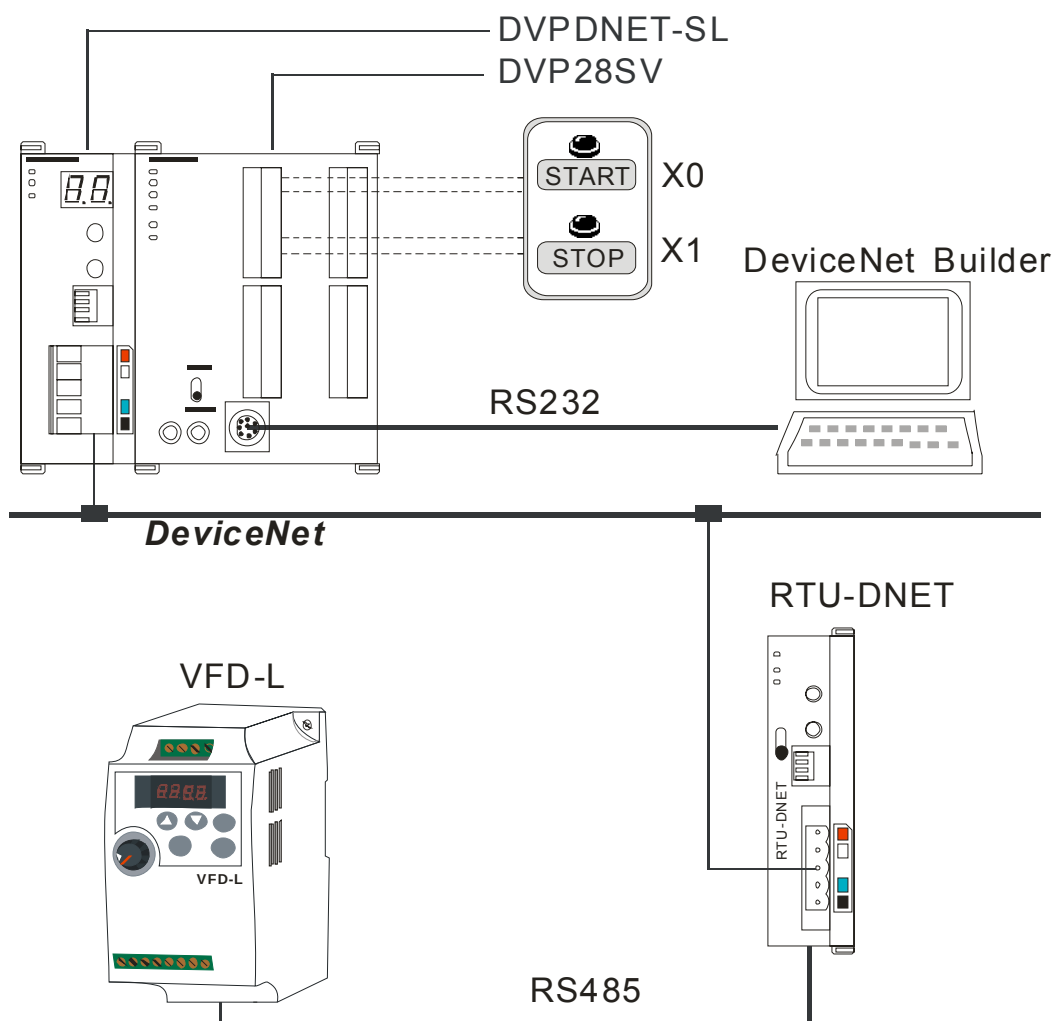
10 Application Example on Constructing DeviceNet Network

In this section, we will present an application example, illustrating how to construct a DeviceNet network and the configuration of the network.

Target	Using an X point of DVP28SV to control RUN/STOP of the remote VFD-L AC motor drive.
--------	---

10.1 How to Construct a DeviceNet Network

1) The connection



Note:

RTU-DNET, a Delta DeviceNet remote IO communication module supports the MODBUS communication function.

