DELTA ELECTRONICS, INC.

RTU-DNET

DeviceNet Remote I/O Communication Module

Application Manual

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

DVP-0214120-03

⚠ 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.*

✓ *RTU-DNET is an OPEN TYPE device and therefore 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.*

✓ *RTU-DNET 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 RTU-DNET can install, operate, wire and maintain it.*

✓ *DO NOT connect input 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.*

🕮 Table of Contents

1 Introduction

1. Thank you for choosing Delta RTU-DNET. To ensure correct installation and operation of RTU-DNET, please read this chapter carefully before using your RTU-DNET.
2. This chapter only provides introductory information on RTU-DNET. For more detailed information on DeviceNet protocol, please refer to relevant references or literatures.
3. RTU-DNET is defined as DeviceNet slave and its IO extension ports are used to connect Slim DI/DO module and special module. Its RS-485 port is used to connect Modbus device such as the AC motor drive, servo drive, temperature controller, PLC and so on.
4. RTU-DNET is a remote I/O communication module applicable to the connection between DeviceNet and DVP Slim DIDO module and special modules. RTU-DNET offers functions such as status diagnosis, error treatment and so on.

1.1 Features

- Supports the standard DeviceNet communication protocol as DeviceNet slave
- Supports explicit connection via predefined Master/Slave connection set.
- Supports polling
- The network configuration software DeviceNet Builder provides the graphic configuration interface, automatically scans and recognizes the extension module, configures CR register of special module as IO material, sets the methods to deal with the errors and diagnoses the error status of each module.
- According to the actual demand, user selects whether to retain the data in the buffer register information when the network is off line.
- Max. 128 digital input points, 128 digital output points and max. 8 special modules extentendable
- Supports MODBUS communication protocol and can be connected to 8 MODBUS devices.

1.2 Function and Specifications

■ DeviceNet Connection

Transmission Method	CAN
Electrical Isolation	500 VDC
Interface	Removable connector (5.08mm)
Transmission Cable	2-wire twister shielded cable with 2-wire bus power and drain

■ DeviceNet Communication

Communication Protocol	Standard DeviceNet communication protocol
Message Type	I/O polling, explicit, Group 2 only servers
Baud Rates	Standard: 125 kbps; 250 kbps; 500 kbps Extension: 10 kbps; 20 kbps; 50 kbps; 125 kbps; 250 kbps; 500 kbps; 800kbps;1M kbps

■ RS-485 communication port

Baud rate	2400bps; 4800 bps; 9600 bps; 19200 bps; 38400 bps; 57600 bps; 115200 bps
Communication Protocol	Standard MODBUS communication protocol
Transmission Format	<7,E,1>ASCII <8,E,1>ASCII/RTU <7,O,1>ASCII <8,O,1>ASCII/RTU <7,E,2,>ASCII <8,N,1>ASCII/RTU <7,O,2,>ASCII <8,N,2>ASCII/RTU
Transmission Cable	2-wire twister shielded cable

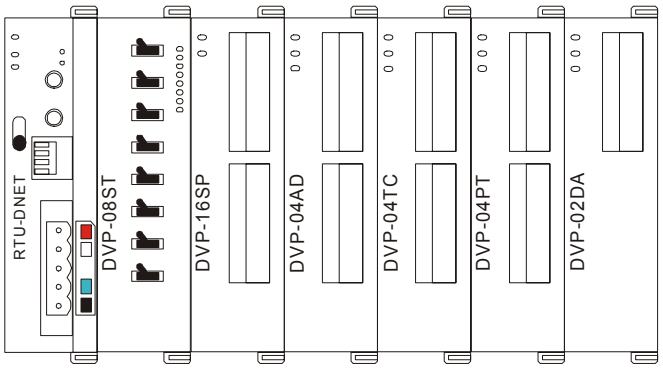
■ Electrical specification

Voltage	11 ~ 25 VDC, supplied by DeviceNet network
Current	60mA

■ Environment

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); 50 ~ 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

1.3 Extension Modules Connectable to RTU-DNET



■ DVP Slim DI/DO extension units connectable to RTU-DNET

Slim DI/DO (model name)	Default I/O mapping data (DeviceNet → RTU-DNET)	Default I/O mapping data (RTU-DNET → DeviceNet)
DVP-08SM11N	N/A	8 bits
DVP-08SN11R/T	8 bits	N/A
DVP-08SP11R/T	8 bits	8 bits
DVP-16SP11R/T	8 bits	8 bits
DVP-08ST	N/A	8 bits

■ Special modules connectable to RTU-DNET

Special module (model name)	Default I/O mapping data (DeviceNet → RTU-DNET)		Default I/O mapping data (RTU-DNET → DeviceNet)	
	Start CR	Length (words)	Start CR	Length (words)
DVP-02DA	CR#10	2	N/A	N/A
DVP-04DA	CR#6	4	N/A	N/A
DVP-04AD	N/A	N/A	CR#12	4
DVP-06AD	N/A	N/A	CR#12	6
DVP-04TC	N/A	N/A	CR#14	4
DVP-04PT	N/A	N/A	CR#18	4
DVP-06XA	CR#10	2	CR#12	4
DVP-01PU	CR#42	4	CR#33	4

Note:

While connected to a special module, the start CR and length of uploaded/download data of RTU-DNET can be set up in DeviceNet network configuration tool.

1.4 The MODBUS Device RTU-DNET Supports

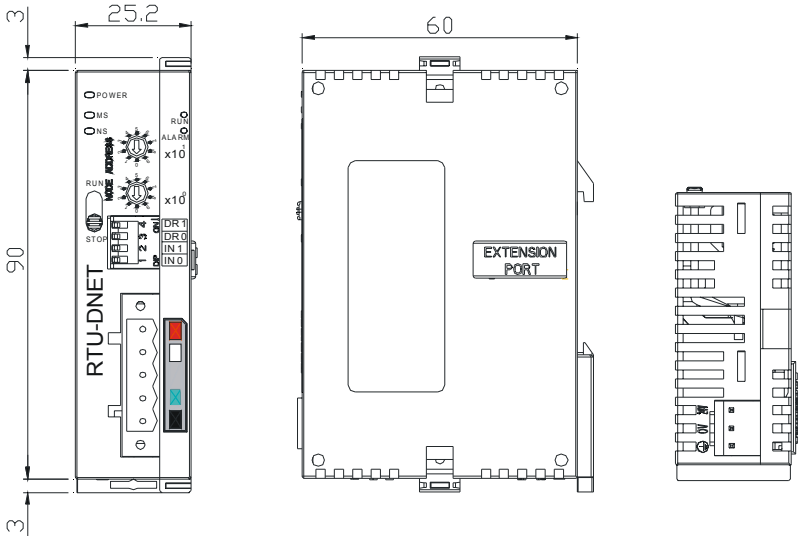
RTU-DNET supports the standard MODBUS protocol and therefore it supports MODBUS devices like Delta motor drive, Delta servo drive, Delta temperature controller, Delta PLC and etc.

Note：

- ✓ RTU-DNET is always used as the MODBUS master and the MODBUS device connected with it is under its control.
- ✓ The communication format of MODBUS device should be the same as that of RTU-DNET.

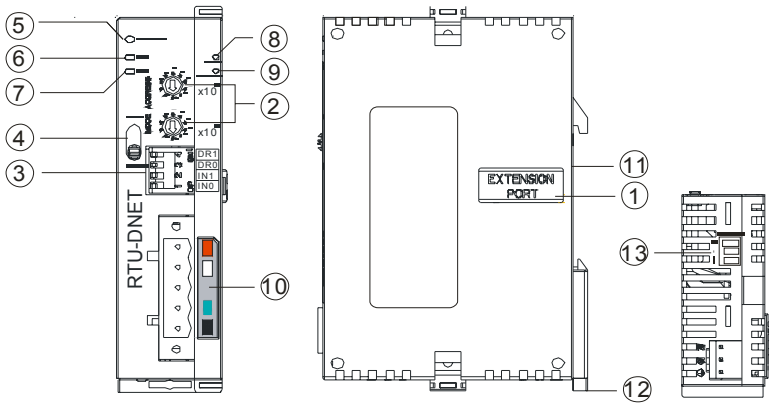
2 Product Profile & Outline

2.1 Dimension



Unit: mm

2.2 Product Profiles

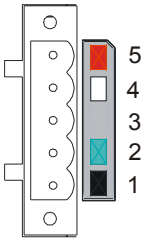


1. Extension port	8. RUN indicator
2. Address switch	9. ALARM indicator
3. Function switch	10. DeviceNet connection port
4. RUN/STOP switch	11. DIN rail
5. POWER indicator	12. DIN rail clip
6. MS (Module Status) indicator	13. RS485 communication port
7. NS (Network Status) indicator	

2.3 DeviceNet Connection Port

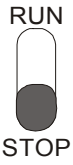
The connector is used for the connection to DeviceNet. Wire by using the connector enclosed with RTU-DNET.

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



2.4 RUN/STOP Switch

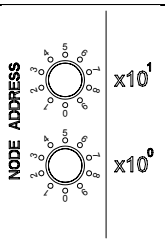
RUN/STOP action	Explanation
STOP → RUN	1. Re-detecting the extension module. 2. Reading/writing the data in the extension module.
RUN → STOP	Stop reading/writing the data in the extension module.



2.5 Address Switch

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

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



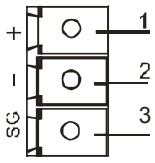
Example: If you need to set the node address of RTU-DNET to 26, simply switch the corresponding switch of $x10^1$ to 2 and the corresponding switch of $x10^0$ to 6.

Notes:

- Please set up the node address when the power is switched off. After the setup is completed, re-power RTU-DNET.
- When RTU-DNET 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.

2.6 RS485 Communication Port

Pin	Signal	Content
1	+	Signal+
2	-	Signal-
3	SG	GND

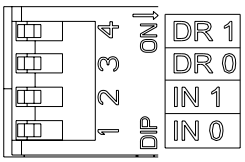


2.7 Function Switch

The function switches are for:

- Setting up data retention function (IN0)
- Setting up the baudrate of DeviceNet (DR0 ~ DR1)

DR1	DR0	Baud Rate
OFF	OFF	125 kbps
OFF	ON	250 kbps
ON	OFF	500 kbps
ON	ON	Entering the mode of the extended baud rate (Please refer to chapter 6)
IN0	OFF	When DeviceNet is off, the I/O data in the buffer area will be cleared.
	ON	When DeviceNet is off, the I/O data in the buffer area will be held.
IN1	Reserved	



Notes:

- Please set up the function switch when the power is switched off. After the setup is completed, re-power RTU-DNET.
- When RTU-DNET 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.

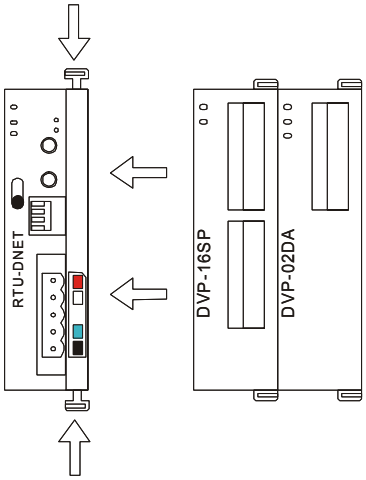
2.8 Extension Port

The extension port is used on connecting RTU-DNET to DVP Slim DI/DO extension units and special modules.

3 Basic Operation

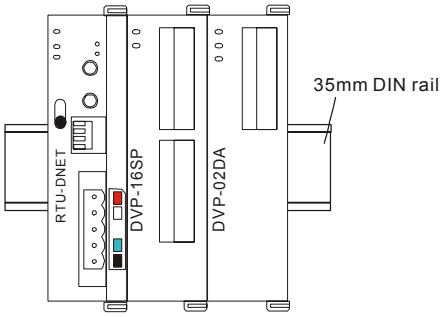
3.1 Connecting RTU-DNET to DVP Slim DI/DO Extension Unit

- Open the fixing clips on top and bottom of RTU-DNET. Meet the extension port of Slim DI/DO with RTU-DNET.
- Press the fixing clips on top and bottm of Slim DI/DO and check if the connection is fine.



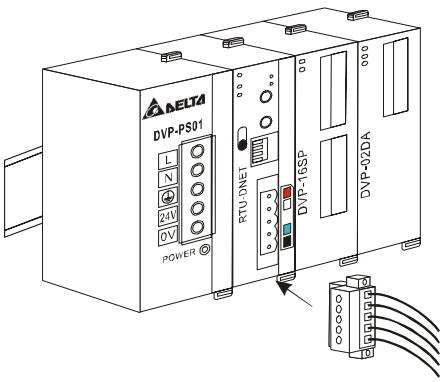
3.2 Installing RTU-DNET and DVP Slim DI/DO on DIN Rail

- Use 35mm DIN rail.
- Open the DIN rail clip on RTU-DNET and Slim DI/DO. Insert RTU-DNET and Slim DI/DO onto the DIN rail.
- Clip up the DIN rail clips on RTU-DNET and Slim DI/DO to fix them on the DIN rail, as shown below.



