DVPDNET-SL

DeviceNet Network Scanner

Operation Manual

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

DVP-0204520-05

September 6, 2023

⚠ Warning

- ✓ *This operation manual provides functional specifications, installation, basic operation and settings, as well as an introduction to relevant network protocols.*
- ✓ *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.*
- ✓ *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.*

🕮 Table of Contents

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 the PLC together. It can be configured through DeviceNet software.

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 kbps

1.2 Basic Functions of DVPDNET-SL

➢ DVPDNET-SL DeviceNet scanner can be used as a master or a slave on the DeviceNet network. When being used as a master, it supports following functions:

- Automatically carrying out the data exchange with PLC MPU. Users only need to operate the special registers in the PLC to realize the monitoring of all slaves.
- Supports client function of explicit message.
- Supports all kinds of I/O connections with salves: 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.
- Automatically exchanging data with the PLC. Users only need to edit the D registers in the PLC without using FROM/TO instruction.
- Polling
- Max. lengths 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 the PLC which can be extendable on its left side (E.g. DVP-SV, DVP-EH2_L, DVP-SX2, DVP-SA2, DVP10MC11T, DVP-SV3, DVP-SX3 and 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 the power line)
Voltage	DeviceNet network provides direct current: 11–25V, 28mA (typical value), 125mA impulse current (24 VDC)

■ DeviceNet Communication

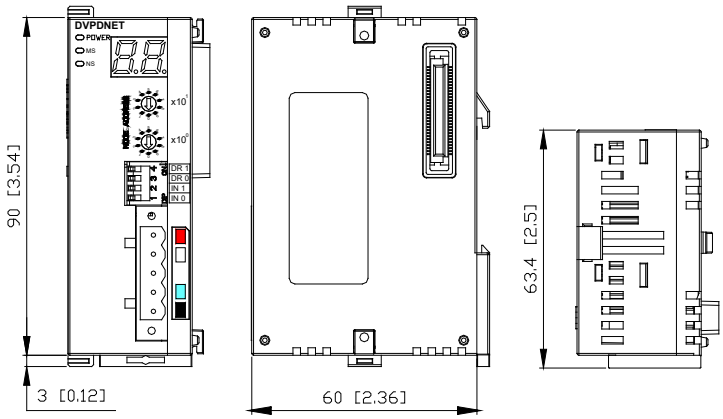
Item	Specification
Message type	Explicit connection, IO polled connection, bit-strobe connection, COS/CC connection
Baud rate	Standard mode: 125 kbps; 250 kbps; 500 kbps Extended mode: 10 kbps; 20 kbps; 50 kbps; 125 kbps; 250 kbps; 500 kbps; 800kbps; 1M kbps

■ Environment

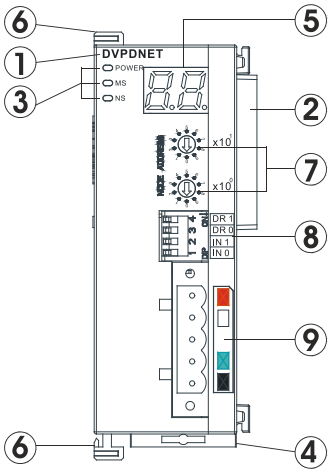
Item	Specification
Noise immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8KV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2KV, Digital I/O: 1KV Analog & Communication I/O: 1KV Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV RS (IEC 61131-2, IEC 61000-4-3): 26MHz – 1GHz, 10V/m
Operation	0ºC – 55ºC (temperature); 5 – 95% (humidity); pollution degree 2
Storage	-25ºC – 70ºC (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 Profile

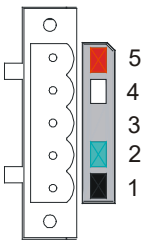


1. Model name
2. Extension port
3. Power, MS and NS LED indicators
4. DIN rail clip
5. Digital indicator
6. Extension clip
7. Address switch
8. Function switch
9. DeviceNet connection port

2.3 DeviceNet Connection Port

This is for the connection to the DeviceNet network. Wire by using the connector enclosed with DVPDNET-SL.

PIN	Signal	Color	Function
5	V+	Red	24 VDC
4	CAN_H	White	Signal+
3	-	-	Shield wire
2	CAN_L	Blue	Signal-
1	V-	Black	0 VDC

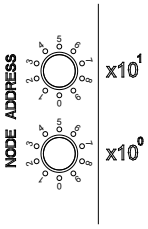


Note: Either end of the communication cable should be connected with a terminal resistor of 121Ω and the resistors should be connected between "Signal+" and "Signal-".

2.4 Address Switch

The switch is used for setting up the node address of DVPDNET-SL on the DeviceNet network. 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:

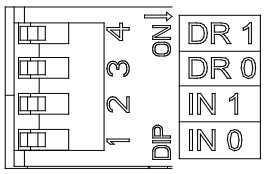
- Please set up the node address when the power is switched off. After the setup is completed, re-power DVPDNET-SL.
- Use the slotted screwdriver to rotate the switch carefully in case you scratch the switch.

2.5 Function Switch

The function switches are for:

- Setting up the work mode (IN0)
- Setting up the baud rate of the DeviceNet network (via 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	



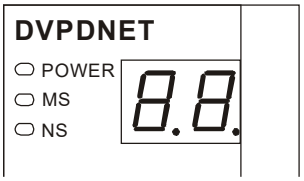
Note:

- After setting up the function switch is complete, 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.

2.6 Digital Indicator

The digital indicator provides following two functions:

- Displaying the node address and error of DVPDNET-SL
- Displaying the error of the 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 correction.

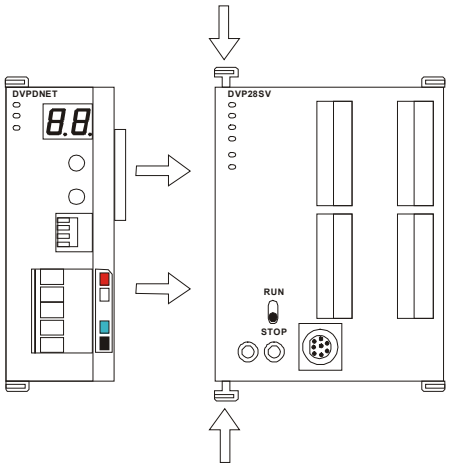
2.7 I/O Extension Port

The extension port is mainly used for connecting DVPDNET-SL to the PLC.

3 Installation

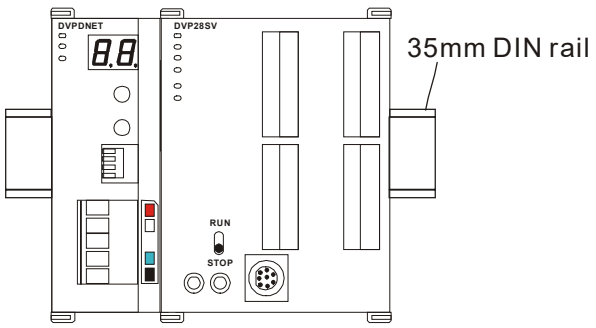
3.1 Connecting DVPDNET-SL to PLC

- 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.



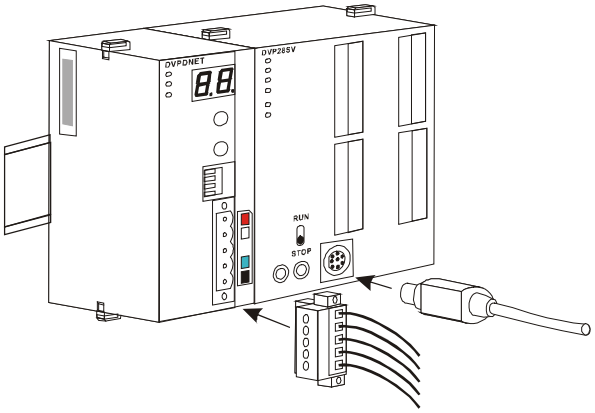
3.2 Installing DVPDNET-SL and PLC on DIN Rail

- 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.



3.3 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

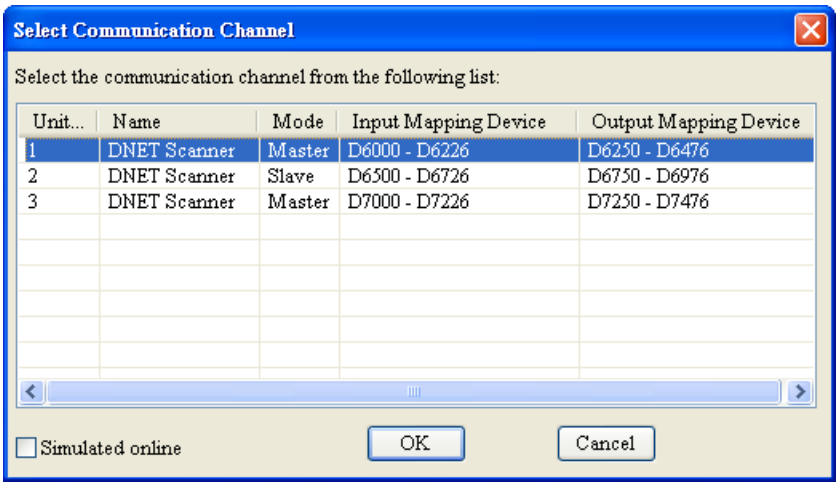
Before DVPDNET-SL starts to work, it must be configured through DeviceNet Builder software.

Note:

Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas in Section 4.2. We take DVP-SV as the PLC for description below.

