



User Manual 用户手册



RX Horizontal Multi-Function Distributed I/O

DEVICENET protocol
Remote IO Module
Distributed IO Module

CATALOGUE

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1.Preface

1.1 Document Usage Instructions

This document outlines the product's functional specifications, installation, operation, and settings, as well as information regarding network protocols. This document is intended for use by well-trained electrical automation engineers only.

(1) Disclaimer

The author has conducted the necessary review of the document. However, as the product progresses and evolves, the document may contain errors in technical parameters or editing. We reserve the right to make adjustments and modifications without prior notification to the users.

(1) Trademark

CANOPEN® is a registered trademark of the CIA Association.

(3) Patent Description

The designer of this product has obtained patent protection for both its appearance and the technical implementation method. Any attempt to copy, imitate or reverse engineer it could potentially violate the law.

(4) Copyright

Without the author's permission, it is strictly prohibited to copy, distribute or use this document.

1.2 Safety matters

This product is a professional equipment designed for industrial use and can only be operated by personnel with electrical operation experience. Before use, please carefully read this manual and follow the instructions to operate it properly to avoid causing personal injury or product damage.

This product is designed with an IP20 protection level. When using it, it needs to be installed in a distribution cabinet with dust-proof and moisture-proof functions.

1.3 Document History

版本	日期	说明
V1.00	2018.11.01	首发
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1.4 Reference document

《IEC11631-22007 Programmable controllers –Part 2:Equipment requirements and tests》；

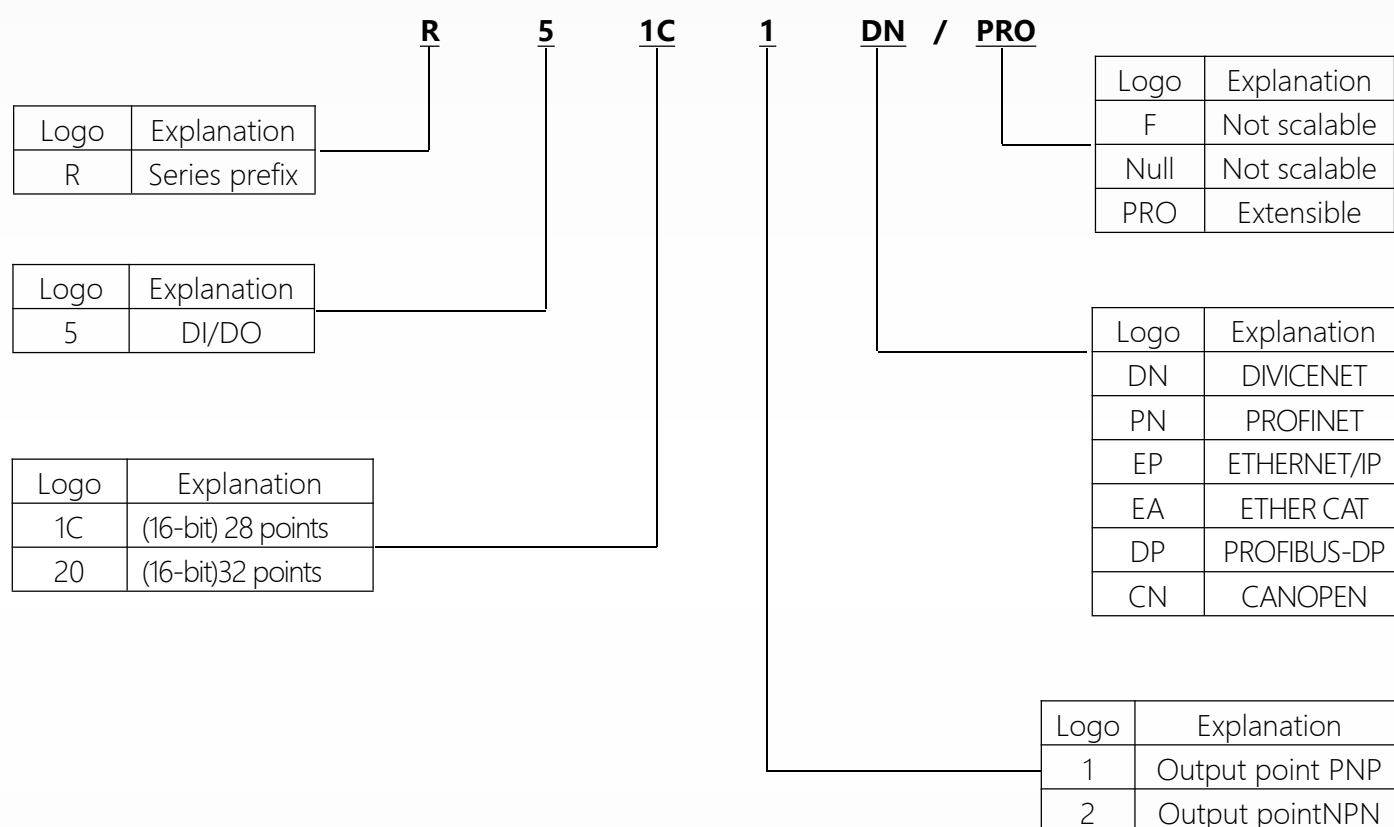
《IEC/TR 6115 8Industrial Communication Network - Fieldbus Specification》；



