I-87124
DeviceNet Master Module

User's Manual

Warranty

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Revision

Version	Firmware Version	Date	Author	Description
2.3	2.2	2015 4/20	Johney	Update the figure 1.2 and the figure 1.3
2.2	2.2	2010 07/13	Johney	Add the function I87124_GetBackplaneHandle
2.1	2.1	2009 10/13	Johney	Add the function I87124_ReadbackOutputData
2.0	2.0	2009 07/15	Johney	Improve the efficiency. New API functions. Add search functions. Support PACs: 1. WP-8000 series 2. ViewPAC series
1.0	1.0	2007 10/12	Johney	This manual is for the I-87124 module.

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1. General Information

1.1 DeviceNet Introduction

The CAN (Controller Area Network) is a serial communication protocol, which efficiently supports distributed real-time control with a very high level of security. It is an especially suited for networking "intelligent" devices as well as sensors and actuators within a system or sub-system. In CAN networks, there is no addressing of subscribers or stations in the conventional sense, but instead, prioritized messages are transmitted. DeviceNet is one kind of the network protocols based on the CAN bus and mainly used for machine control network, such as textile machinery, printing machines, injection molding machinery, or packaging machines, etc. DeviceNet is a low level network that provides connections between simple industrial devices (sensors, actuators) and higher-level devices (controllers), as shown in Figure 1.1.

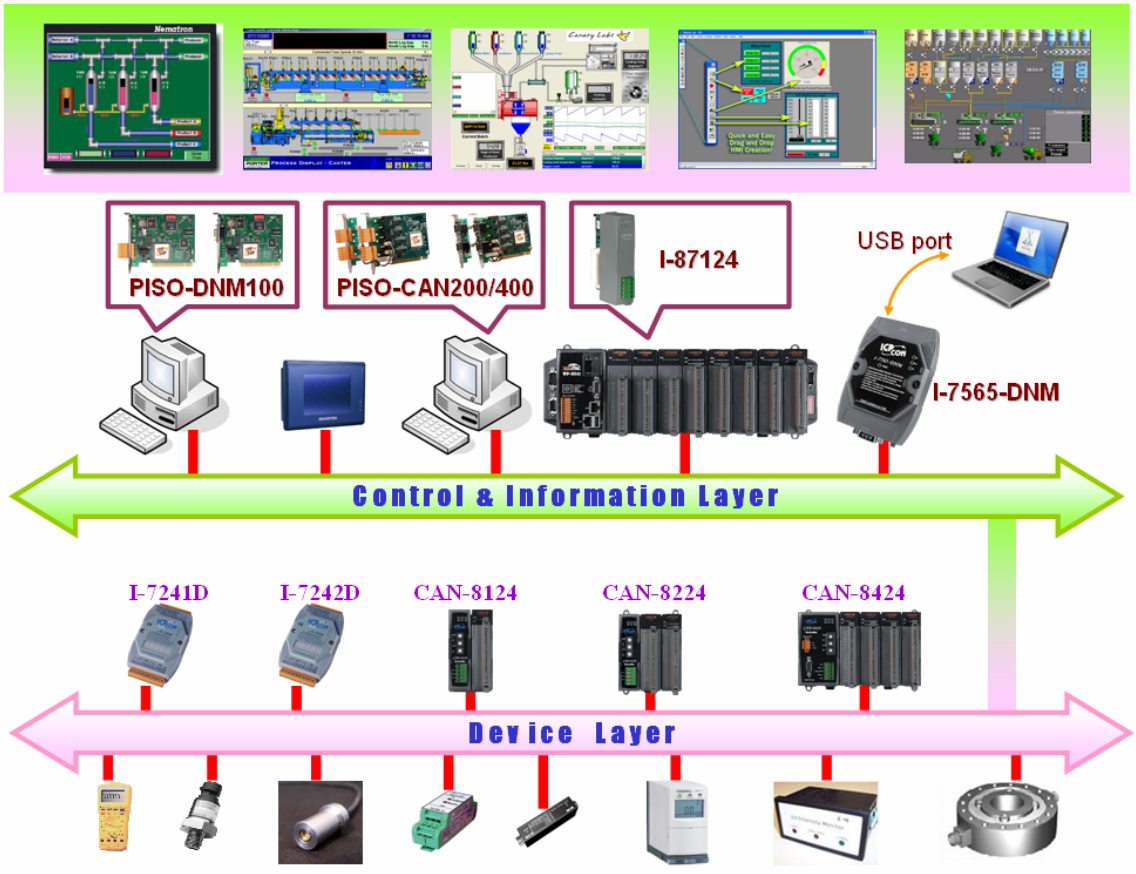


Figure 1.1 Example of the DeviceNet network

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DeviceNet is a cost effective solution to one kind application of control c\area network. It reduces the connection wires between devices and provides rapid troubleshooting rejection function. The transfer rate can be up to 500Kbps within 100 meters. The transfer distance can be up to 500 meters in 125Kbps (See Table 1.1). It allows direct peer to peer data exchange between nodes in an organized and, if necessary, deterministic manner. Master/Slave connection model can be supported in the same network. Therefore, DeviceNet is able to facilitate all application communications based on a redefine a connection scheme. However, DeviceNet connection object strands as the communication path between multiple endpoints, which are application objects that is needed to share data.

Baud rate (bit/s)	Max. Bus length (m)
500 K	100
250 K	250
125 K	500

Table 1.1 The Baud rate and the Bus length

I-87124 can represent an economic solution of DeviceNet application and be a DeviceNet master device on the DeviceNet network. I-87124 supports Group 2 only Server and UCMM functions to communication with slave devices. It has an independent CAN bus communication port with the ability to cover a wide range of DeviceNet applications. Besides, I-87124 uses the new CAN controller Phillips SJA1000T and transceiver 82C250, which provide bus arbitration, error detection with auto correction and re-transmission function. It can be installed on the WP-8000 and ViewPAC system. It is popularly applied in the industrial automation, building automation, vehicle, marine, and embedded control network. Therefore, that is an easy way to develop the DeviceNet network with I-87124.

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1.2 DeviceNet Applications

DeviceNet is the standardized network application layer optimized for factory automation. It is mainly used in low- and mid-volume automation systems. Some users have also implemented DeviceNet for machine control systems. The main DeviceNet application fields include the following application area (For more information, please refer to www.odva.org):

- Production cell builds and tests CPUs
- Beer brewery
- Equipment for food packing
- Fiberglass twist machine
- Sponge production plant
- Isolation wall manufacturing
- Overhead storage bin production
- Pocket-bread bakery
- Dinnerware production
- HVAC module production
- Textile machines
- Trawler automation system
- LCD manufacturing plant
- Rolling steel door production
- Bottling line
- Tight manufacturing



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1.3 I-87124 Architecture

The I-87124 provides users to establish DeviceNet network rapidly by Master/Slave connection model. I-87124 is a high-performance DeviceNet master module with one CPU inside. This architecture of the I-87124 almost doesn't cost MCU resource and really increases the work efficiency on DeviceNet network. Applying the I-87124, users don't need to take care of the detail of the DeviceNet protocol. The inside firmware implements the DeviceNet protocol to help users to establish the connection with DeviceNet slave devices easily. The illustration about the idea is shown as Figure 1.2.

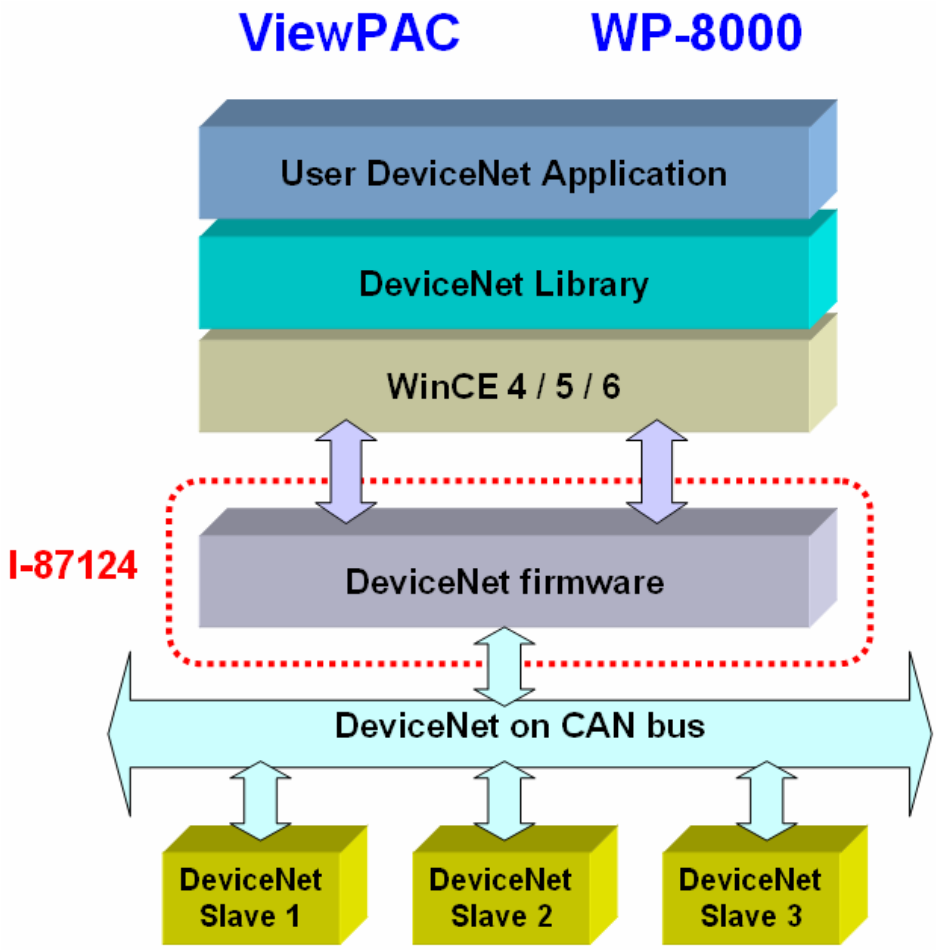


Figure 1.2 I-87124 architecture.

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1.4 DeviceNet Master Characteristics

Using the API functions, users don't need to take care of the detail of the DeviceNet protocol. It can reduce the complexity of user's DeviceNet Master Software. The firmware mainly supports the Predefined Master-Slave Connection Set and UCMM functions to allow users to merge third party's DeviceNet devices into the DeviceNet network. It can help users to establish the connection with DeviceNet slave devices easily. The general application architecture is demonstrated as Figure 1.3.

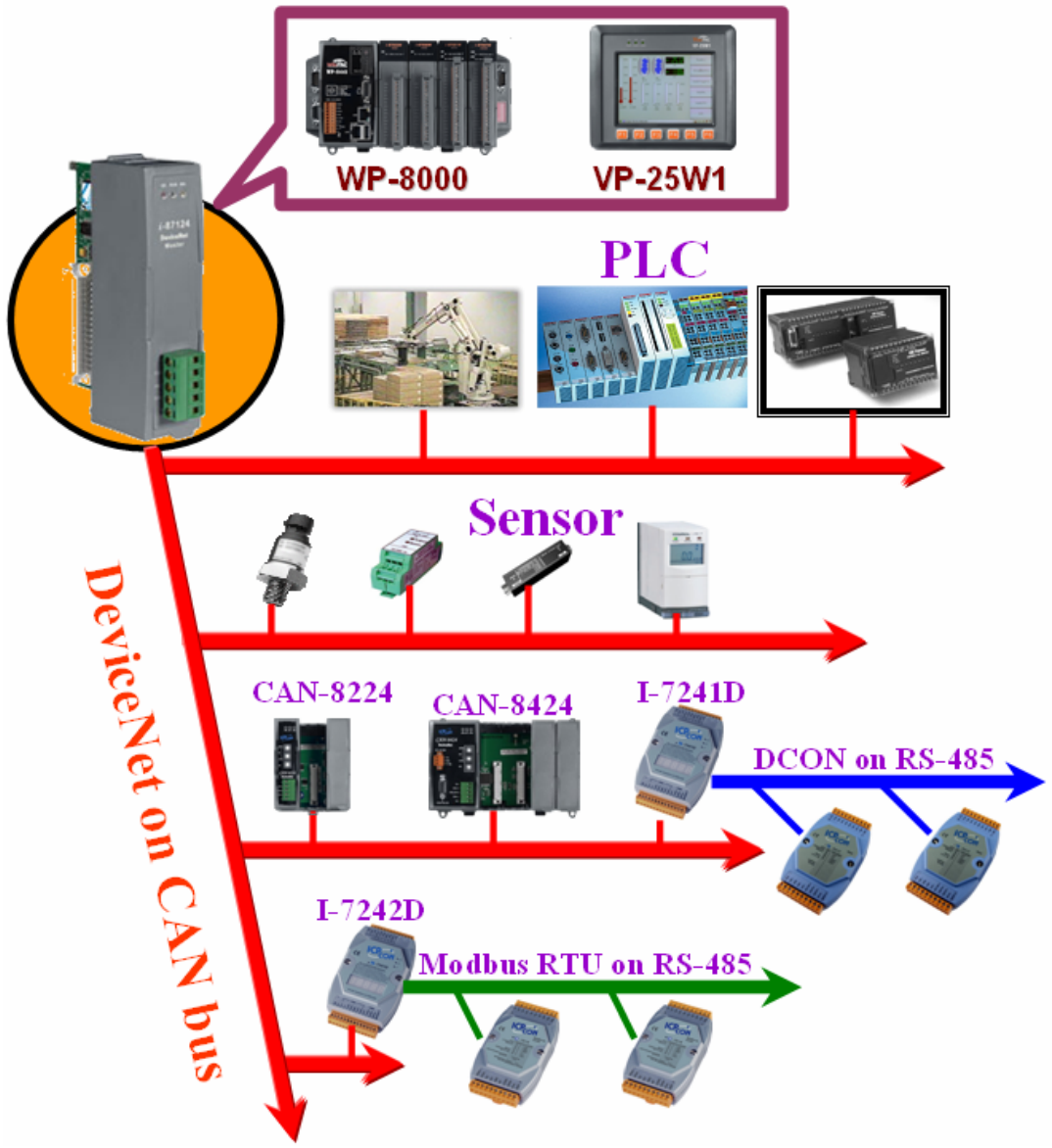


Figure 1.3 Application architecture

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The DeviceNet protocol firmware provides the DeviceNet Master mechanism to communicate with slave devices by the Predefined Master/Slave Connection Set and UCMM Connection Set. In the DeviceNet communication protocol can be clarify as two forms: One is the Explicit Message and others are I/O Messages. Here, we only provide one explicit message connection and four I/O connections as depicted in Figure 1.4.