3.3 Connecting to DeviceNet Connection Port

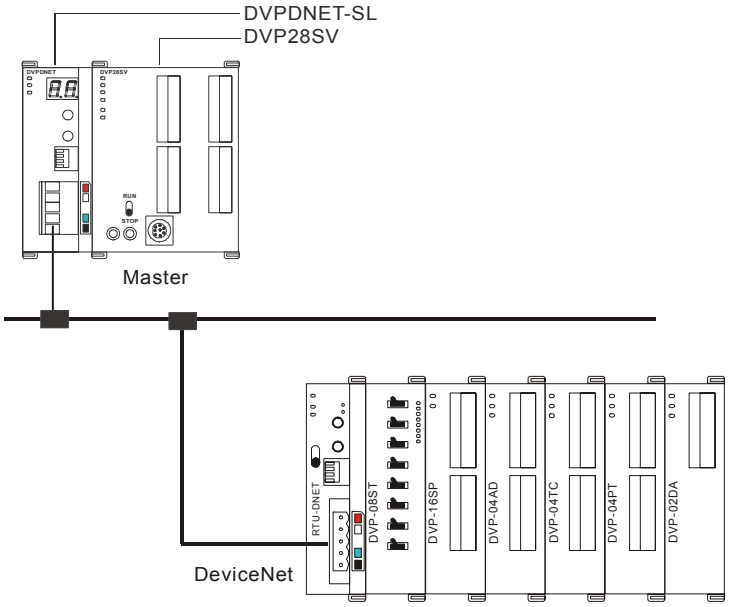
- The colors on the PINs on the DeviceNet connection port match the colors of the connection cables. Make sure you connect the cable to the right PIN.
- We recommend you also apply Delta's power module in the connection.



4 How to Configure RTU-DNET

In this section we will introduce how RTU-DNET as a DeviceNet slave realizes the data exchange between DeviceNet master and DVP Slim DI/DO extension unit.

- DeviceNet master sends the data to Slim DI/DO.
- RTU-DENT sends the input data from Slim DI/DO to DeviceNet master.



4.1 Terms

No.	Item	Unit	Explanation
1	Control word	Word	For setting up the mode of RTU-DNET, e.g. “H8000” for STOP mode and “H8001” for RUN mode. See 4.3 for more details.
2	Status word	Word	Displaying the status of RTU-DNET. See 4.3 for more details.
3	Number of digital input points	Bit	The digital input points shall be 8’s multiple. The number will be regarded as 8 when it is less than 8 and as 16 when it is bigger than 8 but less than 16.
4	Number of digital output points	Bit	The digital output points shall be 8’s multiple. The number will be regarded as 8 when it is less than 8 and as 16 when it is bigger than 8 but less than 16.
5	Length of input data of special module	Word	The length of input data of the special module connected to RTU-DNET
6	Length of output data of special module	Word	The length of output data of the special module connected to RTU-DNET

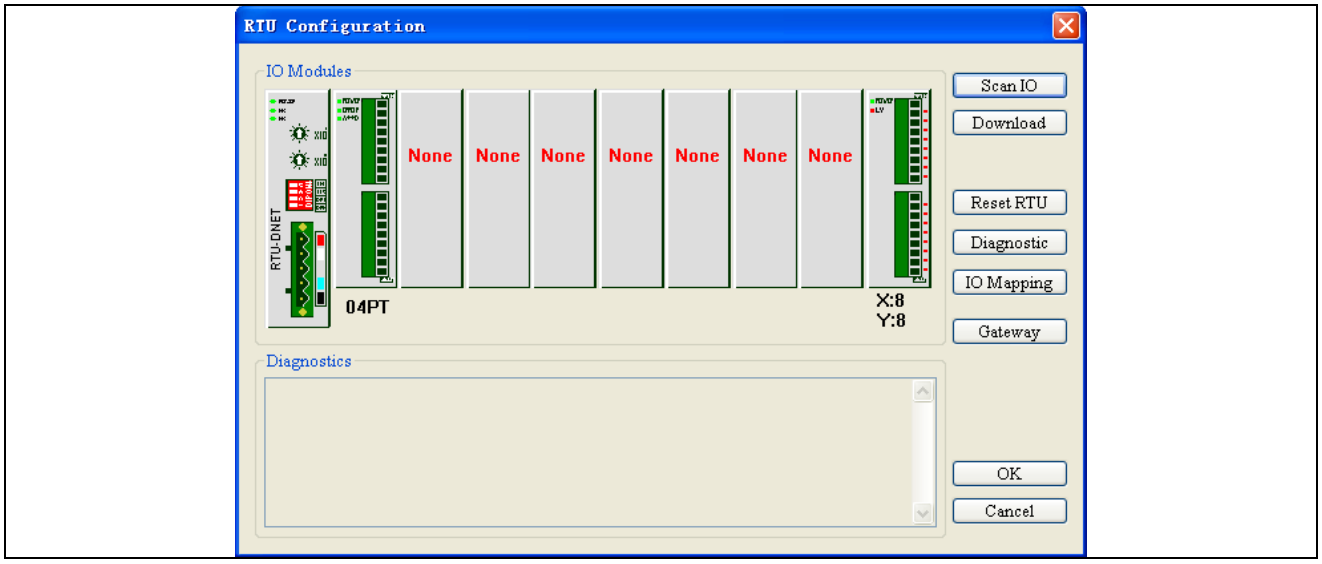
No.	Item	Unit	Explanation
7	Length of input I/O data	Byte	The sum of the length of the status word of RTU-DNET and the input data of the special module connected to it. One input channel of the special module occupies 2 bytes. 8 points of the digital input are counted as 1 byte.
8	Length of output I/O data	Byte	The sum of the length of the control word of RTU-DNET and theoutput data of the special module connected to it. One output channel of the special module occupies 2 bytes. 8 points of the digital output are counted as 1 byte.
9	Number of special modules	Unit	The number of special modules connected to RTU-DNET. Range: 0 ~ 8
10	Diagnostic interval time	Sec	The interval when RTU-DNET executes diagnosis. Range: 1 ~ 65, Default: 5 secs
11	Special module offline treatment	N/A	How RTU-DNET will react when the special module connected to it is offline. You can choose “Ignored”, “Alarm” or “Stop DeviceNet IO”. Default: Alarm
12	Special module erro treatment	N/A	How RTU-DNET will react when it detects errors. You can choose “Ignored”, “Alarm” or “Stop DeviceNet IO”. Default: Alarm
13	Reset RTU-DNET	N/A	Reset the configuration of RTU-DNET to default settings.
14	Add control word and status word to I/O data	N/A	For you to decide whether to add control word and status word to I/O data. When you choose not to do it, the I/O data in RTU-DNET and DeviceNet master will not include control word and status word. If you choose to add them in, the I/O data in RTU-DNET and DeviceNet master will include control word and status word.
15	Work mode	N/A	For you to set up the work mode of the special module connected to RTU-DNET. When set to “auto mode”, RTU-DNET will configure default CR of the special module as DeviceNet I/O mapping data. When set to “custom mode”, you can configure any CR in the special module as DeviceNet I/O mapping data.
16	Number of input data connected	---	The number of input data of the special module connected to RTU-DNET
17	Number of output data connected	---	The number of output data of the special module connected to RTU-DNET
18	Length of input data	Word	The sum of the length of input data of the special modules connected to RTU-DNET

No.	Item	Unit	Explanation
19	Length of output data	Word	The sum of the length of output data of the special modules connected to RTU-DNET
20	I/O mapping	N/A	The I/O mapping relation between RTU-DNET and the special module connected to it

4.2 Introduction to the Software Interfaces

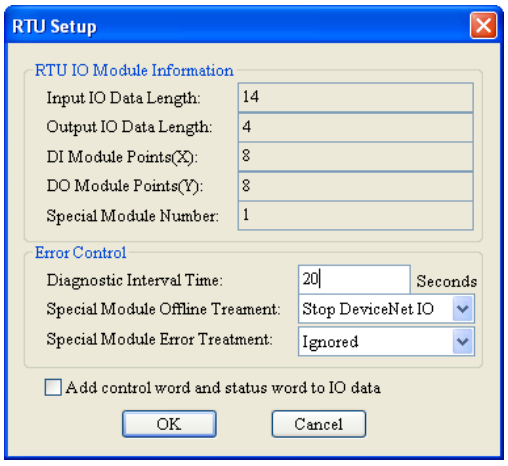
4.2.1 “RTU configuration” Interface

Double click on the existing RTU-DNET icon on the software main page and then click on “IO configure…” button in the dialog box which pops up. Finally the following “RTU configuration” page appears.



4.2.2 “RTU setup” Interface

In the “RTU configuration” page above, double click on “RTU-DNET” icon on the leftmost side of the page to make the following “RTU setup” dialog box appear. Then you can set up the error control attribute, control word and status word in the following dialog box.

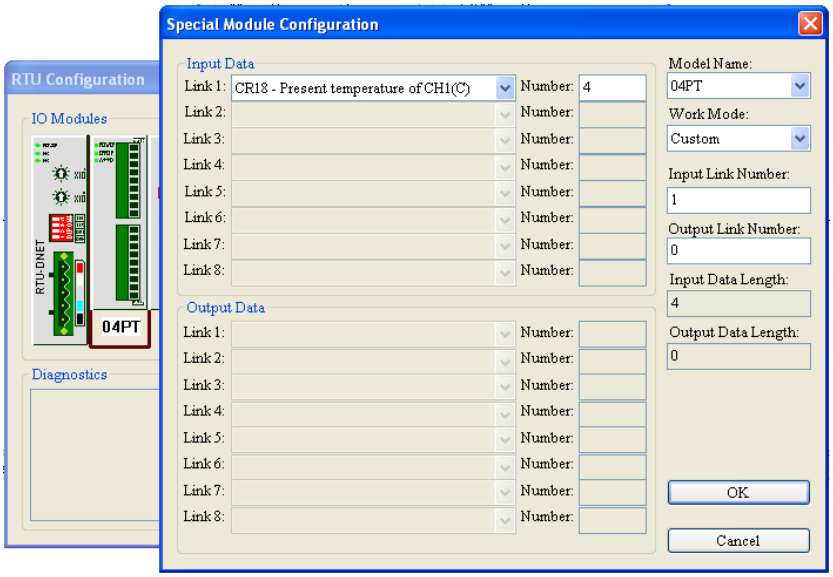


Explanation of RTU setup parameters:

Item	Content	Default
Input I/O data length	The sum of the length of the status word of RTU-DNET and the input data of the special module connected to it. One input channel of the special module occupies 2 bytes. 8 points of the digital input are counted as 1 byte.	N/A
Output I/O data length	The sum of the length of the control word of RTU-DNET and the output data of the special module connected to it. One output channel of the special module occupies 2 bytes. 8 points of the digital output are counted as 1 byte.	N/A
DI module points (X)	The digital input points should be 8's multiple. The number will be regarded as 8 when it is less than 8 and as 16 when it is bigger than 8 but less than 16.	N/A
DO module points (Y)	The digital output points should be 8's multiple. The number will be regarded as 8 when it is less than 8 and as 16 when it is bigger than 8 but less than 16.	N/A
Special module number	The number of the special module connected to RTU-DNET. Range: 0 ~ 8	N/A
Diagnostic interval time	The interval time when RTU-DNET executes diagnosis Range: 1~65 seconds.	5 seconds
Special module offline treatment	How RTU-DNET will react when the special module connected to it is offline. You can choose "Ignored", "Alarm" or "Stop DeviceNet IO".	Alarm
Special module error treatment	How RTU-DNET will react when it detects error. You can choose "Ignored", "Alarm" or "Stop DeviceNet IO".	Alarm
Add control word and control word to I/O data	For you to decide whether to add control word and status word to I/O data. When you choose not to do it, the I/O data in RTU-DNET and DeviceNet master will not include control word and status word. If you choose to add them in, the I/O data in RTU-DNET and DeviceNet master will include control word and status word.	No control word and status word are added to I/O data

4.2.3 "Special module configuration" interface

In the page of "RTU configuration" given above, double click on "04PT" icon and then "Special module configuration" page appears for configuring the special module.