2.Product Overview

2.1 Model list

The R51C1-DN series remote I/O products support the high-performance DeviceNet bus communication protocol. Through the digital or analog I/O interfaces integrated in the module body, they can directly provide high-performance input and output functions without the need for additional DeviceNet bus couplers. The expandable version of the module can also increase the required number of IO points by selecting different expansion modules.



Number	Model number	Explanation
1	R51C1-DN	16DI, 12DQ (transistors), fixed I/O points, DeviceNet remote I/O module

Table 1 DeviceNet Remote I/O Module

2.2 R51C1-DN Specifications

This article only provides explanations for the product specification parameters of the R51C1-DN model. For the specification parameters of other models, please contact your supplier for information.

2.2.1 DI specification

The specifications for digital input (DI) are shown in Table 2.

Number	Project	Specification
1	Number of channels	16
2	Access type Ton	2 bytes
3	Toff	Type. 18uS / Max. 35uS
4	Input type	Type. 135uS / Max. 250uS
5	Input connector	Source type or leakage type
6	Rated input voltage	Plug-and-socket connector
7	"0" signal level	24 V DC (-15 %/+20 %), (IEC 61131-2, type 1)
8	"1" signal level	-3...+5 V (IEC 61131-2, type 1)
9	Input current	15...30 V (IEC 61131-2, type 1)
10	Electrical isolation	Typ. 10mA/Ch(IEC 61131-2, type 1)
11	Number of channels	Input/Control Area: 500V DC

Table 2 Specifications for Digital Input

2.2.2 DQ Specification

The specifications and parameters of the MOSFET digital output (DQ) are shown in Table 3.

Number	Project	Specification
1	Number of channels	12
2	Access type Ton	2 bytes
3	Toff	Type. 12uS / Max. 25uS
4	Output type	Type. 10mS / Max. 20mS (空载)
5	Output connector	Source type
6	Load type	Plug-and-socket connector
7	Rated output voltage	Pure resistive, inductive, bulb
8	Maximum output current	24 V DC (-15 %/+20 %), (IEC 61131-2, type 1)
9	Rated total output current	Max. 0.5 A /Ch,Independent short-circuit protection for each channel
10	Power connector	6A
11	Number of channels	Two sets of 2-pin spring connectors

Table 3 MOSFET Output Specifications

2.2.3 DeviceNet Communication specification

The DeviceNet communication specification parameters are shown in Table 4.