4.1.1 Communication Channel Selection

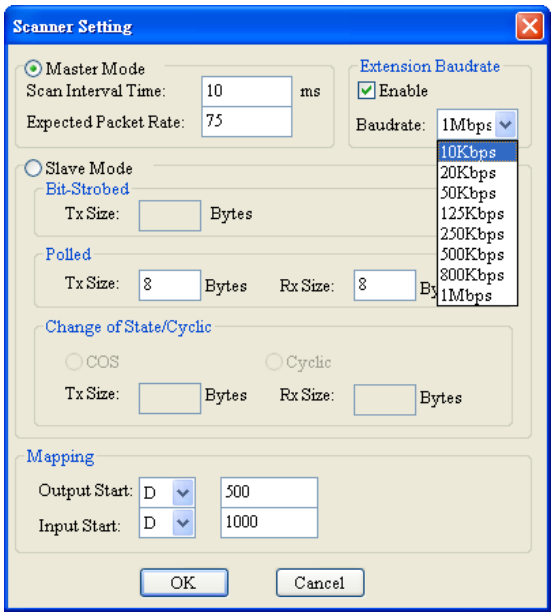
Max. 8 DVPDNET-SL modules can be connected to the left side of the PLC and every DVPDNET-SL is a communication channel. When there are three DVPDNET-SL modules connected to PLC's left side and DeviceNet Builder software is online, the following dialog box will pop up for you to select the current channel.



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 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 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.

4.1.2 Setup of Scan Module

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

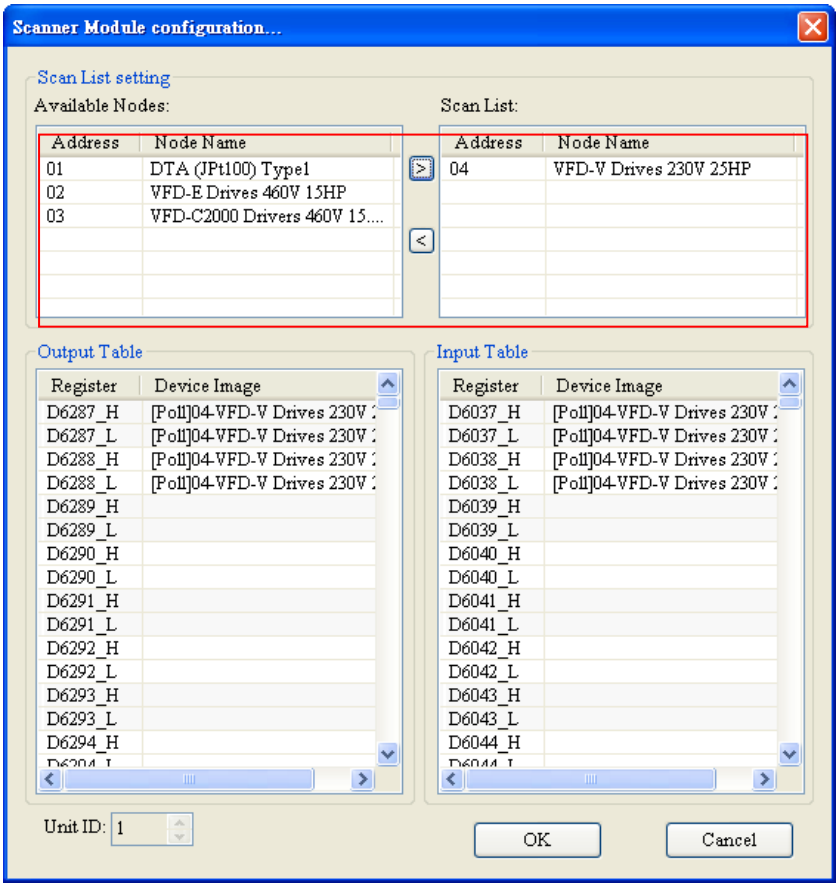


Parameter	Explanation
Master mode	For setting DVPDNET-SL as master.
Scan interval time	The cycle time for master to send and receive the real time data after real-time data connection is successful.
Expected Packet Rate	The result value of the parameter multiplied by 4 is the timeout time. (Unit: ms) 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.

4.1.3 Setup of Scan List

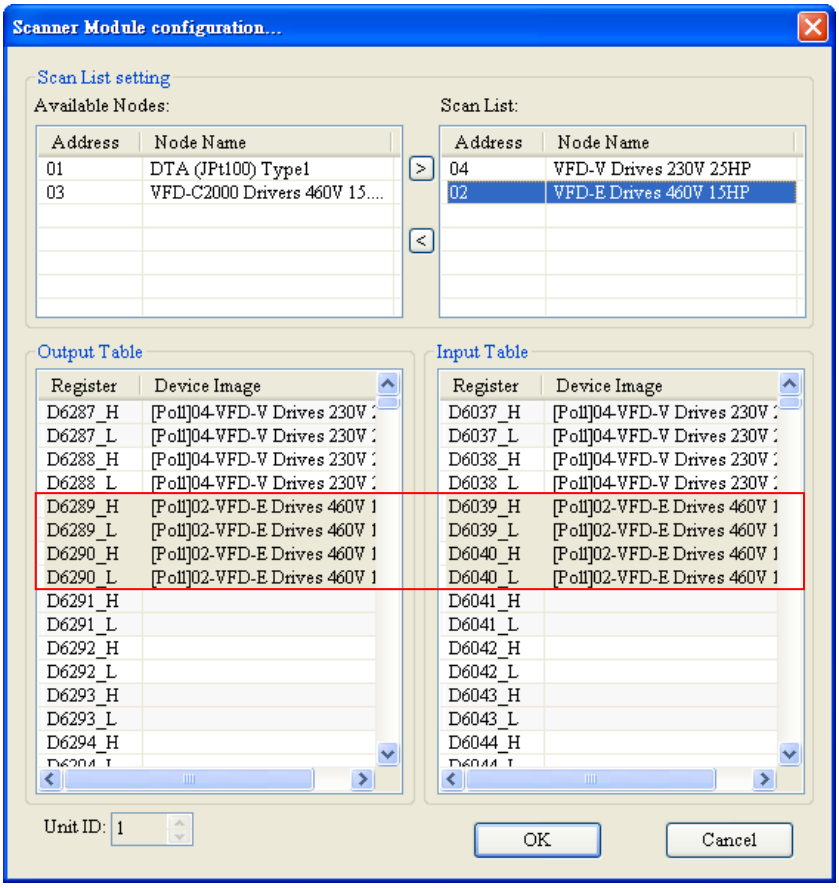
Double click the existing icon of DVPDNET-SL in the DeviceNet Builder interface and then the following dialog box appears for configuring the scan module.



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.

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.



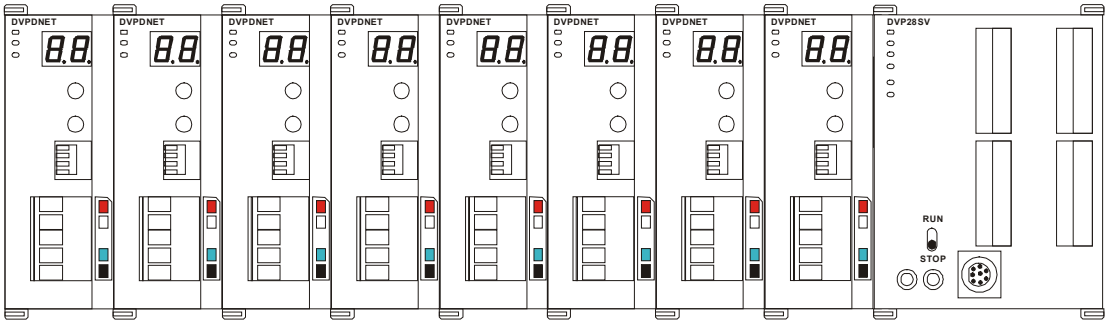
Parameter	Explanation
Output Table	PLC’s registers and the corresponding output data are shown in “Output table”. The values in PLC’s registers will be sent to slave in real time as the control data of the slave.
Input Table	PLC’s registers and the corresponding input data are shown in “input table”. 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.

4.2 Input and Output Mapping Areas

4.2.1 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.



- 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-SV, DVP-EH2_L, DVP-SX2, DVP-SA2 or DVP10MC11T, 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

  - When the PLC is DVP-SV3 and 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

Unit No	Mapping devices	
	Output mapping	Input mapping
5	D18250 – D18497	D18000 – D18247
6	D18750 – D18997	D18500 – D18747
7	D19250 – D19497	D19000 – D19247
8	D19750 – D19997	D19500 – D19747

4.2.2 I/O Mapping Area Assignment (in Master Mode)

- When the PLC is DVP-SV, DVP-EH2_L, DVP-SX2, DVP-SA2 or DVP10MC11T, 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

- 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

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.

4.2.3 I/O Mapping Area Assignment (in Slave Mode)

- When the PLC is DVP-SV, DVP-EH2_L, DVP-SX2, DVP-SA2 or DVP10MC11T, 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.

- 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.