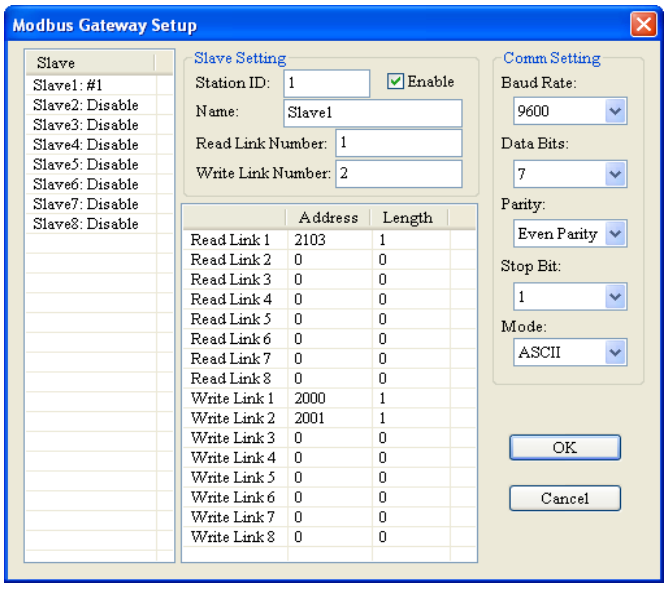


Explanation of special module setup parameters:

Item		Explanation
Module name		The special module connected to the right side of RTU-DNET such as: 02DA, 04AD, 04DA, 04PT, 04TC, 06AD, 06XA, 01PU
Work mode		There are Auto mode and Custom mode for option. If Auo is selected, CR of special module is called automatically through the software. (CR is the internal register of special module); if Custom is selected, user can call CR of special module according to actual demand.
Input link number		The number of the input data link to be opened is decided by the value through the software. If the value is 1, the input data link 1 will be opened.
Output link number		The number of the output data link to be opened is decided by the value through the software. If the value is 2, the input data link 1 and 2 will be both opened.
Input data length		The input data length of current special module
Output data length		The output data length of current special module
Input data	Link 1	The start CR of input data link 1
	Number	The length of input data link 1 (Unit: Word)
Output data	Link 1	The start CR of output data link 1
	Number	The length of output data link 1 (Unit: Word)

4.2.4 “Modbus Gateway Setup” interface

In the page of “RTU configuration” given above, click on “Gateway” button and then the following “Modbus Gateway Setup” dialog box pops up for configuring MODBUS device.



Explanation of “Modbus Gateway Setup” parameters:

Item		Explanation
Station ID		The node address of MODBUS device connected to RTU-DNET (Range: 1-247)
Enable		If “Enable” is choosed, the corresponding MODBUS device will be started.
Slave name		For setting the identification name of MODBUS device.
Read Link Number		For setting the number of read link built between MODBUS device and RTU-DNET
Write Link Number		For setting the number of write link built between MODBUS device and RTU-DNET
Read Link 1	Node address	It is the start parameter address of MODBUS device RTU-DNET reads in Read Link 1.
	Length	It is the data length of MODBUS device RTU-DNET reads in Read Link 1. (Unit: WORD. Max.: 20)
Write Link 1	Node address	It is the start parameter address in MODBUS device RTU-DNET writes in Read Link 1.
	Length	It is the data length in MODBUS device RTU-DNET writes in Read Link 1. (Unit: WORD. Max.: 20)
Baud rate		For setting the communication format between RTU-DNET and MODBUS device.
Data Bits		
Parity		
Stop Bit		
Mode		

4.3 DeviceNet I/O Mapping Data

4.3.1 Control Word and Status Word in RTU-DNET

■ Control word

Bit	Status value	Explanation
0	0	Setting RTU-DNET to STOP mode
	1	Setting RTU-DNET to RUN mode
1	0/1	Reserved
2	0/1	Reserved
3	0/1	Reserved
4	0/1	Reserved
5	0/1	Reserved
6	0/1	Reserved
7	0/1	Reserved
8	0/1	Reserved
9	0/1	Reserved
10	0/1	Reserved
11	0/1	Reserved
12	0/1	Reserved
13	0/1	Reserved
14	0/1	Reserved
15	0	Disabling control word
	1	Enabling control word

■ Status word

Bit	Status value	Explanation
0	0	RTU-DNET detects DI/DO extension unit.
	1	RTU-DNET does not detect DI/DO extension unit.
1	0	The configurations of RTU-DNET and the extension unit connected to it are consistent.
	1	The configrations of RTU-DNET and the extension unit connected to it are inconsistent.
2	0	No error occurs in the special module.
	1	Error occurs in the special module.
3	0	The special module operates normally.
	1	The special module is detected offline.
4	0	The configuration data are valid.
	1	The configuration data are invalid.

Bit	Status value	Explanation
5	0	RTU-DNET operates normally.
	1	The power of RTU-DNET is in low voltage.
6	0	RTU-DNET operates normally.
	1	RTU-DNET detects unidentifiable special module.
7	0	RTU-DNET operates normally.
	1	More than 8 special modules connected to RTU-DNET, or the number of digital I/O points exceeds 128.
8	0	No error in MODBUS device occurs.
	1	Error in MODBUS device occurs.
9	0	RTU-DNET is in RUN status.
	1	RTU-DNET is in STOP status.
10	0/1	Reserved
11	0/1	Reserved
12	0/1	Reserved
13	0/1	Reserved
14	0/1	Reserved
15	0/1	Reserved

4.3.2 I/O Data Mapping

■ If the I/O data do not include control word and status word of RTU-DNET, the I/O data mapping of DeviceNet master and RTU-DNET will be:

● DeviceNet master → RTU-DNET

Master (byte)	RTU-DNET	
0	Special module	Low byte of the 1st special module output channel 1
1		High byte of the 1st special module output channel 1
2		Low byte of the 1st special module output channel 2
3		High byte of the 1st special module output channel 2
…		…
N	Slim DI/DO	Y0 ~ Y7 on the 2nd Slim DI/DO
N+1		Y0 ~ Y7 of the 1st Slim DI/DO
N+2		Y0 ~ Y7 on the 4th Slim DI/DO
N+3		Y0 ~ Y7 on the 3rd Slim DI/DO
…		…
X	MODBUS device	Low byte of some parameter of the 1st MODBUS device
X+1		High byte of some parameter of the 1st MODBUS device

Master (byte)	RTU-DNET	
X+2		Low byte of some parameter of the 1st MODBUS device
X+3		High byte of some parameter of the 1st MODBUS device
…		…

- RTU-DNET → DeviceNet master

Master (byte)	RTU-DNET	
0	Special module	Low byte of the 1st special module input channel 1
1		High byte of the 1st special module input channel 1
2		Low byte of the 1st special module input channel 2
3		High byte of the 1st special module input channel 2
…		…
N	Slim DI/DO	X0 ~ X7 on the 2nd Slim DI/DO
N+1		X0 ~ X7 of the 1st Slim DI/DO
N+2		X0 ~ X7 of the 4th Slim DI/DO
N+3		X0 ~ X7 of the 3rd Slim DI/DO
…		…
X	MODBUS device	Low byte of some parameter of the 1st MODBUS device
X+1		High byte of some parameter of the 1st MODBUS device
X+2		Low byte of some parameter of the 1st MODBUS device
X+3		High byte of some parameter of the 1st MODBUS device
…		…

■ If the I/O data include control word and status word of RTU-DNET, the I/O data mapping of DeviceNet master and RTU-DNET will be:

- DeviceNet master → RTU-DNET

Master (byte)	RTU-DNET	
0	RTU-DNET	Low byte of control word of RTU-DNET
1		High byte of control word of RTU-DNET
2	Special module	Low byte of the 1st special module output channel 1
3		High byte of the 1st special module output channel 1
4		Low byte of the 1st special module output channel 2
5		High byte of the 1st special module output channel 2
…		…
N	Slim DI/DO	Y0 ~ Y7 on the 2nd Slim DI/DO
N+1		Y0 ~ Y7 of the 1st Slim DI/DO

Master (byte)	RTU-DNET	
N+2		Y0 ~ Y7 on the 4th Slim DI/DO
N+3		Y0 ~ Y7 on the 3rd Slim DI/DO
…		…
X	MODBUS device	Low byte of some parameter of the 1st MODBUS device
X+1		High byte of some parameter of the 1st MODBUS device
X+2		Low byte of some parameter of the 1st MODBUS device
X+3		High byte of some parameter of the 1st MODBUS device
…		…

- RTU-DNET → DeviceNet master

Master (byte)	RTU-DNET	
0	RTU-DNET	Low byte of status word of RTU-DNET
1		High byte of status word of RTU-DNET
2	Special module	Low byte of the 1st special module output channel 1
3		High byte of the 1st special module output channel 1
4		Low byte of the 1st special module output channel 2
5		High byte of the 1st special module output channel 2
…		…
N	Slim DI/DO	X0 ~ X7 of the 2nd Slim DI/DO
N+1		X0 ~ X7 of the 1st Slim DI/DO
N+2		X0 ~ X7 of the 4th Slim DI/DO
N+3		X0 ~ X7 of the 3rd Slim DI/DO
…		…
X	MODBUS device	Low byte of some parameter of the 1st MODBUS device
X+1		High byte of some parameter of the 1st MODBUS device
X+2		Low byte of some parameter of the 1st MODBUS device
X+3		High byte of some parameter of the 1st MODBUS device
…		…

Note:

- If you choose to make the control word and status word of RTU-DNET to be I/O data, the first word in the I/O data area will automatically be distributed to control word and status word.
- In the alignment of RTU-DNET and the extension modules connected to it, the data of special modules appear prior to the data of Slim DI/DO extension units which is prior to MODBUS device.
- If there are two same modules connected in the right of RTU-DNET, the one closest to it is the first unit.

5 Application Examples

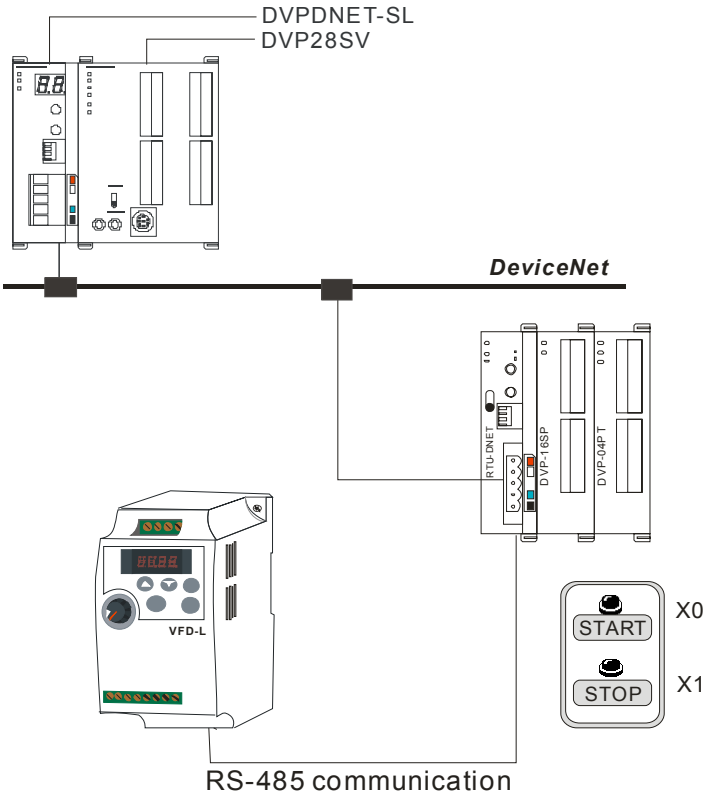
In this section, we will explain how to configure RTU-DNET and the I/O mapping relation between RTU-DNET and DVPDNET-SL by an application example.

Control requirement:

1. Manual mode: when X0=ON, motor drive moves positively at 1000 HZ; when X1=ON, it stops moving.
2. Auo mode: when DVP04PT detects that the temperature is more than 35 celsius degree, the motor drive moves positively at 1000HZ; when it detects that the temperature is less than 20 celsius degree, motor drive stops moving.
3. Priority for manual mode: After manul mode starts up, auto mode will be invalid.

5.1 How to Construct a DeviceNet Network by RTU-DNET

1. The DeviceNet network



2. The devices used in this example:

Device name	Explanation
DVPDNET-SL	Delta DeviceNet master
DVP28SV11T	Delta slim-type PLC MPU
RTU-DNET	Delta DeviceNet remote IO module
DVP04PT	Delta temperature collecting module used for collecting temperature
DVP16SP	Delta digital input/ output module with 8 points for input and 8 points for output
VFD-L (0.2kW)	Delta L series of motor drive
Button box	Used for controlling ON/OFF status of X0 and X1 of DVP16SP

3. Setup of fieldbus module:

Module name	Node address	Baud rate
DVPDNET-SL	1	500Kbps
RTU-DNET	2	500Kbps

Note: For DeviceNet node address setting, please refer to section2.5 and for DeviceNet baud rate setting, please see section 2.7.