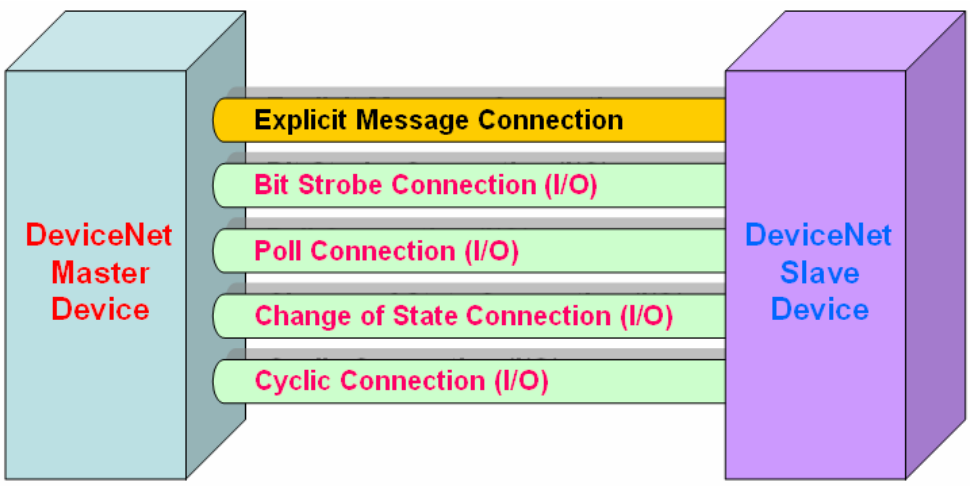


Figure 1.4 DeviceNet Messaging

The DeviceNet Communication Protocol is based on the concept of connections method. Master should create connections with slave devices based on the command of exchanging information and I/O data. To establish the master control mechanism, there are only four main steps to be followed. Figure 1.5 demonstrates the basic process for the DeviceNet master communication. The every step function is described in below:

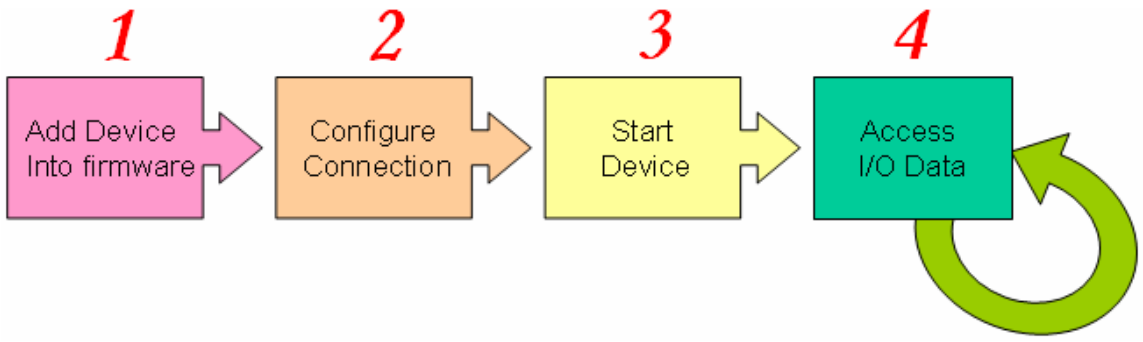


Figure 1.5 Four steps to establish connection

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1. **Add device into firmware**

   You should provide the slave device's MAC ID to add into firmware by using API function.

2. **Configure connection**

   You can check the slave device's I/O connection type and the I/O data length. When configuring the I/O connection, you should provide these parameters.

3. **Start Device**

   After configuring connections, users should start device by using API function. The master will communicate with the slave device.

4. **Access I/O data**

   After communicating with slave devices, you can access the I/O data with corresponding read/write function.

After adding the device into the firmware, the master will wait for the I/O configuration information. Then users can create the I/O connections in the next step. Once I/O connections have been created and started, I/O data may be exchanged among devices in the DeviceNet network according to master device demand. Therefore, the master device can access I/O data of the slave devices by one of the four I/O connection methods. The API functions are not only easy to use but also providing a lot of the DeviceNet Master functions to retrieve and deliver the slave's I/O data. For more information, please refer to functions description and demo programs in section 4.

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1.5 I-87124 Firmware Characteristics

The I-87124 is a high-performance DeviceNet master module. The firmware inside the board implements DeviceNet protocol automatically when the module is active. The firmware always listens to the bus and receives the message at the same time. It works as shown in Figure 1.6.

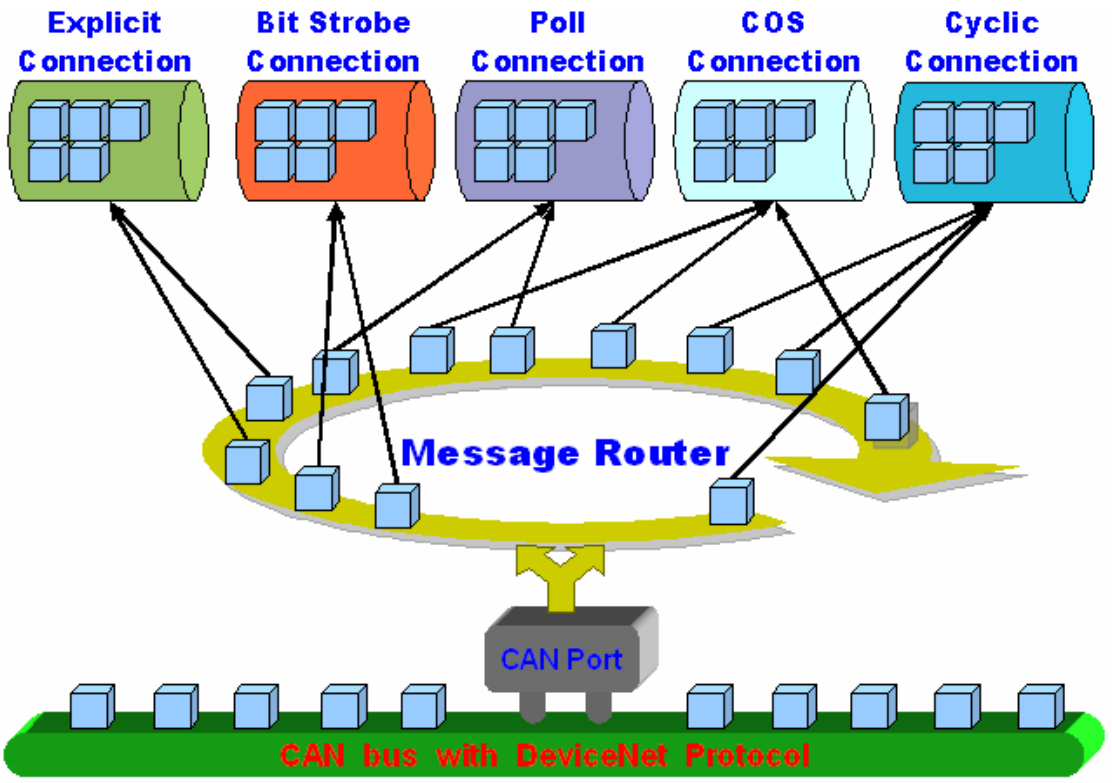


Figure 1.6 Message Router

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The I-87124 firmware has a “ScanList” to store the remote slave devices information. After power off, the information still exists in the EEPROM. When the users turn on the WP-8000/ViewPAC next time, the “ScanList” will be loaded from EEPROM. The users can easily use the DLL functions to configure it, including adding devices or removing devices. It works as shown in Figure 1.7. There is more information about the library functions in chapter 4.

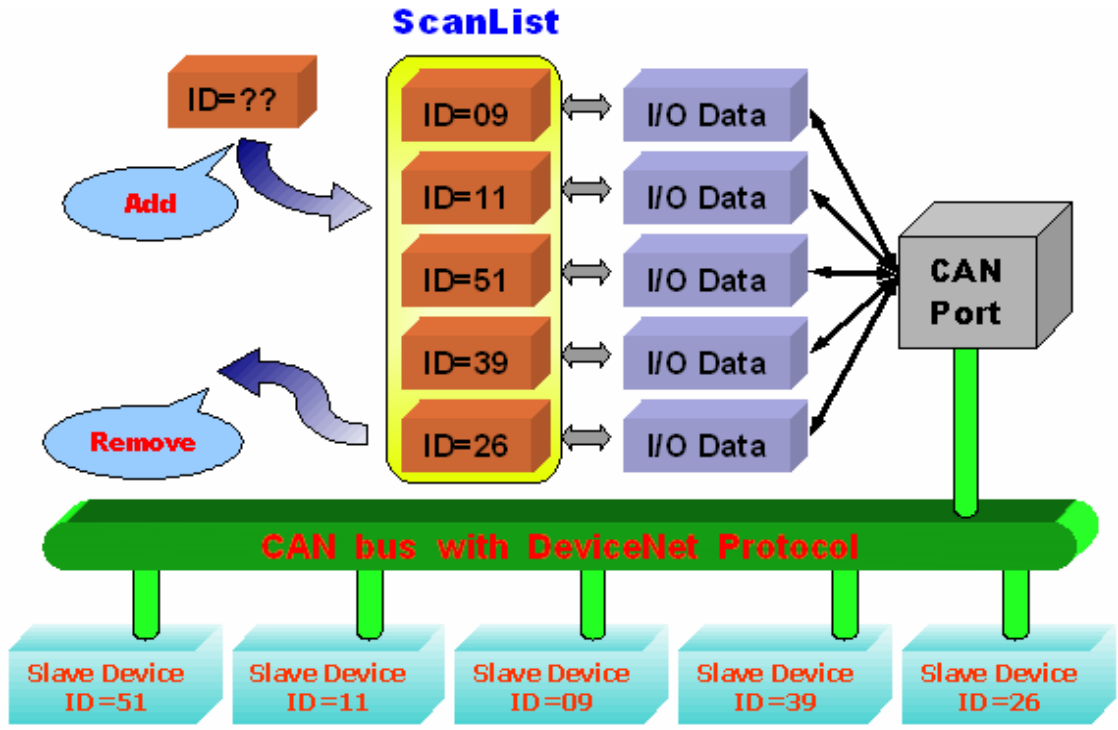


Figure 1.7 ScanList data structure

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1.6 Features

Hardware Features

- CPU : 80186, 80 MHz or compatible.
- CAN Port : 5-pin screwed terminal block (CAN_L, CAN_SHLD, CAN_H, N/A for others).
- CAN Controller : NXP SJA1000T with 16M Hz clock.
- CAN Transceiver : NXP 82C250.
- Isolation : 3000 VDC for DC-to-DC, 2500 Vrms for photo-couple.
- Specification : ISO-11898-2, CAN 2.0A and CAN 2.0B.
- 3 indicating LED (RUN, NS and MS).
- Terminator resistor : Switch select 120Ω terminator resistor.
- Power Consumption : 2W.
- Operating Temperature : -25 ~ 75°C
- Storage Temperature : -40 ~ 80°C
- Humidity : 5 ~ 95% RH, non-condensing

DeviceNet Firmware Features

- Programmable Master MAC ID.
- Programmable transfer-rate 125K, 250K, 500K.
- Each port support maximum nodes up to 64
- Support Group 2 Only Server functions
- Support UCMM functions
- Predefined Master-Slave Connection Set
- The maximum Fragment number is (Input/Output) up to 64
- Support I/O Operation Mode: Poll, Bit-Strobe and Change Of State/Cyclic
- Support Auto-Scan slave device function.
- Support on-line adding and removing devices.
- Support Auto-Reconnect when the connection is broken.

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1.7 Block Diagram

The figure 1.8 shows the block diagram of the I-87124 module.

1. UART Driver :
   The UART Driver provides the communication channel between PAC (WP-8000 or ViewPAC) and I-87124 module.

2. EEPROM :
   The EEPROM stores the configuration information. After restarting the PAC (WP-8000 or ViewPAC), the configuration data will be loaded form the EEPROM automatically.

3. Control CPU :
   The CPU inside implementing the DeviceNet firmware.

4. CAN Controller :
   The CAN controller is used for sending and receiving the CAN messages. There is photo isolation between CAN controller and CAN bus.

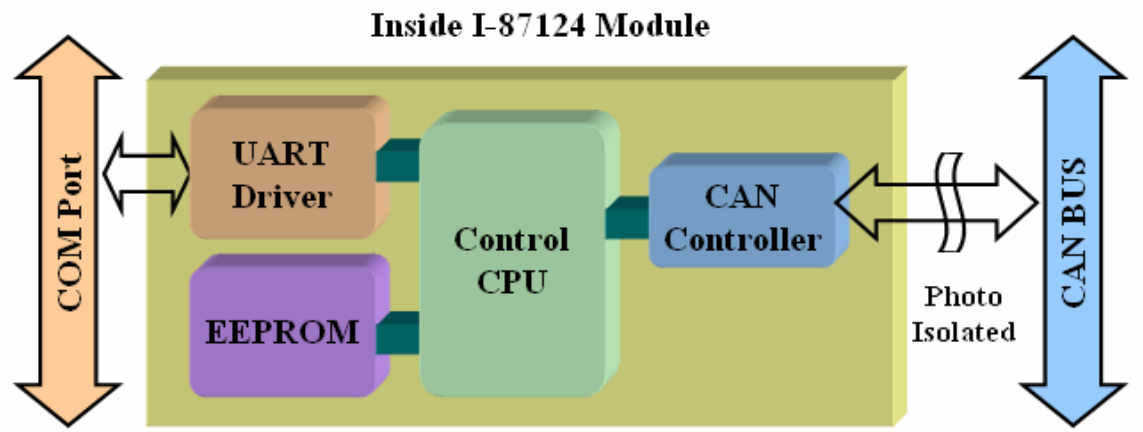


Figure 1.8 Block diagram of the I-87124 module

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1.8 Product Check List

In addition to this manual, the package includes the following items:

- □ I-87124 module;
- □ Software CD ROM;
- □ Quick Start manual;
- □ Release Note

It is recommended that users should read the release note first. All of the important information needed will be provided in the release note as follows:

- □ Where you can find the software driver, utility and demo programs.
- □ How to install software & utility.
- □ Where is the diagnostic program?
- □ FAQ's and answers.

Attention !

If any of these items are missing or damaged, please contact your local field agent. Keep aside the shipping materials and carton in case you want to ship or store the product in the future.

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2. Hardware Configuration

This section will describe the hardware settings of the I-87124. This information includes the wire connection and terminal resistance configuration for the CAN network.