Number	Project	Specification
1	Communication protocol	DeviceNet
2	Information type Node monitoring	IO polling connection
3	Bit rate (kbps)	Life protection, node protection, heartbeat producer/consumer 125K, 250K, 500K
4	Communication address range	01 - 64
5	Physical interface	5-PIN socket
6	Number of stations	Up to 64
7	Port protection	Air discharge 15kV, contact discharge 8kV (IEC 61000-4-2)
8	Transmission cable Protection level	2-core shielded twisted copper cable
9	Communication protocol	IO polling connection
10	Information type Node monitoring	IP20

Table 4 DeviceNet Communication Specifications

2.2.4 Power supply specifications

The module power supply is divided into three independent parts: the control part, the digital input part, and the MOSFET digital output part, which are isolated from each other. Therefore, three independent power supplies need to be provided for each part of the circuit or they can be directly connected in parallel.

① The control voltage uses 24V DC (-15% / +20%), with a maximum current consumption of 0.5A, and has polarity reverse protection; the electrical isolation withstand voltage between it and other I/O parts is 500V DC.

② The digital input voltage uses 24V DC (-15% / +20%), with a maximum current consumption of 16*10mA; the electrical isolation withstand voltage between it and other I/O parts is 500V DC.

③ The MOSFET digital output part uses 24V DC (-15% / +20%), with a maximum current consumption of 8*0.5A, and has channel-independent overcurrent protection; the electrical isolation withstand voltage between it and other I/O parts is 500V DC.



3. Structure Explanation

3.1 Shell

The module adopts the standard enclosure design of the Rx series remote I/O module. Its dimensions are: 120.5 * 80 * 62 (W/H/D, mm). The height of the lower rail clip protrusion is $h = 5.5$ mm. It supports an IP20 protection level.

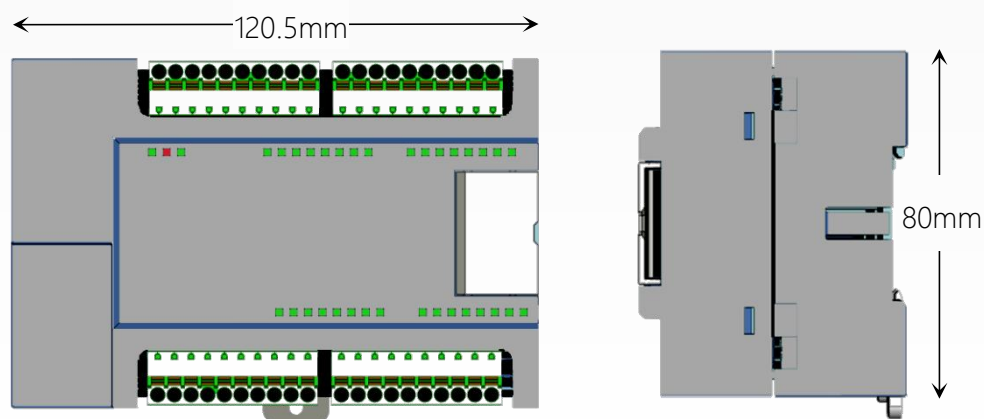


Figure 1 Module Dimension Diagram

3.2 Installation Method

① The design of the module adopts natural convection cooling method. At least 25 mm of space must be reserved above and below the device to ensure normal heat dissipation. The distance between the front panel and the back panel should also be maintained at least 75 mm.

② The module can be easily installed on a standard DIN rail or the back panel of the control cabinet. The rail specification is TS35/7.5, as shown in Figure 2.