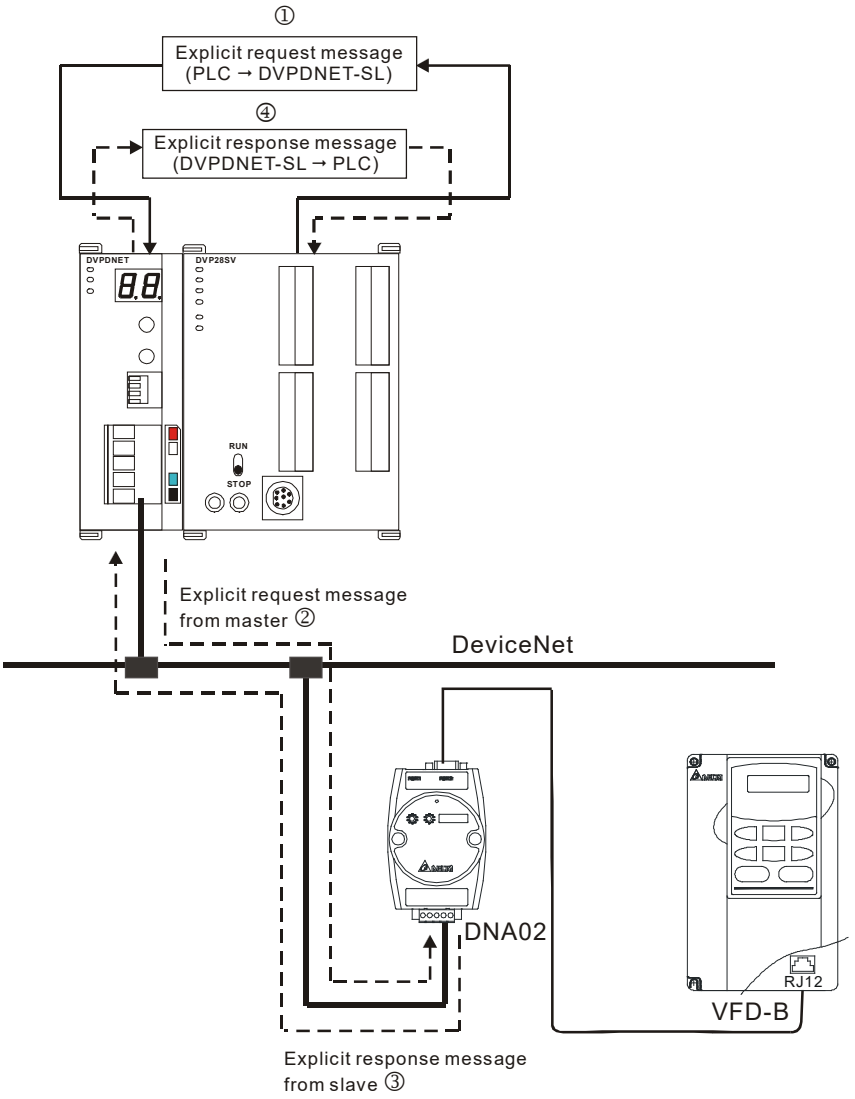
5 Sending Explicit Message from Ladder Diagram

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.

5.1 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.

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 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	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 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:

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 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

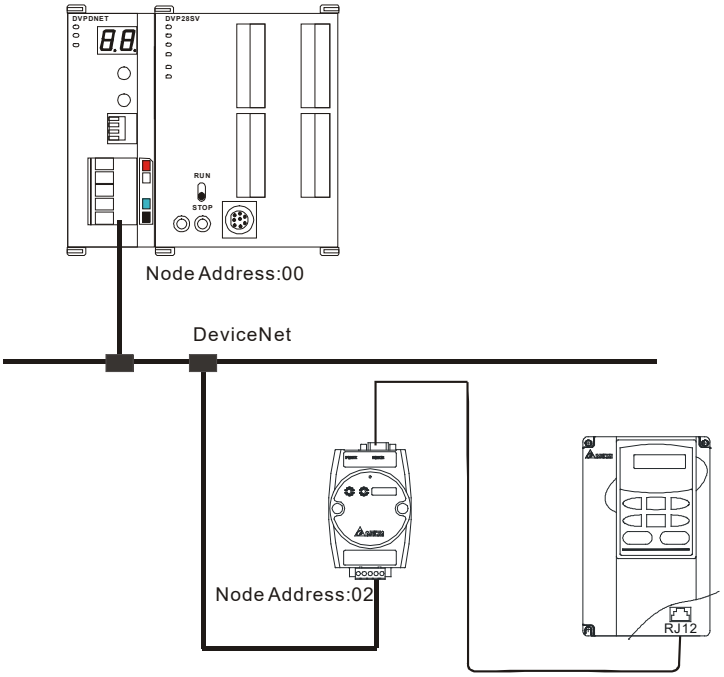
3) Notes:

- 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 IFD9502

1> Connection Figure



Note:

Delta DeviceNet slave module, IFD9502 can connect VFD AC motor drive to the DeviceNet network.

2> Parameters setting and devices explanation

■ Settings for 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”.

■ Settings for DNA02

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

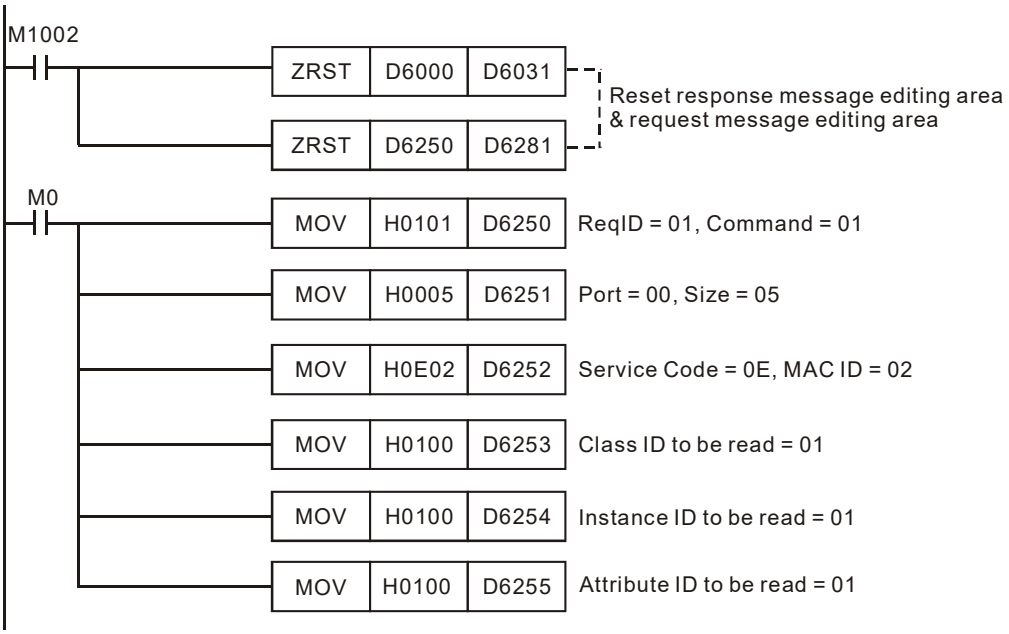
■ Settings for VFD-B

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= 05 Hex							
	D6252	0E02 Hex	Service Code= 0E Hex								MAC ID= 02 Hex							
	D6253	0001 Hex	High bye of Class ID=00 Hex								Low byte of Class ID= 01 Hex							
	D6254	0001 Hex	High byte of Instance ID= 00Hex								Low byte of Instance ID= 01 Hex							
	D6255	0001 Hex	N/A								Attribute ID= 01 Hex							
Response message editing area	D6000	0101 Hex	ReqID= 01 Hex								Status= 01 Hex							
	D6001	0002 Hex	Port= 00 Hex								Size= 02 Hex							
	D6002	8E02 Hex	Service Code= 8E Hex								MAC ID= 02 Hex							
	D6003	031F Hex	High byte of Service Data= 03 Hex								Low byte of Service Data= 1F Hex							

3> PLC program



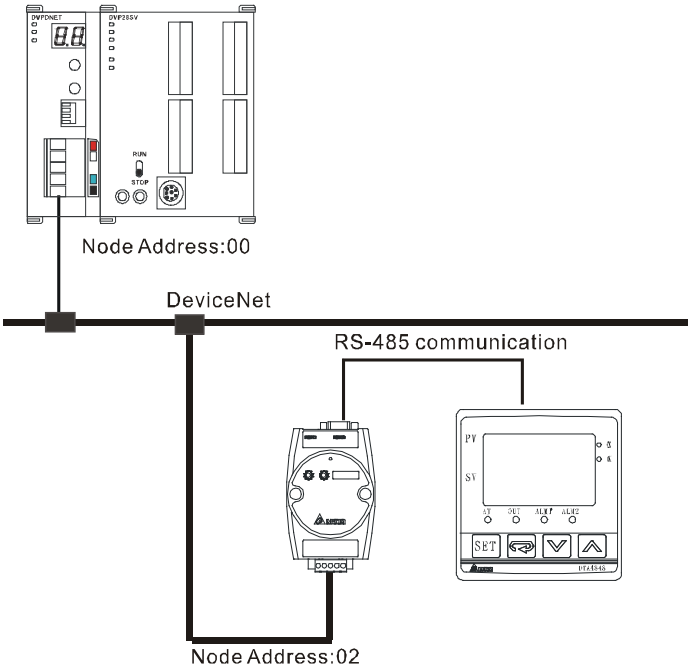
4> Program explanation

- 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”.

1> Connection Figure



Note:

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

2> Parameters setting and devices explanation

■ Settings for 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”.