2.1 Board Layout

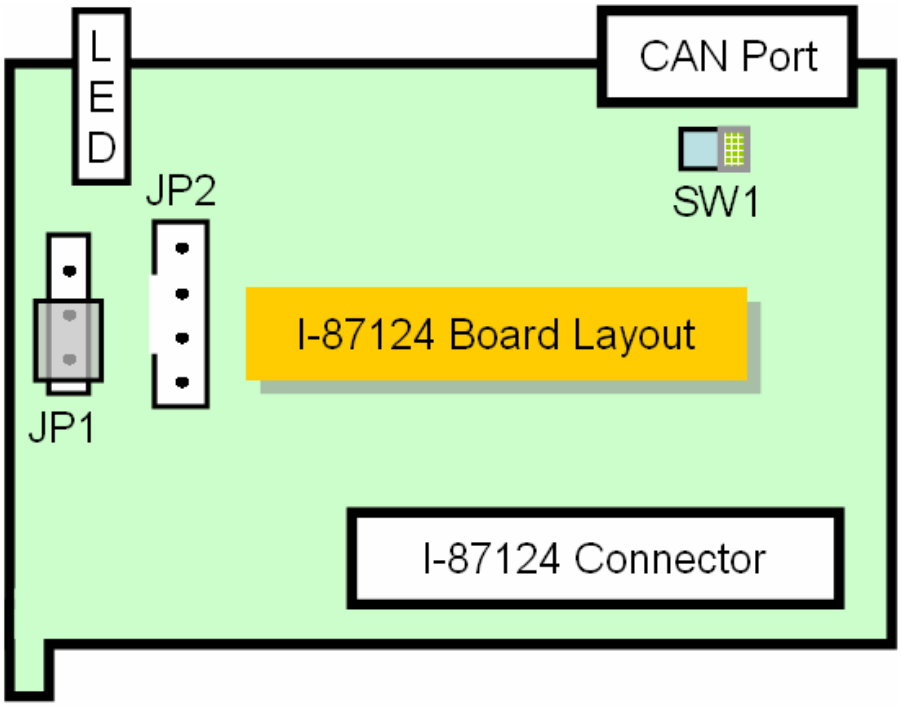


Figure2.1 I-87124 Board LAYOUT



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2.2 Jumper Selection

The following table shows the definition of jumpers. Users need to refer to this table to configure the I-87124 hardware.

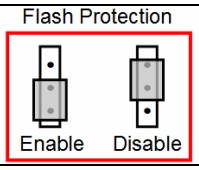
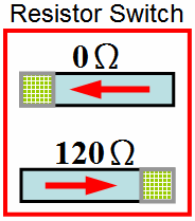
Jumper	Description	Status
JP1	Flash Protection. If you need to update the firmware, you should make it disable before you download the firmware.	
JP2	Download connector. If you need to update the firmware, you should use the download cable (CA0904) to download the new firmware.	
SW1	CAN Port 120Ω terminal resistor.	

Table 2.1 Jumper selections

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2.3 Connector Pin Assignment

The I-87124 is equipped with one **5-pin screwed terminal connector** for wire connection of the CAN bus. The connector's pin assignment is specified as follows:

The 5-pin screwed terminal connector of the CAN bus interface is shown in Figure 2.5 and the corresponding pin assignments are given in Table 2.2.

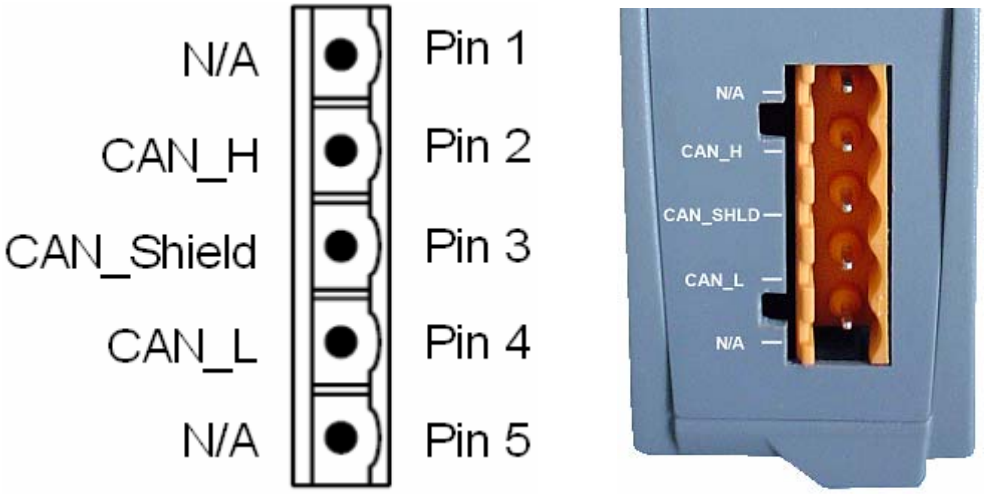


Figure2.5 5-pin screwed terminal connector

Pin No.	Signal	Description
1	N/A	No use
2	CAN_H	CAN_H bus line (dominant high)
3	CAN_SHLD	Optional CAN Shield
4	CAN_L	CAN_L bus line (dominant low)
5	N/A	No use

Table 2.2 Pin assignment of the 5-pin screwed terminal connector

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2.4 Wire connection

In order to minimize the reflection effects on the CAN bus line, the CAN bus line has to be terminated at both ends by two terminal resistances as in the following figure. According to the ISO 11898-2 spec, each terminal resistance is 120Ω (or between 108Ω~132Ω). The length related resistance should have 70 mΩ/m. Users should check the resistances of the CAN bus, before they install a new CAN network.

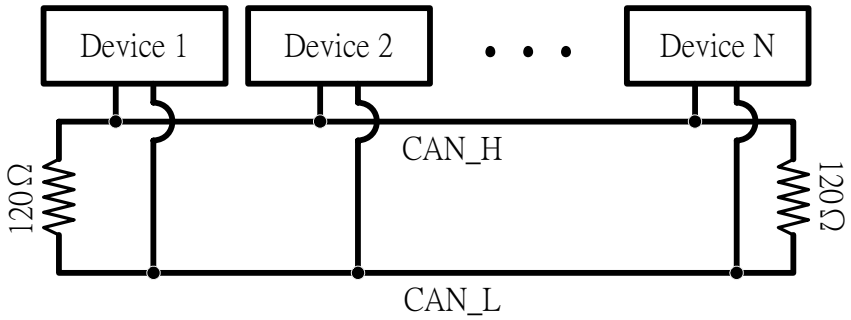


Figure 2.4 CAN bus network topology

Moreover, to minimize the voltage drop over long distances, the terminal resistance should be higher than the value defined in the ISO 11898-2. The following table can be used as a good reference.

Bus Length (meter)	Bus Cable Parameters		Terminal Resistance (Ω)
	Length Related Resistance (mΩ/m)	Cross Section (Type)	
0~40	70	0.25(23AWG)~ 0.34mm^2(22AWG)	124 (0.1%)
40~300	< 60	0.34(22AWG)~ 0.6mm^2(20AWG)	127 (0.1%)
300~600	< 40	0.5~0.6mm^2 (20AWG)	150~300
600~1K	< 20	0.75~0.8mm^2 (18AWG)	150~300

Table 2.4 Relationship between cable characteristics and terminal resistance

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2.5 Indicator LED



2.5.1 NS LED (Red)

The [NS] LED means Network Status. It indicates that there are errors on the bus or there is any slave device's MAC ID collides with the I-87124's MAC ID. There are two situations in [NS] LED.

(1). LED off:

This indicates that there is no error on the bus and about the MAC ID.

(2). LED twinkle (Red):

This indicates that there are errors on the bus which maybe the situations as shown bellow:

(a) The CAN connector doesn't connect to the slave devices.

(b) The power of the slave devices is off.

(c) The MAC ID collision between master and slave devices is occurring.

2.5.2 RUN LED (Green)

The [RUN] LED indicates the I-87124's firmware status. There are three situations in [RUN] LED.

(1). LED off :

This indicates that there are some errors on the bus or in the I-87124 module. The DeviceNet firmware is not running.

(2). LED twinkle (Green) :

This indicates that the CAN bus works fine. But there is no any slave devices configuration in the I-87124's EEPROM. The DeviceNet firmware

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is waiting for configuration.

(3). LED solid on (Green) :

This indicates that the DeviceNet firmware is running. The I-87124 module is communicating with the slave devices.

2.5.3 MS LED (Yellow)

The [MS] LED means Module Status. It indicates any slave devices which is disconnecting with the I-87124 module. There are two situations in [MS] LED.

(1). LED off :

This shows that all of the slave devices are communicating with the I-87124 normally.

(2). LED twinkle (Yellow) :

This shows that at least one slave device occurs communication errors. Maybe the configuration errors or slave devices errors happened.

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2.6 Update the I-87124's firmware

When the users want to download the new firmware into the I-87124, the users need to follow the steps as described below.

A. Preparing the hardware

(1) General RS-232 cable.

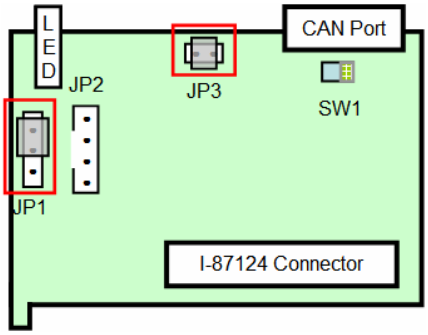
(2) The specific download cable RS-232 9-pin to 4-pin (Part No. CA0904)



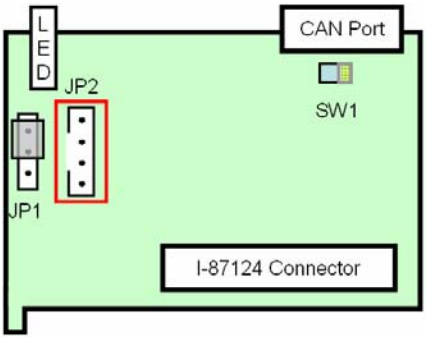
(3) The WP-8000 or ViewPAC series MCU.

B. Selecting the jump and connecting the cable

(1) The users should make the flash protection jump disable and connect the JP3.



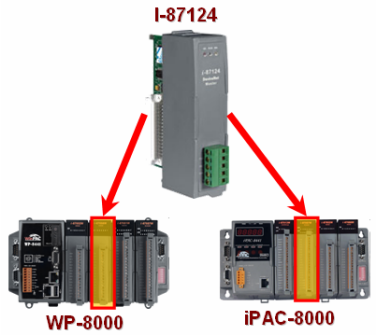
(2) Connect the download cable (CA0904) with JP2.



(3) Connect the download cable (CA0904) with the COM port in the PC.

(4) Plug the I-87124 into the WP-8000 or ViewPAC series MCU.

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C. Preparing the software and the new firmware

(1) The download toolkit. (7188xw.exe)



(2) The new firmware. (87124Vxx.exe and autoexec.bat)

D. Starting to update the new firmware

(1) Turn on the WP-8000 or ViewPAC series MCU.

(2) Run the 7188xw.exe.

(3) There are seven steps to complete the download process.

Step 1 : key in the command “del /y”

Step 2 : key in the command “load”

Step 3 : press ALT + E

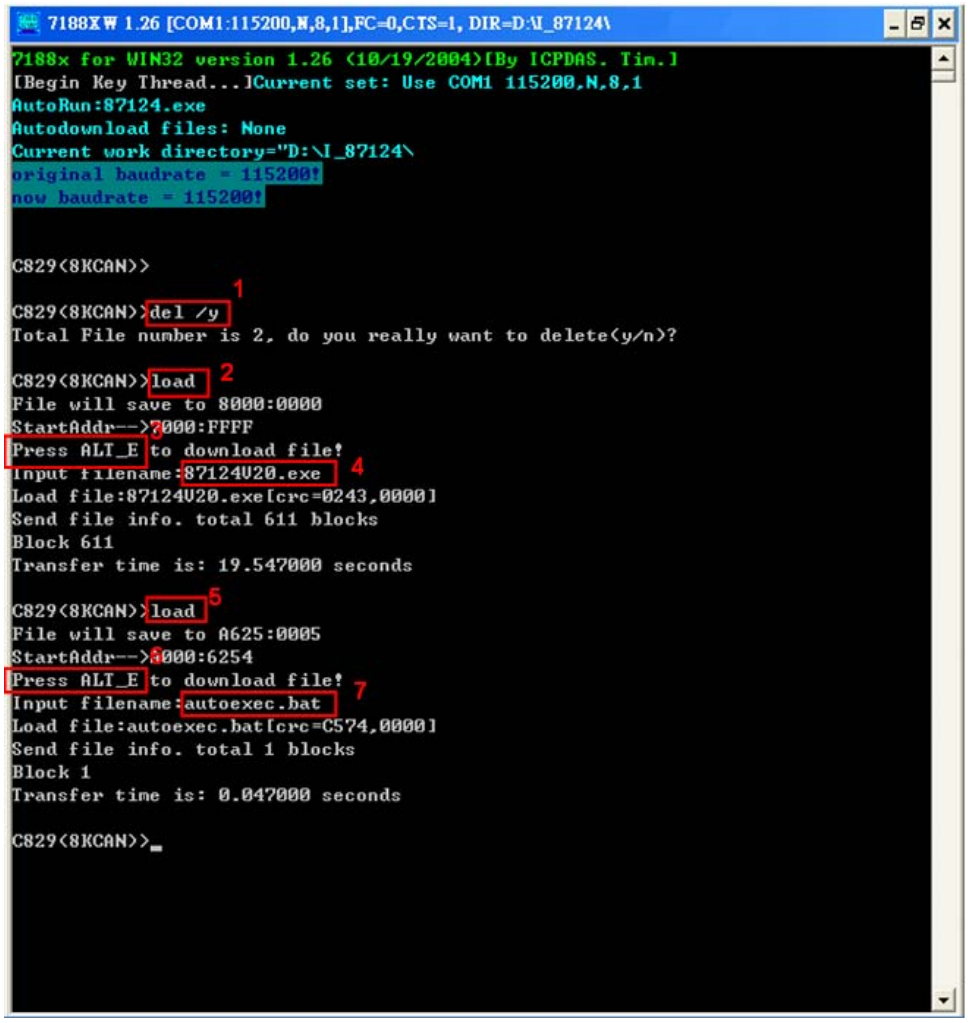
Step 4 : key in the firmware name “87124Vxx.exe”. (xx is the version No.)

Step 5 : key in the command ‘load”

Step 6 : press ALT + E

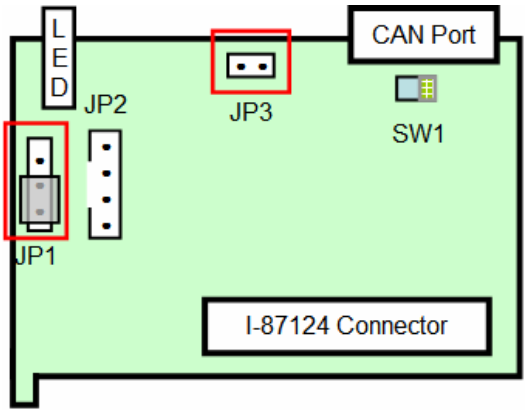
Step 7 : key in the firmware name “autoexec.bat”.

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(4) Turn off the WP-8000 or ViewPAC series MCU.