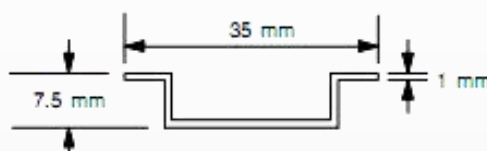
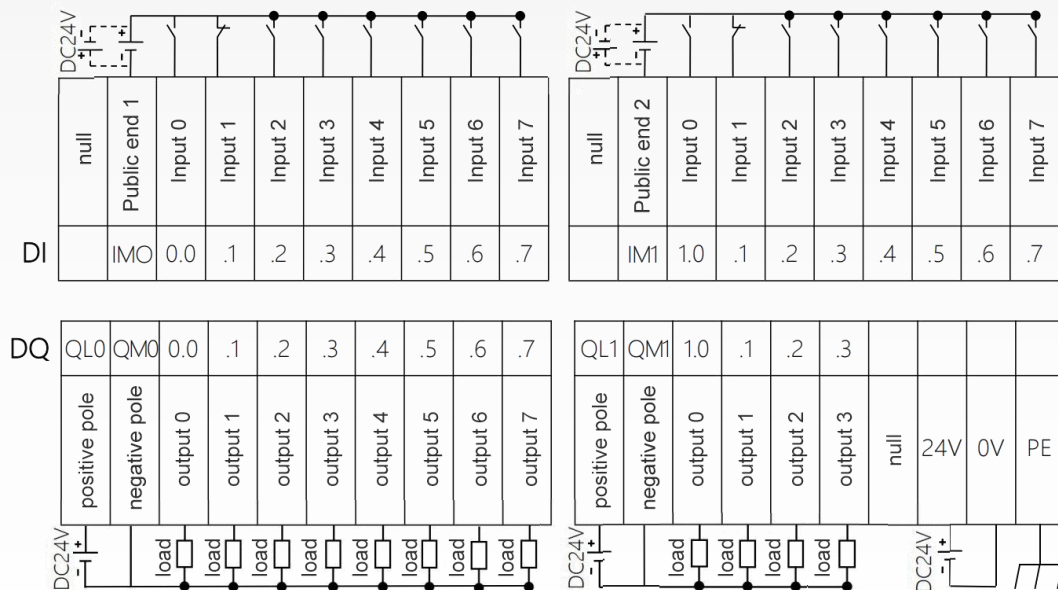


Figure 2 DIN rail



4. Hardware Description

4.1 R51C1-DN Circuit diagram



4.2 Communication interface

The module uses an open 5PIN socket as the physical interface for DeviceNet communication.

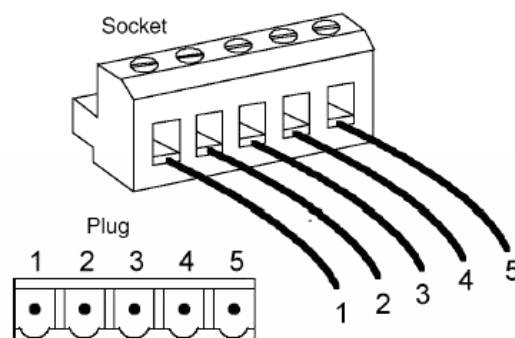
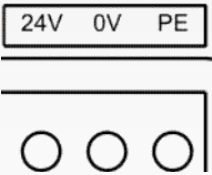


Figure 3 Module Wiring Diagram

Pin	Signal	Description
1	GND	Bus ground
2	L	Signal-
3	SD	Shield wire
4	H	Signal+
5	NC	N.C.

Table 5 DeviceNet Communication Interface

4.3 Communication Power Supply



24V	24V, positive terminal of the DC power supply
0V	0V, negative terminal of the DC power supply
PE	Connect to the ground

Table 6 Power Connection Terminal

4.4 Node ID setting

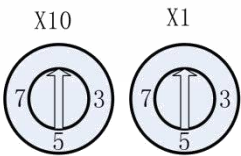


Figure 4 Node ID Setting Switch

The module sets the node ID through two decimal-digit encoding switches, as shown in the figure below. The range of node ID setting is from 01 to 64. The module program only reads the node ID setting at power-on, and any modifications during operation are invalid..

4.5 Baud rate

Baud rate	1	2	3
125K	OFF	OFF	OFF
250K	OFF	ON	ON
500K	ON	OFF	ON

Table 7 DeviceNet Baud Rate

4.6 LED Instruction

The LED indicators of the module are divided into two parts: system status indicator and I/O status indicator.