4. Setup of VFD-L:

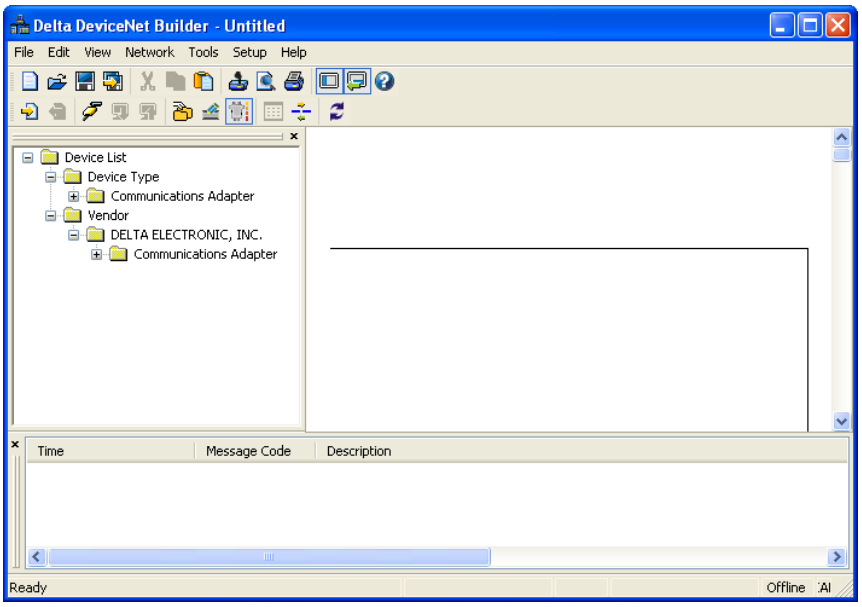
Parameter	Vaule	Explanation
P02-00	04	The given frequency of VFD-L originates from RS485 communication.
P02-01	03	The operating frequency of VFD-L originates from RS485 communication.
P09-00	01	The RS485 communication address of VFD-L is set to”1”.
P09-01	01	The baud rate of VFD-L is set to”9600”.
P09-04	01	The communication format of VFD-L is set to ” 7,E,1,ASCII”.

5. Please check and ensure that DI/DO module, special module, MODBUS device and RTU-DNET all work normally, the wiring of the whole network is proper and the power for the DeviceNet network is supplied normally.

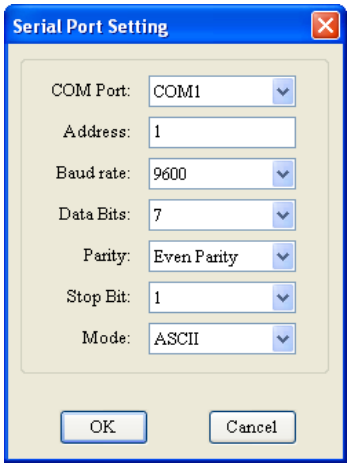
5.2 How to Configure Network by DeviceNet Network Configuration Tool

- Configuration of RTU-DNET

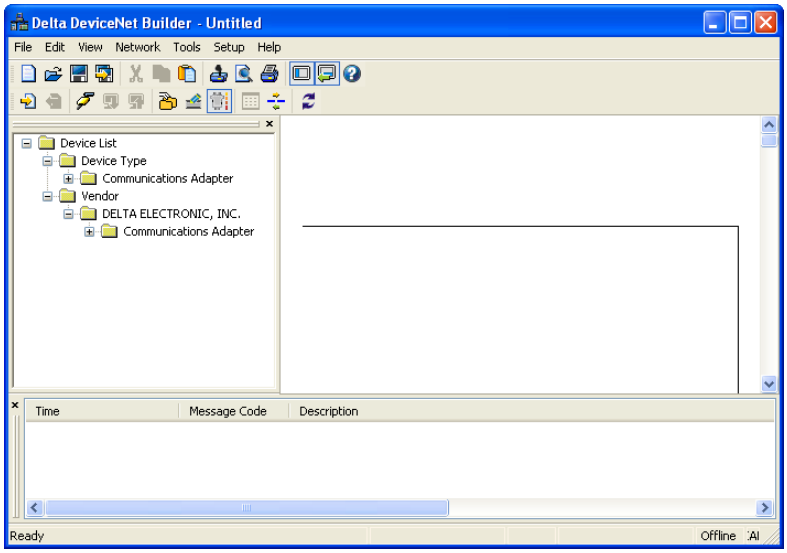
1. Open DeviceNetBuilder software and then the following page appears.



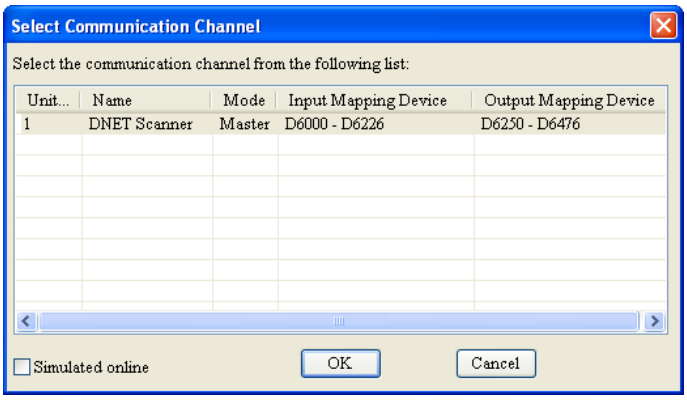
2. Select “Setup”> “Communication setting” > “System communication port” and then “serial port setup” pops up below.



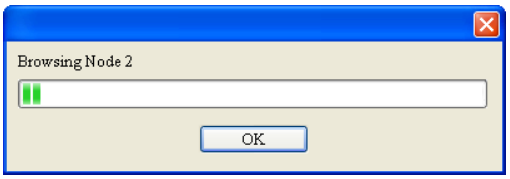
3. After setting is finished, click on “OK” to return to the main page below.



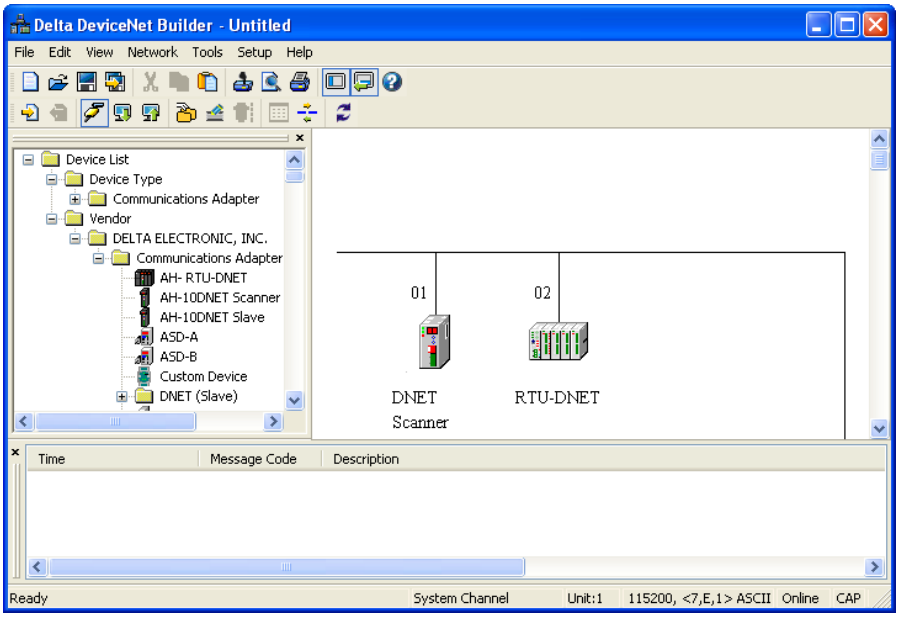
4. Select “Network” > “Online”, and then “Select Communication Channel” dialog box appears as follows.



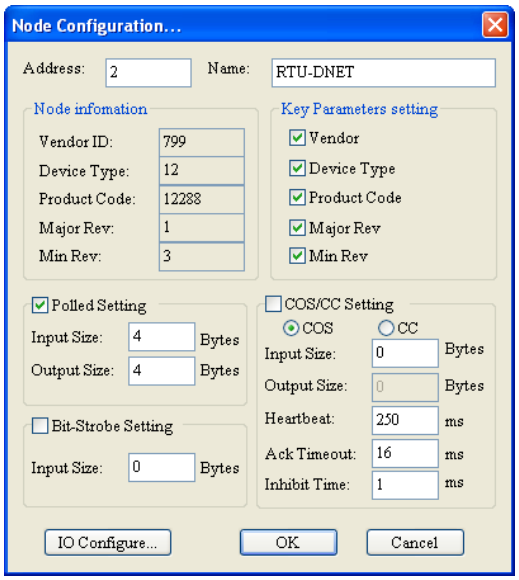
5. Click on “OK” and then DeviceNetBuilder software starts scanning the whole network.



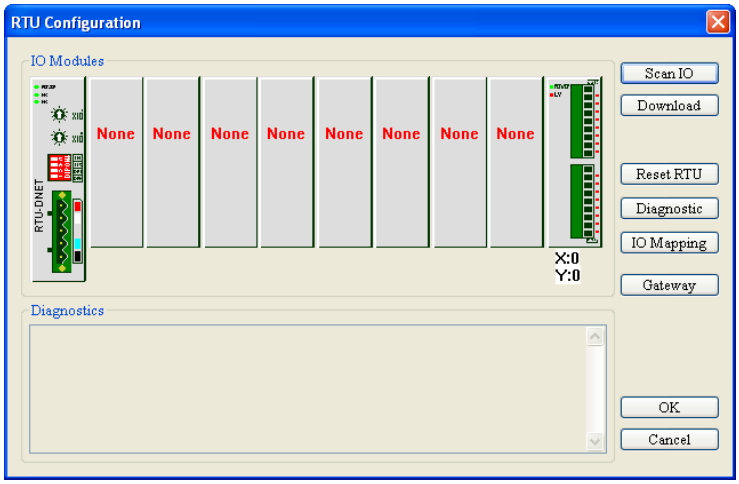
6. If the bar on the dialog box does not progress, it means the connection between the PC and DVP-SV is abnormal, or there are other programs also usinig the COM port on the PC. After the scan is completed, the dialog box will tell you that the scan is completed, and the icons and device names of all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



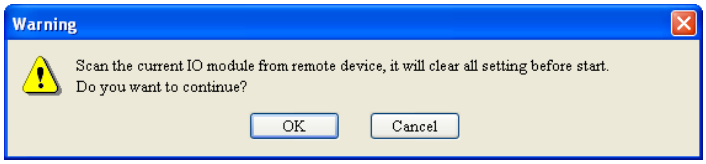
7. Double click on RTU-DNET icon (node 2), and the “Node Configuration” box shows up.



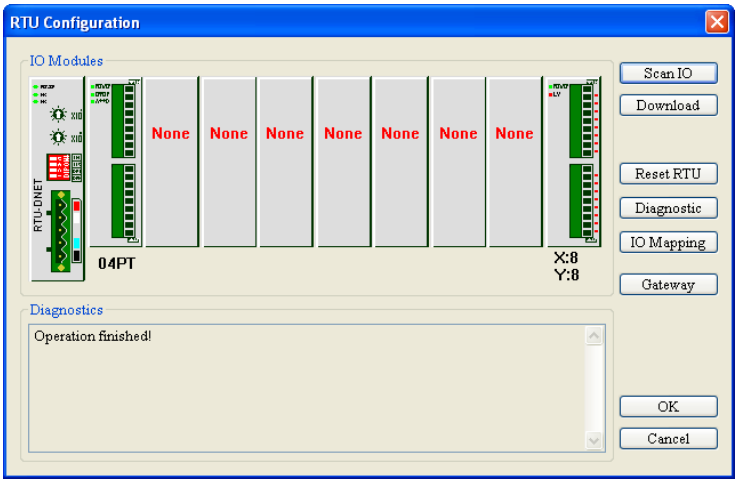
8. Click on “IO Configure…” button in “Node Configuration" dialog box, and you will then see “RTU Configuration” page.



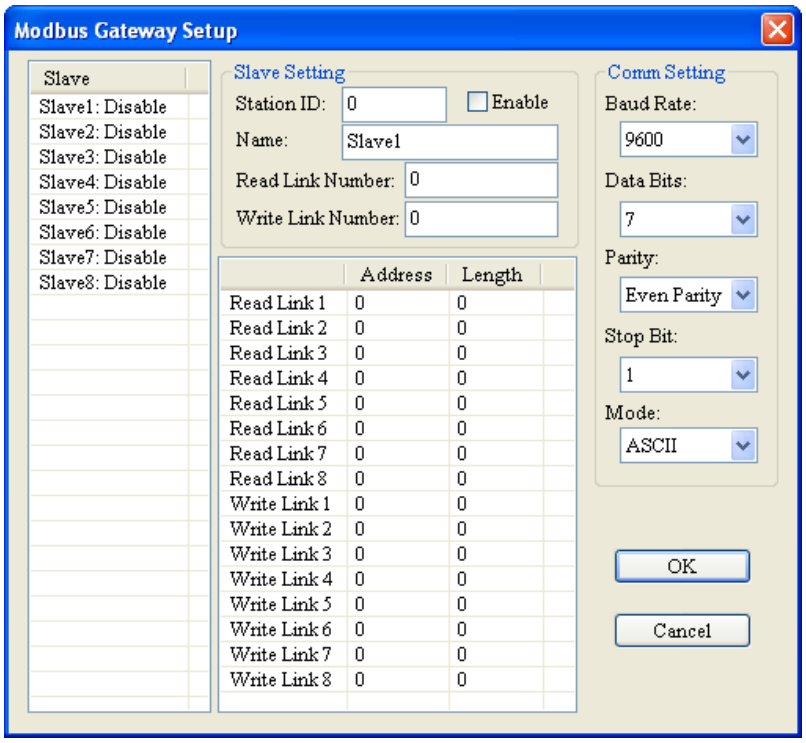
9. Click on “Scan IO”, and the “Warning” dialog box will appear.