■ Settings for DNA02

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

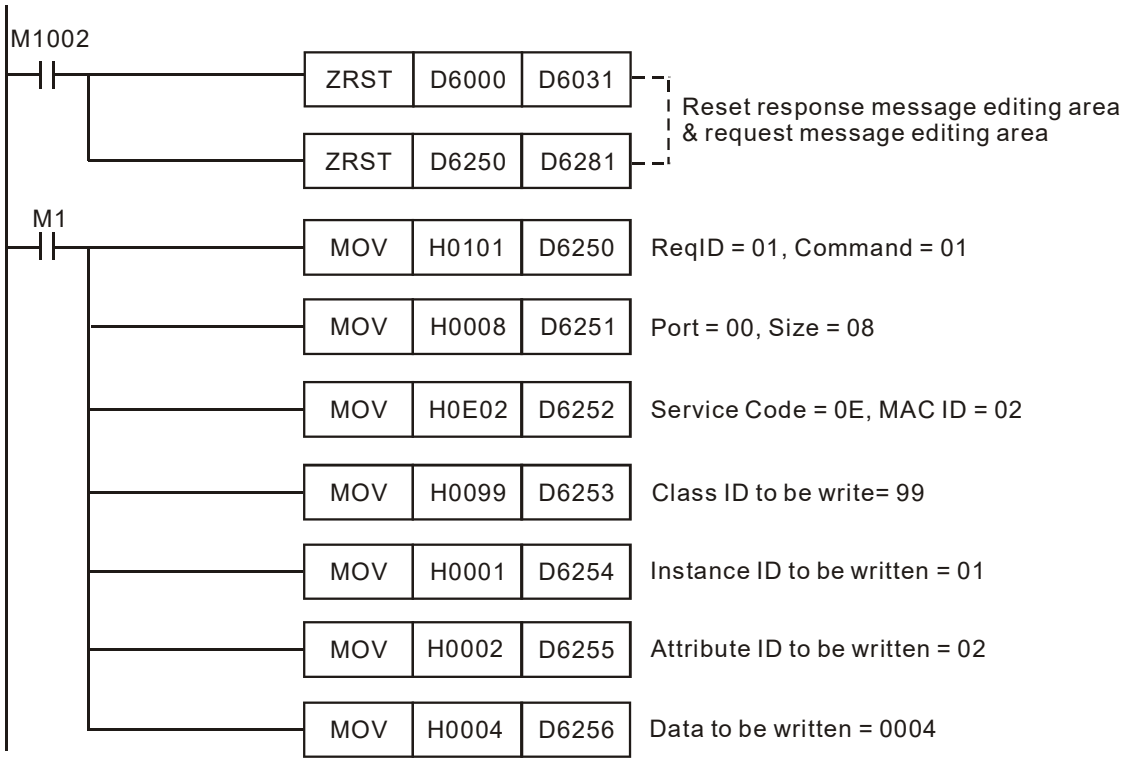
■ Settings for VFD-B

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							

3> PLC program



4> 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.

6 Bit-Strobe Command

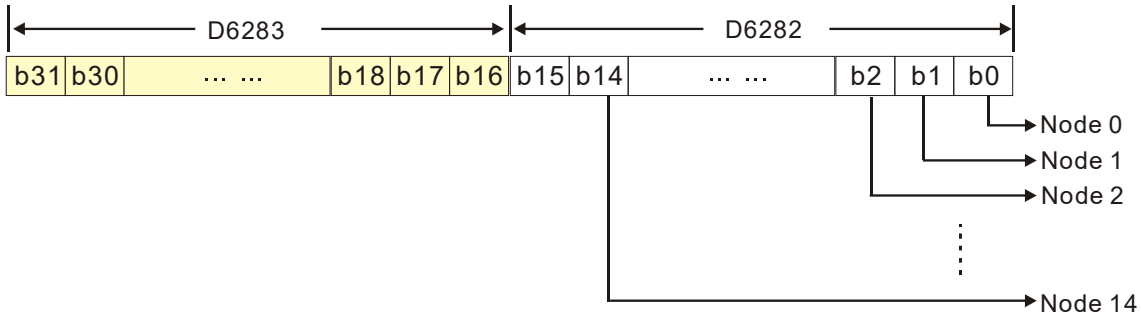
6.1 Principle of Bit-Strobe

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 in Section 4.2. 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.

7 Display of Node Status on Network

7.1 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 read-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-SV, DVP-EH2_L, DVP-SX2, DVP-SA2 or DVP10MC11T on the right of the DVPDNET-SL module, 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 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 node in the scan list is normal, the corresponding bit is OFF. If the node occurs with abnormality, its corresponding bit will become 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, the content in D6036 is 0. While DVPDNET-SL is being initialized, the value in the high byte of D6036 is 1 and the low byte is 0. When an error occurs in DVPDNET-SL, the value in the high byte of D6036 is 2 and the low byte contains an error code. For detains on error codes, please refer to Digital Display Diagnosis in Section 11.2.

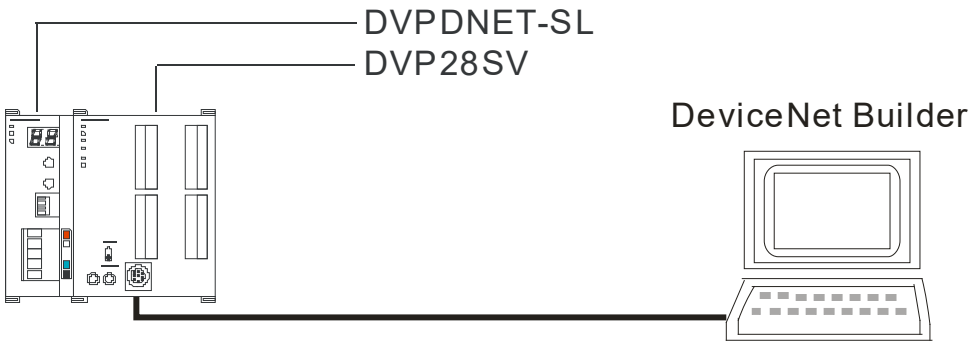
Note: Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas in Section 4.2. We take DVP-SV as the PLC for description below.

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							

8 Setup of Slave Mode

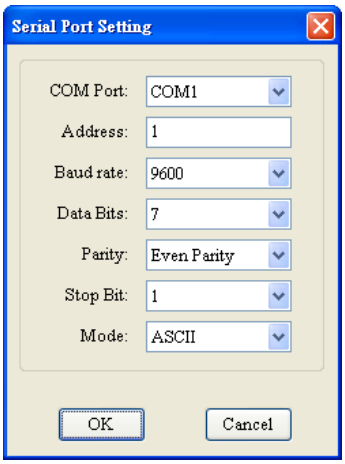
DVPDNET-SL can serve as slave through modifying the mode in the software. As DVPDNET-SL serves as slave, the default input / output data length is 8 bytes and max input / output data length is 255 bytes.
DVPDNET-SL can work in slave mode by using the following method.

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 in Section 4.2. We take DVP-SV as the PLC for description below.

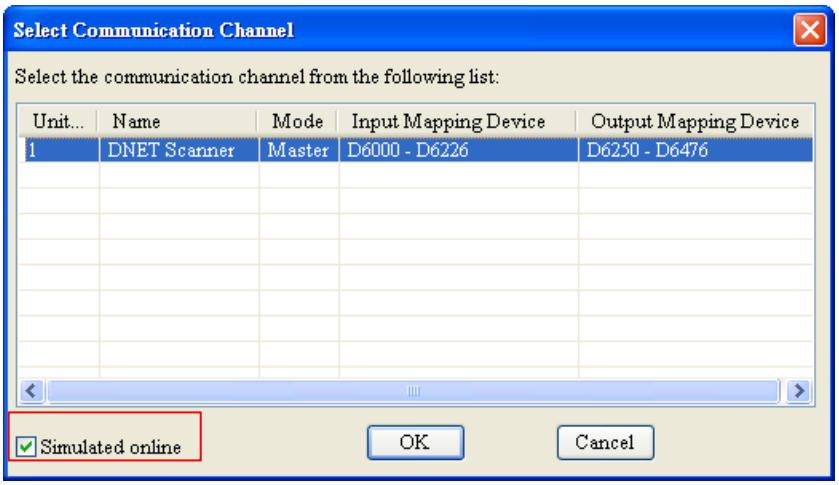
2) Open DeviceNet Builder software, and select “Setup” => “Communication Setting” => “System Channel”, and the “Serial Port Setting” dialog box will appear as below.



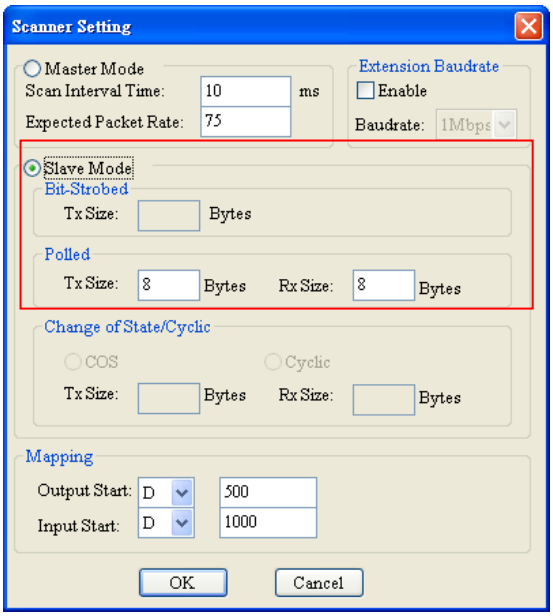
3) Set up the communication parameters for the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after the configuration is finished.

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	1
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

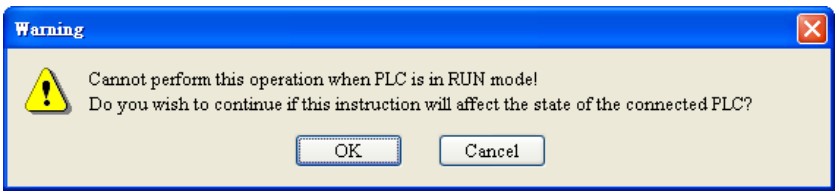
4) Select “Network” => "Online” and the “Select Communication Channel” dialog box will appear. Click on “OK” to start scanning the DeviceNet network after selecting “analog online” in the following window.



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.