4.6.1 System status indication

The module uses three different colored LEDs to indicate the system status, as shown in Table 8.

NAME	Color	Explanation	
PWR	green	24V Power Indicator	
		ON	The power supply is operating normally.
		OFF	Power failure
ERR	red	Module failure	
		ON	The DeviceNet bus has not entered the correct mode:
		Double flash	Heartbeat and node protection error
		OFF	The DeviceNet bus has entered a state where it can operate
RUN	orange	Operation indicator light	
		ON	The module enters the operation state and successfully establishes a loop data exchange with the main station.
		单闪	The module enters the operation stop state.
		快闪	The module enters the pre-operation (PRE-OPERATIONAL) state.

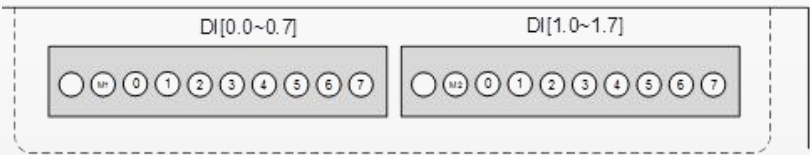
Table 8 System Status Indicator Lights

4.6.2 I/O status indicator

The digital input/output ports use green LEDs to indicate the status of the corresponding channels. When the light is on, it indicates that the logic state of the input/output port is "1", and when the light is off, it indicates that the logic state of the input/output port is "0".

4.7 Digital input interface

The digital quantity input interface is connected using two sets of 10P plug-in connectors, with a total of 16 input signals divided into DI-0 and DI-1 groups, as shown in the following figure.



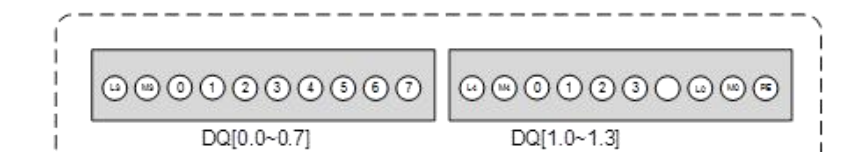
Digital Input-0		Digital Input-1	
O	Null	O	null
M1(*)	DI Public Port 1	M2(*)	DI Public Port 2
0	DI-0.0	0	DI-1.0
1	DI-0.1	1	DI-1.1
2	DI-0.2	2	DI-1.2
3	DI-0.3	3	DI-1.3
4	DI-0.4	4	DI-1.4
5	DI-0.5	5	DI-1.5
6	DI-0.6	6	DI-1.6
7	DI-0.7	7	DI-1.7

Table 9 Digital Input Terminals

Note*: M1 and M2 are directly connected in parallel within the module.

4.8 Digital output interface

The digital output interface is connected using two sets of 10P plug-in connectors. The 12 output signals occupy the left 16P section of the connectors. Each digital output port is equipped with an independent 0.5A overcurrent protection.



Digital Output -0		Digital Output -1	
L3(*)	DQ Positive terminal of the power supply	L4(*)	DQ Positive terminal of the power supply
M3(*)	DQPower negative terminal	M4(*)	DQPower negative terminal
0	DQ-0.0	0	DQ-0.0
1	DQ -0.1	1	DQ -0.1
2	DQ -0.2	2	DQ -0.2
3	DQ -0.3	3	DQ -0.3
4	DQ -0.4	O	Null
5	DQ -0.5	L0	Block power supply, as described in Section 4.3
6	DQ -0.6	M0	
7	DQ -0.7	PE	

Table 10 Digital Output Terminals

Note*: L3/M3 and L4/M4 are directly connected in parallel within the module and are electrically isolated from the control circuit. When using, an external 24V DC power supply needs to be provided separately for the DQ circuit.



5.CANOPEN Bus

5.1 Bus transmission technology

The R51C1-DN series I/O modules are compatible with the DeviceNet bus and are modules that comply with global industrial standards based on DeviceNet bus technology.

