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# PISO-CAN200-D/T PISO-CAN400-D/T DASYLab CAN Driver User's Manual

## **Warranty**

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

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# 1 General Information

## 1.1 CAN Bus 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 provides the error process mechanisms and message priority concepts. These features can improve the network reliability and transmission efficiency. Furthermore, CAN supplies the multi-master capabilities, and is 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.



**Figure 1.1 Example of the CAN network**

The CAN system is generally applied in the embedded systems as well as automation control applications. More and more application stories are proposed recently. The main CAN application fields include passenger car, off-highway and off-road vehicle, maritime electronics, factory automation, lifts and escalators, building automation...etc.

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## 1.2 DASyLab CAN Driver Characteristics

ICP DAS DASyLab CAN DLL driver provides users to establish CAN communication network rapidly. It is special for ICPDAS PISO-CAN200/400 PCI interface card. By the way of using the library, most of the CAN communication protocols will be handled by the modules of this DLL library automatically. Therefore, it can help users reducing the complexity of developing a CAN network without the detail CAN bus technology background. The general application architecture is demonstrated as the Figure 1.2.

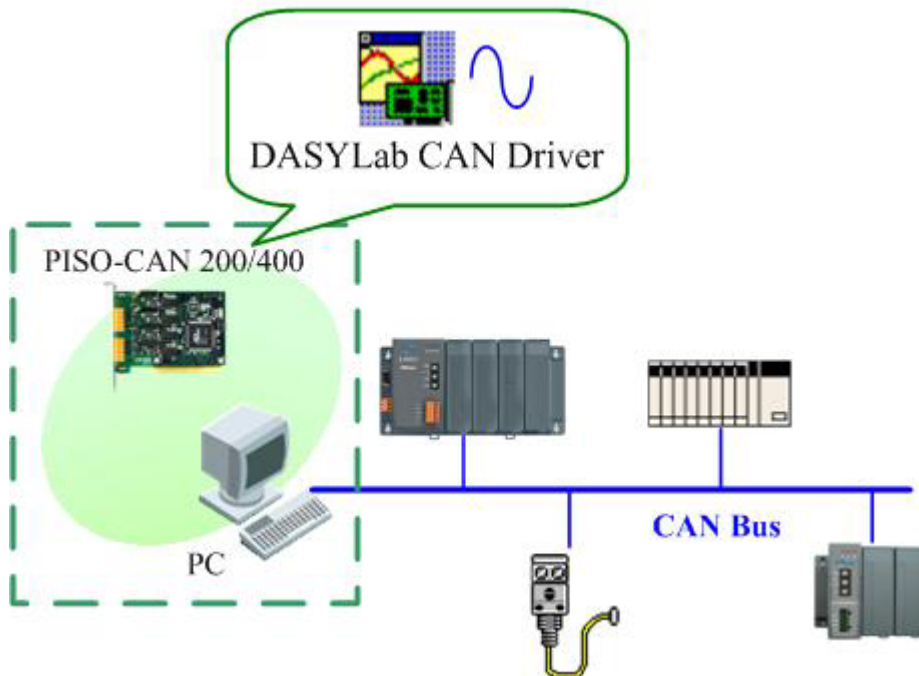


Figure 1.2 Application architecture

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## 1.3 DASYSLab CAN Driver Specification

- Support DASYSLab 8
- Driver is only for Windows 2000/XP platform
- Supported PISO-CAN 200/400-D/T.
- Provide 8 kinds of CAN baud rate, such as 10K, 20K, 50K, 125K, 250K, 500K, 800K, and 1M.
- Allow user-defined CAN baud rate.
- The range of sample rate is from 50Hz to 5000Hz.
- Block size range is from 1 to 4096.
- Support both CAN 2.0A and CAN 2.0B specification.
- Provide Intel mode and Motorola mode for remote CAN device.

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## 2 Software Installation

The DASyLab CAN DLL driver is the CAN function collections for the PISO-CAN200/400 CAN card used on DASyLab 8.0 environment on Windows 2000/XP. Before users use this driver to develop the CAN interface, the PISO-CAN200/400 driver must be installed because the DASyLab CAN driver need to call the function of PISO-CAN200/400 driver. The driver architecture is shown in the following Figure2.1.