2) Set up DVPDNET-SL, RTU-DNET and VFD-L according to the table below.

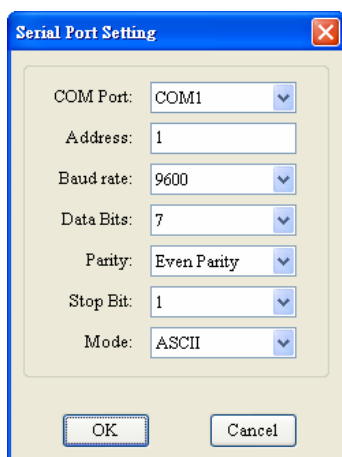
Module	Node address	Baud rate
DVPDNET-SL	01	500kbps
RTU-DNET	02	500kbps

VFD-L parameter	Set value	Explanation
02-00	4	Transmit the frequency of VFD-L via RS485 communication.
02-01	3	Control operation of VFD-L via RS485 communication.
09-00	1	Set the node address of VFD-L in Modbus to 1.
09-01	1	Set the communication rate of VFD-L in Modbus 9600
09-04	1	Set the communication format of VFD-L in Modbus to 7, E, 1, ASCII.

10.2 How to Configure Network by DeviceNet Network Configuration Tool

1) Configuration of DeviceNet slave

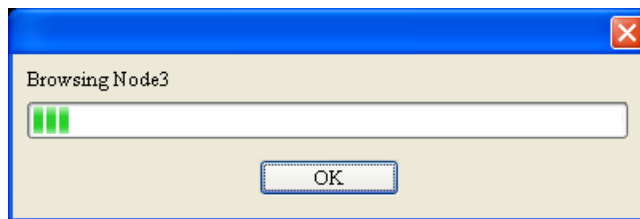
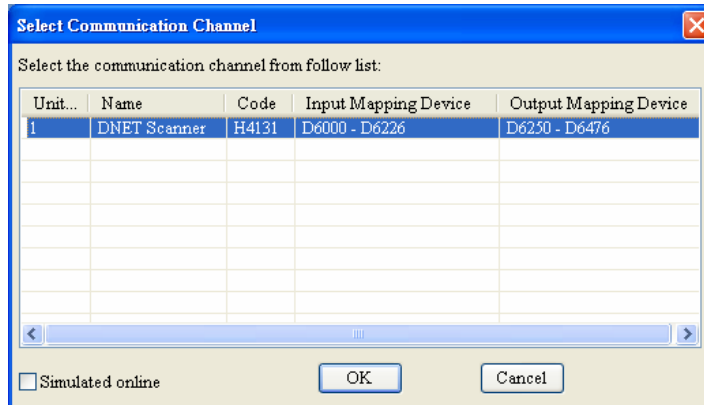
- 1> Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel”, and the “Serial Port Setting” dialog box will appear as below.



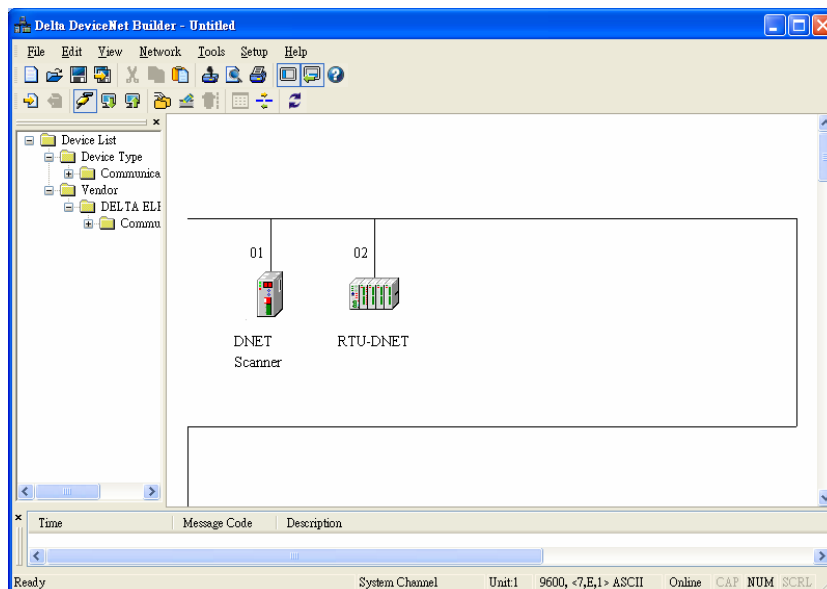
- 2> Set up the communication parameters in the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after configuration is finished.