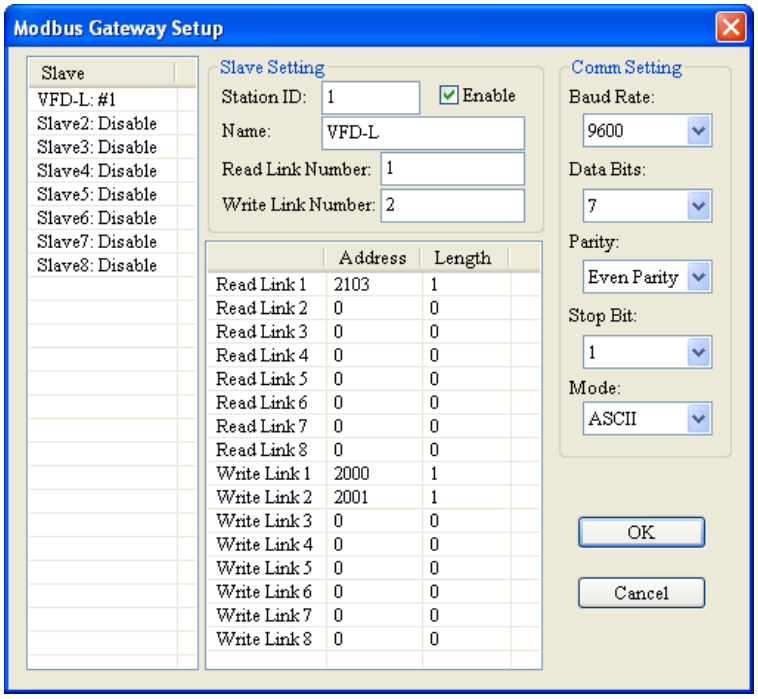
10. Click on “OK”. DeviceNet Builder will then detect the special module connected to RTU-DNET and the number of points in the Slim DI/DO extension unit and display the information on “RTU Configuration” page.



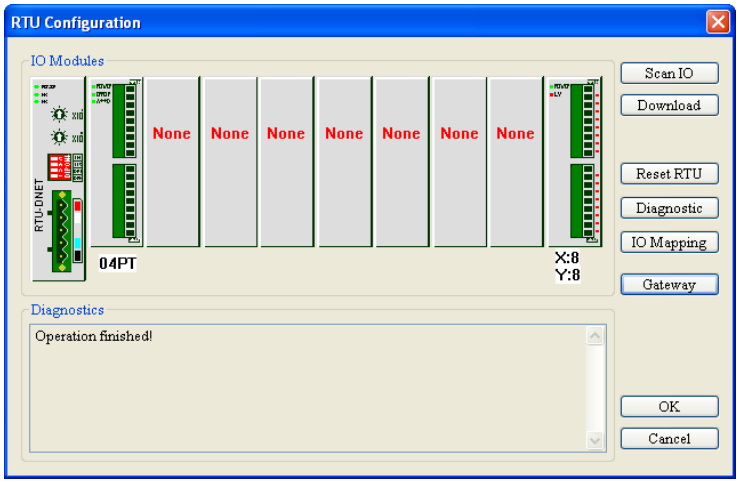
11. Click on “Gateway” button to enter the “MODBUS Gateway Setup” dialog box.



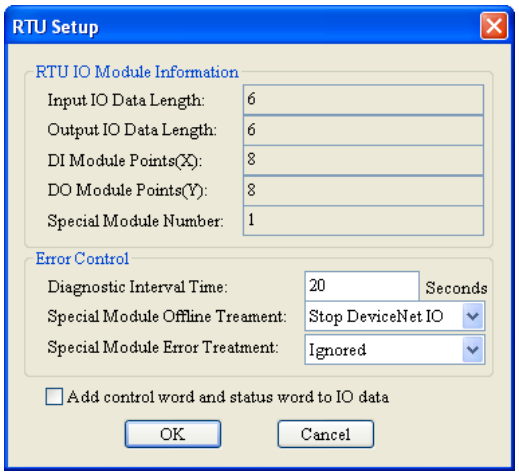
12. Set up the parameters in the above dialog box and see 4.2.4 for explanation of the parameters.



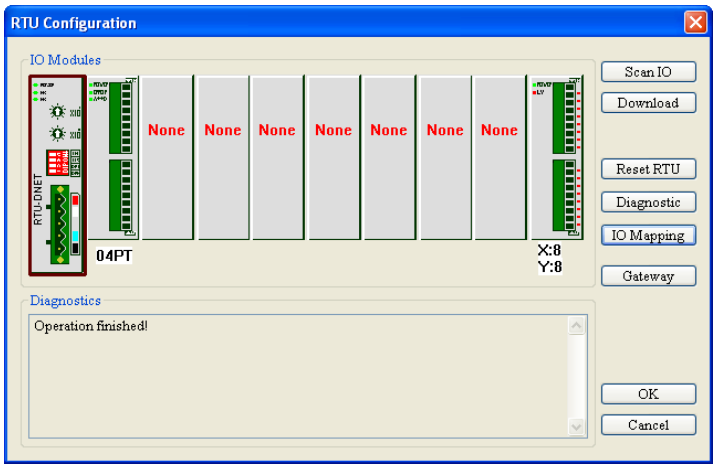
13. After setup is finished, click on “OK” to return to “RTU Configuratioin” page.



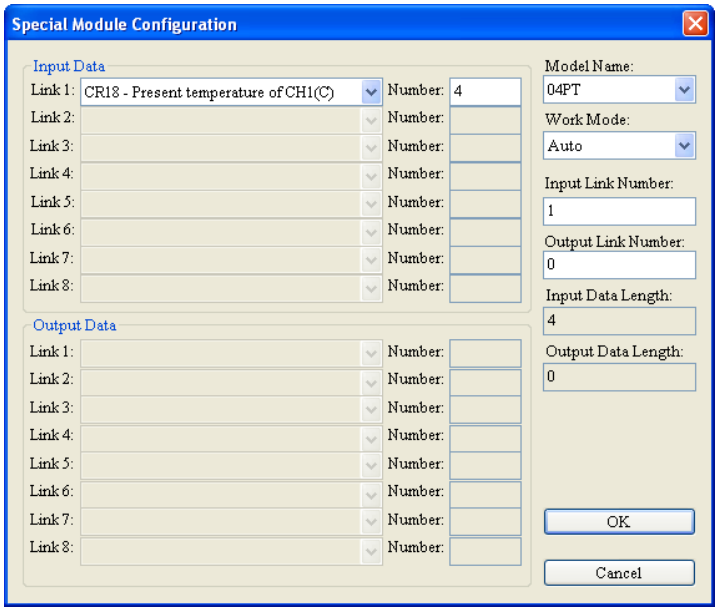
14. Double click “RTU-DNET” icon and then “RTU Setup” page appears. You can see 4.2.2 for explanation of the parameters in the following page.



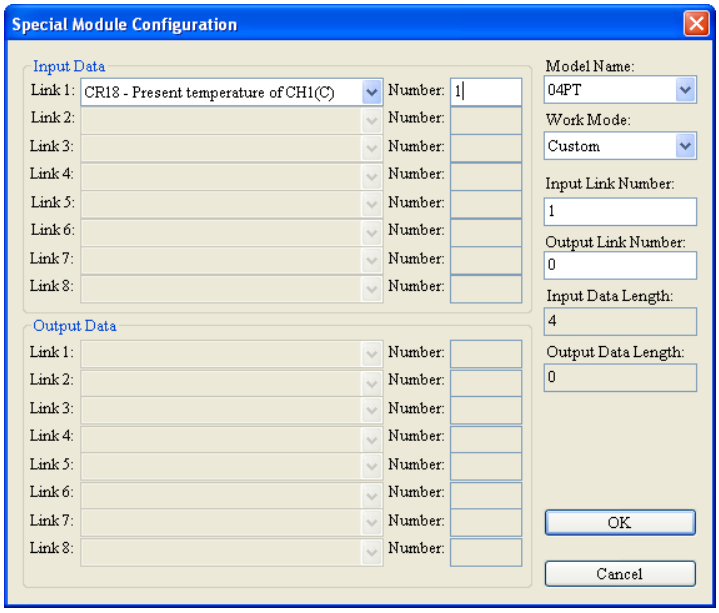
15. After setup is completed, click on “OK” to return to “RTU configuratioin” page.



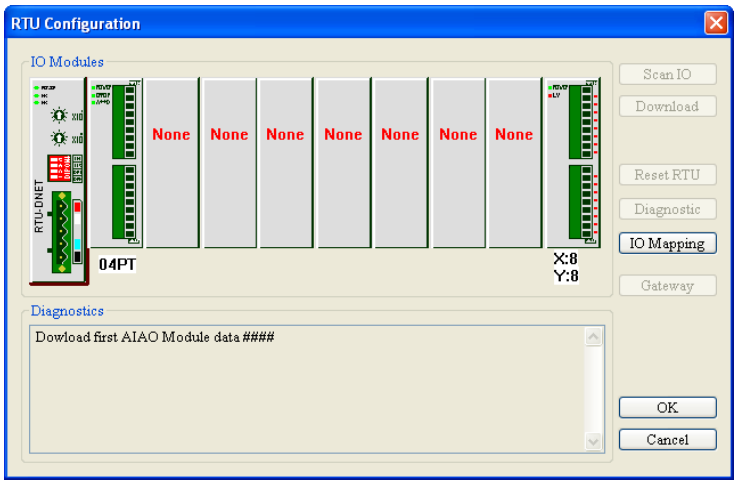
16. Double click “04PT” and then “Special Module Configuration” dialog box displays. For the parameter explanation, see 4.2.3.



17. Select “Custom” in “Work Mode” column in the above page and then you could reset configuration of 04PT.

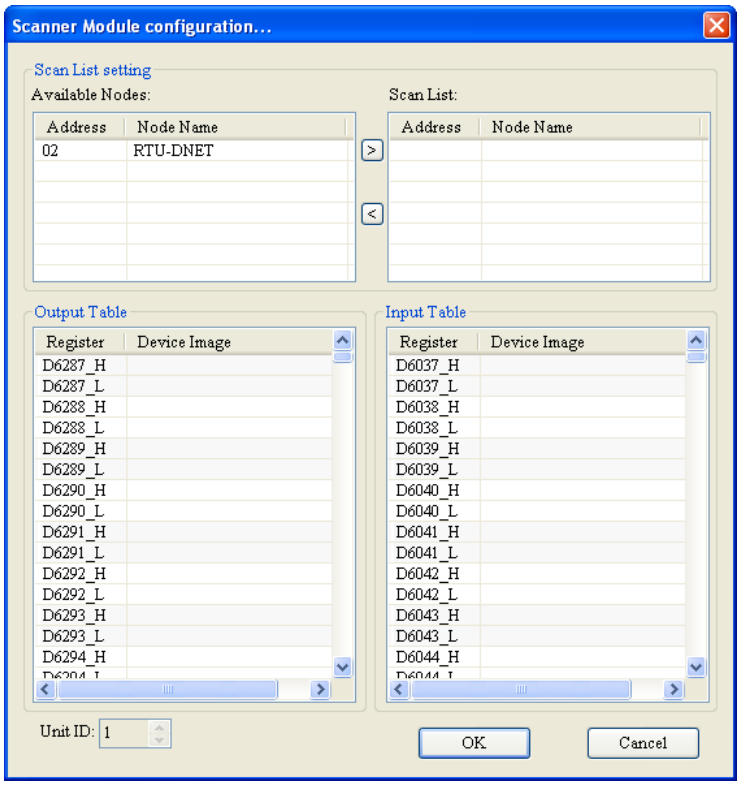


18. Click on “OK” in the above “Special Module Configuration” page after confirming the configuration data set up. Next, click “Download” in the “RTU-DNET configuration” page to download the configuration data to RTU-DNET. After download is completed, click on “OK”.