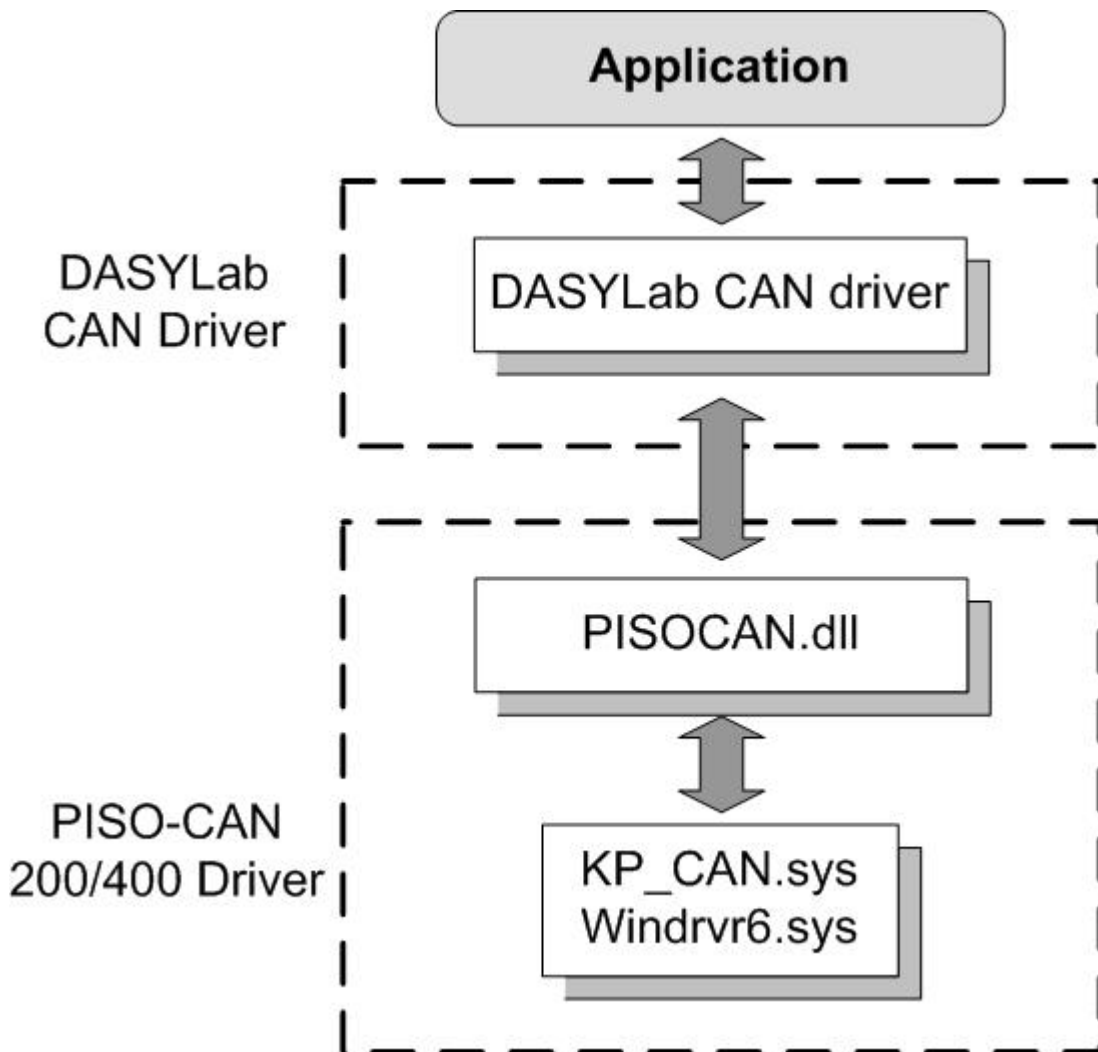


Figure 2.1 Driver concept of DASyLab CAN driver

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## 2.1 Installation Driver Step by Step

When users want to use the DASyLab CAN driver, the PISO-CAN200/400 CAN card driver and DASyLab 8.0 must be installed firstly. Afterwards, users should install DASyLab CAN driver. After finishing the installation process, the demo programs may be a good reference for users to build a simple CAN DASyLab application. In the demo programs, basic functions and operation methods of CAN modules are introduced. It is very helpful for users to understand how to use these functions and how to develop their CAN applications. For more information about the demo programs, please refer to the section 5. The following description shows the step-by-step procedures about how to install the PISO-CAN200/400 driver and DASyLab CAN driver.

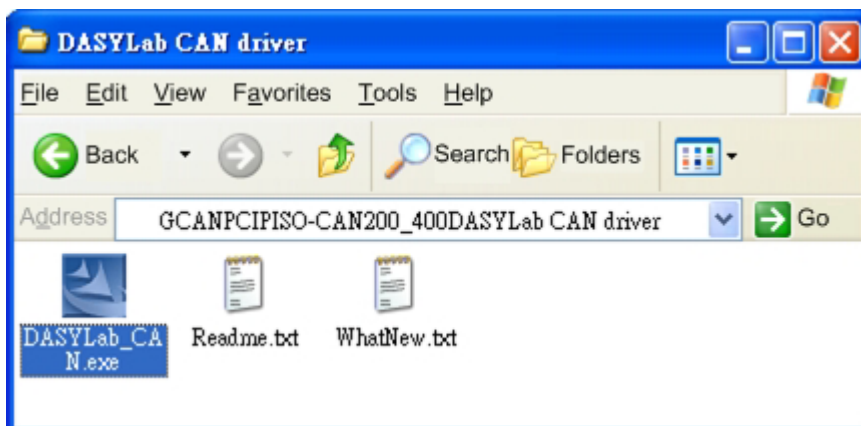
### **Install the PISO-CAN200/400 CAN card driver**

Please refer to the PISO-CAN200/400 user manual. It can be found in the product package box. Users also can download it in the following website.

<http://www.icpdas.com/download/pci/piso-can/manual/piso-can.pdf>

### **Install the DASyLab CAN Driver**

Step 1: Find the setup file in product CD with the path \CAN\PC\PISO-CAN200\_400\DASyLab\_CAN\_driver\ or download it from the web : <http://www.icpdas.com/download/pci/piso-can/index.htm>. Then, execute DASyLab\_CAN.exe to install the DASyLab CAN driver.

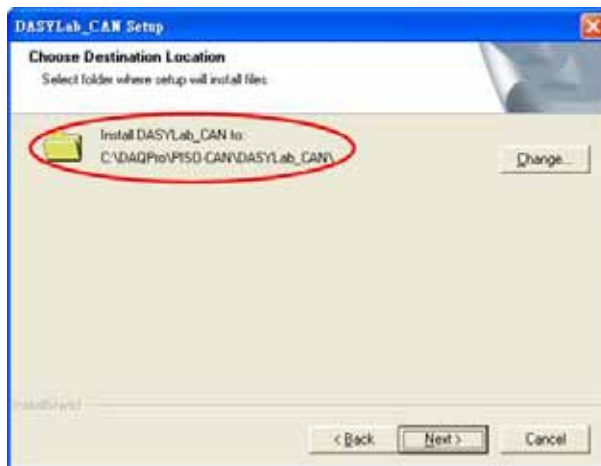


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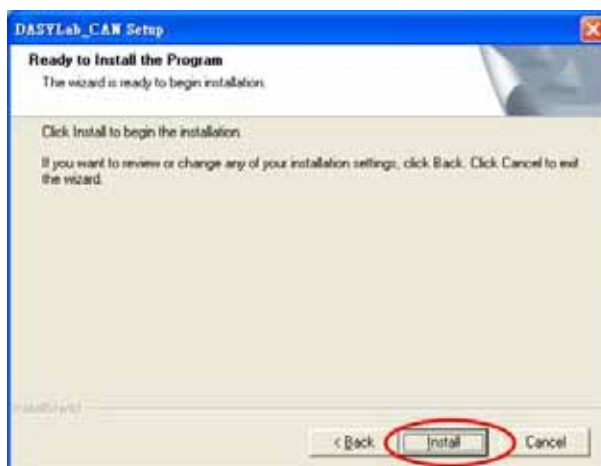
Step 2: Click “Next” to start the DASYLab CAN driver installation.



Step 3: Select the folder where the driver will be installed and click “Next” button to continue. Here, default path is used.