●Network topology

The DeviceNet network supports linear topologies with terminators. All devices are connected in a bus structure, and a single bus segment can connect up to 64 stations (master or slave).

5.1.1 Transmission rate and cable length

The relationship between the transmission rate of the module and the length of the cable is shown in Table 11.

Transmission rate (kbps)	The range (m) of a single bus segment
500	100
250	250
125	500

Table 11 Transmission Rate and Range of Cables

5.2 Communication Protocol CANOPEN

The Rx-DN series I/O modules support DeviceNet version communication. The master/slave stations use cyclic data exchange to achieve the read/write func

5.2.1 Module Configuration and Address Allocation

The DI/DQ data of R51C1-DN is mapped to the main station's memory space through the configuration file.

- 16 digital inputs are mapped to the high and low bytes of a register on the PLC host;
- 12 digital outputs are mapped to the high and low bytes of a register on the PLC host;

5.2.2 User Parameters

The R51C1-DN module is a switch quantity module. The configuration of user parameters can be found in the detailed description of Section 6.1.

5.2.3 Diagnostic Function

The module has no diagnostic parameters.

5.2.4 System Behavior Characteristics

The behavior characteristics of the module follow the standard DeviceNet protocol, and there are mainly five states:

- Reset (Reset Node)

All module information is reset. It returns to the power-on state.

- Reset Communication

The module only resets the communication parameters.

- Pre-operational (Pre-operational)

In this state, the master station and the slave station are in the configuration transmission stage, and the RUN indicator flashes rapidly. TPDO transmission cannot be performed.

- Operation (operate)

Module information is in the process data transmission stage with the master station. The RUN indicator is constantly on.

- Stop State

Module information stops exchanging data with the host and enters the safety mode.

5.3 Device Database File (EDS)

DeviceNet uses the device database file (EDS) to describe the communication characteristics of the device. The EDS file is a readable ASCII text document that contains general and specific specifications for communication.

5.3.1 File Name

The latest version of the EDS file for the R51C1-DN matching is: R51C1_DNV1.eds.

- "R51C1" indicates the product number, corresponding to the R51C1-DN, 16DI/12DQ (MOSFET) remote I/O module;
- "V1" indicates the version number, the first version (only applicable to R51C1-DN).



6.I/O Process data

6.1 Module parameter configuration

The following is an explanation of the configuration parameters for the modules based on the Delta DeviceNet Builder software.

6.2 Configure DVPDNET-SL

6.2.1 Software Introduction

Before the DVPDNET-SL scanning module can operate normally, it must be configured through the configuration software (DeviceNet Builder).

6.2.2 Communication signal selection

The left side of the PLC host can connect up to eight DVPDNET-SL modules. Each DVPDNET-SL is a communication channel. When three DVPDNET-SL modules are connected to the left side of the PLC host, when the configuration software (DeviceNet Builder) is launched, a dialog box as shown in the figure below will pop up. This dialog box is used to select the current channel.



Parameter Name	Detailed description
Unit Number Name	The first DVPDNET-SL (DNET Scanner) unit on the left side of the PLC host has the unit number 1. Up to eight DVPDNET_SL modules can be connected to the left side of the PLC host. The farther the DVPDNET-SL module is from the PLC host, the larger the unit number.
Code	The name of the DVPDNET-SL module in the software.
Input mapping	This parameter is used to display the current mode of the DVPDNET-SL, which is either the master station or the slave station.
Output mapping	The register area allocated by the PLC host to the DVPDNET-SL. This area is mainly used to receive information from the DeviceNet slave stations. The data of the slave stations in the bus will be automatically updated to these registers.
Unit Number Name	The register area allocated by the PLC host to the DVPDNET-SL. This area is mainly used to control the DeviceNet slave stations. The control data of these registers will be automatically sent to the DeviceNet slave stations in the bus. After the slave station receives the data, it will take corresponding actions based on these data.