(5) Make the flash protection enable and disconnect the JP3.



(6) Turn on the WP-8000 or ViewPAC series MCU and enjoy the new firmware of the I-87124.

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3. Flow Diagram for DeviceNet Application

3.1 Flow Diagram for Searching Devices

Before developing the DeviceNet applications, users should diagnose the connection between the slave devices. First, the users can search the slave devices in the network by using the searching functions. If the connection between the master with other slave devices is fine, the uses can find the information of the corresponding slave devices. When the users have no idea to communicate with the slave devices, users can follow these steps shown in figure 3.2. The following functions can help users to get the DeviceNet information of the slave devices. The users can find out the problem of the slave devices by using these functions. The detail information about those functions is in the next chapter.

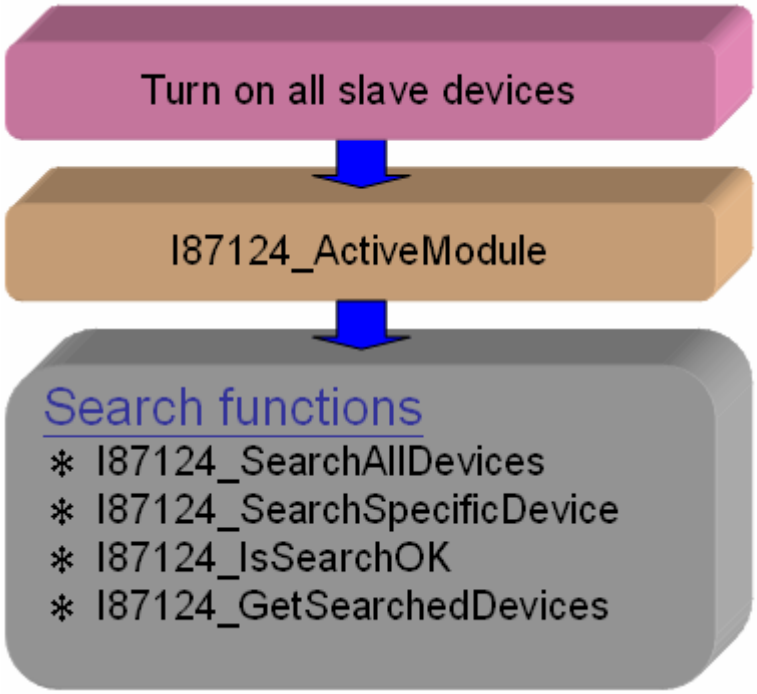


Figure 3.2 Searching Diagram

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3.2 Flow Diagram for Slave Configuration

After getting the DeviceNet I/O information of the slave devices, users should save the parameters into the EEPROM within the I-87124 module. The firmware in the I-87124 module will load the previous configuration from the EEPROM in the next boot-up. When the devices in the DeviceNet network are changed, the users must set the configuration data to fit the application. The configuration diagram is shown in Figure 3.3. There is more information about those functions in the next chapter.

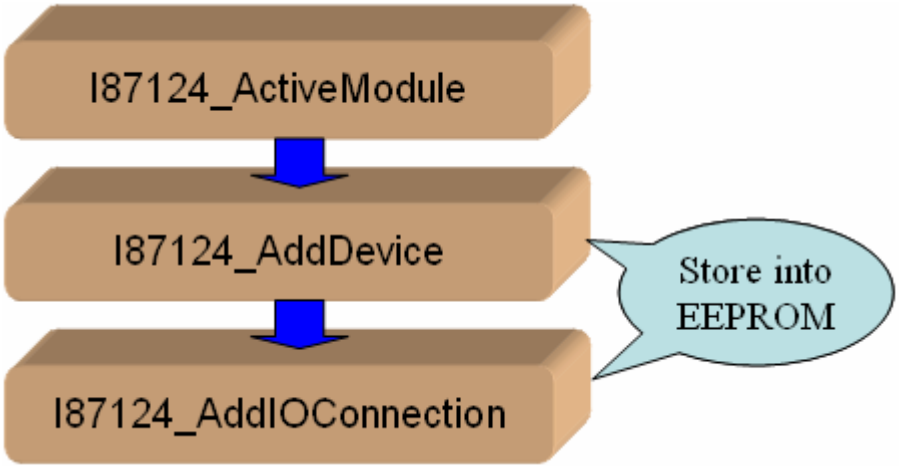


Figure 3.3 Slave Configuration Diagram

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3.3 Flow Diagram for On-line Adding/Removing Device

The I-87124 provides the on-line adding/removing slave device functions. The users need not to break the communication between original slaves device when adding or removing the slave devices. The users can follow the steps to achieve this function. The steps are shown in Figure 3.6 and Figure 3.7.

1. On-line Adding Devices :

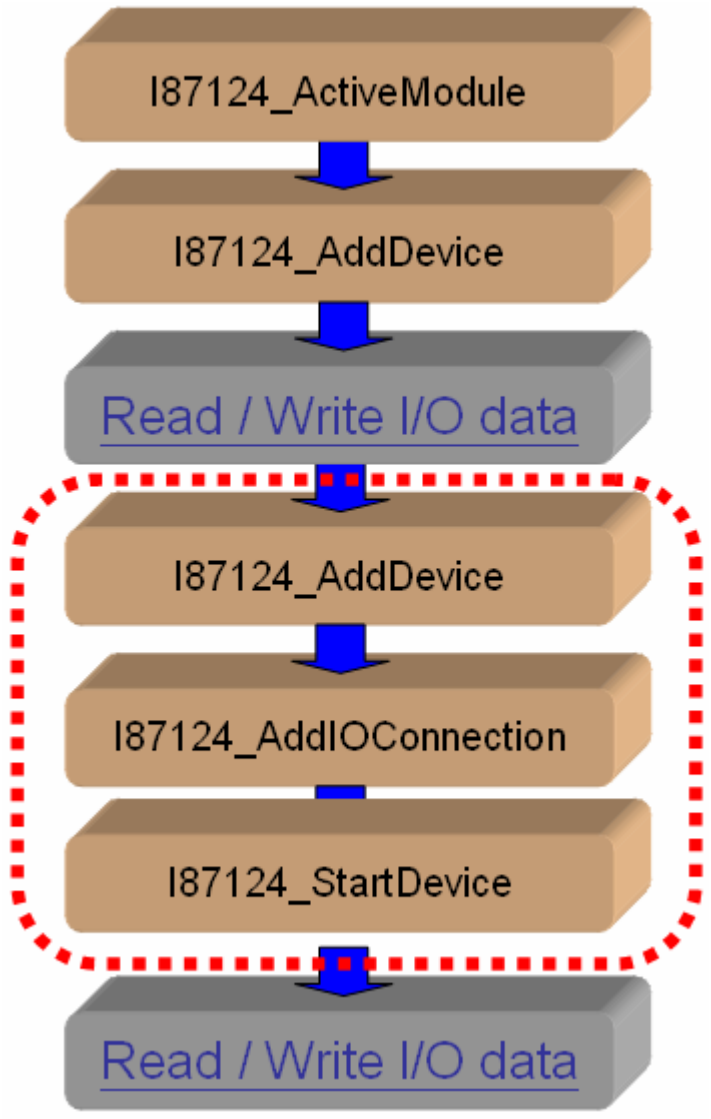


Figure 3.6 On-line Add Device Diagram

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2. On-line Removing Devices :

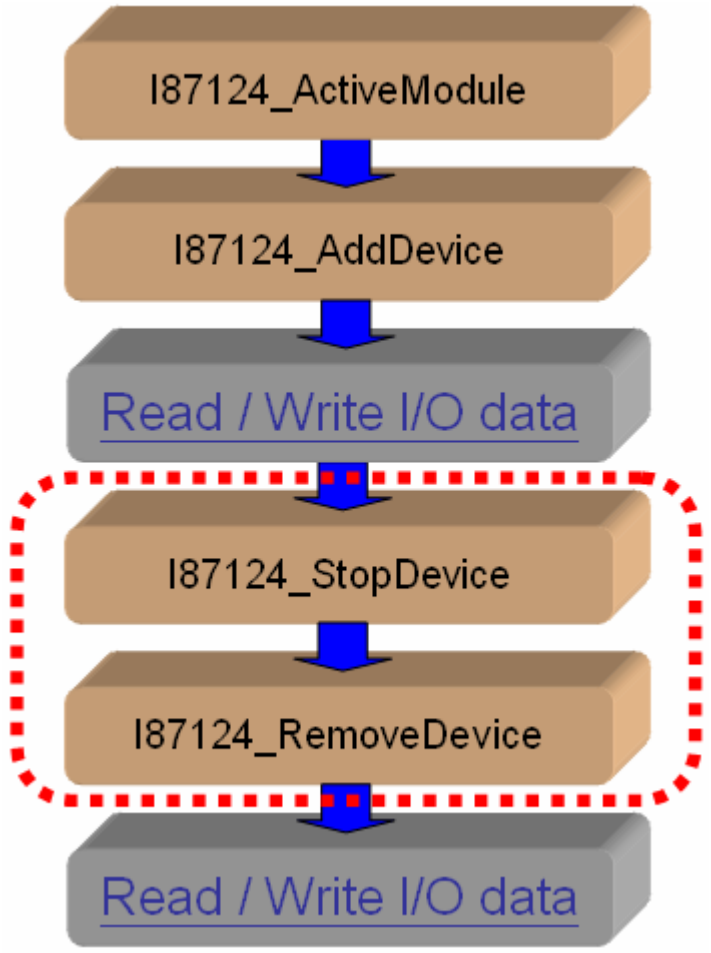


Figure 3.7 On-line Remove Device Diagram

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3.5 Flow Diagram for “SetAttribute” and “GetAttribute”

The users can set or get DeviceNet device's property via DeviceNet network. The I-87124 provides these functions to set or get the properties of the remote devices easily. The steps are shown in Figure 3.8.

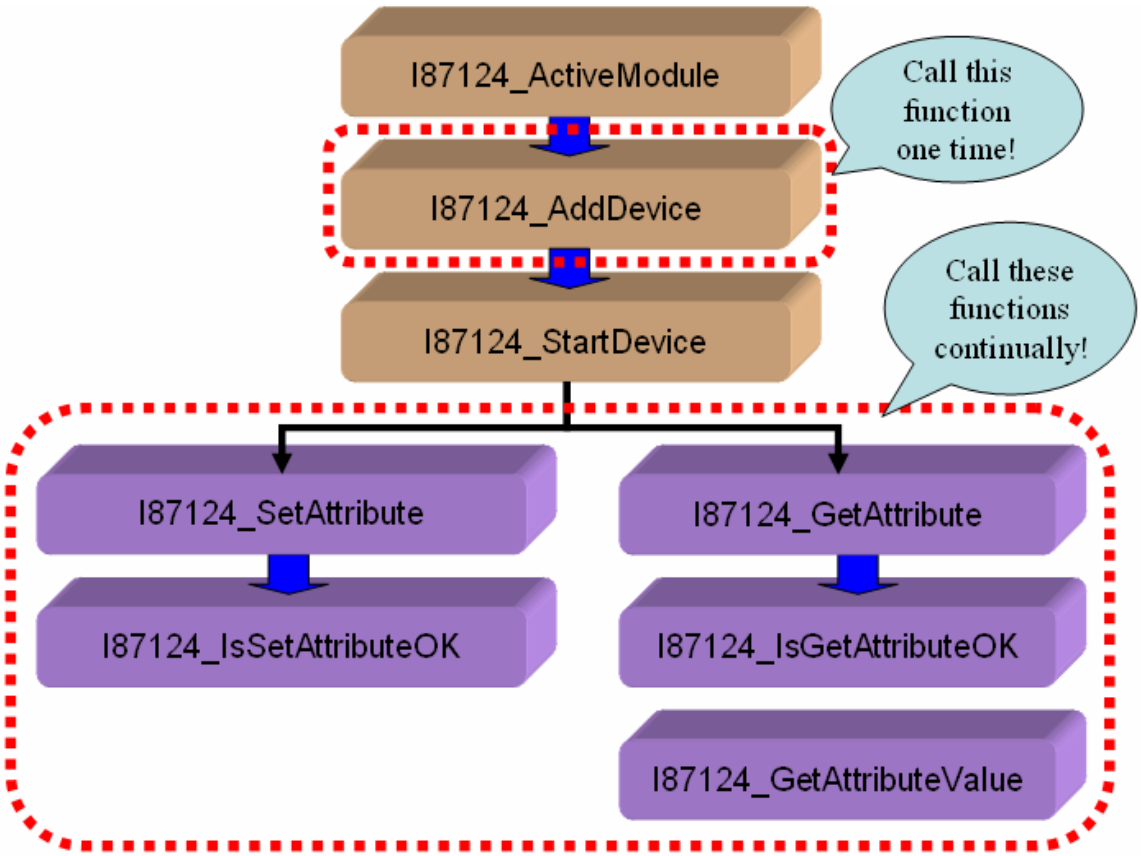


Figure 3.8 “SetAttribute” and “GetAttribute” Diagram

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3.6 Flow Diagram for I/O Connection

The users can read or write device's I/O data via the DeviceNet I/O connections like Poll, Strobe, COS and Cyclic connection. There are four important steps to read and write the I/O data easily. Firstly, the users should know the device's I/O input length (in Byte) and output length (in Byte). Secondly, the users should set these two parameters by calling I87124_AddIOConnection. Thirdly, the users can set the initial output value by calling I87124_WriteOutputData before starting the specific slave device. If the users do not initialize the output value, the firmware default output value is 0. Fourthly, the users can start communicating with device to read or write I/O data. If the specific slave device doesn't have any output channel, the firmware will start communicating with the device automatically. The Figure 3.9 shows the main steps to achieve this function. There are more functions described in chapter 4.