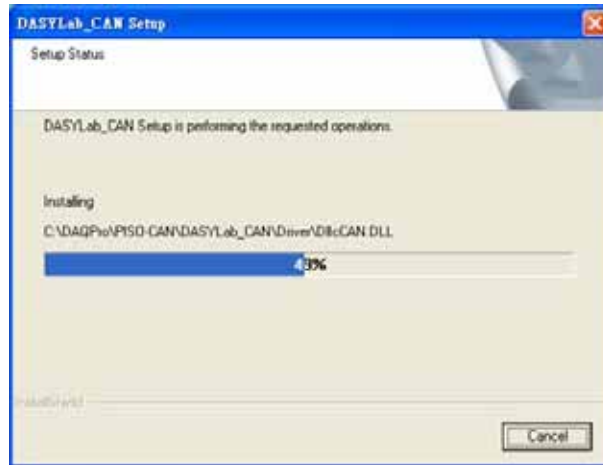


Step 4: Click the button “Install” to continue.

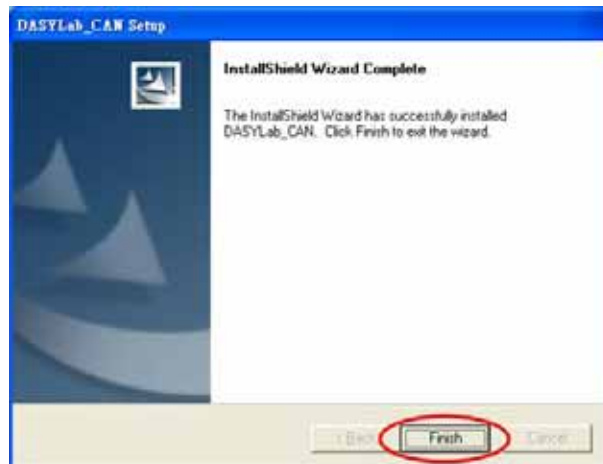




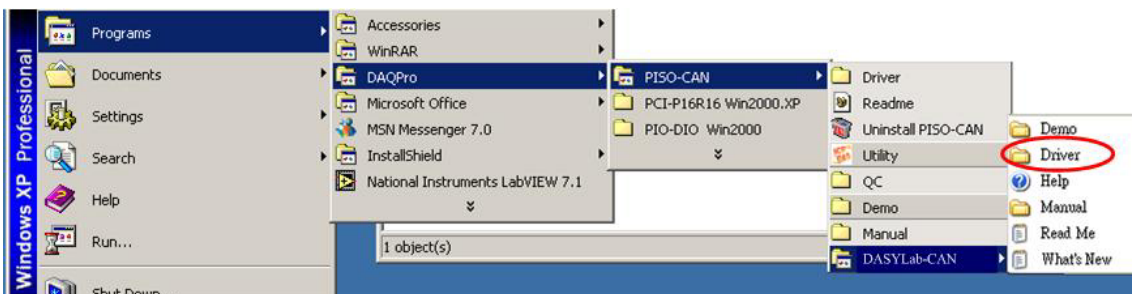
Step 5: Wait for the DASyLab CAN driver installation.



Step 6: After finishing the process, click "Finish" to complete the installation.



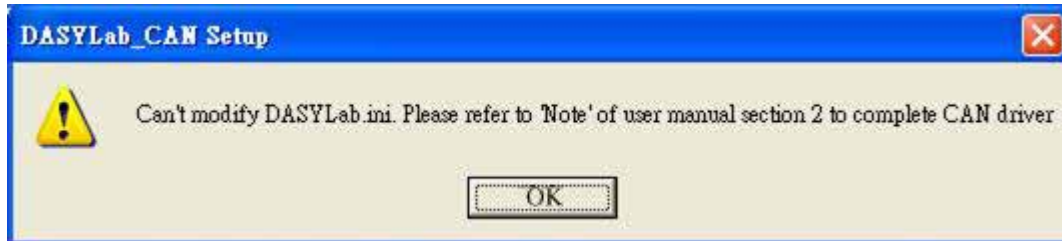
Step 7: When finishing the DASyLab CAN driver installation, the DASyLab folder will be found at the Start menu shown as below.



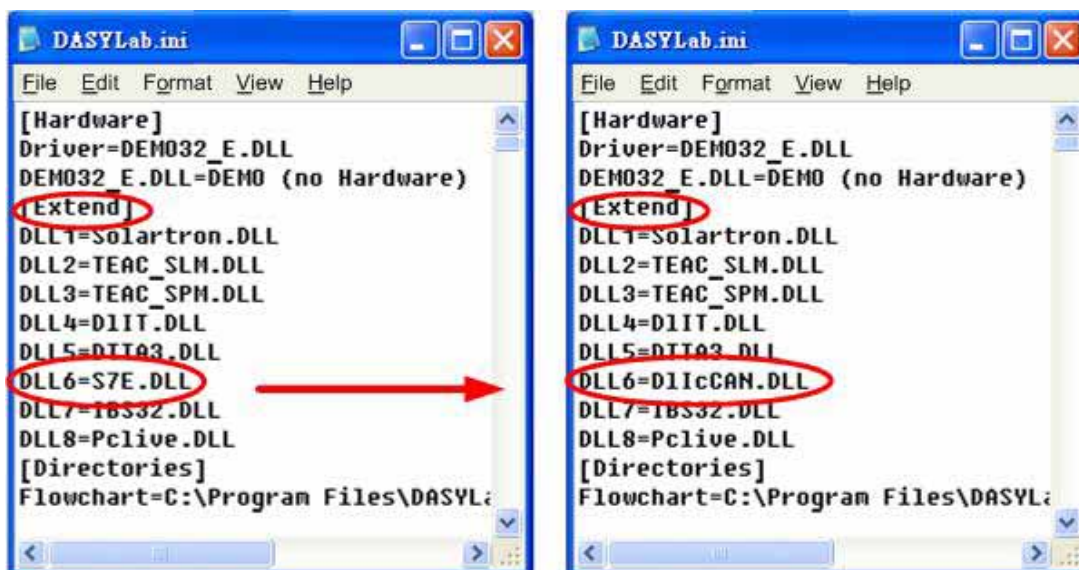
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## Note:

The error message "Can't modify DASYLab.ini. Please refer to 'Note' of user manual section 2 to complete CAN driver" may appear during the installation:



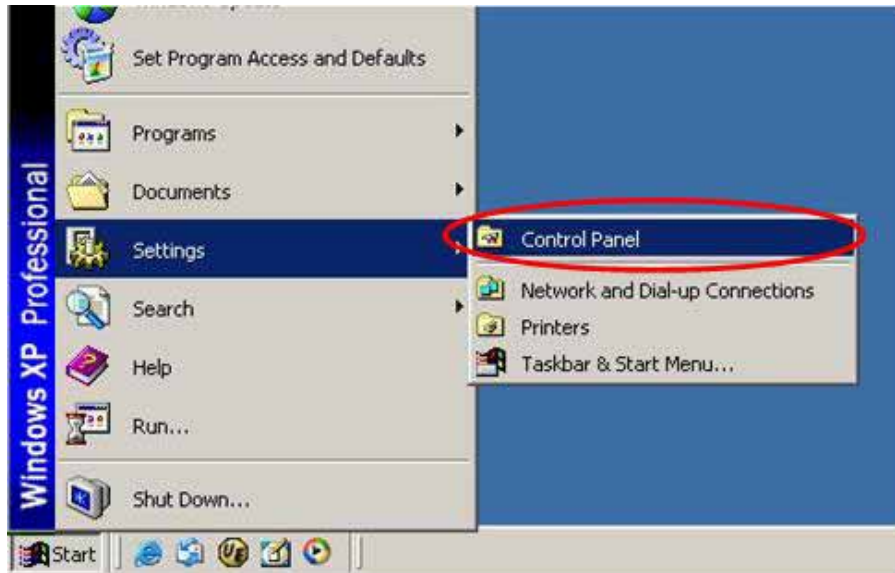
This means that the DASYLab CAN driver had installed completely, but the DASYLab.ini can't be modified by the installer. It may occur because the DASYLab has linked eight drivers. Users can check this linked driver in the "[Extend]" field in the DASYLab.ini file. If users want to hang the DASYLab CAN driver to DASYLab, users need to decide which driver can be dropped from the "[Extend]" field of the ini file, and replace the name of the linked driver by "DllcCAN.DLL". For example, there is one line described as "DLL6=S7E.DLL" in the "[Extend]" field. If users want to replace driver 6 by the DASYLab CAN driver, they can modify it as "DLL6=DllcCAN.DLL". Then, users can use the DASYLab CAN driver in the DASYLab environment, but the driver S7E.DLL will be useless.



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## 2.2 Remove DASyLab CAN Driver

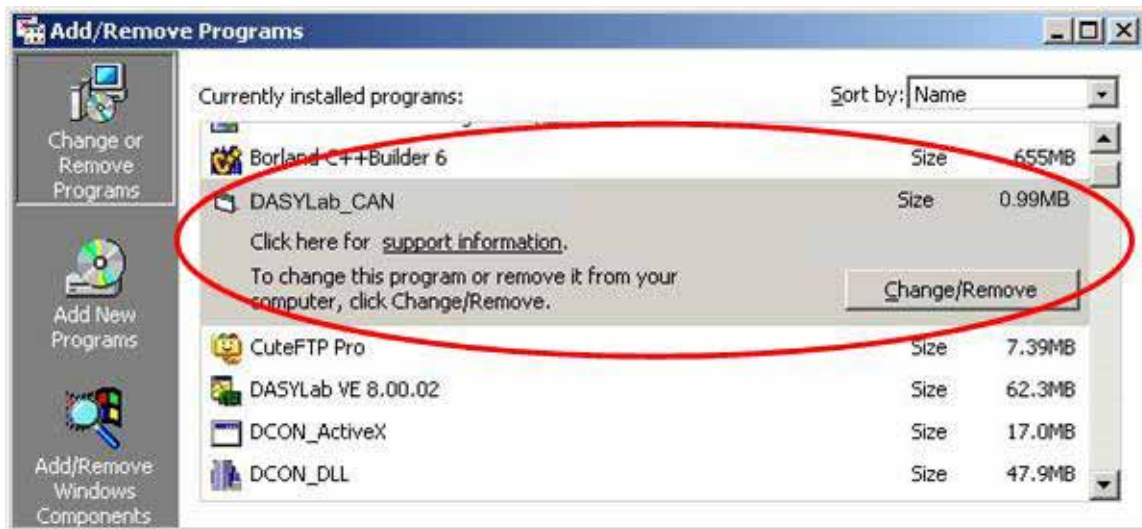
Step 1: Click “Start” in the task bar. Select the Settings/Control Panel as shown in the following figure.



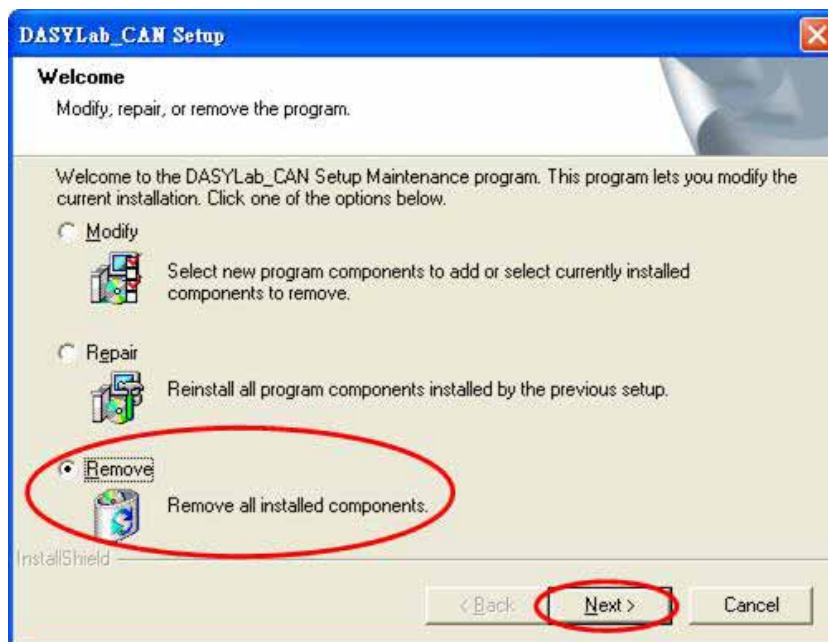
Step 2: Click the “Add/Remove Programs” icon to open the dialog.



Step 3: Find out the LabCAN, and click the button “Change/Remove”.



Step 4: Choose “Remove” option and click the button “Next” to remove the software.



Step 5: Click the button “Yes” to remove the software.