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

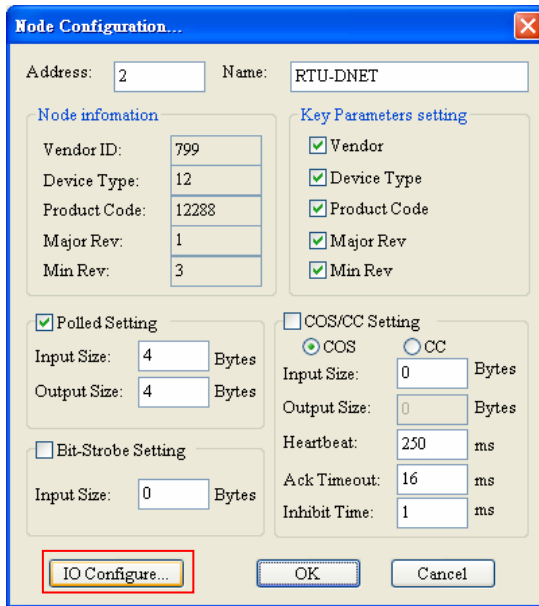
- 3> Select "Network" => "Online", and the "Select Communication Channel" dialog box will appear. Clicking on "OK" starts scanning the DeviceNet network.



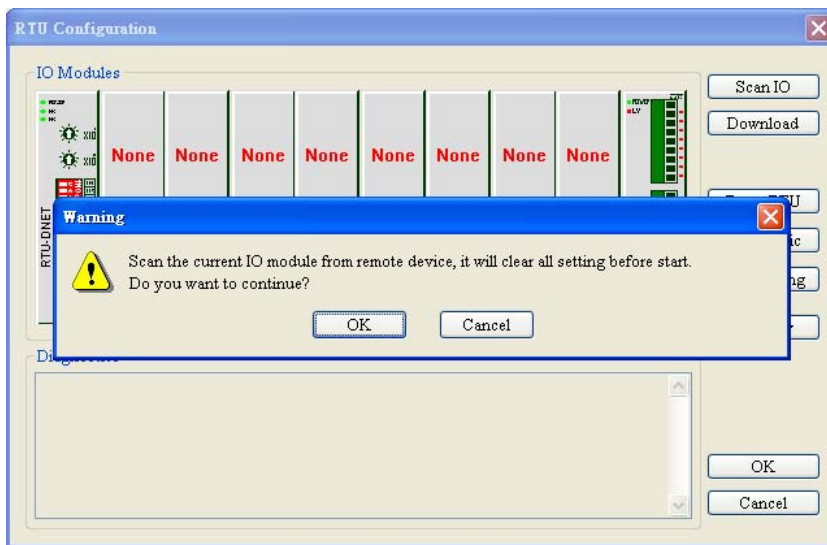
- 4> If the bar on the dialog box does not progress, it means the connection between the PC and DVP-SV is abnormal, or there are other programs also using the COM port on the PC. After the scan is completed, the dialog box will tell you that the scan is completed, and the icons and device names of all the nodes scanned on the network will be shown on the screen. See the figure below, in which the node address of DVPDNET-SL and RTU-DNET are 01 and 02 respectively.