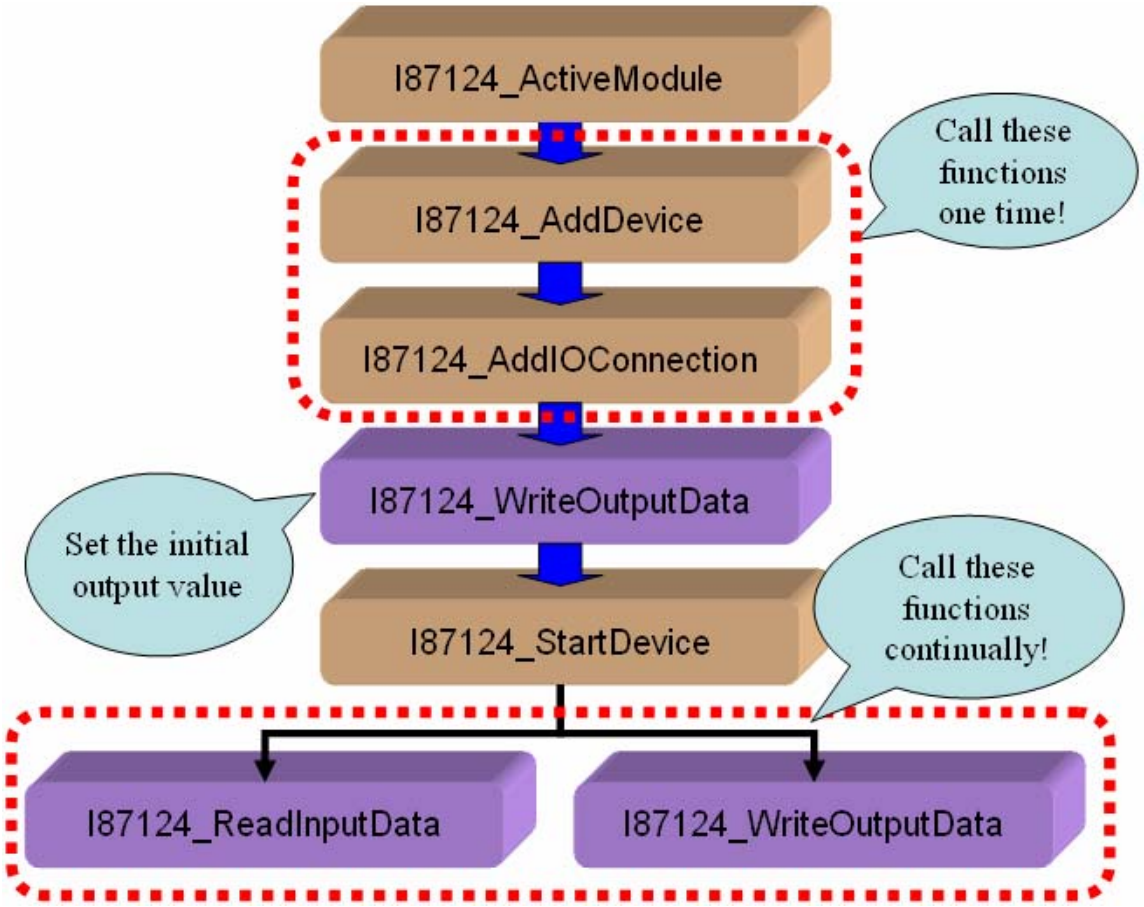


Figure 3.9 I/O Connection Diagram

Note: The Strobe connection doesn't support the output channel. The users can not use the I87124_WriteOutputData with Strobe connection.

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4. Function description

All the functions of the I-87124 can be separated into five groups. The idea is shown Figure 4.1. There is more detail description in CH 4.1.

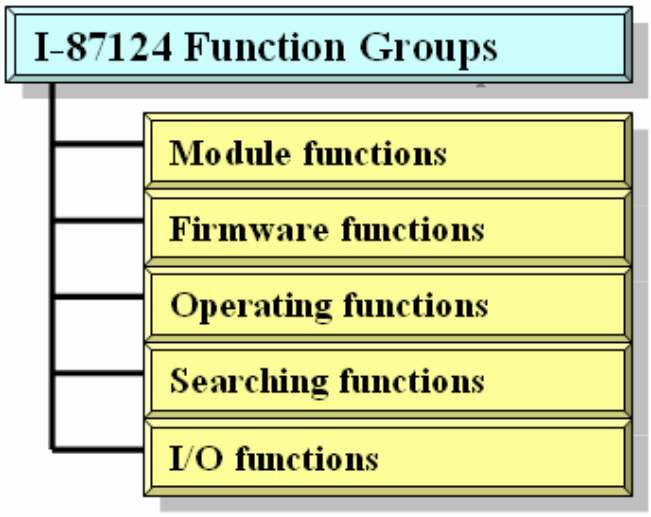


Figure 4.1 Five Function Groups

[Module Functions]

These functions in this group help users to find I-87124 modules or get module's information. The users can use these functions to configure or manage the modules in the WP-8000 or ViewPAC series MCU.

[Firmware Functions]

These functions in this group help users to operate the firmware or get the status of the firmware inside the I-87124 module.

[Operating Functions]

These operating functions are the important operation of the DeviceNet master. They help users to configure the whole network.

[Searching Functions]

These searching functions can help user to debug the network, including the wire connection, the slave device's setting, and etc. When building the DeviceNet network, the user can use these functions to make sure that the network or the slave devices are fine.

[I/O Functions]

These functions help user to read or write the I/O data from or to the remote slave devices.

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4.1 DLL Function Definition and Description

All the functions provided in the I87124_eVC.DLL or I87124_DotNET.DLL are listed in the following table and detail information for every function is presented in the next sub-section. However, in order to make the descriptions more simply and clear, the attributes for the both the input and output parameter functions are given as **[input]** and **[output]** respectively, as shown in the following table.

Keyword	Set parameter by user before calling this function?	Get the data from this parameter after calling this function?
[input]	Yes	No
[output]	No	Yes

Table 4.1.1 Functions Table (Module Functions) 1/1

No.	Function Name	Description
1	I87124_TotalI87124Module	Get total I-87124 modules in the MCU
2	I87124_ActiveModule	Make I-87124 module active
3	I87124_CloseModule	Close all the I-87124 modules
4	I87124_GetDLLVersion	Get the DLL version of the I87124_eVC.DLL or I87124_DotNET.DLL

Table 4.1.2 Functions Table (Firmware Functions) 1/1

No.	Function Name	Description
1	I87124_GetFirmwareVersion	Get the version of the firmware inside the I-87124 module
2	I87124_ResetFirmware	Reset the firmware in the I-87124 module

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Table 4.1.3 Functions Table (Operating Functions) 1/2

No.	Function Name	Description
1	I87124_SetMasterMACID	Set the MAC ID of the I-87124 module (DeviceNet Master's MAC ID)
2	I87124_GetMasterMACID	Get the MAC ID of the I-87124 module (DeviceNet Master's MAC ID)
3	I87124_GetBaudRate	Get the baud rate of the CAN bus
4	I87124_SetBaudRate	Set the baud rate of the CAN bus
5	I87124_GetMasterStatus	Get the status of the I-87124 module (DeviceNet Master's status) at present
6	I87124_GetSlaveStatus	Get the slave device's status.
7	I87124_StartDevice	I-87124 will start to communicate with the specific slave device
8	I87124_StopDevice	I-87124 will stop to communicate with the specific slave device
9	I87124_StartAllDevice	I-87124 will start to communicate with all slave devices
10	I87124_StopAllDevice	I-87124 will stop to communicate with all slave devices
11	I87124_AddDevice	Add the specific slave device's information into the I-87124 module (DeviceNet Master)
12	I87124_RemoveDevice	Remove the specific slave device's information from the I-87124 module (DeviceNet Master)
13	I87124_AddIOConnection	Add I/O information of the specific slave device into the I-87124 module (DeviceNet Master)
14	I87124_RemoveIOConnection	Remove specific slave device's I/O information from the I-87124 module (DeviceNet Master)

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Table 4.1.4 Functions Table (Operating Functions) 2/2

No.	Function Name	Description
16	I87124_GetAttribute	Send the get attribute command to the slave device.
17	I87124_IsGetAttributeOK	Check whether the slave has replied for the getting command or not.
18	I87124 GetAttributeValue	Get the attribute value of the I87124_GetAttribute
19	I87124_SetAttribute	Send the set attribute command to the slave device.
20	I87124_IsSetAttributeOK	Check whether the slave has replied for the setting command or not.
21	I87124_GetDeviceInfoFromScanList	Get specific slave device's I/O information form the Scan List within the I-87124 module.
22	I87124_GetScanList	Get the I/O information of all slave devices form the Scan List within the I-87124 module.
23	I87124_ImportEEPROM	Write the I/O information of all slave devices into the EEPROM within the I-87124 module.
24	I87124_ClearAllConfig	Clear all configurations in the EEPROM within the I-87124 module.

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Table 4.1.5 Functions Table (Searching Functions) 1/1

No.	Function Name	Description
1	I87124_SearchAllDevices	I-87124 will search the DeviceNet network to find out the I/O information of all slave devices.
2	I87124_SearchSpecificDevice	I-87124 will search the DeviceNet network to find out the I/O information of specific slave devices.
3	I87124_IsSearchOK	Check whether the I-87124 has searched completely or not.
4	I87124_GetSearchedDevices	Get the result of the searching command and retrieve the slave's I/O information.

Table 4.1.6 Functions Table (I/O Functions) 1/1

No.	Function Name	Description
1	I87124_ReadInputData	Read the input data via I/O connection like Poll, Strobe, COS, Cyclic.
2	I87124_WriteOutputData	Write the output data via I/O connection like Poll, COS, Cyclic. The Strobe doesn't support this operation.

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4.2 Function Return Code

Table 4.2.1 Interpretation of the return code (General Error) 1/1

Return Code	Error ID	Comment
0	I87124_NoError	No error
10008	I87124_PortNotActive	The backplane COM port doesn't be activated.
10015	I87124_PortNoResp	The backplane COM port replied nothing.
10025	I87124_PortInUse	The backplane COM port is used by another program.
10027	I87124_ReStartPort	The module has been re-plugged. Please restart your application.
5000	DNMXS_UnKnowError	The DeviceNet has some unknown errors.
1000	DNMXS_BoardNotActive	The I-87124 has not been activated.
1001	DNMXS_OnlineError	The master MAC ID collides with other slave device in the DeviceNet network.
1002	DNMXS_CANBusError	The CAN port can't send message. Please check the baud rate or the port of the CAN bus.
1003	DNMXS_Booting	The I-87124 is still booting.
1050	DNMXS_MACIDError	The MAC ID is exceed the range(0 ~ 63)
1051	DNMXS_BaudRateError	The baud rate is exceed the range(0 ~ 2)
1052	DNMXS_ConnectionTypeError	The connection type is exceed the range (0 ~ 4)
1053	DNMXS_DuplicMasterMACID	The MAC ID is the same with the master's ID.
1054	DNMXS_EEPROMError	The EEPROM is out of order.
1055	DNMXS_NowScanning	The I-87124 is searching the slave.
1056	DNMXS_ScanListError	The Scan List has some errors.
1057	DNMXS_DeviceExist	The information of the slave device already exists.
1058	DNMXS_DeviceNotExist	The information of the slave device doesn't exist.
1059	DNMXS_MapTableError	The MapTable has some errors.

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Table 4.2.2 Interpretation of the return code (I/O Error) 1/1

Return Code	MapTable Error	Comment
1100	DNMXS_ExplicitNotAllocate	The Explicit connection is not established.
1101	DNMXS_PollNotAllocate	The Poll connection is not established.
1102	DNMXS_BitStrobeNotAllocate	The Strobe connection is not established.
1103	DNMXS_COSNotAllocate	The COS connection is not established.
1104	DNMXS_CyclicNotAllocate	The Cyclic connection is not established.
1105	DNMXS_PollAlreadyExist	The Poll connection has been established.
1106	DNMXS_BitStrobeAlreadyExist	The Poll connection has been established.
1107	DNMXS_COSAlreadyExist	The COS connection has been established.
1108	DNMXS_CyclicAlreadyExist	The Cyclic connection has been established.
1109	DNMXS_CommunicationPause	The communication between I-87124 and all slave devices has been suspended.

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Table 4.2.3 Interpretation of the return code (Slave Error) 1/1

Return Code	DeviceNet Error	Comment
1150	DNMXS_SlaveNoResp	The slave has no any response.
1151	DNMXS_WaitForSlaveResp	The I-87124 is waiting for the response form the slave device.
1152	DNMXS_SlaveRespError	The slave replied some errors.
1153	DNMXS_OutputDataLenError	The output length of the I/O connection doesn't match the device's output length.
1154	DNMXS_InputDataLenError	The input length of the I/O connection doesn't match the device's input length.

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4.3 Function Description

4.3.1 I87124_TotalI87124Module

- **Description:**

  The function can get the count of total I-87124 modules in the user's WP-8000 or ViewPAC series MCU.

- **Syntax:**

  DWORD I87124_Total I87124Module (BYTE *TotalModules ,
  BYTE *SlotNoList)

- **Parameter:**

  TotalModules: [output] The amount of total modules.
  SlotNoList: [output] The list of all slot No. of each modules.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.2 I87124_ActiveModule

- **Description:**

  The function is used to activate the entire I-87124 module. It must be called once before using the other functions of I-87124 APIs.

- **Syntax:**

  DWORD I87124_ActiveModule (void)

- **Parameter:**

  None

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.3 I87124_CloseModule

- **Description:**

  The function is used to stop and close the backplane COM port driver. This method must be called once before exiting the user's application program.

- **Syntax:**

  DWORD I87124_CloseModule (void)

- **Parameter:**

  None

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.4 I87124_GetDLLVersion

- **Description:**

  The function can obtain the version information of I87124_eVC.DLL or I87124_DotNET.DLL

- **Syntax:**

  DWORD I87124_GetDLLVersion (void)

- **Parameter:**

  None

- **Return:**

  The DLL version information. For example: If 100(hex) is return, it means firmware version is 1.00.

- **Error Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.5 I87124_GetFirmwareVersion

- **Description:**

  The function can obtain the version information of the firmware inside the I-87124 module.

- **Syntax:**

  DWORD I87124_GetFirmwareVersion (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  The firmware version information. For example: If 100(hex) is return, it means firmware version is 1.00.

- **Error Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.6 I87124_ResetFirmware

- **Description:**

  The function is used to reset the I-87124 firmware. When the users have changed the baud rate of CAN bus or changed the Master's MAC ID, the function must be called to make the change enable. After calling this function, the users should wait for 1 or 2 seconds to make the firmware boot up completely.

- **Syntax:**

  DWORD I87124_ResetFirmware (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.7 I87124_GetMasterMACID

- **Description:**

  The function can get the MAC ID of the DeviceNet master (I-87124).

- **Syntax:**

  DWORD I87124_GetMasterMACID (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  The MAC ID information (0 ~ 64).

- **Error Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.8 I87124_SetMasterMACID

- **Description:**

  The function can set the MAC ID of the DeviceNet master (I-87124). After calling this function, the users must call I87124_ResetFirmware to make the change enabled. It will save the information in the EEPROM in the I-87124.

- **Syntax:**

  DWORD I87124_SetMasterMACID (BYTE cSlot,BYTE MasterMACID)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  MasterMACID: [input] The new MAC ID of the master. (0 ~ 63)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.9 I87124_GetBaudRate

- **Description:**

  This function can help you to get the DeviceNet baud rate information of I-87124.

- **Syntax:**

  DWORD I87124_GetBaudRate (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  The CAN bus baud rate information in the I-87124.
  If the value is 0, the baud rate is 125Kbps.
  If the value is 1, the baud rate is 250Kbps.
  If the value is 2, the baud rate is 500Kbps.

- **Error Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.10 I87124_SetBaudRate

- **Description:**

  This function can set the DeviceNet baud rate of the I-87124. After calling this function, you must call I87124_ResetFirmware to reset the firmware to make change enabled.