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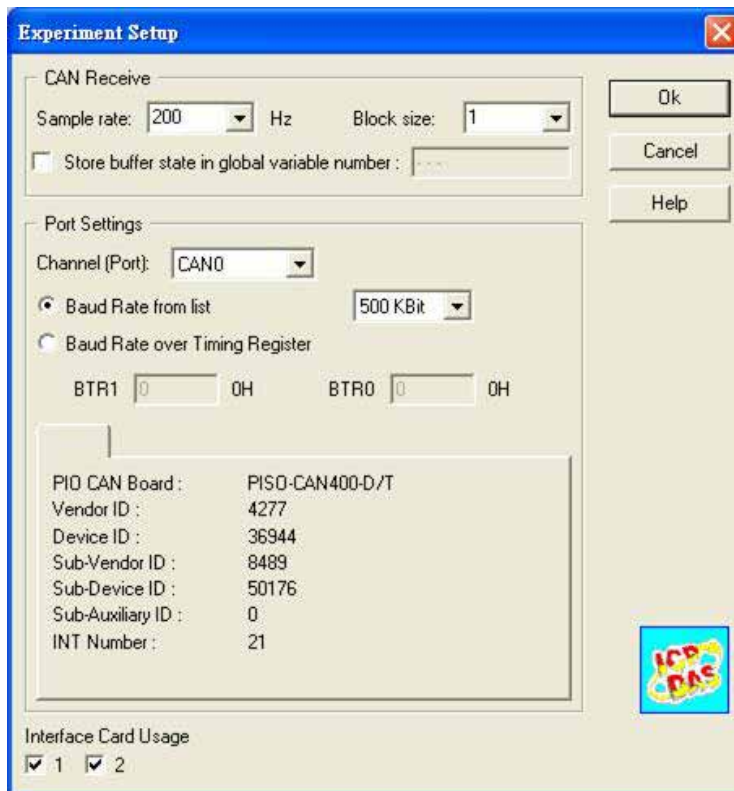
### 3 Driver Description

After install the DASyLab CAN drive, the button "ICP DAS-CAN" will be installed in the menu of DASyLab worksheet. There are five functions, "Experiment Setup...", "Receive", "Send", "Help", and "About ICP DAS-CAN..." for users to use.



#### 3.1 Experiment Setup

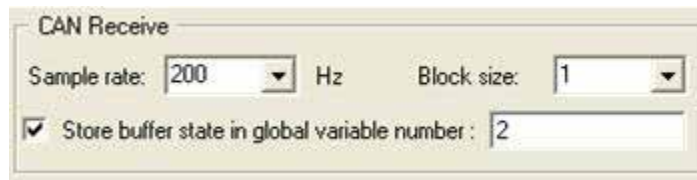
Before using DASyLab CAN driver, users must decide some parameters of CAN port of PISO-CAN 200/400, such as the using port NO., baudrate, the arbitration for sending or receiving CAN message,... and etc.



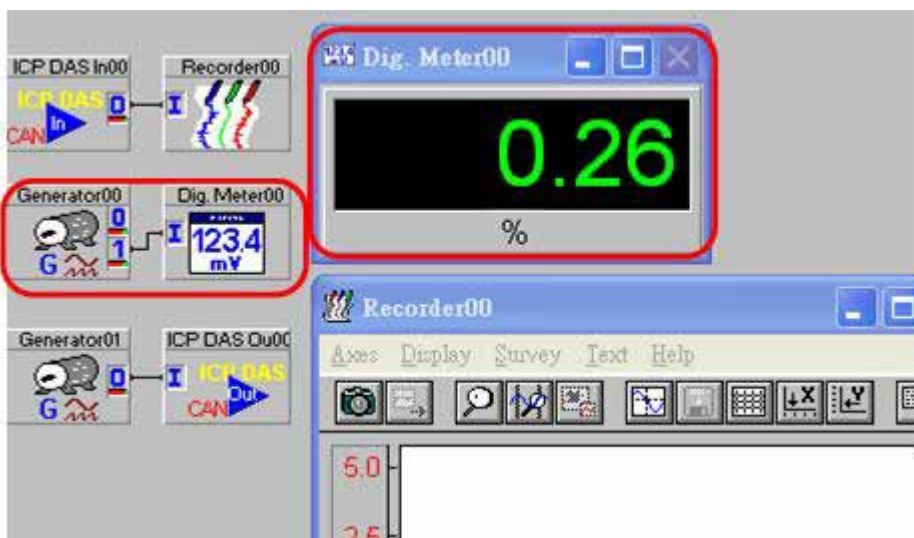
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Click "ICP DAS-CAN" and select "Experiment Setup" in the menu of DASyLab worksheet, then the setting window will pop up as follows:

In CAN Receive frame, user can select sample rate and block size in the "Sample rate " and "Block size " filed. These two parameters is defined for all channels. The range of sample rate is from 50 to 5000, and the range of block size is from 1 to 4096. These two parameters strongly influence the real-time performance of the system and the speed of the measuring process. If users want to see the FIFO state, check the "Store buffer state in global variable number " and use the Generator module with "Read global variables function", to output the buffer state from CAN receive module. The parameter of "Store buffer state in global variable number" can choose which global variable channel of Generator module will be used.

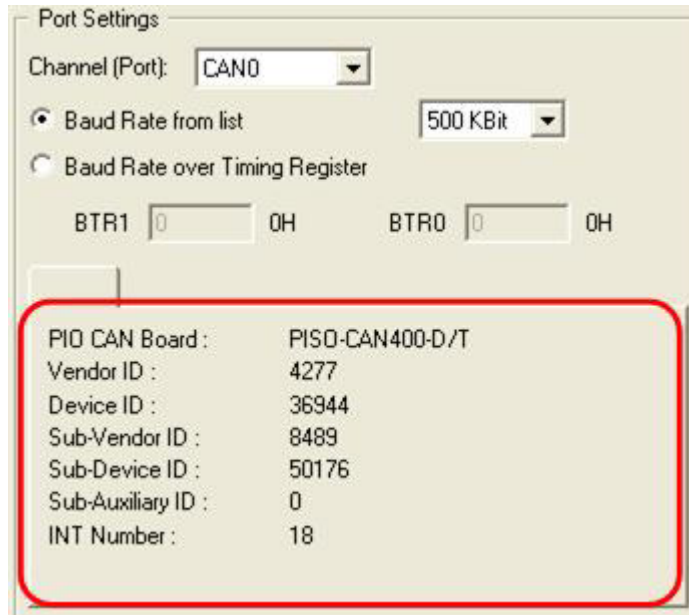


For example, set this parameter to 2, then the buffer state will be outputed from the channel 2 of General module. Users can drag and drop a "Generator module" with "Read global variables function" and a "Dig. Meter module" in the worksheet. Obtain the channel 2 value of Generator module to see the buffer state as follows. When the buffer state reach to 100, the buffer is overflow.