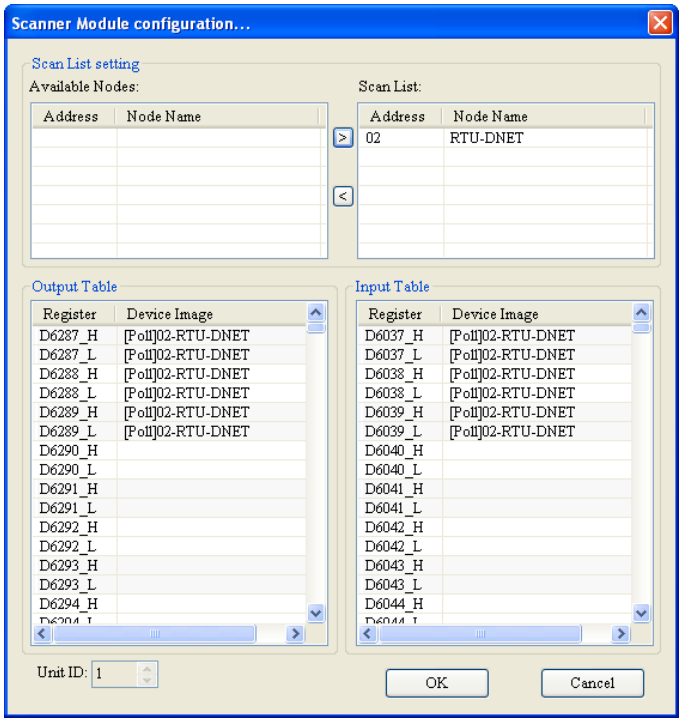


■ Configuration of DVPDNET

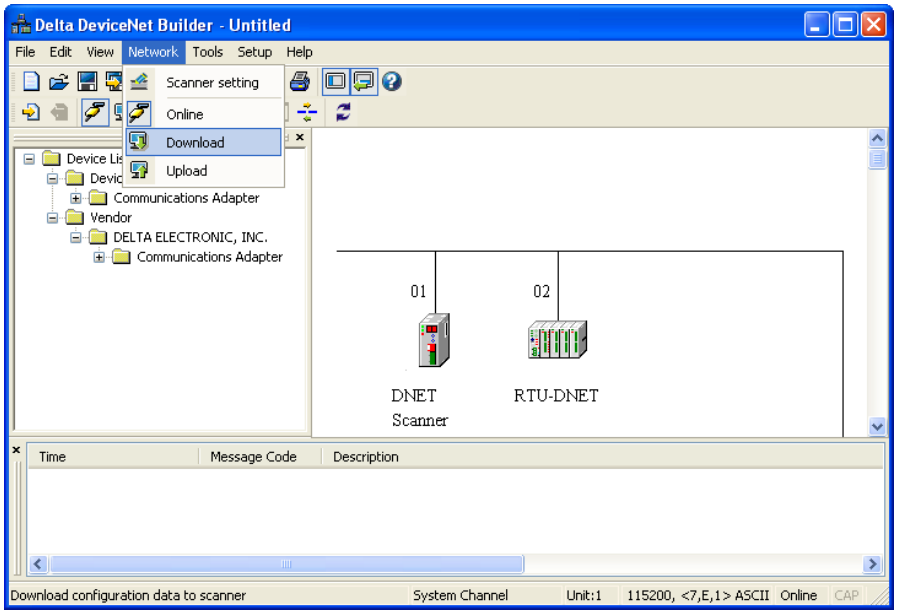
1. Double click on DNET Scanner (node 01), and the “Scan Module Configuration…” dialog box will appear. You can find the currently available node, RTU-DNET, in the list on the left side. On the right side, there is an empty “Scan List”.

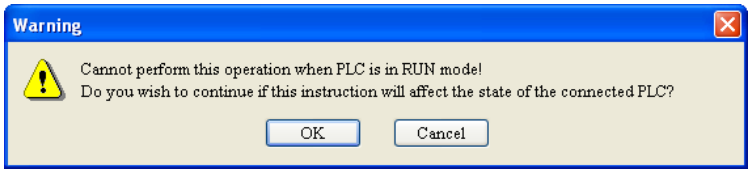


2. Move the slave devices on DeviceNet in the “Available Nodes” list on the left side to the “Scan List” on the right side. Select a node and click on [>]. Follow the steps to move all the nodes to the scan list.

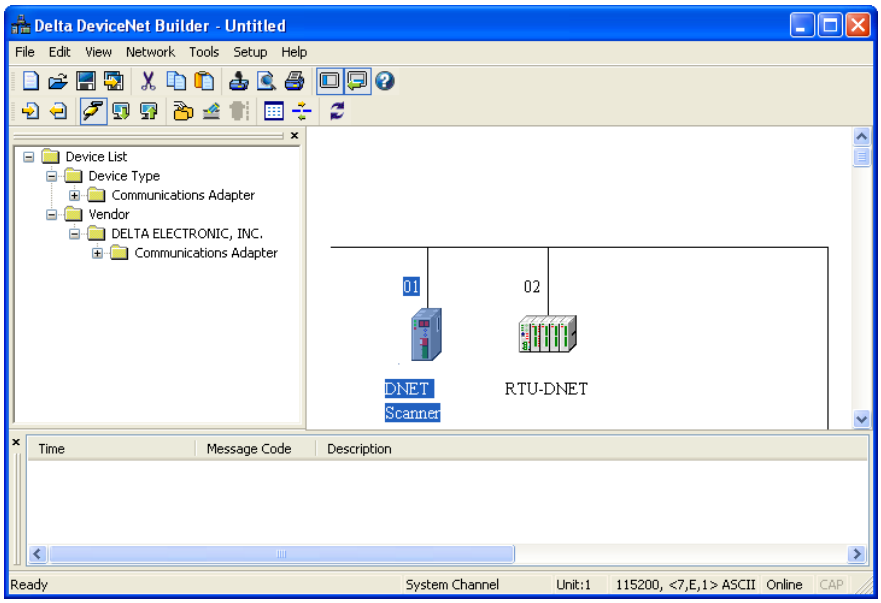


3. Confirm all the settings and click on “OK”. Next, download the configuration to DVPDNET-SL. If DVP-SV is in RUN mode while you are downloading the configuration, a "Warning” dialog box will appear.





4. Click on “OK” to continue the download. Make sure DVP-SV is in RUN mode. Now, you can see the MS LED and NS LED on RTU-DNET and DVP-SV become green. And LED nixie tube of DVPDNET shows “01”.

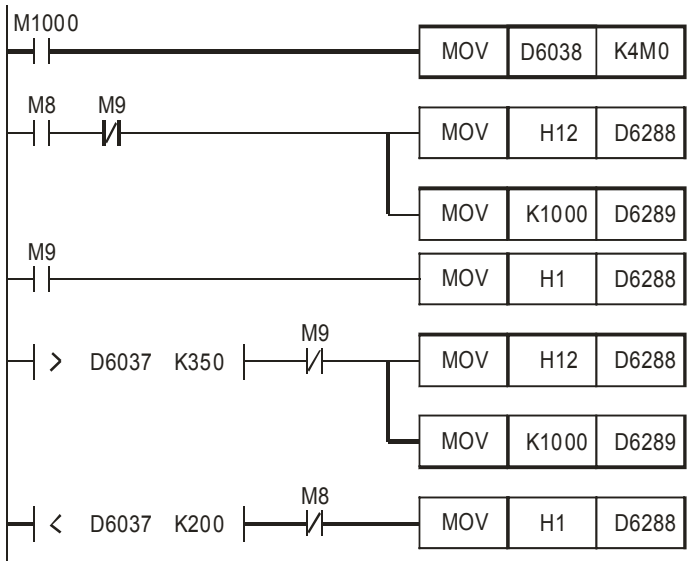


5.3 Control the Network by Using Ladder Diagram

- Follow the above steps to configure the network and then construction of the mapping relation between modules will succeed.
- The following table shows the relations between the register of DVP28SV, RTU-DNET and its subordinate devices.

Input:				
D6037 low eight bit	←	RTU-DNET	←	Read the temperature value for DVP04PT channel 1
D6037 high eight bit	←		←	
D6038 low eight bit	←		←	Not used
D6038 low high eight bit	←		←	Read the status of X0-X7 of DVP16SP
D6039 low eight bit	←		←	Read the output frequency of VFD-L (H2103)
D6039 high eight bit	←		←	
Output:				
D6287 low eight bit	→	RTU-DNET	→	Not used
D6287 high eight bit	→		→	Control Y0-Y7 of DVP16SP
D6288 low eight bit	→		→	Control the control word of VFD-L (H2000)
D6288 high eight bit	→		→	
D6289 low eight bit	→		→	Control the control frequency of VFD-L (H2001)
D6289 high eight bit 位	→		→	

- Ladder diagram



The status of X0-X7 in DVP16SP is reflected in M8-M15

When X0=ON for DVP16SP, the motor drive moves positively at the frequency of 1000 Hz

When X1=ON for DVP16SP, the motor drive stops running.

When the temperatur is over 35 celsius degree that temperature sersor detects, the motor drive stops running.

When the temperatur is under 20 celsius degree that temperature sersor detects, the motor drive moves positively at 1000Hz.

6 Method of Setting Extended Baud Rate

The DeviceNet baud rate for RTU-DNET includes standard mode and extended mode. In standard mode, RTU-DNET supports the three baud rate such as 125Kbps, 250Kbps, 500Kbps. In extended mode, it supports 10Kbps, 20Kbps, 50Kbps, 125Kbps, 250Kbps, 500Kbps, 800Kbps, 1Mbps.

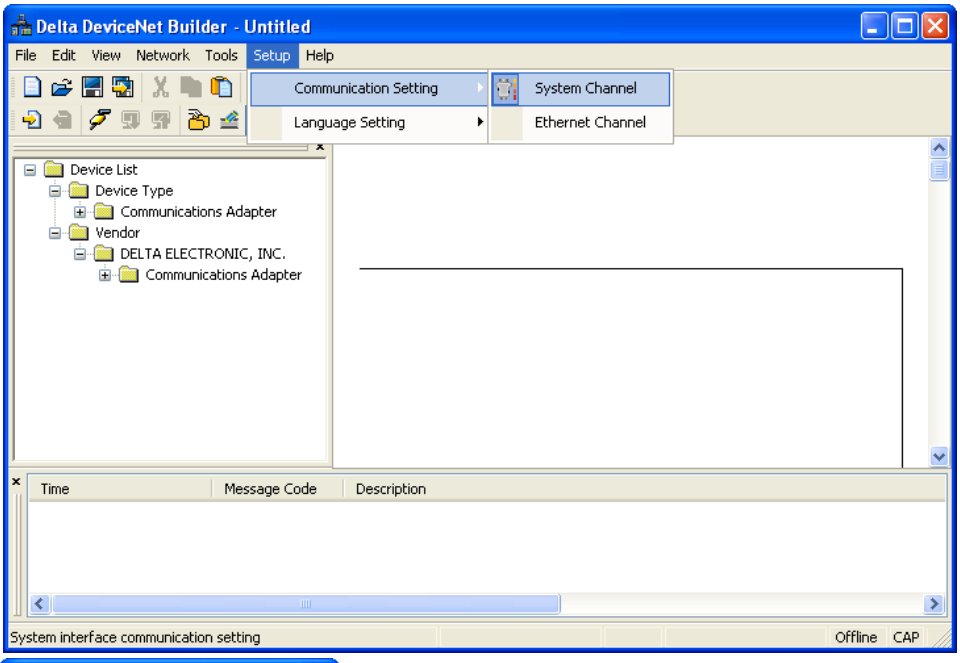
In this chapter, we mainly introduce the method of setting extension module.

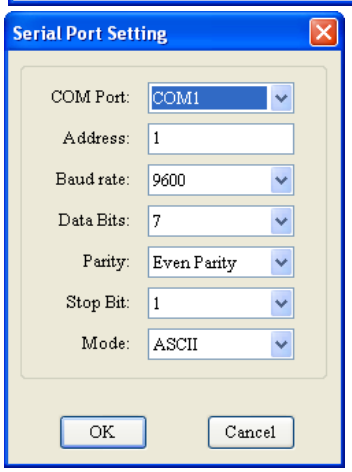
Standard mode can be set by function switch but extended mode must be set by function switch and the software together. Please refer to 2.7 for function switch setup.

Method of setting extended baud rate:

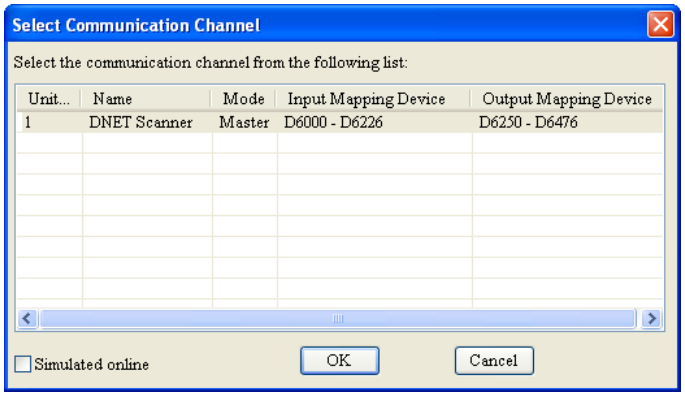
(1) Adjust the hardware switch “DR0” in RTU-DNET and DVPDNET to OFF, and “DR1” to ON. And then repower them on. The baud rates for the two modules are both set to 500kbps.

(2) Open DeviceNet software and set up the communication format of the software.