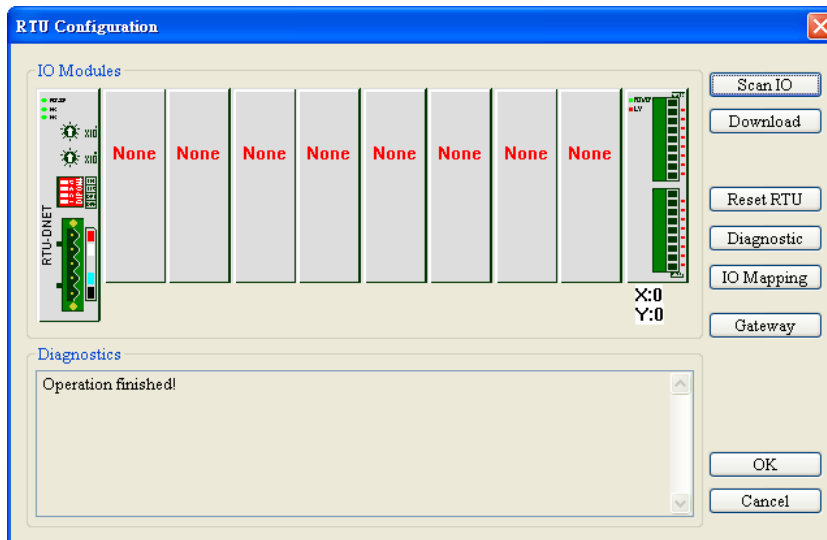
- 5> Double click on RTU-DNET (node 02), and the "Node Configuration..." dialog box will appear.



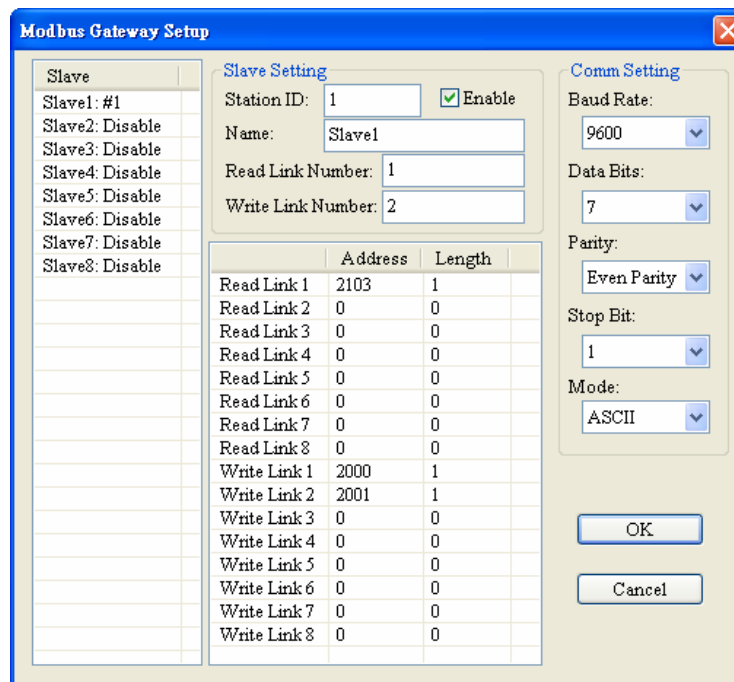
- 6> Click on "IO Configure..." button in "Node Configuration" dialog box, and you will then see "RTU Configuration" page where you click on "Scan IO" button and "Warning" dialog box will appear. Click "OK" then DeviceNet Builder will detect the devices connected to RTU-DNET as below.



- 7> Because no special module is connected to the right side of RTU-DNET, "None" will show in the location of the special module in the following window. The point number for X and Y are both 0. Then click on "Gateway setting".