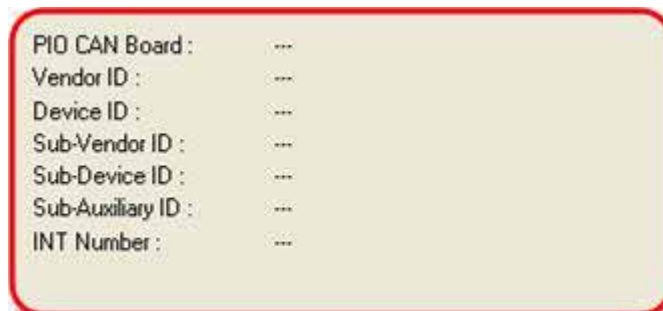


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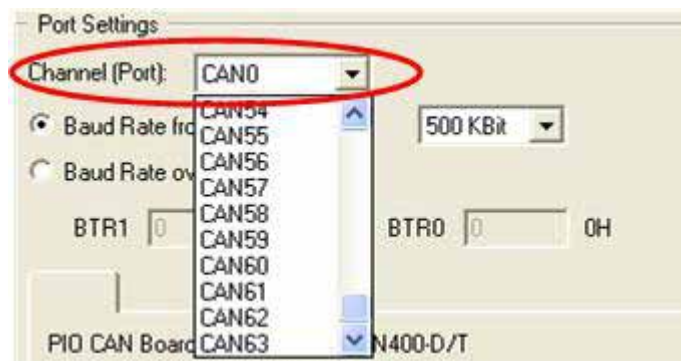
In Port Settings frame, users can set baudrate of each CAN port, and see some information of the CAN port. When users select the CAN port in “Channel(Port)” field, The information of the CAN port is displayed as follows.



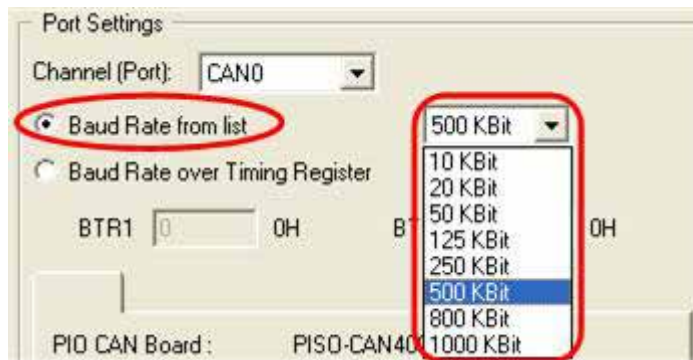
If the CAN port selected by users is not exist, no CAN port information will be shown as follows.



To set baudrate, select the CAN port firstly. There are maximum 64 CAN ports (from CAN 0 to CAN 63) supported by DASyLab CAN driver.



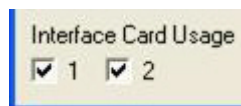
Secondly, set CAN baudrate for the selected CAN port. If users check the "Baud Rate from list" combo box, there are 8 kinds of baud rate to select.



The second item, "Baud Rate over Timing Register" is used for user-defined baud. Before using this parameter, users must have the background of the CAN chip, SJA1000. The CAN baud rate is calculated by using SJA1000 specification with 16MHz oscillator. For example, setting the BTR0 = 01H and BTR1 = 1CH of SJA1000 can get 1M bps baud rate.



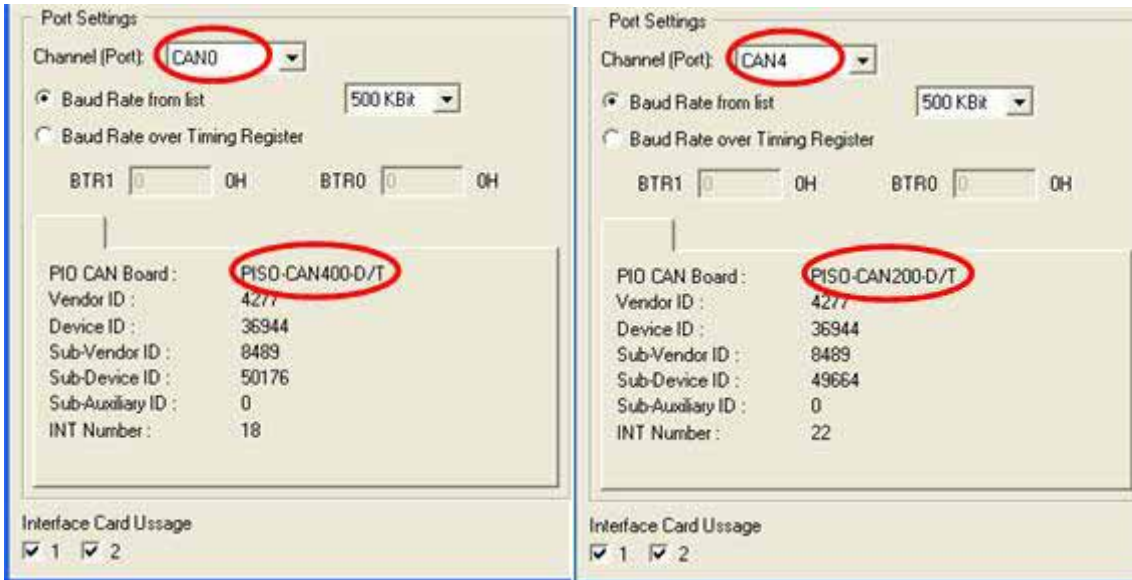
If user want to check how many CAN card is in the PC. This parameter "Interface Card Usage" which is located in the bottom of the "Experiment Setup" window is displayed below.