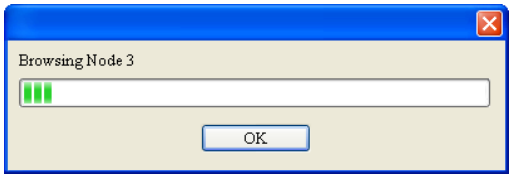




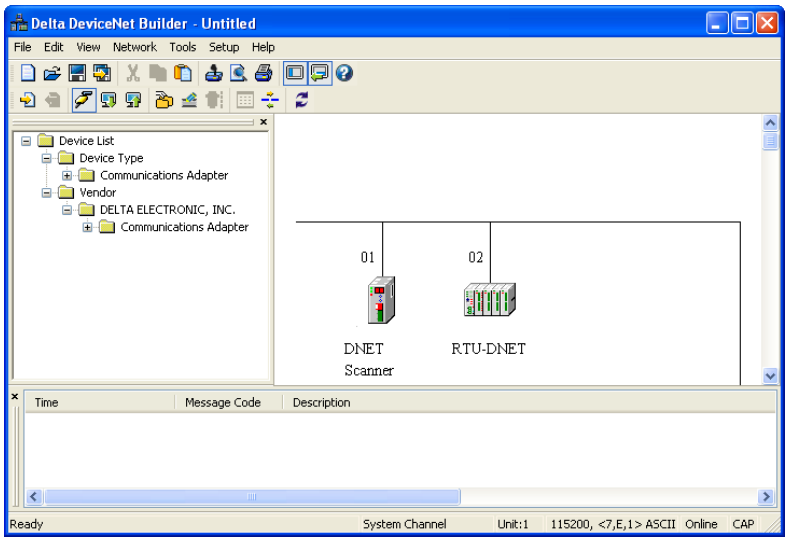
(3) Select “Network” > “Online” and then “Select Communication Channel” dialog box appears.



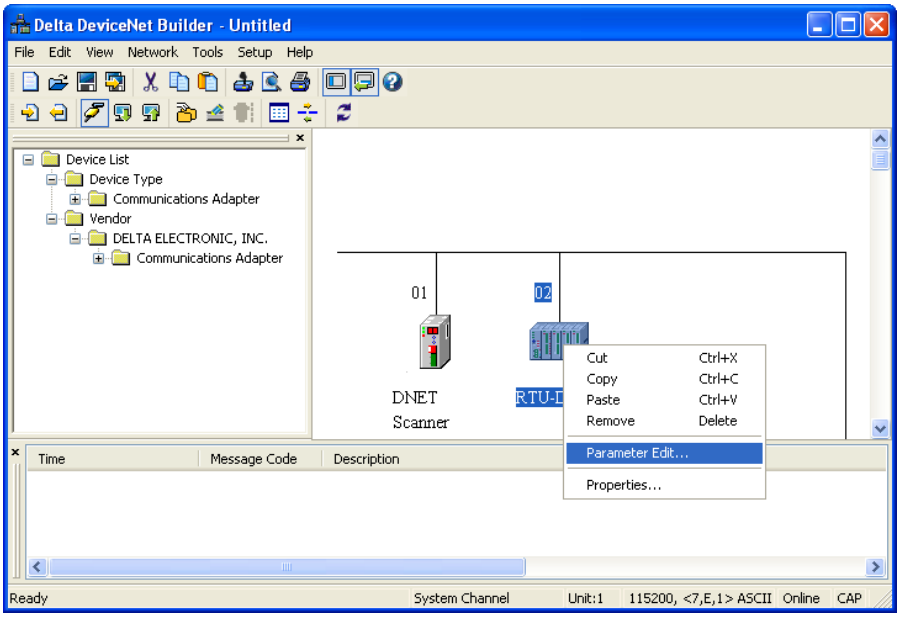
(4) Click on “OK” button and then DeviceNetBuilder software starts scanning the network.



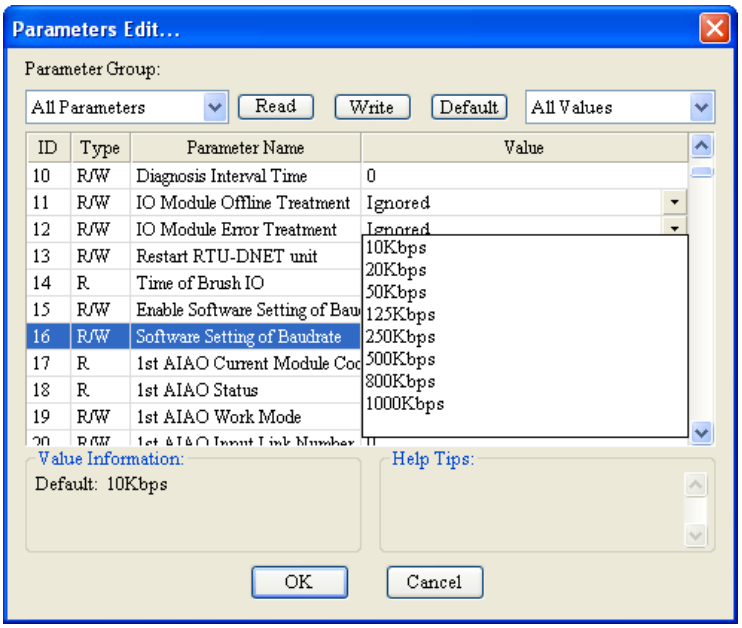
(5) If the bar on the dialog box does not progress, it means the connection between the PC and DVP-SV is abnormal, or there are other programs also usinig the COM port on the PC. After the scan is completed, the dialog box will tell you that the scan is completed, and the icons and device names of all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



(6) Choose “RTU-DNET” icon, then press the right button of the mouse, finally select “Parameter Edit…” in the following menu to enter “Parameters Edit…” page.



(7) Set “Enable Software Setting of Baudrate” as “Enable” and then choose the baud rate needed, finally click on “Write” button as shown below,



(8) After reading is completed, click on “OK” to return to the main page. Then adjust the hardware switches DR0 and DR1 in DVP-DNET to ON. Finally, repower on to finish setting the baud rate.

7 LED Indicator & Trouble-shooting

RTU-DNET provides three types of diagnostic methods such as LED indicator diagnosis, status diagnosis, software diagnosis.

7.1 LED Indicator Diagnosis

POWER LED

LED status	Indication	How to correct
Off	Power is abnormal.	Make sure RTU-DNET 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 RTU-DNET is powered. 2. Make sure the nodes on the bus are communicating normally. 3. Make sure at least 1 node or more are communicating on the network through RTU-DNET. 4. Check if the baudrate of RTU-DNET is the same as that of the master.
Green light blinking	On-line but not connected to DeviceNet	--
Green light on	On-line and connected to DeviceNet normally	--
Red light blinking	On-line but I/O connection timed-out	Please refer to code displayed in digital displayer of DVPDNET for troubleshooting of the error
Red light on	Network error, cannot check duplicate ID, no network power or bus-off	1. Make sure all the devices have their unique node address. 2. Check if the network installation is proper. 3. Check if the baud rate of RTU-DNET is the same as that for the bus. 4. Check if the node address of RTU-DNET is valid. 5. Check if the network power is normal.

MS LED

LED status	Indication	How to correct
Off	No power or off-line	Make sure RTU-DNET is powered.
Green light blinking	Waiting for I/O data, no I/O data or PLC is in STOP mode.	Switch the PLC to RUN status and start I/O data exchange.
Green light on	I/O data are normal.	--
Red light blinking	No network power; configuration error	1. Check if the network power is normal. 2. Reset the parameters in RTU-DNET.
Red light on	Hardware error	Send your RTU-DNET back to the factory for repair.

ALARM LED

LED status	Indication	How to correct
Off	Normal or no power supply	--
Red light blinking	1. The configuration data in RTU-DNET is invalid 2. The module on the right of RTU-DNET is reporting wrongly or has been off line. 3. MODBUS device connected to RTU-DNET is offline or error occurs.	Check the subordinate device of RTU-DNET after acquiring the related diagnostic information via DeviceNetBuilder.
Red light on	1. Fatal error or errors in the configured data 2. RTU-DNET detects low voltage.	1. Acquire diagnostic information through DeviceNet Builder. 2. Check the power supply for RTU-DNET.

RUN LED

LED status	Indication	How to correct
Off	RTU-DNET in STOP mode	--
Green light on	RTU-DNET in RUN mode	--

7.2 Diagnosis of Status Word

The status word in RTU-DNET is to display the operating staus of special module, DI/DO module and MODBUS devices. You can find the method for using status word in section 4.2.2 and 4.3.2.

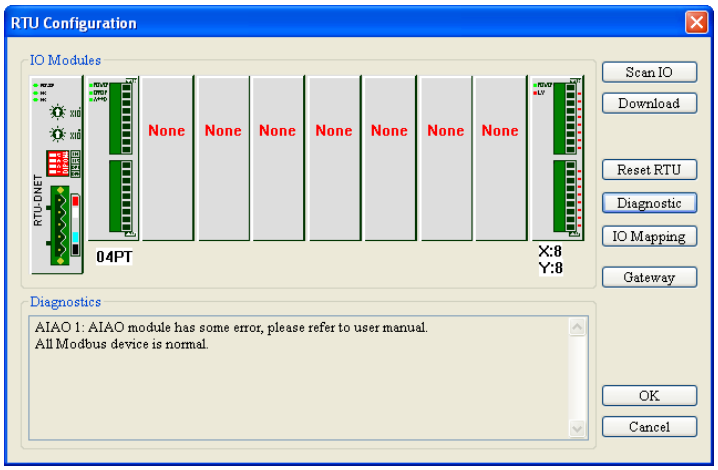
Diagnosis of Status Word:

Bit	Status value	Explanation	How to deal with
bit0	0	RTU-DNETdetects the extension module	--
	1	RTU-DNETdoes not detect the extension module	1. Check if there is extension modules on the right side of RTU-DNET 2. Repower RTU-DNET
bit1	0	The extension module connected to RTU-DNET corresponds with the configuration	--
	1	The extension module connected to RTU-DNET does not correspond with the configuration	Redownload the configuration data to RTU-DNET through DeviceNetBuilder software.
bit2	0	No error in special module	--
	1	Errors in special module occur.	Check the special module
bit3	0	Special module works normally.	--

Bit	Status value	Explanation	How to deal with
	1	RTU-DNET detects the special module is offline.	Check the spcecial module and repower RTU-DNET.
bit4	0	Configuration data is valid	--
	1	Configuration data is invalid	Redownload the configuration data to RTU-DNET through DeviceNetBuilder software.
bit5	0	RTU-DNET works normally.	--
	1	The voltage for RTU-DNET is too low.	Check the power module of RTU-DNET
bit6	0	RTU-DNET works normally.	--
	1	RTU-DNET detects the unidentifiable special module	Check if RTU-DNET supports the special module
bit7	0	RTU-DNET works normally.	--
	1	The special module connected to RTU-DNET exceeds 8 units or the digital IO points exceed 128.	Uninstall the extra module
bit8	0	No error in MODBUS device	--
	1	Error in MODBUS device	1. Check the connection cable between RTU-DNET and MODBUS device 2. Check the communication format, communication node ID and baud rate of MODBUS device and RTU-DNET are consistent.
bit9	0	RTU-DNET is in RUN status	--
	1	RTU-DNET is in STOP status	1. Check the RUN/STOP status of RTU-DNET 2. Check the control word in RTU-DNET is written H8000 3. Check if there is fatal eror in RTU-DNET

7.3 Diagnosis of Software

In the “RTU configuration” page, click on “Diagnostic” button to display the relevant information in the “Diagnostics” area.



Note：

- ✓ DeviceNetBuilder must be on line so that diagnosis of software can be initiated.