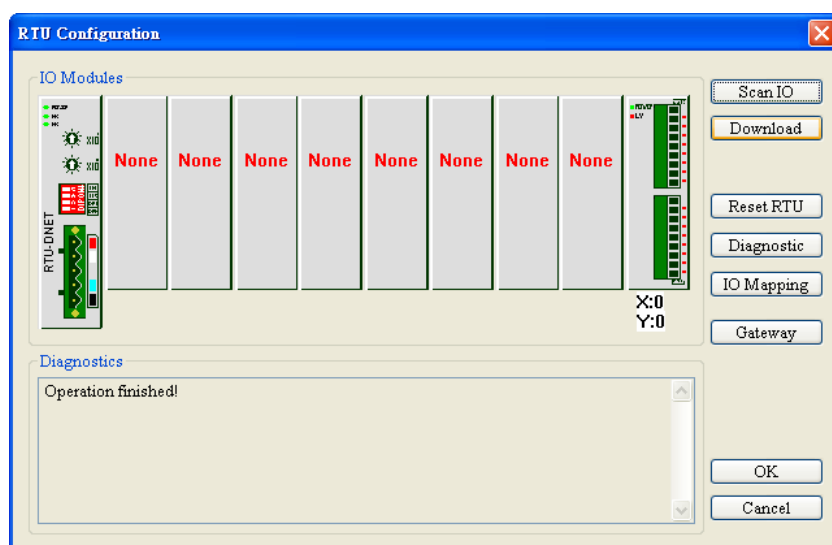


- 8> In the interface of “Modbus gateway setting”, use the parameters of one slave and fill the relevant values there. You can refer to the user manual of RTU-DNET.



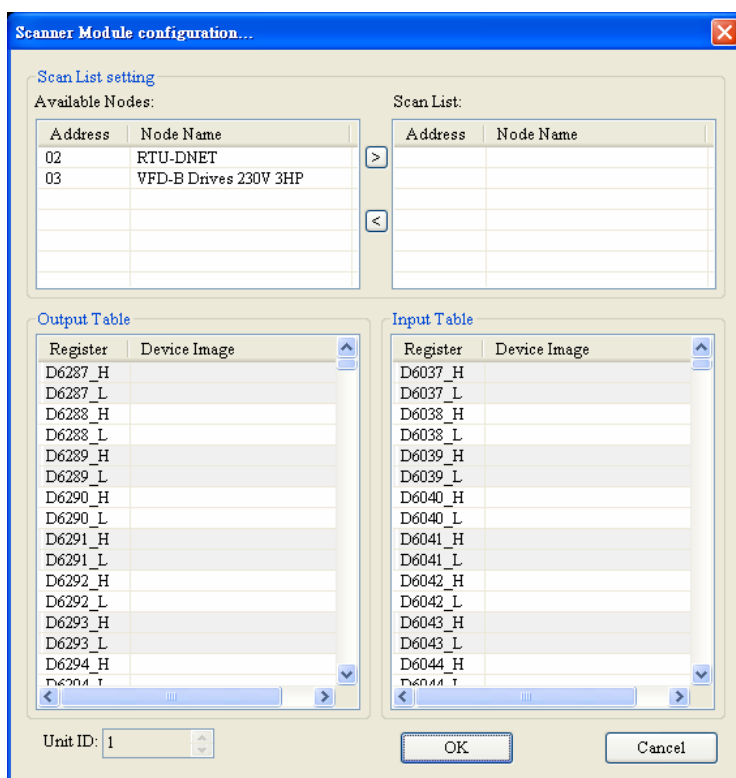
Note: The slave here is the slave in Modbus network without direct relation with DeviceNet network.

- 9> Click on “OK” in the above window and then click on “Download” in the following window to download the configuration data to RTU-DNET. After download is finished, the configuration of RTU-DNET is completed.