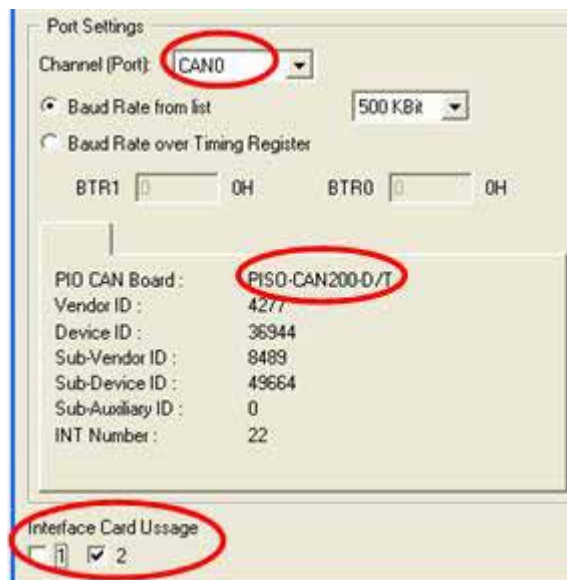
For example, there are two CAN cards in the PC, two check boxes will be show here. All CAN cards in PC will be set to useful for default value. If user want to disable one of these two CAN cards, cancel the check box what you want to disable. Then, click OK button of "Experiment Setup" dialog, close DASyLab environment, and restart it again. The disable CAN card will not work in DASyLab.



For example, There are two CAN cards in the PC, the card 1 is PISO-CAN 400 and the card 2 is PISO-CAN 200. From CAN 0 to CAN 3 are the ports of card 1 and from CAN 4 to CAN 5 are the ports of card 2.



Then, disable the card 1 and restart DASyLab. The card 1 will disable and the CAN 0 to CAN 1 will be the ports of card 2.



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## 3.2 Revice

In Receive function, there are two modules, CAN Data Receive and CAN RTR Receive, to be used. They are described below.

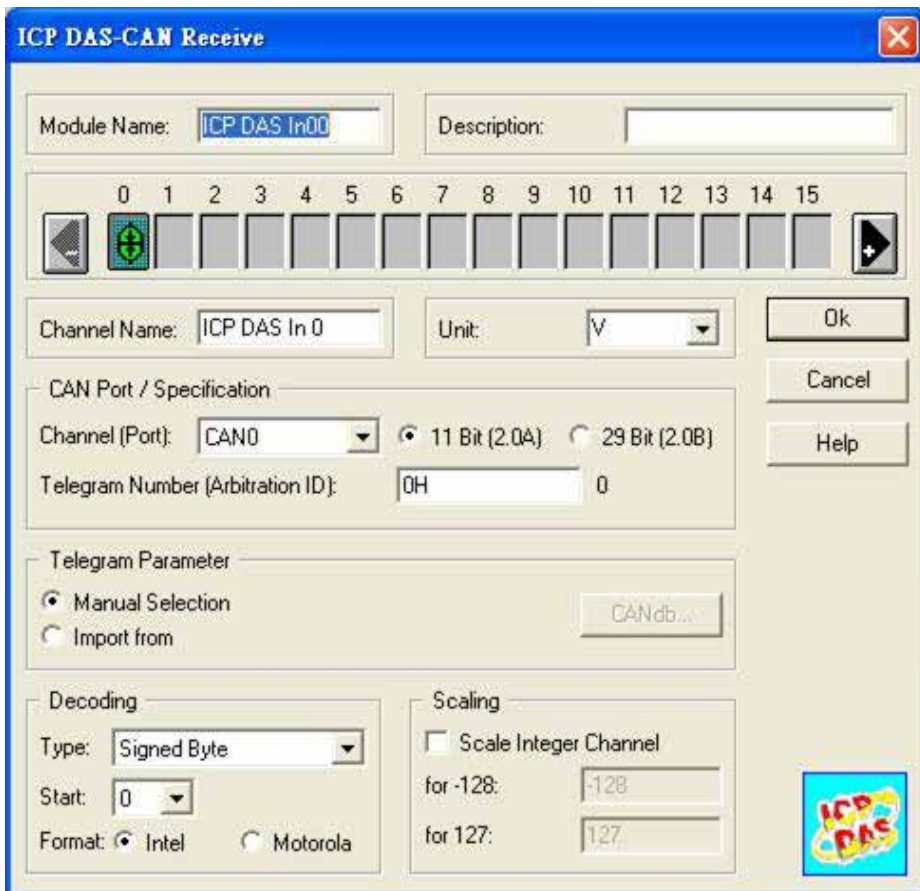


### 3.2.1 CAN Data Receive

Draw and drag CAN Data Receive module on the DASyLab worksheet.



Double click this module to pop up the configure window.

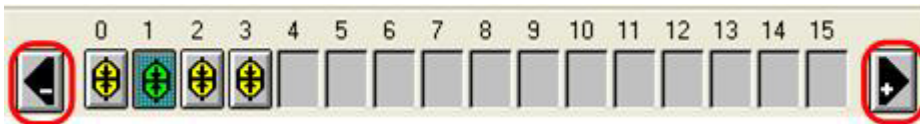


User can set this module's name in the "Module Name" field, and type some descriptions in "Description" field as follows.



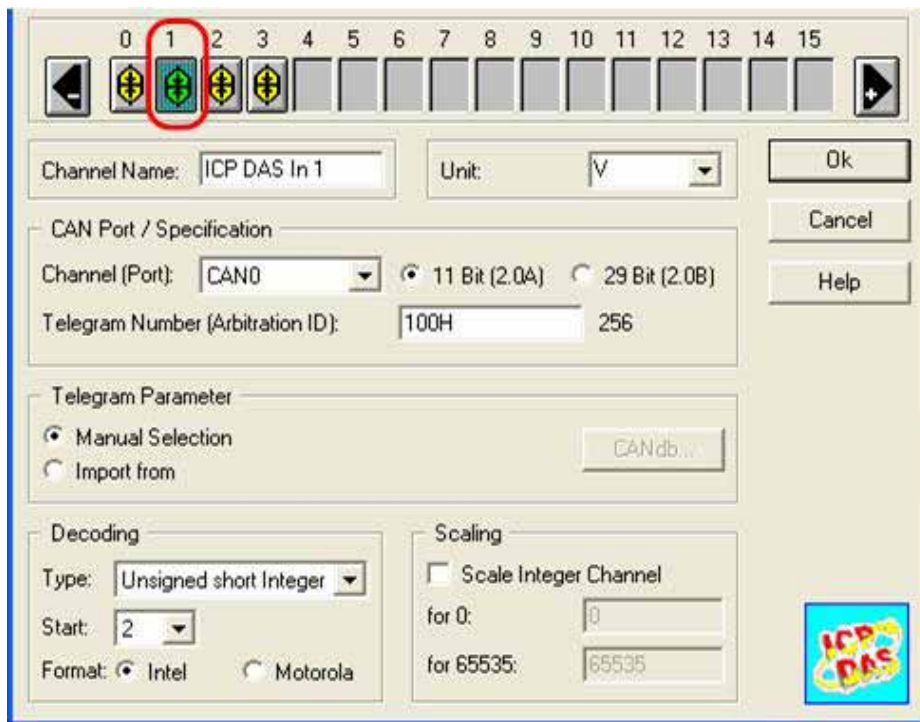
Module Name: ICP DAS In00      Description: This is a demo test for Rx

There are maximum 16 channels (from 0 to 15) for each module. Push "+" button to enable a channel and "-" button to disable a channel.