- **Syntax:**

  DWORD I87124_SetBaudRate (BYTE cSlot,BYTE BaudRate)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  BaudRate: [input] The new baud rate value.
  0 : 125K bps
  1 : 250K bps
  2 : 500K bps

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.11 I87124_GetMasterStatus

- **Description:**

  The function is used to obtain the firmware status inside the I-87124. The users can call this function to make sure that the DeviceNet master is online successfully.

- **Syntax:**

  DWORD I87124_GetMasterStatus (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.12 I87124_GetSlaveStatus

- **Description:**

  This function is to get the remote slave device's communication status.

- **Syntax:**

  DWORD I87124_GetSlaveStatus (BYTE cSlot, BYTE DesMACID)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DesMACID: [input] The remote slave's MAC ID. (0~63)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.13 I87124_StartDevice

- **Description:**

  This function is used to start to communicate with the specific device that the users applying to.

- **Syntax:**

  DWORD I87124_StartDevice (BYTE cSlot, BYTE DesMACID)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DesMACID: [input] The remote slave's MAC ID. (0~63)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.14 I87124_StopDevice

- **Description:**

  This function is used to stop to communicate with the destination device that the users appointed to.

- **Syntax:**

  DWORD I87124_StopDevice (BYTE cSlot, BYTE DesMACID)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.15 I87124_StartAllDevice

- **Description:**

  This function is used to start to communicate with all slave devices in ScanList.

- **Syntax:**

  DWORD I87124_StartAllDevice (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.16 I87124_StopAllDevice

- **Description:**

  This function is used to stop to communicate with all destination devices in ScanList.

- **Syntax:**

  DWORD I87124_StopAllDevice (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.17 I87124_AddDevice

- **Description:**

  This function can add the slave devices into the ScanList of the I-87124 and save the information into the EEPROM. Before communicating with any slave devices, the users should call this function to add these devices.

- **Syntax:**

  DWORD I87124_AddDevice (BYTE cSlot, BYTE DesMACID,
  WORD Explicit_EPR)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  Explicit_EPR: [input] The Expected Packet Rate. (Usually is 2500).

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.18 I87124_RemoveDevice

- **Description:**

  This function is used for removing the specified slave device from the ScanList in the I-87124. And the information of the device in EEPROM is erased at the same time.

- **Syntax:**

  DWORD I87124_RemoveDevice (BYTE cSlot, BYTE DesMACID)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.19 I87124_AddIOConnection

- **Description:**

  This method is used to configure the I/O connection of the specific MAC ID device. The I-87124 can get/set the data via the connection, which connects to the specific slave, according to the produced / consumed connection path of this slave device. This configuration data will be saved into EEPROM within the I-87124.

- **Syntax:**

```
DWORD I87124_AddIOConnection (BYTE cSlot, BYTE DesMACID,
                              BYTE ConType,
                              WORD DeviceInputLen,
                              WORD DeviceOutputLen,
                              WORD EPR)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  ConType: [input] The remote slave device's I/O connection type
  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type
  DeviceInputLen: [input] The remote slave device's input length. (Byte)
  DeviceOutputLen: [input] The remote slave device's output length. (Byte)
  EPR: [input] The expected packet rate. (mSec)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.20 I87124_RemoveIOConnection

- **Description:**

  The function is used to remove the I/O connection configuration.

- **Syntax:**

  DWORD I87124_RemoveIOConnection (BYTE cSlot, BYTE DesMACID,
  BYTE ConType)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  ConType: [input] The remote slave device's I/O connection type
  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.21 I87124_GetAttribute

- **Description:**

  This function is used to send the request command to retrieve the attribute value of the specific device's instance. Before calling this function, you must start the device. After calling this function, you should execute the "I87124_GetAttributeValue" to get the response message returned from remote slave device.

- **Syntax:**

```
DWORD I87124_GetAttribute (BYTE cSlot, BYTE DesMACID,
                           BYTE ClassID, BYTE InstanceID,
                           BYTE AttributeID)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  ClassID: [input] The remote slave device's ClassID
  InstanceID: [input] The remote slave device's InstanceID
  AttributeID: [input] The remote slave device's AttributeID

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.22 I87124_IsGetAttributeOK

- **Description:**

  This function is used to check whether the I-87124 has received the response message or not. After checking the response message, you should execute the “I87124_GetAttributeValue” to get the response message returned from remote slave device.

- **Syntax:**

  DWORD I87124_IsGetAttributeOK (BYTE cSlot, BYTE DesMACID)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device’s MAC ID (0~63)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.23 I87124_GetAttributeValue

- **Description:**

  This function is used to get the attribute value of the specific device's instance from the remote slave device. Before calling this function, the users should call I87124_GetAttribute to send request command first.

- **Syntax:**

  DWORD I87124_GetAttributeValue (BYTE cSlot, BYTE DesMACID,
  WORD *DataLen, BYTE *DATA)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  DataLen: [output] The length of the attribute value (in byte).
  DATA: [output] The attribute value that returned from the slave device.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.24 I87124_SetAttribute

- **Description:**

The method is used to set the attribute of the specific device's instance. Before calling this function, you must start the device. After calling this function, you should execute the "I87124_IsSetAttributeOK" to check the response message returned from the remote slave device.

- **Syntax:**

```
DWORD I87124_SetAttribute (BYTE cSlot, BYTE DesMACID,
                           BYTE ClassID, BYTE InstanceID,
                           BYTE AttributeID, WORD DataLen,
                           BYTE *DATA)
```

- **Parameter:**

cSlot: [input] The slot number which the I-87124 is plugged in.
DestMACID: [input] The remote slave device's MAC ID (0~63)
ClassID: [input] The remote slave device's ClassID
InstanceID: [input] The remote slave device's InstanceID
AttributeID: [input] The remote slave device's AttributeID
DataLen: [input] The length of the attribute value (in byte).
DATA: [input] The attribute value that the users want to send.

- **Return:**

Please refer to the chapter 4.2 for the function return code.

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4.3.25 I87124_IsSetAttributeOK

- **Description:**

  This function is used to get the response value after executing the "I87124_SetAttribute" function.

- **Syntax:**

  DWORD I87124_IsSetAttributeOK (BYTE cSlot, BYTE DesMACID)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.26 I87124_ClearAllConfig

- **Description:**

  This function will clear all configurations in the EEPROM of the I-87124.

- **Syntax:**

  DWORD I87124_ClearAllConfig (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.27 I87124_SearchAllDevices

- **Description:**

  This function is used to retrieve all devices in DeviceNet network. Attention! This function will terminate all communications with remote devices. This function is usually used for developing or debugging applications.

- **Syntax:**

  DWORD I87124_SearchAllDevices (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.28 I87124_SearchSpecificDevice

- **Description:**

  This function is used to retrieve some devices which specified by the users. Attention! This function will terminate all communications with remote devices. This function is usually used for developing or debugging applications.

- **Syntax:**

  DWORD I87124_SearchSpecificDevice (BYTE cSlot,WORD ListCount,
  BYTE *DesMACIDList)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  ListCount: [input] The amount of the slave's ID.
  DestMACIDList: [input] The list of all slave's MAC ID.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.29 I87124_IsSearchOK

- **Description:**

  This function will check whether the searching process has finished or not.

- **Syntax:**

  DWORD I87124_IsSearchOK (BYTE cSlot)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.30 I87124_GetSearchedDevices

- **Description:**

  This function will get the device which have been searched in the network

- **Syntax:**

  DWORD I87124_GetSearchedDevices (BYTE cSlot,
  WORD *TotalDevices,
  BYTE *DesMACID,
  BYTE *Type,
  WORD *DeviceInputLen,
  WORD *DeviceOutputLen)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in the PAC.
  TotalDevices: [output] The amount of all slave device which are found.
  DesMACID: [output] The list of slave's MAC ID which are found.
  Type: [output] The list of slave's connection type which are found.
  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type

  DeviceInputLen: [output] The list of slave's input length which are found.
  DeviceOutputLen: [output] The list of slave's output length which are found.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.31 I87124_GetDeviceInfoFromScanList

- **Description:**

  This function will get the ScanList data of certain device in the I-87124.

- **Syntax:**

```
DWORD I87124_GetDeviceInfoFromScanList
                    (BYTE cSlot, BYTE DesMACID, WORD *ListCount,
                     BYTE *ConnectionTypeList, WORD *InputDataLenList,
                     WORD *OutputDataLenList,WORD *EPRList)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DesMACID: [input] The MAC ID number.
  ListCount: [output] The amount of all information items.
  ConnectionTypeList: [output] The list of slave's connection type.

  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type

  InputDataLenList: [output] The list of slave's input length.
  OutputDataLenList: [output] The list of slave's output length.
  EPRList: [output] The list of slave's expected packet rate.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.32 I87124_GetScanList

- **Description:**

  This function will get all the ScanList data in the I-87124.

- **Syntax:**

```
DWORD I87124_GetScanList (BYTE cSlot, WORD *TotalDevices,
                          BYTE *DesMACIDList,
                          BYTE *ConnectionTypeList,
                          WORD *InputDataLenList,
                          WORD *OutputDataLenList,
                          WORD *EPR_List)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  TotalDevices: [output] The data count of all the information.
  DestMACIDList: [output] The MAC ID of all the slave devices in the ScanList.
  ConnectionTypeList: [output] The connection type of all the slave devices in the ScanList.

  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type

  InputDataLenList: [output] The input data length of all the slave devices in the ScanList.
  OutputDataLenList: [output] The output data length of all the slave devices in the ScanList.
  EPR_List: [output] The EPR value of all the slave devices in the ScanList.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.33 I87124_ImportEEPROM

- **Description:**

  This function will write all specific devices' information in the ScanList to the EEPROM.

- **Syntax:**

```
DWORD I87124_ImportEEPROM (BYTE cSlot,WORD ListCount,
                           BYTE *ConnectionTypeList,
                           WORD *InputDataLenList,
                           WORD *OutputDataLenList,
                           WORD *EPR_List)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  ListCount: [input] The data count of all the information.
  ConnectionTypeList: [input] The connection type of all slave devices.

  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type

  InputDataLenList: [input] The input data length of all slave devices.
  OutputDataLenList: [input] The output data length of all slave devices.
  EPR_List: [input] The EPR value of all slave devices.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.34 I87124_ReadInputData

- **Description:**

  This function is to get the data according with the produced connection path of the specific MAC ID device via the I/O connection.

- **Syntax:**

```
DWORD I87124_ReadInputData (BYTE cSlot, BYTE DesMACID,
                            BYTE ConType, WORD *IOLen,
                            BYTE *IODATA)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  ConType: [input] The connection type of the remote slave.
  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type

  IOLen: [output] The length of the I/O data (In byte).
  IODATA: [output] The remote I/O data.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.35 I87124_WriteOutputData

- **Description:**

  The function will set the data according with the consumed connection path of the specific MAC ID device via the I/O connection.

- **Syntax:**

```
DWORD I87124_WriteOutputData (BYTE cSlot, BYTE DesMACID,
                              BYTE ConType, WORD IOLen,
                              BYTE *IODATA)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  ConType: [input] The connection type of the remote slave.

  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type

  IOLen: [Input] The length of the I/O data (In byte).
  IODATA: [Input] The remote I/O data.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.36 I87124_SendExplicitMSG

- **Description:**

  This function is used to send the explicit request command to retrieve or configure the attribute value of the specific device's instance. Before calling this function, you must start the device. After calling this function, you should execute the "I87124_GetExplicitMSGRespValue" to get the response message returned from remote slave device.

- **Syntax:**

```
DWORD I87124_SendExplicitMSG (BYTE cSlot, BYTE DesMACID,
                              BYTE ServiceID, BYTE ClassID,
                              BYTE InstanceID,WORD DataLen,
                              BYTE *DATA)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  ServiceID: [input] The remote slave device's ServiceID.
  ClassID: [input] The remote slave device's ClassID.
  InstanceID: [input] The remote slave device's InstanceID.
  DataLen: [input] The length of the attribute value (in byte).
  DATA: [input] The attribute value that the users want to send.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.37 I87124_IsExplicitMSGRespOK

- **Description:**

  This function is used to check whether the I-87124 has received the response message or not. After checking the response message, you should execute the "I87124_GetExplicitMSGRespValue" to get the response message returned from remote slave device.

- **Syntax:**

  DWORD I87124_IsExplicitMSGRespOK (BYTE cSlot, BYTE DesMACID)

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.38 I87124_GetExplicitMSGRespValue

- **Description:**

  This function is used to get the attribute value of the specific device's instance from the remote slave device. Before calling this function, the users should call I87124_SendExplicitMSG to send request command first.

- **Syntax:**

```
DWORD I87124_GetExplicitMSGRespValue (BYTE cSlot,
                                      BYTE DesMACID,
                                      WORD *DataLen ,
                                      BYTE *DATA)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  DataLen: [output] The length of the attribute value (in byte).
  DATA: [output] The attribute value that returned from the slave device.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.39 I87124_ReadbackOutputData

- **Description:**

  The function will read the data according with the consumed connection path of the specific MAC ID device via the I/O connection.

- **Syntax:**