6.2.3 Scanning module settings

This dialog box is mainly used to set the current mode of DVPDNET-SL: master station mode or slave station mode.



The dialog box is titled "扫描模块设定" (Scanning Module Settings). It contains the following sections:

- 主站模式 (Master Station Mode):**
 - 扫描时间间隔 (Scan Time Interval): 10 毫秒 (ms)
 - 超时设定 (EPR) (Timeout Setting): 75
 - 扩展波特率 (Extended Baud Rate):
 - ☒ 启动 (Start)
 - 波特率 (Baud Rate): 1Mbps (dropdown menu with options: 10Kbps, 20Kbps, 50Kbps, 125Kbps, 250Kbps, 500Kbps, 800Kbps, 1Mbps)
- 从站模式 (Slave Station Mode):**
 - ☐ 位选通 (Bit-Strobed)
 - 发送长度 (Transmit Length): [] 字节 (bytes)
 - ☐ 轮询 (Polled)
 - 发送长度 (Transmit Length): 8 字节 (bytes) 接收长度 (Receive Length): 8 字节 (bytes)
- COS/CC:**
 - ☐ COS ☐ Cyclic
 - 发送长度 (Transmit Length): [] 字节 (bytes) 接收长度 (Receive Length): [] 字节 (bytes)
- 装置映射地址 (Device Mapping Address):**
 - 输出起始地址 (Output Start Address): D [] 500
 - 输入起始地址 (Input Start Address): D [] 1000

Buttons: 确定 (OK), 取消 (Cancel)

Parameter Name	Specific Description
Main Station Mode	Set DVPDNET-SL to the main station mode.
Scan Time Interval	The period during which the main station sends and receives real-time data after the successful establishment of the real-time data connection.
Timeout Setting	If the main station does not receive a response from the slave station within the timeout period, it considers the slave station to be offline.
Extended Baud Rate	This parameter takes effect only in the main station mode.
Slave Station Mode	No settings required for the main station.
Bit Select	Reserved and has no practical effect.
Polling	No settings required for the main station.
COS/CC	Reserved and has no practical effect.
Device Mapping Address	Has no practical effect.