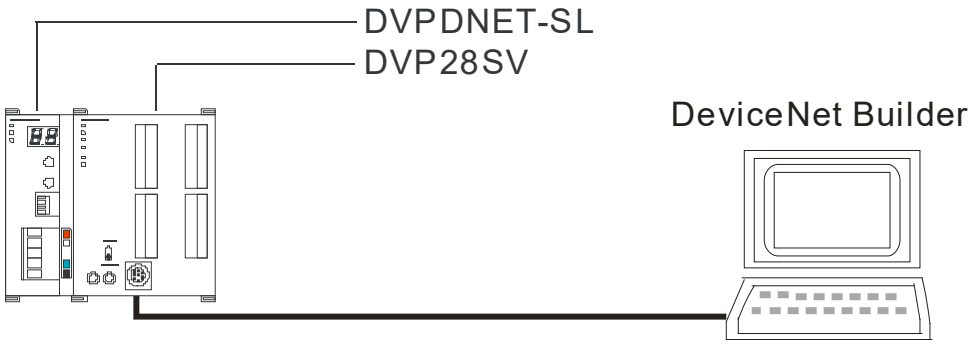


7) After download is finished, power PLC off and then repower it. At this time, DVPDNET-SL has been set as slave mode.

9 Setup of Extended Baud Rate

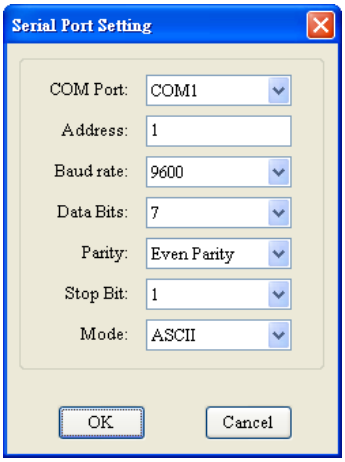
9.1 Setup of Extended Baud Rate (in Master Mode)

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 in Section 4.2. We take DVP-SV as the PLC for description below.

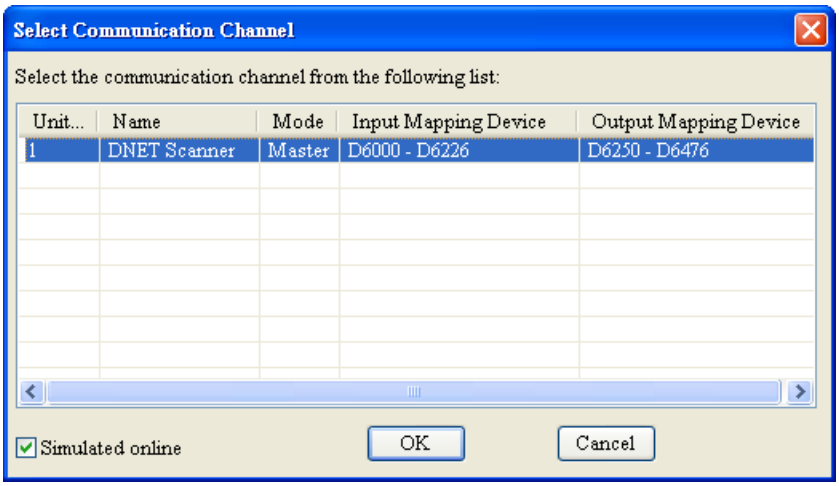
2) Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel”. And then the following dialog box appears.



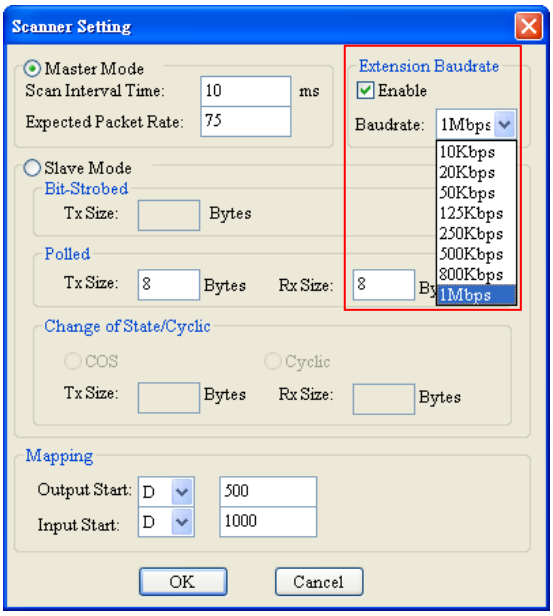
3) Set up the communication parameters for the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after the configuration is finished.

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	1
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

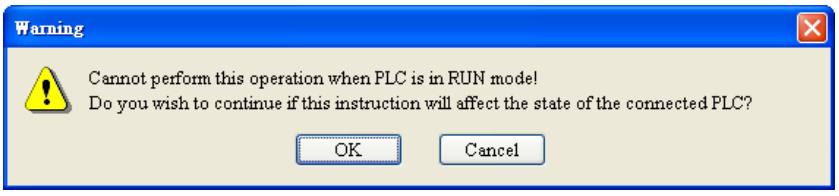
4) Select “Network” => "Online” and the following “Select Communication Channel” dialog box will appear. Click on “OK”.



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.



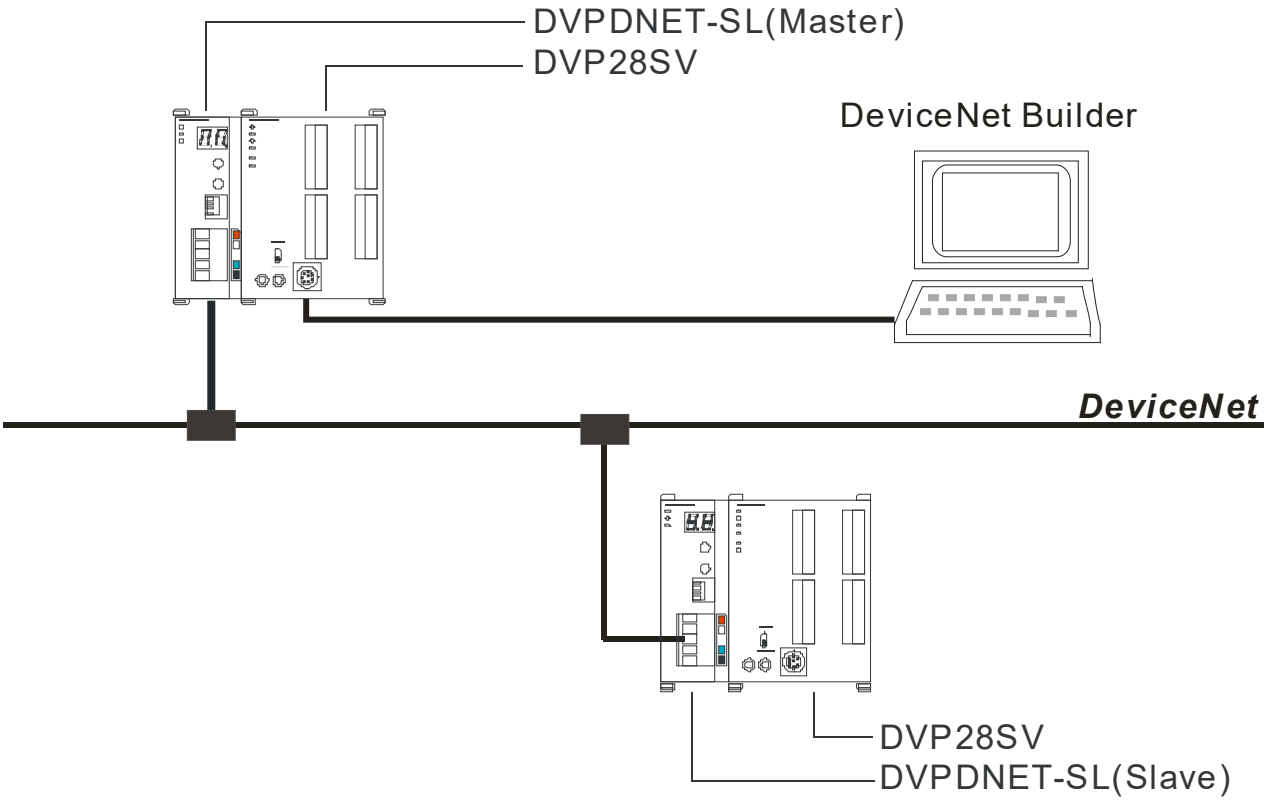
6) Select “Network” => “Download” and the following dialog box appears. Click “OK” to download the configuration data to DVPDNET-SL.



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.

9.2 Setup of Extended Baud Rate (in Slave Mode)

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



Note:

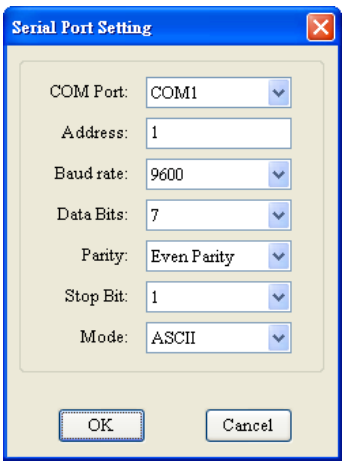
a. The DVPDNET-SL at the bottom of the figure above has been set to work in slave mode.

b. The node addresses of the two DVPDNET-SLs must not be identical. (See Section 2.4).

c. The baud rates of the two DVPDNET-SLs are both 500K bps (See Section 2.5).

d. 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.