Appendix A: DeviceNet Objects RTU-DNET Supports

- DeviceNet objects

Class	Object
0x01	Identity object
0x02	Message router object
0x03	DeviceNet object
0x05	Connection object

- Class 0x01 – Identity object

Class attribute

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT
2	Get	MaxInstance	UINT
3	Get	NumberofInstances	UINT
6	Get	MaxIdClass	UINT
7	Get	MaxIdInstance	UINT

Instance

Attribute ID	Access rule	Name	Data type
1	Get	VendorId	UINT
2	Get	DeviceType	UINT
3	Get	ProductCode	UINT
4	Get	Revision MaxRev MinRev	 USINT USINT
5	Get	Status	WORD
6	Get	Sn	UDINT
7	Get	ProdName StrLen ASCIIStr	 USINT STRING

Common services

Service code	Implemented for		Service name
	Class	Instance	
0x05	No	Yes	Reset
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	No	Find_Next_Object_Instance

- Class 0x02 – Message router object

Class attribute

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT
6	Get	MaxIdClass	UINT
7	Get	MaxIdInstance	UINT

Instance

Attribute ID	Access rule	Name	Data type
2	Get	NumAvailable	UINT
3	Get	NumActive	UINT

Common services

Service code	Implemented for		Service name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single

- Class 0x03 – DeviceNet object

Class attribute

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT

Instance attribute

Attribute ID	Access rule	Name	Data type
1	Get	MACID	USINT
2	Get	BaudRate	USINT
3	Get/Set	BusofInterrupt	BOOL
4	Get/Set	BusofCounter	USINT
5	Get	AllocationInfo AllocationChoice MasterNodeAddress	BYTE USINT
6	Get	MACIDSwitchChanged	BOOL
7	Get	BaudRateSwitchChanged	BOOL
8	Get	MACIDSwitchValue	USINT
9	Get	BaudRateSwitchValue	USINT

Common services

Service code	Implemented for		Service name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single
0x4B	No	Yes	Allocate_Master/Slave_Connection_Set
0x4C	No	Yes	Release_Master/Slave_Connection_Set

- Class 0x05 – Connection object

Class attribute

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT

Instance 1: Explicit message connection

Attribute ID	Access rule	Name	Data type
1	Get	State	USINT
2	Get	InstanceType	USINT
3	Get	TransportClassTrigger	USINT

Attribute ID	Access rule	Name	Data type
4	Get	ProducedConnectionId	UINT
5	Get	ConsumedConnectionId	UINT
6	Get	InitialCommCharacteristics	BYTE
7	Get	ProducedConnectionSize	UINT
8	Get	ConsumedConnectionSize	UINT
9	Get/Set	ExpectedPackedRate	UINT
12	Get/Set	WatchdogTim-outAction	USINT
13	Get	Produced Connection Path Length	USINT
14	Get	Produced Connection Path	EPATH
15	Get	Consumed Connection Path Length	USINT
16	Get	Consumed Connection Path	EPATH

Instance 2: Polled I/O connection

Attribute ID	Access rule	Name	Data type
1	Get	State	USINT
2	Get	InstanceType	USINT
3	Get	TransportClassTrigger	USINT
4	Get	ProducedConnectionId	UINT
5	Get	ConsumedConnectionId	UINT
6	Get	InitialCommCharacteristics	BYTE
7	Get	ProducedConnectionSize	UINT
8	Get	ConsumedConnectionSize	UINT
9	Get/Set	ExpectedPackedRate	UINT
12	Get/Set	WatchdogTimeoutAction	USINT
13	Get	Produced Connection Path Length	USINT
14	Get	Produced Connection Path	EPATH
15	Get	Consumed Connection Path Length	USINT
16	Get	Consumed Connection Path	EPATH

Common services

Service code	Implemented for		Service name
	Class	Instance	
0x05	No	Yes	Reset
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Appendix B: DeviceNet Objects Defined by RTU-DNET

- DeviceNet Object

Class	Object
0x9A	RTU-DNET Setup Parameter Object
0x9B	Extension Module Setup Parameter Object)
0x9C	Extension Module Parameter Object
0x9D	MODBUS communication parameter

- Class 0x9A – RTU-DNET setup parameter object

Class attribute

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT

Instance 1

Attribute ID	Access rule	Name	Data type
1	Get	Revision	UINT

Instance 1

Attribute ID	Access rule	Name	Range	Default	Explanation
1	Get	Length of input I/O data	N/A	N/A	The sum of the length of the status word of RTU-DNET and the input data of the module connected to it. Unit: byte
2	Get	Length of output I/O data	N/A	N/A	The sume of the length of the control word of RTU-DNET and the output data of the module connected to it. Unit: byte
3	Get	Number of digital input points (X)	0 ~ 128	N/A	The number will be regarded as 8 when it is less than 8 and as 16 when it is bigger than 8 but less than 16. Unit: bit
4	Get	Number of digital output points (Y)	0 ~ 128	N/A	The number will be regarded as 8 when it is less than 8 and as 16 when it is bigger than 8 but less than 16. Unit: bit
5	Get	Number of special modules	0 ~ 8	N/A	The number of special modules connected to RTU-DNET

Attribute ID	Access rule	Name	Range	Default	Explanation
6	Get	Length of analog input	N/A	N/A	The length of input data of the special module connected to RTU-DNET. Unit: word
7	Get	Length of analog output	N/A	N/A	The length of output data of the special module connected to RTU-DNET. Unit: word
8	Get	Status word	0 ~ 255	N/A	Displaying the status of RTU-DNET. See 4.3 for more details.
9	Get/Set	Control word	N/A	N/A	For setting up the mode of RTU-DNET, e.g. “H8000” for STOP mode and “H8001” for RUN mode. See 4.3 for more details.
10	Get/Set	Diagnostic interval time	1 ~ 65 secs	5 secs	The interval when RTU-DNET executes diagnosis.
11	Get/Set	Special module offline treatment	0 ~ 2	1	How RTU-DNET will react when the special module connected to it is offline. 0: Ignored 1: Alarm 2: Stop DeviceNet IO
12	Get/Set	Special module error treatment	0 ~ 2	1	How RTU-DNET will react when it detects errors. 0: Ignored 1: Alarm 2: Stop DeviceNet IO
13	Get/Set	RTU-DNET configuration validation	N/A	0	Validating the configuration of RTU-DNET when set to “11”.
14	Get/Set	Reset RTU-DNET	N/A	0	Resetting RTU-DENT when set to “10”. After it, the parameter will change to “0” automatically.

Common services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

- Class 0x9B – Special I/O module sion module setup parameter object

  Class attribute

Attribute ID	Access Rule	Name	Data Type
1	Get	Revision	UINT

Instance 1 ~ 8 (parameters for the 1st ~ 8th special I/O modules)

Attribute ID	Access Rule	Name	Range	Default	Explanation		
1	Get	Model name	N/A	N/A	Model code for the special I/O module		
2	Get	Length of input data	N/A	N/A	The sum of the input data length of special I/O modules connected. Unit: word		
3	Get	Length of output daat	N/A	N/A	The sum of the output data length of special I/O modules connected. Unit: word		
4	Get	Status	0 ~ 63	N/A	b0	0	Special I/O module online
						1	Special I/O module offline
					b1	0	Special I/O module normal
						1	Special I/O module in error
					b2	0	Special I/O module and configuration consistent
						1	Special I/O module and configuration inconsistent
					b3	0	Configuration data valid
						1	Configuration data invalid
					b4	0	Special I/O module identifiable
						1	Special I/O module unidentifiable
					b5 ~ b15		Reserved
5	Get/Set	Work mode	0 ~ 1	0	Work mode of special I/O module 0: auto 1: custom		
6	Get/Set	Number of input data	0 ~ 8	N/A	Number of input data of special I/O modules connected		
7	Get/Set	Number of output data	0 ~ 8	N/A	Number of output data of special I/O modules connected		
8	Reserved						
9	Get	Error code		N/A	Error code in special I/O module		
10~19	Reserved						
20	Get/Set	Start CR for module 1 input data	N/A	N/A	Start CR for the input data of special I/O module 1		
21	Get/Set	Input data length for module 1	N/A	N/A	Length of input data of special I/O module 1		
22	Get/Set	Start CR for module 2 input data	N/A	N/A	Start CR for the input data of special I/O module 2		
23	Get/Set	Input data length for module 2	N/A	N/A	Length of input data of special I/O module 2		
24	Get/Set	Start CR for module 3 input data	N/A	N/A	Start CR for the input data of special I/O module 3		

Attribute ID	Access Rule	Name	Range	Default	Explanation
25	Get/Set	Input data length for module 3	N/A	N/A	Length of input data of special I/O module 3
26	Get/Set	Start CR for module 4 input data	N/A	N/A	Start CR for the input data of special I/O module 4
27	Get/Set	Input data length for module 4	N/A	N/A	Length of input data of special I/O module 4
28	Get/Set	Start CR for module 5 input data	N/A	N/A	Start CR for the input data of special I/O module 5
29	Get/Set	Input data length for module 5	N/A	N/A	Length of input data of special I/O module 5
30	Get/Set	Start CR for module 6 input data	N/A	N/A	Start CR for the input data of special I/O module 6
31	Get/Set	Input data length for module 6	N/A	N/A	Length of input data of special I/O module 6
32	Get/Set	Start CR for module 7 input data	N/A	N/A	Start CR for the input data of special I/O module 7
33	Get/Set	Input data length for module 7	N/A	N/A	Length of input data of special I/O module 7
34	Get/Set	Start CR for module 8 input data	N/A	N/A	Start CR for the input data of special I/O module 8
35	Get/Set	Input data length for module 8	N/A	N/A	Length of input data of special I/O module 8
36 ~ 49	Reserved				
50	Get/Set	Start CR for module 1 output data	N/A	N/A	Start CR for the output data of special I/O module 1
51	Get/Set	Output data length for module 1	N/A	N/A	Length of output data of special I/O module 1
52	Get/Set	Start CR for module 2 output data	N/A	N/A	Start CR for the output data of special I/O module 2
53	Get/Set	Output data length for module 2	N/A	N/A	Length of output data of special I/O module 2
54	Get/Set	Start CR for module 3 output data	N/A	N/A	Start CR for the output data of special I/O module 3
55	Get/Set	Output data length for module 3	N/A	N/A	Length of output data of special I/O module 3
56	Get/Set	Start CR for module 4 output data	N/A	N/A	Start CR for the output data of special I/O module 4
57	Get/Set	Output data length for module 4	N/A	N/A	Length of output data of special I/O module 4
58	Get/Set	Start CR for module 5 output data	N/A	N/A	Start CR for the output data of special I/O module 5
59	Get/Set	Output data length for module 5	N/A	N/A	Length of output data of special I/O module 5
60	Get/Set	Start CR for module 6 output data	N/A	N/A	Start CR for the output data of special I/O module 6
61	Get/Set	Output data length for module 6	N/A	N/A	Length of output data of special I/O module 6
62	Get/Set	Start CR for module 7 output data	N/A	N/A	Start CR for the output data of special I/O module 7

Attribute ID	Access Rule	Name	Range	Default	Explanation
63	Get/Set	Output data length for module 7	N/A	N/A	Length of output data of special I/O module 7
64	Get/Set	Start CR for module 8 output data	N/A	N/A	Start CR for the output data of special I/O module 8
65	Get/Set	Output data length for module 8	N/A	N/A	Length of output data of special I/O module 8

Common services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

- Class 0x9C – Special I/O command module parameter object

Class attribute

Attribute ID	Access Rule	Name	Data Type
1	Get	Revision	UINT
2	Get	MaxInstance	UINT

Instance 1 ~ 8 (CR for the 1st ~ 8th special I/O module)

Attribute ID	Access Rule	Name	Data Type
1	Get	Content in CR#0	UINT
2	Get/Set	Content in CR#1	UINT
3	Get/Set	Content in CR#2	UINT
…	…	…	UINT
9	Get/Set	Content in CR#8	UINT
10	Get/Set	Content in CR#9	UINT
…	…	…	UINT

Common services

Service Code	Implemented for		Data Type
	Claass	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

- Class 0x9D –Special Module Setup Parameter Object

Instance 1 (the communication formats for MODBUS devices)

Attribute ID	Access Rule	Name	Data Type
1	Get/Set	Baud rate	UINT
2	Get/Set	Data length	UINT
3	Get/Set	Parity	UINT
4	Get/Set	Stop	UINT
5	Get/Set	Mode	UINT

Instance 2 ~ 9 (communication parameters from 1 ~ 8 MODBUS devices)

Attribute ID	Access Rule	Name	Data Type
1	Get/Set	Node ID	UINT
2	Get/Set	The link number of ReadLink	UINT
3	Get/Set	The link number of WriteLink	UINT
4	Get/Set	Status	UINT
5~9	Reserved		
10	Get/Set	The start address of ReadLink1	UINT
11	Get/Set	ReadLink1 length	UINT
12	Get/Set	ReadLink2 start address	UINT
13	Get/Set	ReadLink2 length	UINT
14	Get/Set	ReadLink3 start address	UINT
15	Get/Set	ReadLink3 length	UINT
16	Get/Set	ReadLink4 start address	UINT
17	Get/Set	ReadLink4 lenght	UINT
18	Get/Set	ReadLink5 start address	UINT
19	Get/Set	ReadLink5 length	UINT
20	Get/Set	ReadLink6 start address	UINT
21	Get/Set	ReadLink6 length	UINT
22	Get/Set	ReadLink7 start address	UINT
23	Get/Set	ReadLink7 length	UINT
24	Get/Set	ReadLink8 start address	UINT
25	Get/Set	ReadLink8 length	UINT
30	Get/Set	WriteLink1 start address	UINT
31	Get/Set	WriteLink1 length	UINT
32	Get/Set	WriteLink2 start address	UINT
33	Get/Set	WriteLink2 length	UINT
34	Get/Set	WriteLink3 start address	UINT
35	Get/Set	WriteLink3 length	UINT
36	Get/Set	WriteLink4 start address	UINT
37	Get/Set	WriteLink4 length	UINT
38	Get/Set	WriteLink5 start address	UINT
39	Get/Set	WriteLink5 length	UINT
40	Get/Set	WriteLink6 start address	UINT
41	Get/Set	WriteLink6 length	UINT

Attribute ID	Access Rule	Name	Data Type
42	Get/Set	WriteLink7 start address	UINT
43	Get/Set	WriteLink7 length	UINT
44	Get/Set	WriteLink8 start address	UINT
45	Get/Set	WriteLink8 length	UINT