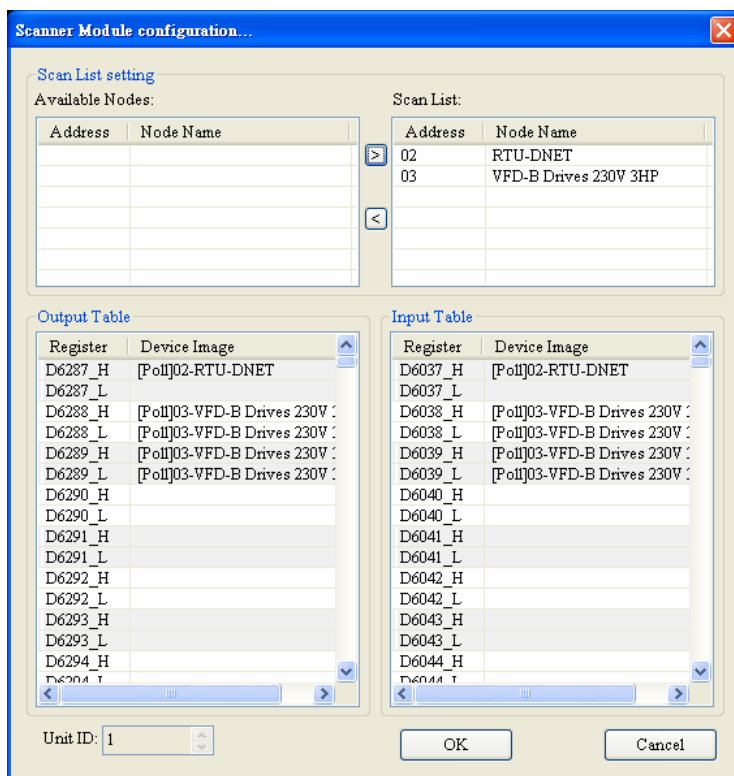


2) Configuration of DeviceNet Master

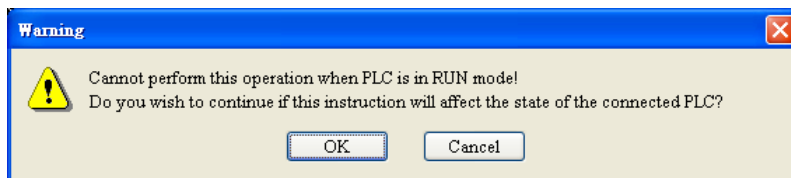
- 1> Double click on DNET Scanner (node 01), and the "Scan Module Configuration..." dialog box will appear. You can find the currently available nodes, RTU-DNET and VFD-B Drives 230V 3HP, in the list on the left side. On the right side, there is an empty "Scan List".



- 2> (2) Move the slave devices on DeviceNet in the "Available Nodes" list on the left side to the "Scan List" on the right side. Select a node and click on . Follow the steps to 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.
- The mapping relation between DVPDNET-SL and slave device is shown as below after configuration of the DeviceNet network following the above steps is completed.

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

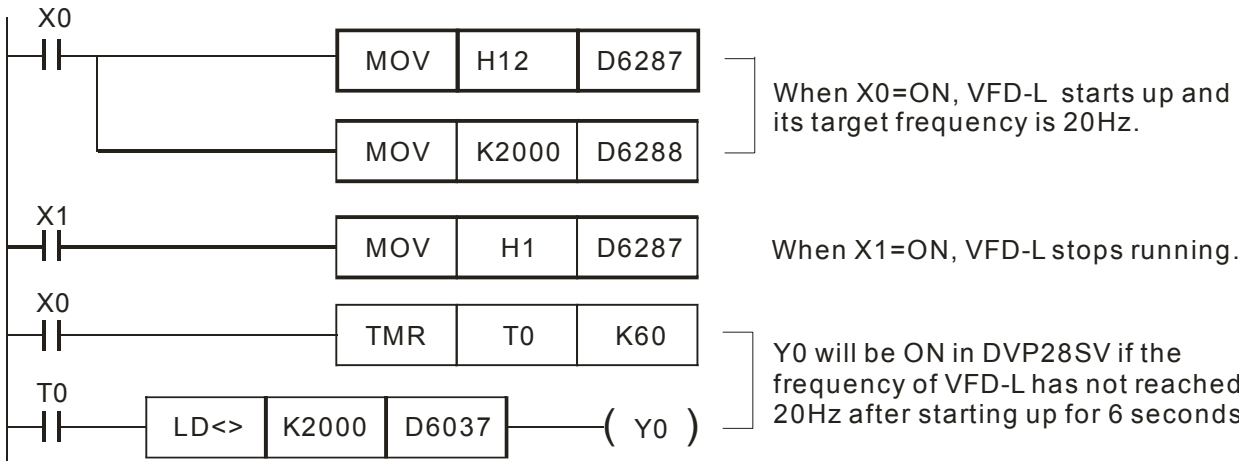
DVP28SV	DVPDNET-SL	RTU-DNET & VFD-L
D6037	⬅	Output frequency of VFD-L (2103H)