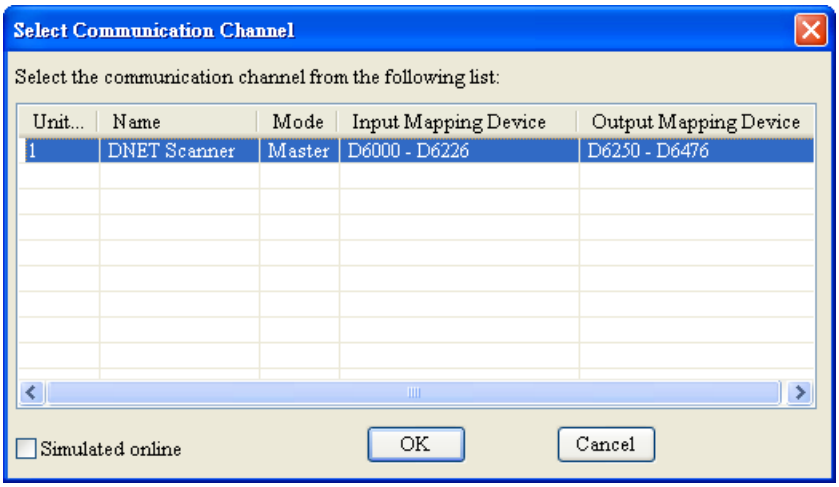
2) Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel” to see the following dialog box.

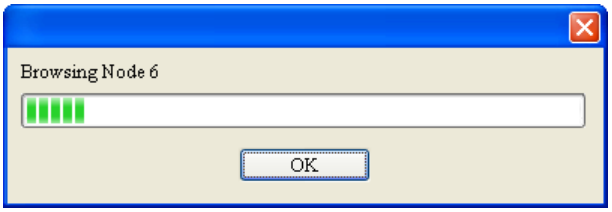


3) Set up the communication parameters for the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after the configuration is finished.

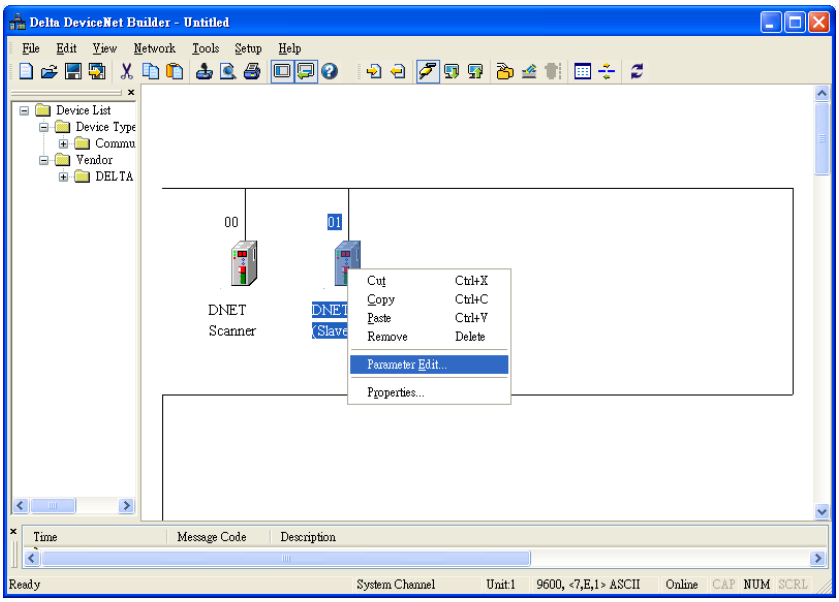
Item	Function	Default
COM Port	COM port on the PC to be used to communicate with DVP-SV	COM1
Address	Communication address of DVP-SV	1
Baud rate	Communication speed between the PC and DVP-SV	9,600 (bps)
Data Bits	Communication protocol between the PC and DVP-SV	7
Parity		Even Parity
Stop Bit		1
Mode	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.

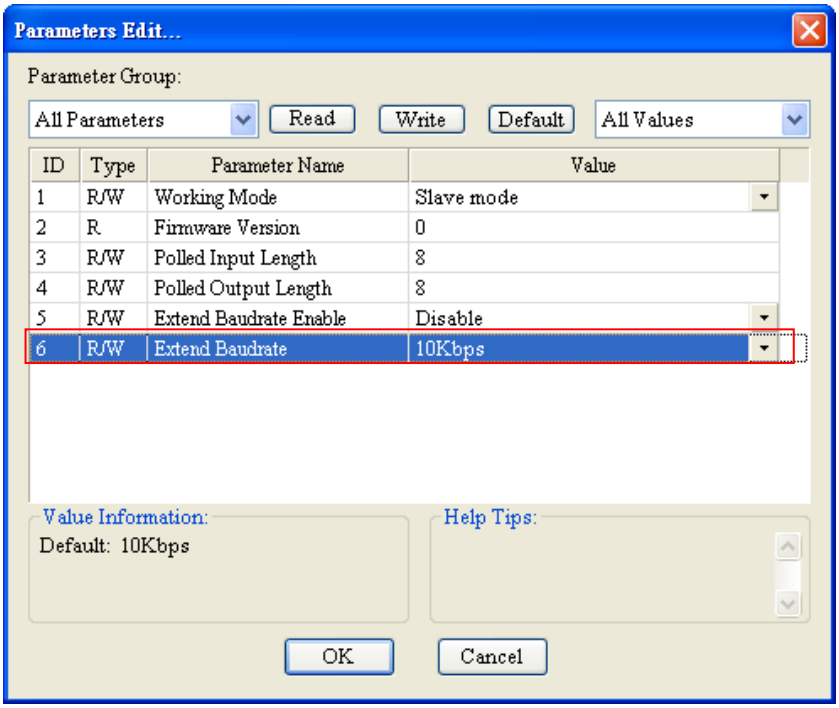




5) After scanning is successful, right click DNET (Slave) to select “Parameter editing”.



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 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.

10 Application Example

This section provides an example on how to construct and configure the DeviceNet network.

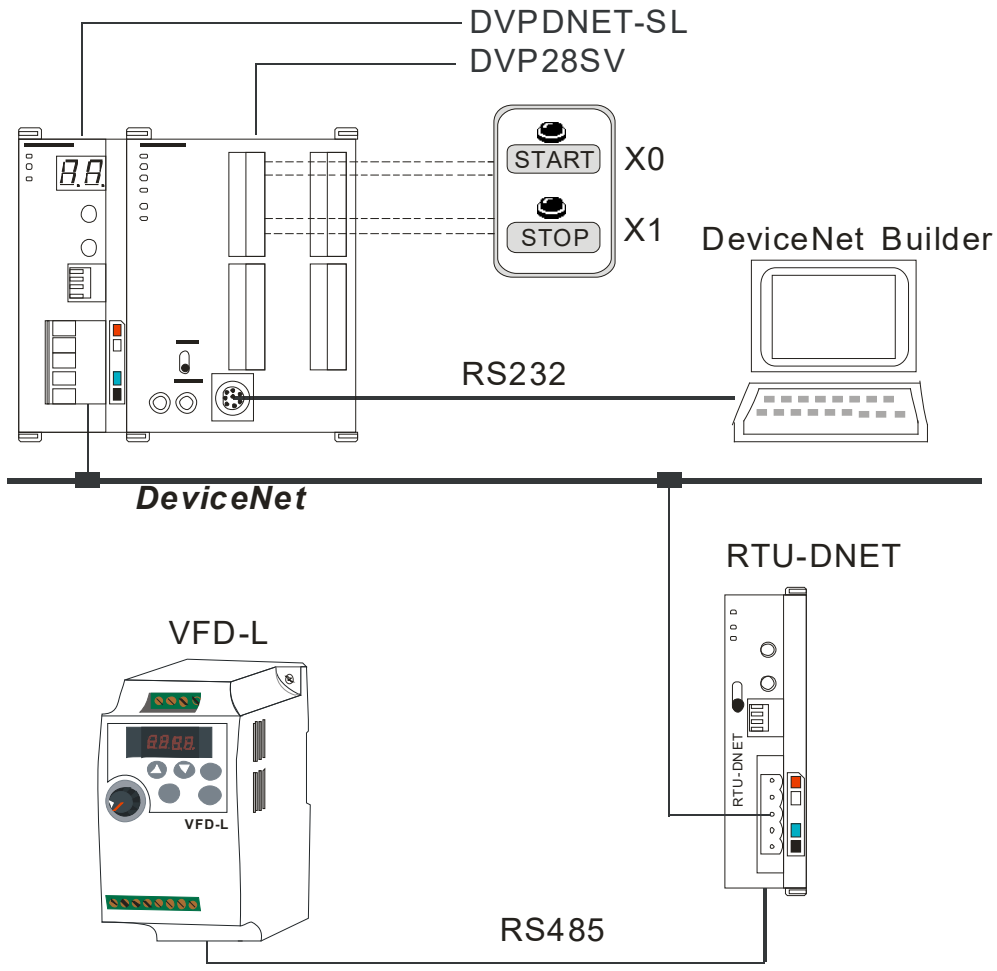
Control requirement	Using X points of DVP28SV to control RUN/STOP of the remote AC motor drive VFD-L.

Note:

Different PLC corresponds to different device addresses. For details, please refer to Input and Output Mapping Areas in Section 4.2. We take DVP-SV as the PLC for description below.

10.1 How to Construct a 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.

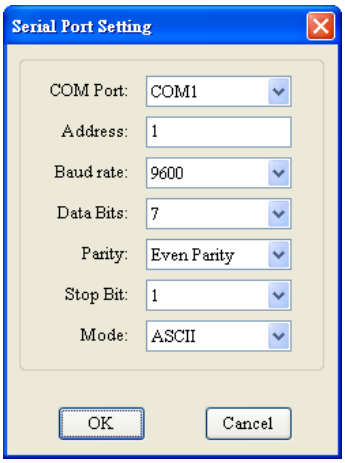
DeviceNet Module	Node address	Baud rate
DVPDNET-SL	01	500kbps
RTU-DNET	02	500kbps

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.