```
DWORD I87124_ReadbackOutputData (BYTE BoardNo,
                                 BYTE DesMACID,
                                 BYTE ConType,
                                 WORD *IOLen,
                                 BYTE *IODATA)
```

- **Parameter:**

  cSlot: [input] The slot number which the I-87124 is plugged in.
  DestMACID: [input] The remote slave device's MAC ID (0~63)
  ConType: [input] The connection type of the remote slave.

  0 : Explicit connection type
  1 : Poll connection type
  2 : Bit-Strobe connection type
  3 : COS connection type
  4 : Cyclic connection type

  IOLen: [output] The length of the I/O data (In byte).
  IODATA: [output] The remote I/O data.

- **Return:**

  Please refer to the chapter 4.2 for the function return code.

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4.3.40 I87124_GetBackplaneHandle

- **Description:**

  The function will get the handle of the Backplane COM port. The users could use “uart_xxx” function to access the I-87K series modules via this handle. If the application has more than one thread, the uart and I87124 functions should be protected by critical section function, like MUTEX or CRITICALSECTION.

- **Syntax:**

  HANDLE I87124_GetBackplaneHandle (void)

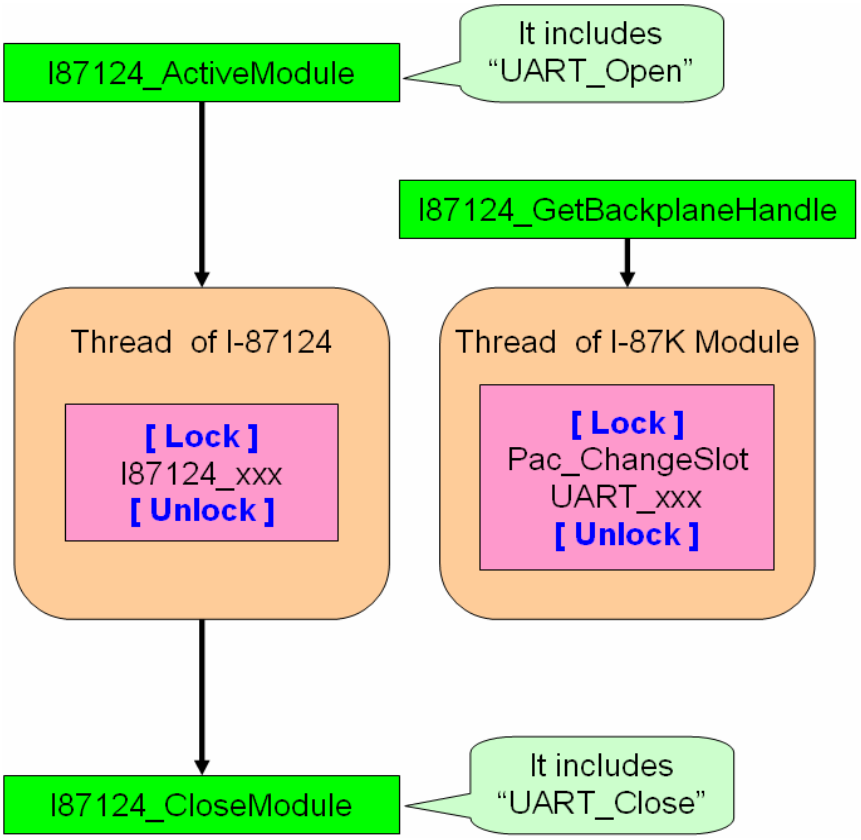
- **Parameter:**

  None

- **Return:**

  The handle of the backplane COM.

- **Usage:**



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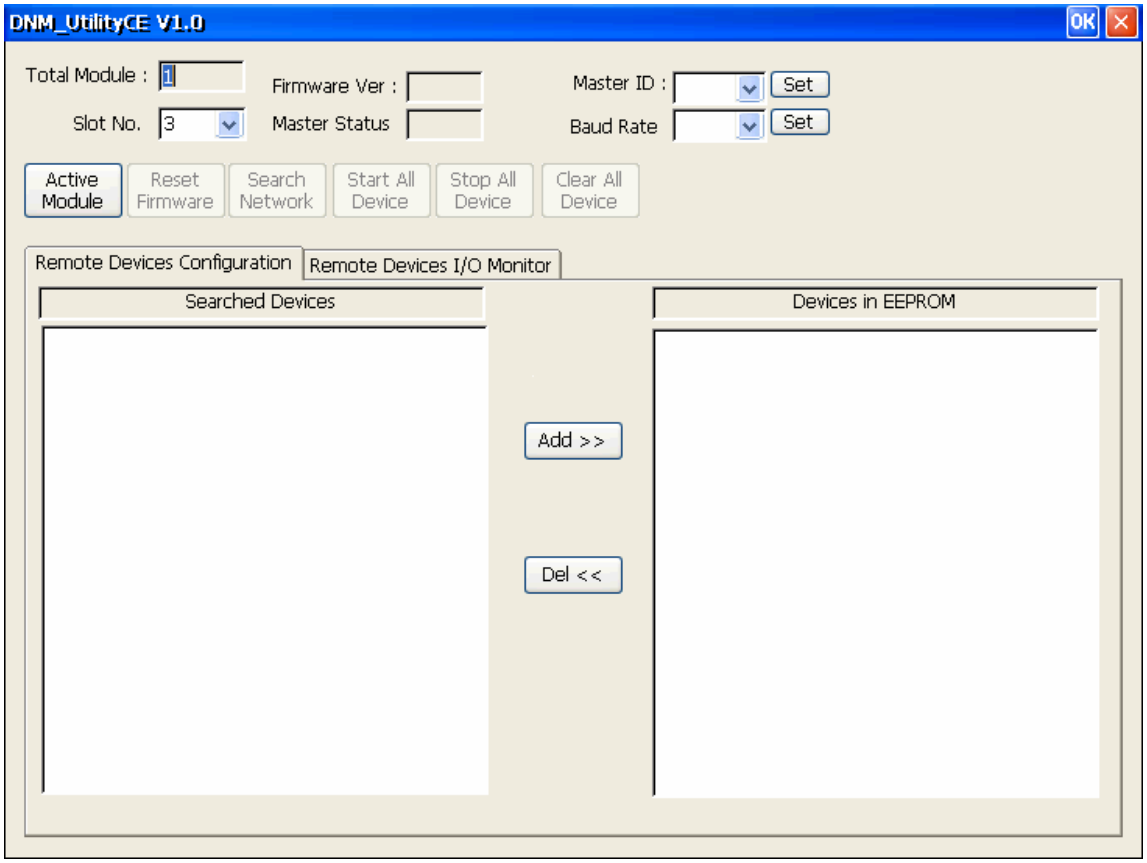
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5. DNM_UtilityCE for WP-8000

The utility does not work normally if the DeviceNet master series hardware driver is not installed correctly.



After searching the I-87124 modules, the screen shoot is shown below.



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5.1 Introduction

The software utility includes various useful functions. These functions help users to diagnose and access the DeviceNet devices. There are three main parts of these functions.

- Diagnosis

This utility supports to search all devices and specific devices in the network. These functions help users to configure the connection of the slave devices. Anymore, the software also can diagnose the remote slave devices when building the DeviceNet network.

- Configuration

This software supports the users to configure the I/O connection of the devices by searching devices. After configuring the I/O connection, the information would be saved into the EEPROM of the I-87124.

- Remote I/O access

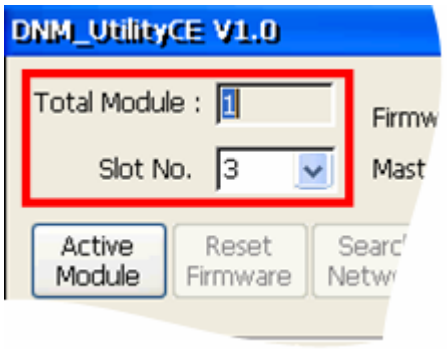
The software utility can easily access the I/O data of all the slave devices. The users can monitor the input data of the specific slave device and change the output data to the remote slave device with this utility.

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5.2 Tutorial Demos

5.2.1 Where to find the Hardware Information

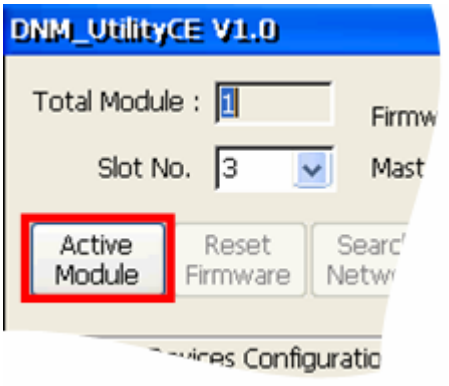
1. The utility would search the number of modules in WP-8000 automatically. It shows the count of the modules which have been found.
2. The utility also lists the slot number of all modules in the “Slot No” field.



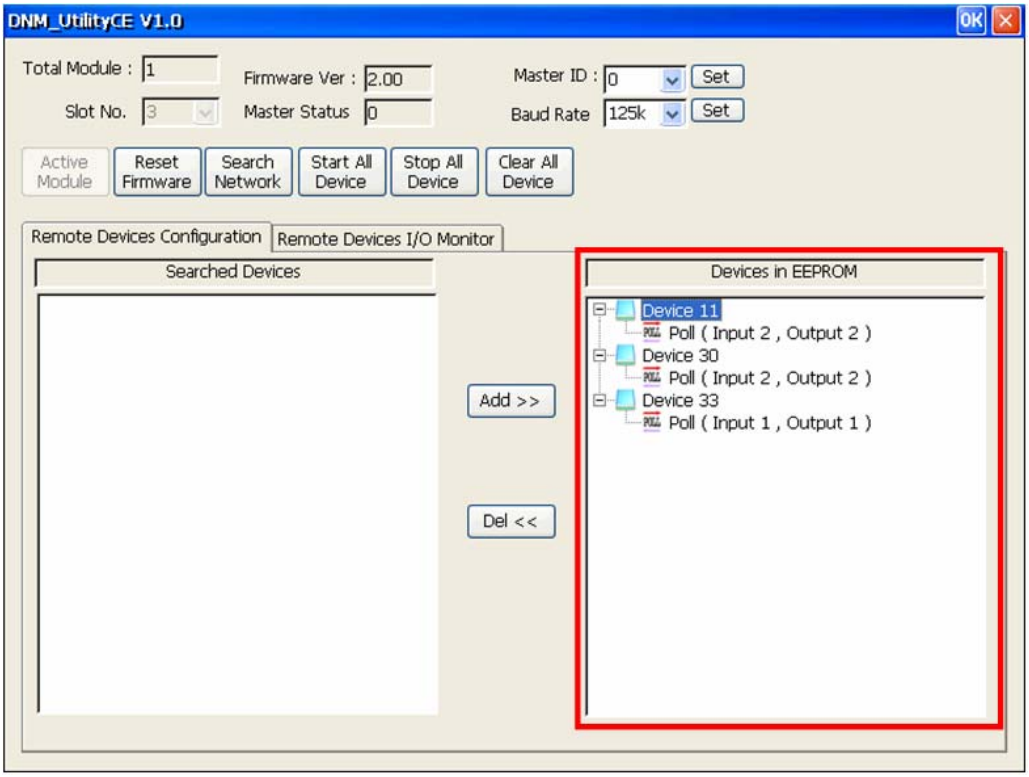
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5.2.2 How to start using the utility

1. Before using this utility, the users should click “ActiveModule” button to activate the DeviceNet master device hardware. That would initialize the DeviceNet master device which you have selected in the “Slot No” field.



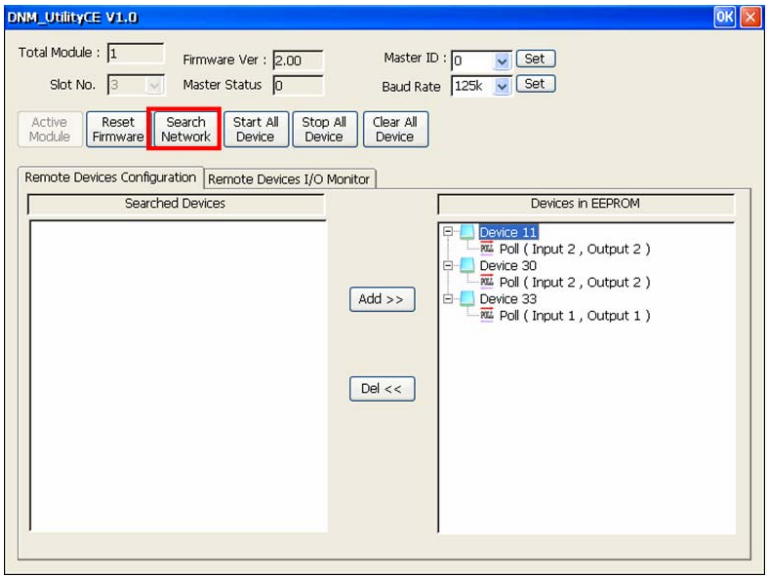
2. After activating the board, the utility will read all configurations from the EEPROM. After reading the configuration from EEPROM of DeviceNet master device successfully, the utility shows the information in the “Devices in EEPROM” field.



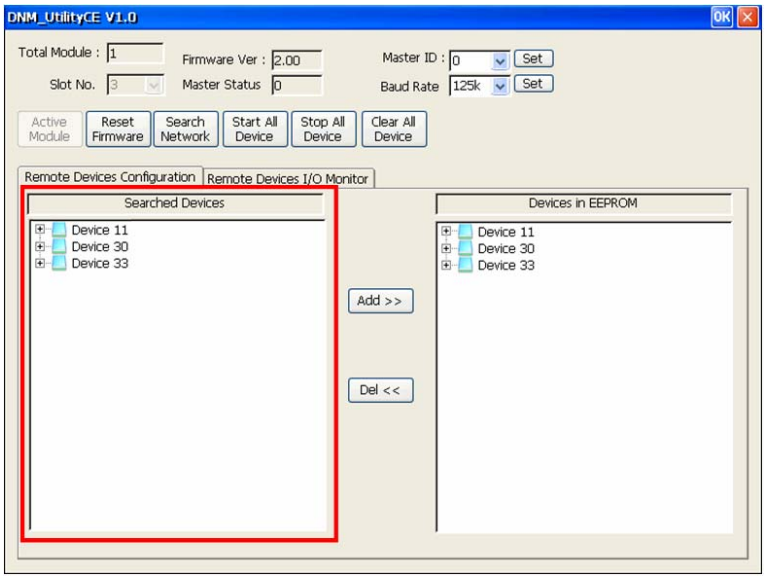
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5.2.3 How to search the slave devices

1. After the module has been activated, the users can press the “Search all Devices” button shown below. As the users press the button, the DeviceNet master device would search the devices. It takes about 30 seconds to search the whole slave devices in the network. The number of scanned devices is 64.

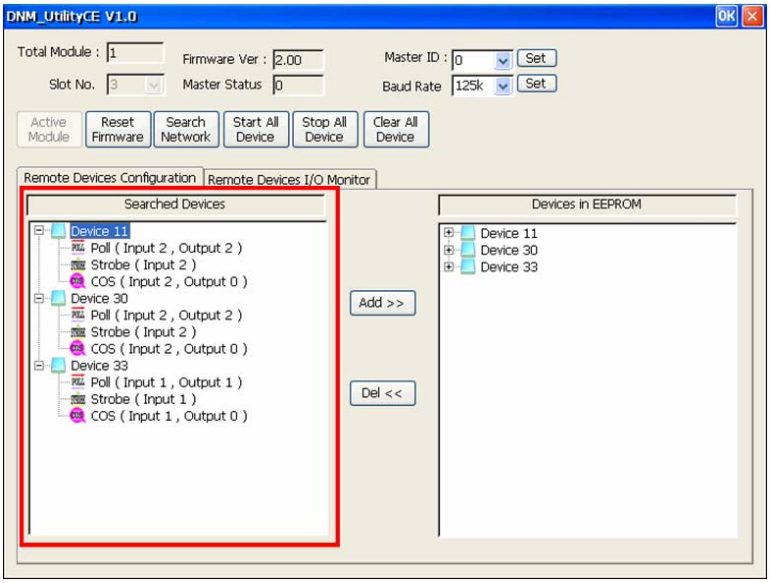


2. After finishing the searching procedure, the utility shows the information of all the slave devices in the “Searched Devices” field.



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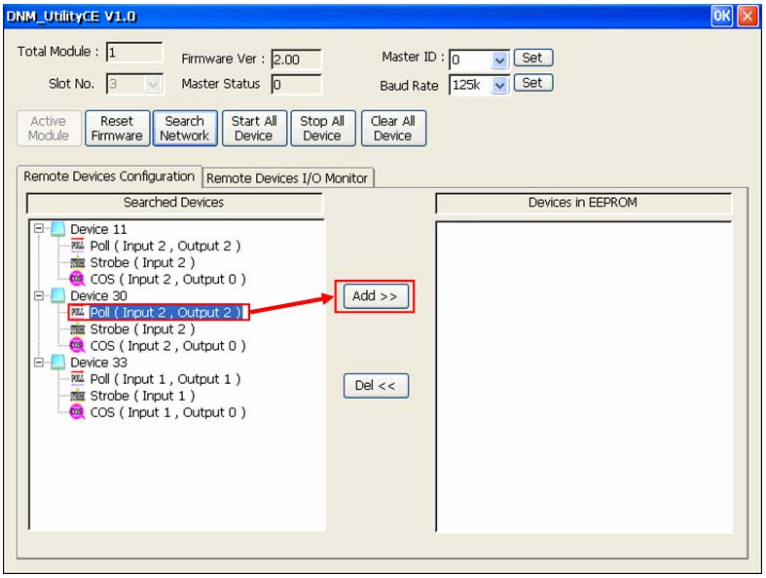
3. The users can expand the device to find out more I/O connection information of those devices. The users can use this I/O information to develop your configuration in the EEPROM.



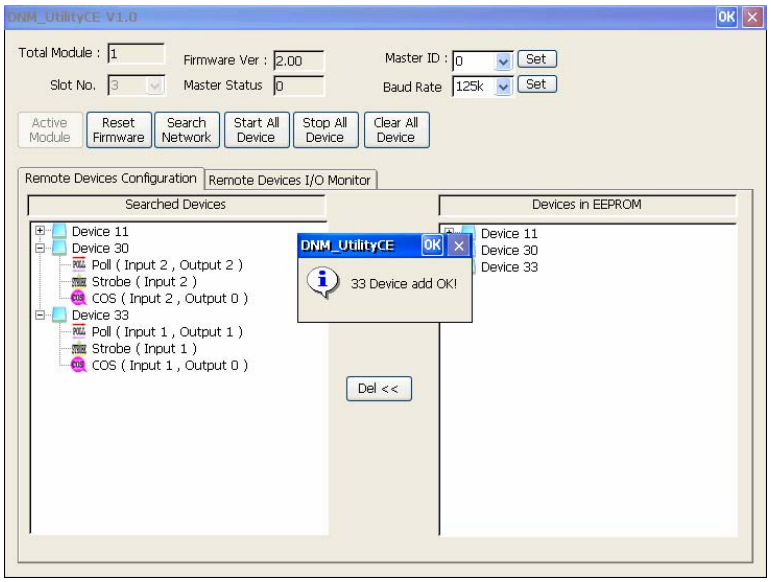