10.3 Ladder Diagram Program

This section introduces how to edit the ladder diagram program to meet the control request of DeviceNet network.

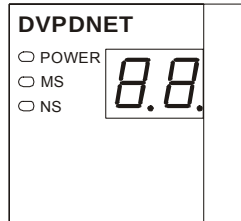
Control request	When X0=ON, VFD-L AC motor drive runs; When X1=ON, VFD-L AC motor drive stops; After VFD-L has run for 6 seconds and at this time the running frequency still has not reached the designated frequency, Y0 of DVP28SV=ON.
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Explanation of PLC Program



11 LED Indicator & Trouble-shooting

DVPDNET-SL supports two diagnostic methods: indicator diagnosis and digital displayer diagnosis.



11.1 LED Indicator Diagnosis

■ POWER LED

LED status	Indication	How to correct
Off	Power is abnormal.	Make sure DVPDNET-SL is powered.
Green light on	Power is normal.	--

■ NS LED

LED status	Indication	How to correct
Off	No power or duplicate ID check has not completed	1. Make sure DVPDNET-SL is powered. 2. Make sure at least 1 node or more are communicating on the network.
Green light blinking	No communication	No correction is needed; check the digital indicator for the error.
Green light on	Normal operation	--
Red light blinking	Error in communication	Check the digital indicator and eliminate the error.
Red light on	Network error; cannot check duplicate ID; bus-off (check the digital indicator)	1. Make sure all the devices have their unique node address. 2. Check the network for correcting media installation and baud rate. 3. Check if the node address of DVPDNET-SL is valid. 4. Check if the network power is normal.

■ MS LED

LED status	Indication	How to correct
Off	No power	Make sure DVPDNET-SL is powered.
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	Some slaves encounter communication error.	Check the digital indicator and make sure the slave information in the scan list is consistent with the slave 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 for repair.

■ MS & NS LED

LED status		Indication	How to correct
NS LED	MS LED		
Off	Off	No power	Make sure DVPDNET-SL is powered.
Off	Green light on	Duplicate ID check has not completed.	Make sure at least 1 node or more are communicating in the network, and the baud rate is the same as the setting in DVPDNET-SL.
Red light on	Green light on	MAC ID detection failure or bus-off	Change the MAC ID setting and 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	Go to your manufacturer or distributor for problem-solving.

11.2 Digital displayer 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 MPU to RUN and start I/O data exchange.
F0	Duplicate MAC ID check failure	Check the node address and 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 of DVPDNET-SL and PLC MPU is normal.
F3	Entering test mode	Switch IN1 from On to Off and re-power DVPDNET-SL.
F4	Bus-off	1. Check if the network cable is normal. 2. Check if the baud rate is correct. 3. Re-power DVPDNET-SL.
F5	No network power	Make sure the cable is correctly connected and check if the network power 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.
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.

Code	Indication	How to correct
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.	Check the configuration of slave device and 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 in the network. 2. Check if either end of the network is connected with the terminal resistor of 121Ω. 3. Check if the baud rates of the node devices in the network are consistent with each other. 4. Check if the communication cable is normal so as to avoid that the cable is disconnected or connected loosely. 5. Re-power 10DNET scanner module.