10.2 How to Configure DeviceNet Network

1) Configuring DeviceNet slave

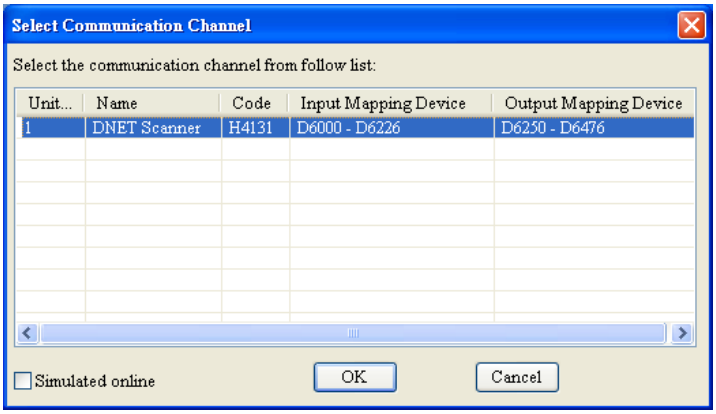
1> Open DeviceNet Builder software and select “Setup” => “Communication Setting” => “System Channel”, and then the “Serial Port Setting” dialog box will appear as below.

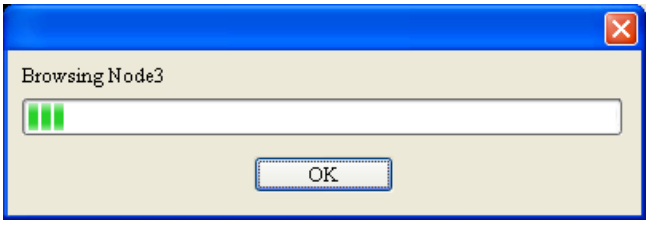


2> Set up the communication parameters for the PC and DVP-SV, e.g. the communication port, address, baud rate and communication format. Click on “OK” after the configuration is finished.

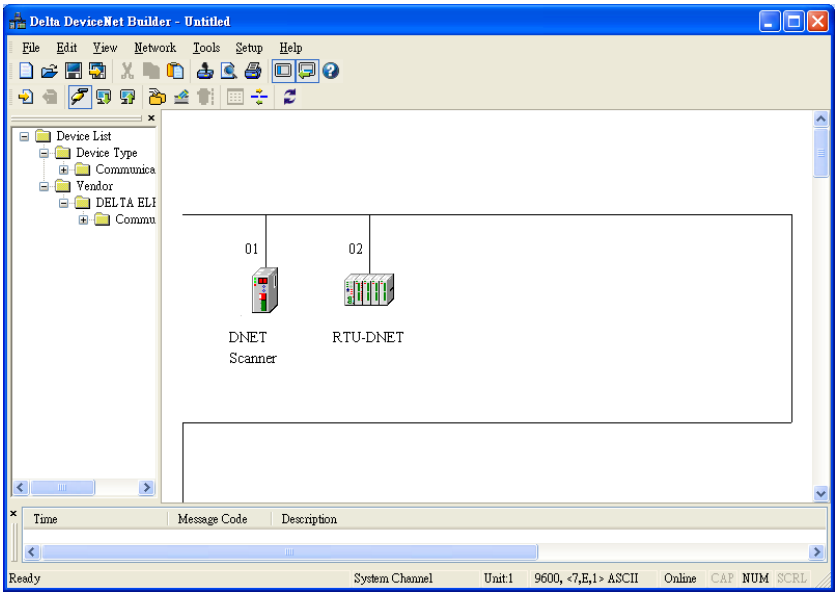
Item	Function	Default
COM Port	COM port on the PC to be used to communicate with DVP-SV	COM1
Address	Communication address of DVP-SV	1
Baud rate	Communication speed between the PC and DVP-SV	9,600 (bps)
Data Bits	Communication protocol between the PC and DVP-SV	7
Parity		Even Parity
Stop Bit		1
Mode	Communication mode between the PC and DVP-SV	ASCII

3> Select “Network” => "Online”, and the “Select Communication Channel” dialog box will appear. Click on “OK” to start scanning the DeviceNet network.

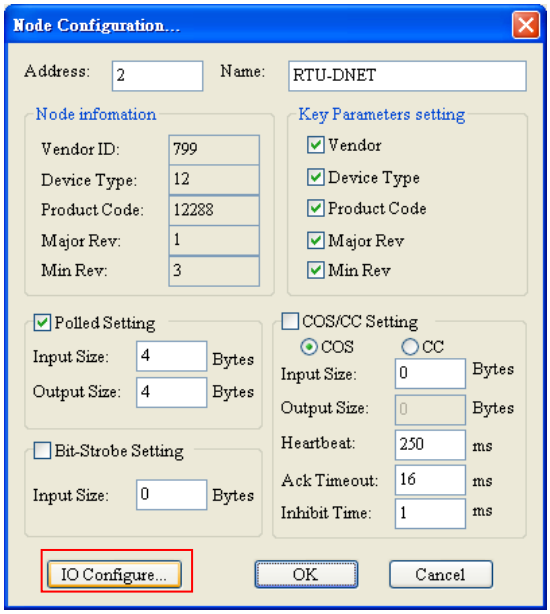




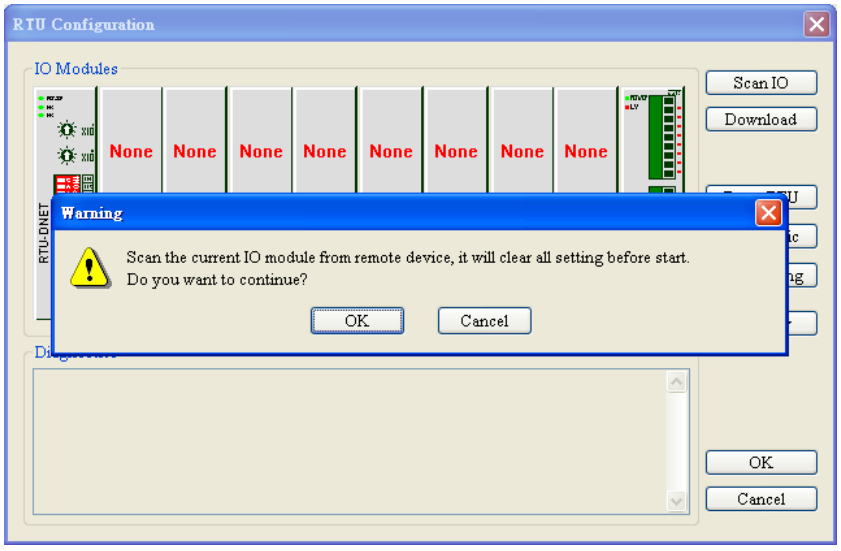
4> If there is no progress in the bar on the dialog box, it means the connection between the PC and DVP-SV is abnormal, or there are other programs also using the COM port on the PC. After the scan is completed, the dialog box will tell you that the scan is completed, and the icons and device names of 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.



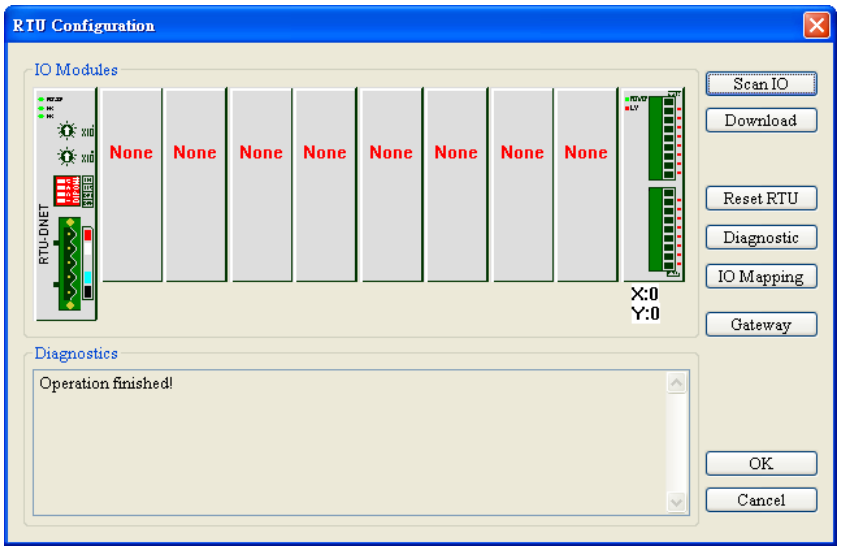
5> Double click on RTU-DNET (node 02), and the "Node Configuration…" dialog box will appear.



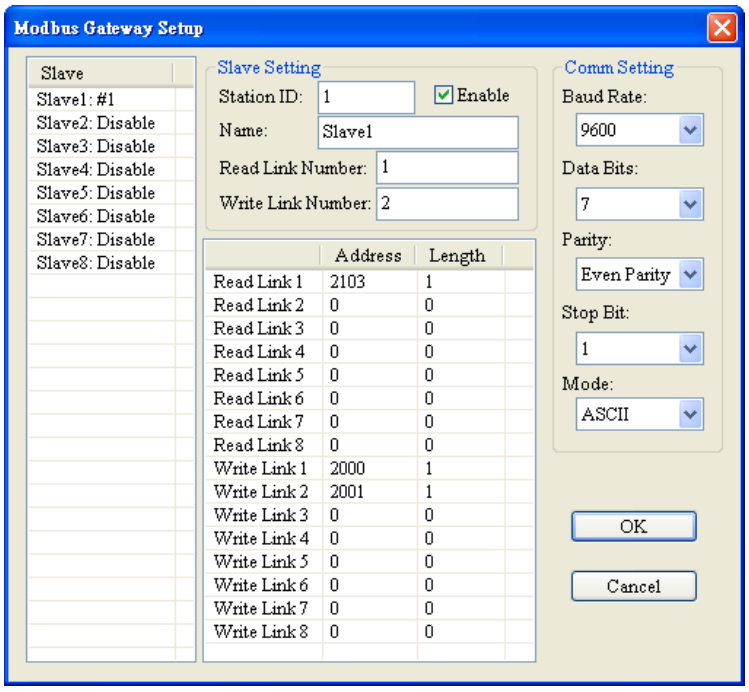
6> Clicking on “IO Configure…” button in “Node Configuration” dialog box, you will see “RTU Configuration” page where you click on “Scan IO” button and “Warning” dialog box will appear. With a click on “OK”, DeviceNet Builder will detect the devices connected to RTU-DNET as below.