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5.2.4 How to add I/O information into the EEPROM

1. Please activate your board or refer to section 5.2.2
2. Please search all devices or refer to section 5.2.3
3. Please select one of the I/O connection items in the “Searched Devices” field. And drag the item into the “EEPROM“ field.



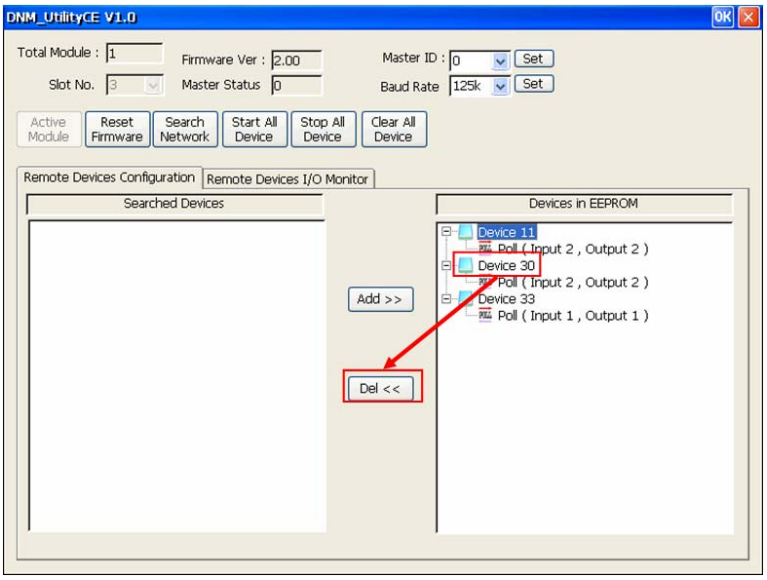
4. If the mission is successful, the users would see the successful message below. And you can find the selected item has been added into the “EEPROM” field.



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5.2.5 How to remove I/O information from the EEPROM

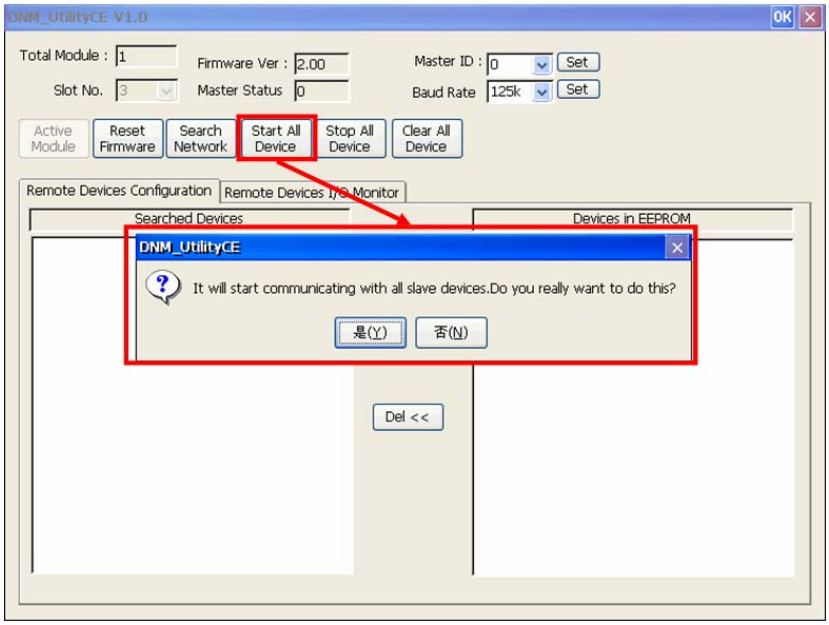
1. Please activate your board or refer to section 5.2.2
2. Please select one of the device items in the “EEPROM” field. And then click the “Del<<” button.



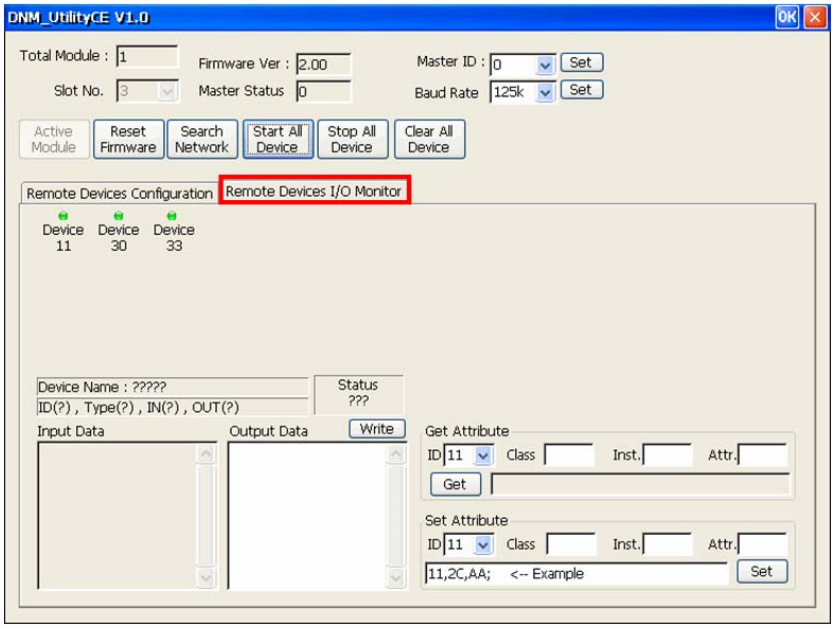
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5.2.6 How to read/write the I/O data form the slave device

1. If the users have no I/O configuration in the EEPROM, please refer to section 5.2.4 to add at least one I/O configuration.
2. Please press “Start all Device” button to communicate with all slave devices. The warning message would pop-up. In this example, please click “Yes”.

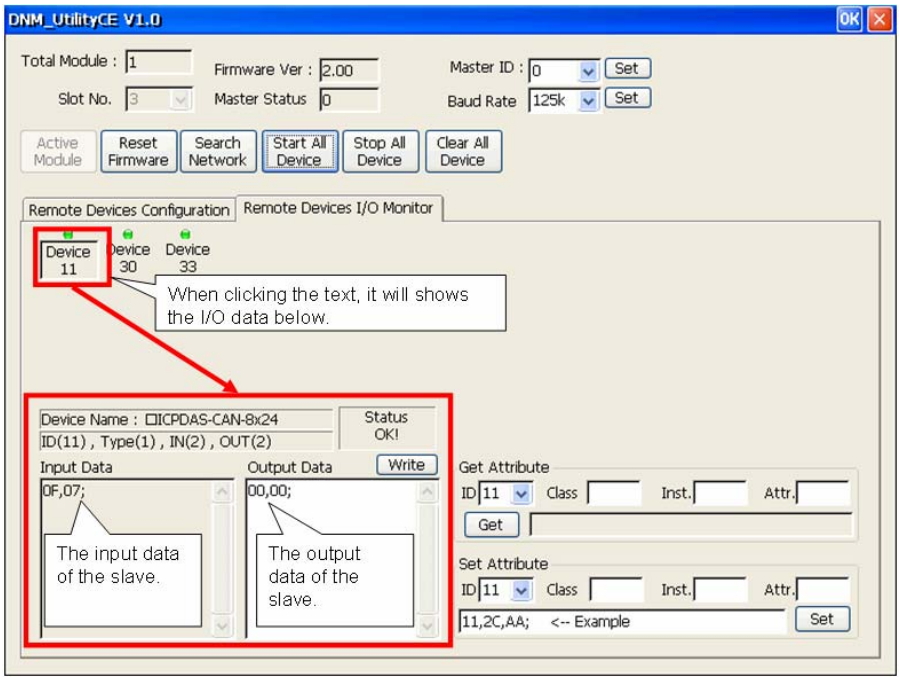


3. The users can click “Remote Device I/O Monitor” page to view the I/O data of the slave devices.

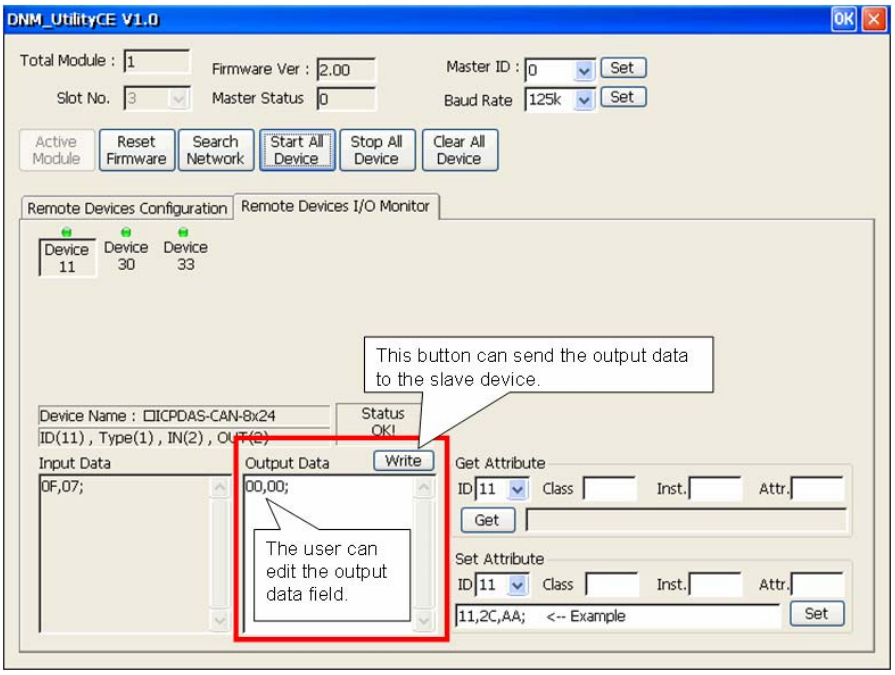


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4. The users can press the device text to display the device information, including the device name and input data.



5. The users can press “Write” button to send the output data to the slave device.



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5.3 Description of the Buttons

Here is the description of the buttons in the software utility.

5.3.1 Total Module Number



This field shows the total number of the I-87124 module in the WP-8000. It will detect the I-87124 hardware automatically when running this software. If the number is 0, the users can not use this software. Please check the installation of the I-87124 module.

5.3.2 Slot Number



This shows which slot the I-87124 has been plugged in. The drop-down list will show the entire slots which the I-87124 module plugged in the WP-8000.

5.3.3 Active Module



This button could activate the I-87124 hardware which is selected in the “Slot No” field. The users should click this button before using other functions.

5.3.4 Reset Firmware



This button can restart the firmware of the I-87124. If the users have changed the master’s ID or baud rate, you must restart firmware to make change enable.

5.3.5 Search All Device



This button can search all the slave devices in the network.

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Notice: When the master is communicating with the slave devices, please don't use this function to avoid breaking the connection to the slave devices.

5.3.6 Start All Device



This button can start to communicate with all slave devices which have configured in the EEPROM.

Notice! If the slave device contains output channels and the initial output value is not set, the master will send default value (0) to the output channels.

5.3.7 Stop All Device



This button would disconnect the communication with all slave devices which have configured in the EEPROM. All remote slave devices will change to the "off-line" state.

5.3.8 Clear All Device



This button can clear all configuration data in the EEPROM. The MAC ID of the master would be reset to 0 and the baud rate reset to 125K bps.

5.3.9 Write Output Data



If the users have started to communicate with the slave device, you can edit the "Output Data" field to change the value to the output channel. Finish editing the value, press the "Write" button to send the new data to the slave device.

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5.3.10 Change Master ID



If the users want to change the MAC ID of the DeviceNet Master, you can select your own setting and then press the “Set” button. After changing the MAC ID, please reset firmware the make the change enable.

5.3.11 Change Baud Rate



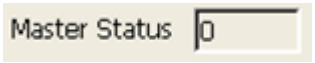
If the users want to change the baud rate of the network, you can select your own setting and then press the “Set” button. After changing the baud rate, please reset firmware the make the change enable.

5.3.12 Firmware Version



This shows the firmware version.

5.3.13 Master Status



This shows the current status of the I-87124. Please refer to the chapter 4.2 for the function return code.

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