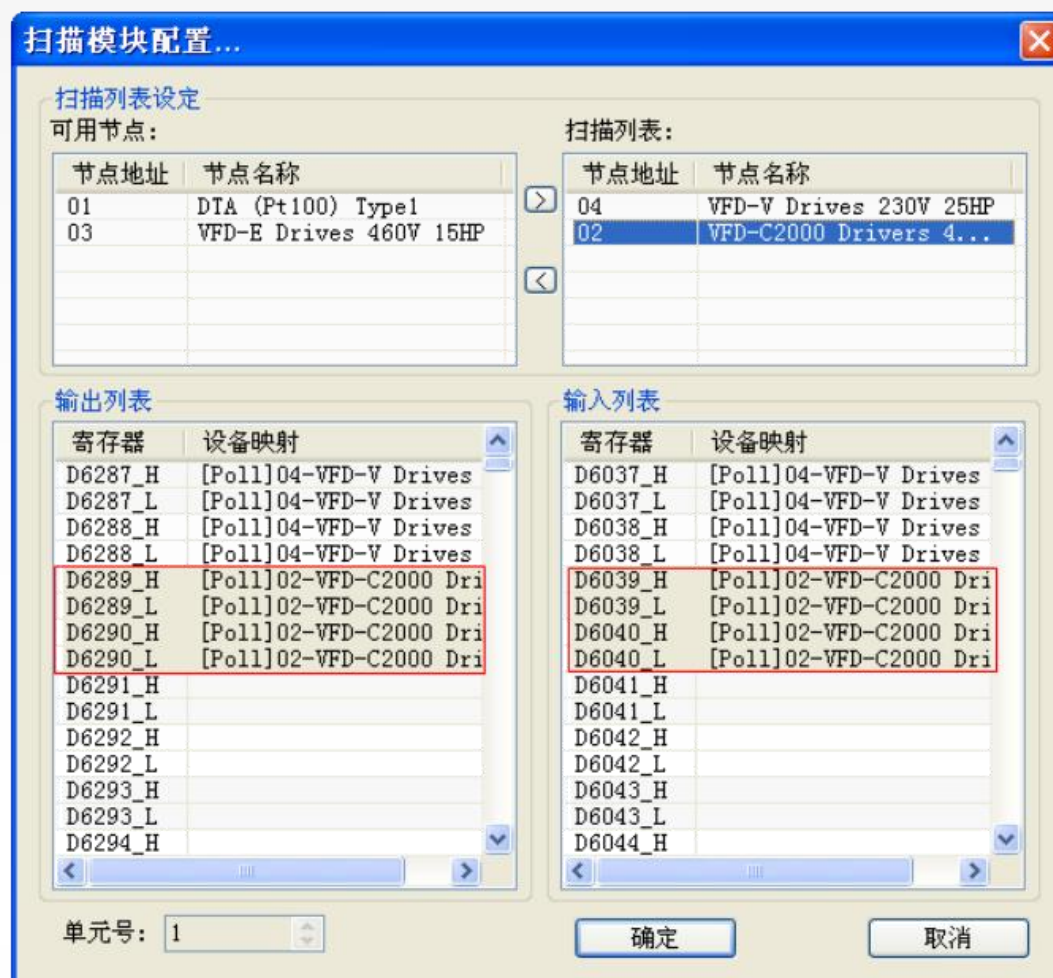
6.2.4 Scan list settings

Double-click the DVPNET-SL icon that has appeared on the software interface (DeviceNet Builder), and the scanning module configuration dialog box will automatically pop up.



Parameter Name	Specific Description
Available nodes	All the slave stations scanned will appear in the "available nodes".
Scanned list	After the configuration information is downloaded to DVPNET-SL, the slave stations in the "available nodes" will not conduct real-time data exchange with DVPNET-SL.
Node address	After the configuration information is downloaded to DVPNET-SL, the slave stations in the "scan list" will not conduct real-time data exchange with DVPNET-SL.
Node name	The station number of the slave station in the DeviceNet bus.

6.2.5 Input list and output list



Parameter Name	Specific Description
Output list	"The output list" correlates the registers of the PLC host with the output data. The values of these PLC registers will serve as the control data for the slave station and will be sent to the slave station in real time.
Input list	"The output list" correlates the PLC host's registers with the input data. The data sent from the slave station to the master station is updated in these PLC registers in real time.
Register	The number of PLC host registers, "D6289-H", represents the high byte of register D6289, and "D6289-L" represents the low byte of register D6289.
Device mapping	The "Poli" used to display the data type and the current name of the slave station indicates the polling information.

6.2.6 RX-DN Module Settings

节点配置...

节点地址: 3

名称: Unknown Device

节点信息

厂商代码: 12345

设备类型: 2123

产品代码: 3234

主要版本: 1

次要版本: 0

关键参数设置

☒ 厂商代码

☒ 设备类型

☒ 产品代码

☒ 主要版本

☒ 次要版本

☒ 轮询 (Polled)

输入长度: 2 字节

输出长度: 2 字节

☐ 位选通 (Bit-Strobed)

输入长度: 0 字节

☐ COS/CC设定

☒ COS

☐ CC

输入长度: 0 字节

输出长度: 0 字节

Heartbeat: 250 毫秒

ACK超时: 16 毫秒

限制时间: 1 毫秒

IO配置...

确定

取消

Parameter Name	Specific Description
Node address	Set the address on the RX-DN module.
Name	It has no actual meaning.
Node information	Consistent with this diagram setting and the EDS file.
Key parameter settings	Consistent with this diagram setting.
Polling	Select polling, with both input and output being 2 bytes.
Bit selection and gating	Reserved but has no actual effect.
COS/CC	Reserved but has no actual effect.

Official website



先进自动化控制及工业网络技术



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