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”.

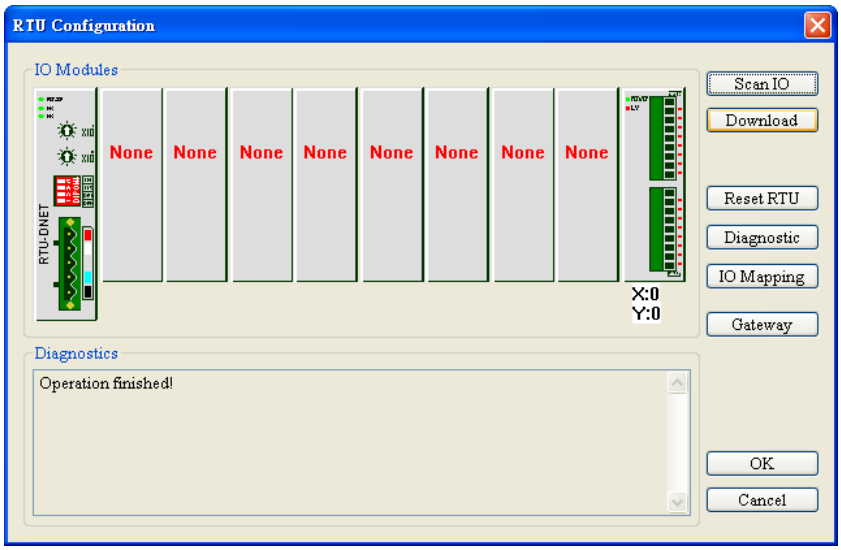


8> In the interface of “Modbus gateway setting”, use the parameters of one slave and fill in relevant values there. You can refer to the user manual of RTU-DNET.



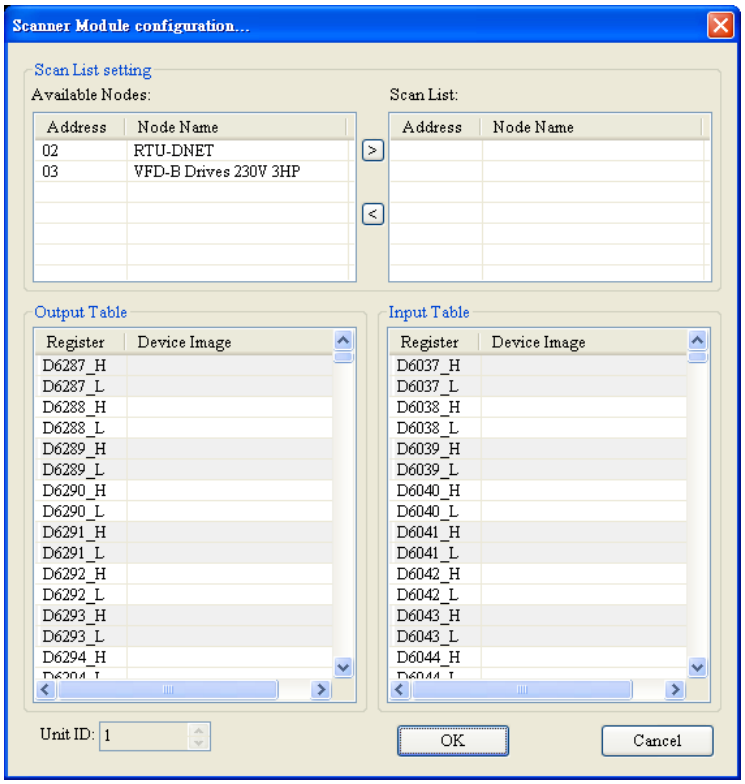
Note: The slave mentioned here is the slave on the Modbus network and has nothing directly to do with the DeviceNet network.

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.

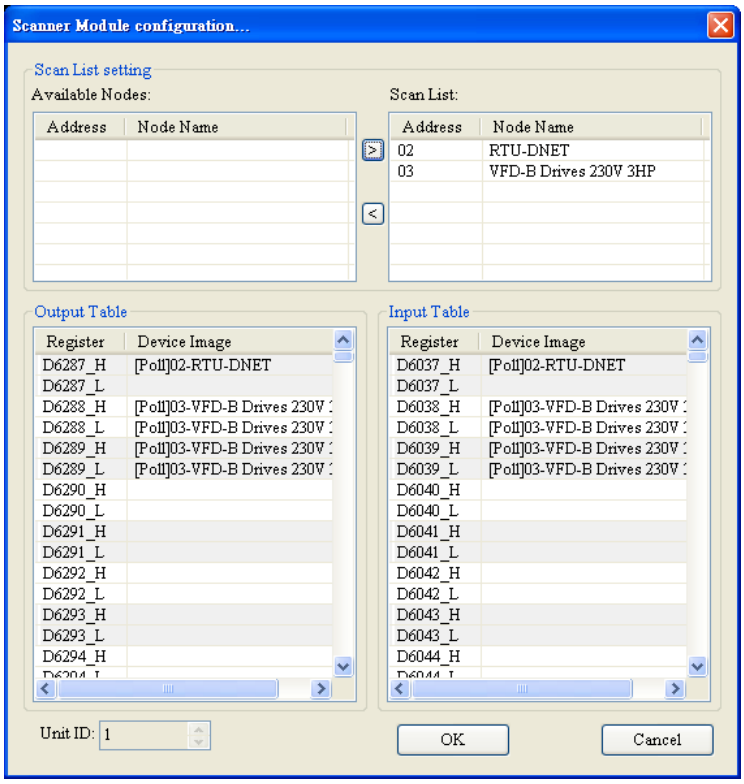


2) Configuration of DeviceNet Master

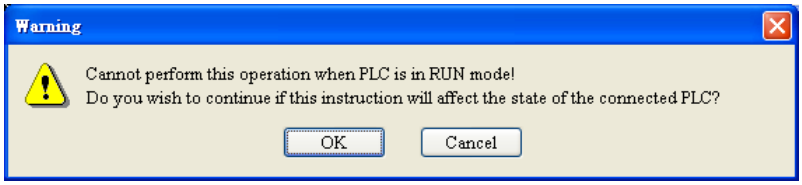
1> Double click on DNET Scanner (node 01), and the “Scan Module Configuration..." dialog box will pop up. You can find the currently available nodes, RTU-DNET and VFD-B Drives 230V 3HP, in the list on the left side. On the right side, there is an empty “Scan List”.



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

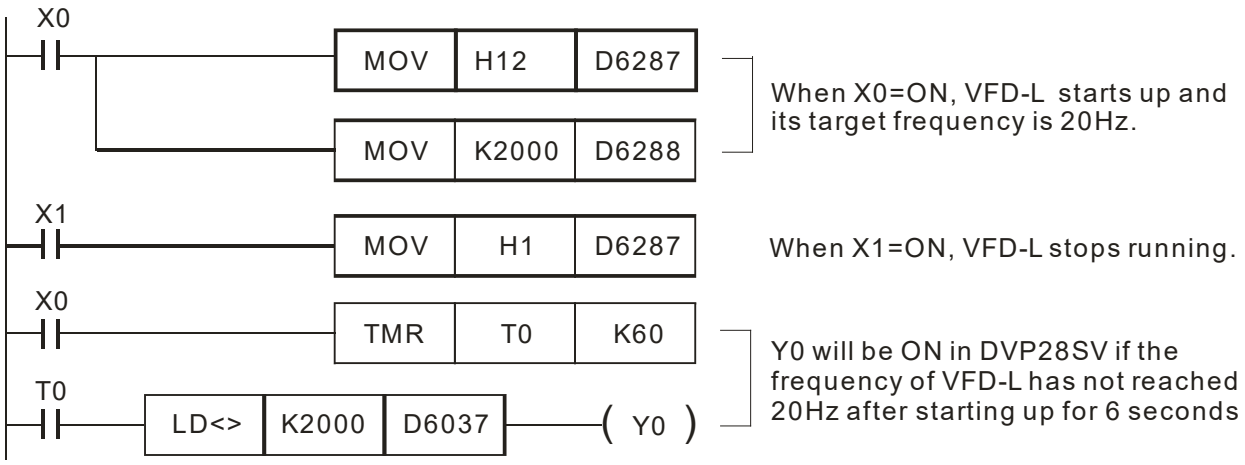
DVP28SV	DVPDNET-SL	RTU-DNET & VFD-L
D6037	⇦	Output frequency of VFD-L (2103H)

10.3 Ladder Diagram Program

This section introduces how to edit the ladder diagram program to meet the requirement of controlling the DeviceNet network.

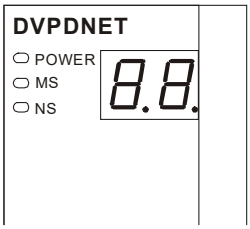
Control requirement	When X0=ON, VFD-L AC motor drive runs; When X1=ON, VFD-L AC motor drive stops; After VFD-L has been operating for 6 seconds, Y0 of DVP28SV is ON if the specified frequency of VFD-L is not reached yet.

Explanation of PLC Program



11 Error Diagnosis & Trouble-shooting

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



11.1 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	Some slaves encounter communication error.	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 for repair.

■ MS & 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.

11.2 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.