Channel selection interface showing 16 channels (0-15). Channel 0 is disabled (black arrow), channels 1-3 are enabled (green plus), and channels 4-15 are disabled (grey). Navigation buttons are on the left and right.

For example, users enable four channels (channel 0 to channel 1) and select channel 1 to configure the parameters for channel 1.



Channel configuration dialog for channel 1. Channel Name: ICP DAS In 1, Unit: V. CAN Port / Specification: Channel (Port): CAN0, 11 Bit (2.0A) selected, 29 Bit (2.0B) unselected, Telegram Number (Arbitration ID): 100H, 256. Telegram Parameter: Manual Selection selected, Import from unselected. Decoding: Type: Unsigned short Integer, Start: 2, Format: Intel selected, Motorola unselected. Scaling: Scale Integer Channel unselected, for 0: 0, for 65535: 65535. Buttons: Ok, Cancel, Help. ICP DAS logo in the bottom right.

User can type the name for this channel firstly. Then select what kind of unit of channel 1 signal will be displayed. There are 12 kinds of unit to be select.

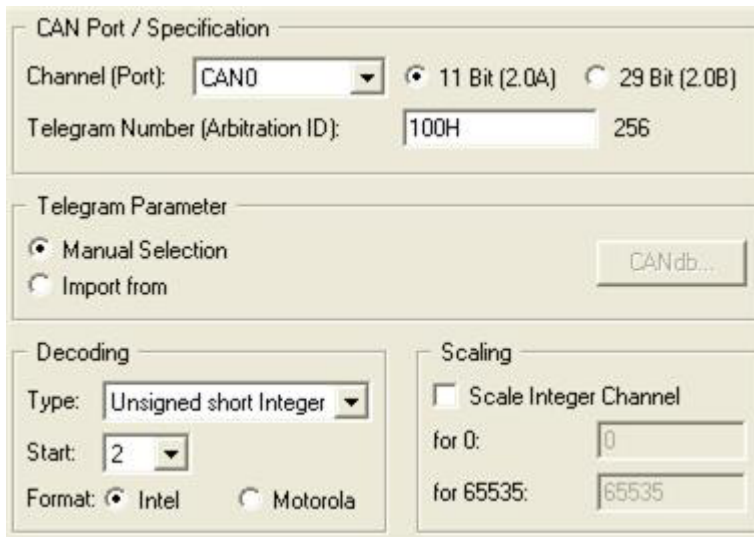


Channel Name: ICP DAS In 1      Unit: [dropdown menu]

Unit dropdown menu options: °C, °F, A, bar

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Choose the “Channel (Port)” to define the CAN port where the channel 1 will receive the CAN message. Select the CAN specification 2.0A/2.0B to decide which CAN specification will be used. Set the arbitration ID. Then the channel 1 will receive CAN data according to this arbitration ID. The telegram parameters have two part, Decoding, and Scaling. If you select the “Manual Selection” item, the parameters in Decoding and Scaling frame must be configured by yourself. Or, you can select the “Import from” item and click “CANdb...” button to import these parameters configuration from the .dbc file produced by CANdb editor. The CANdb editor is made by Vector Company. Please refer to Vector web site for more information.

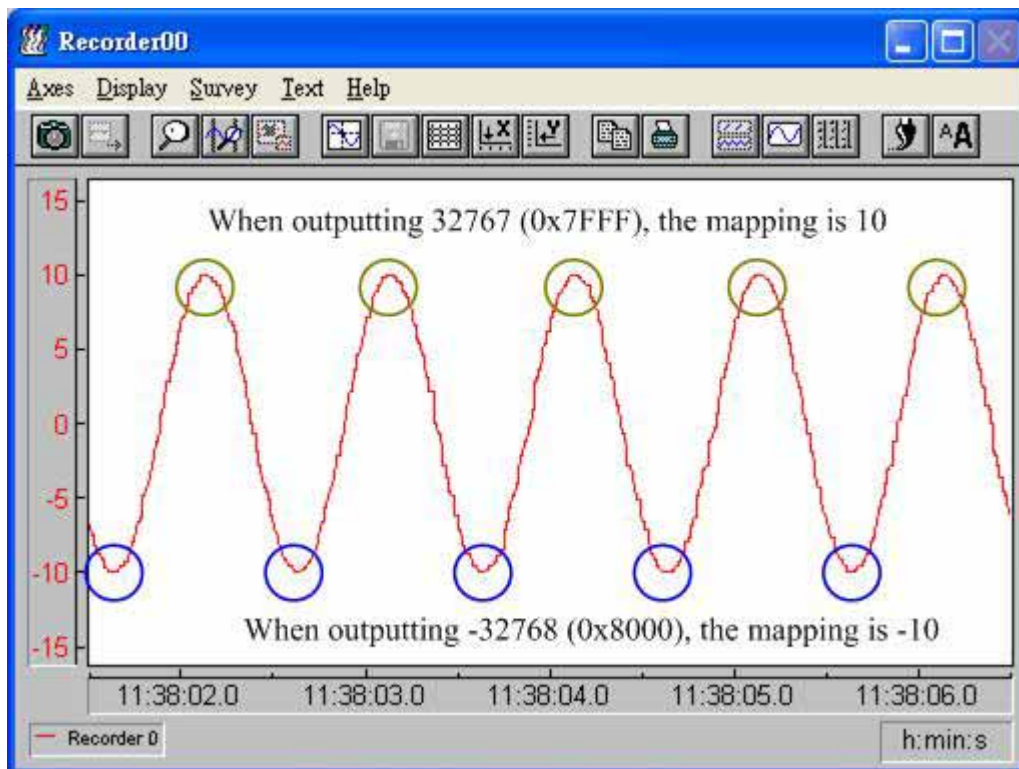
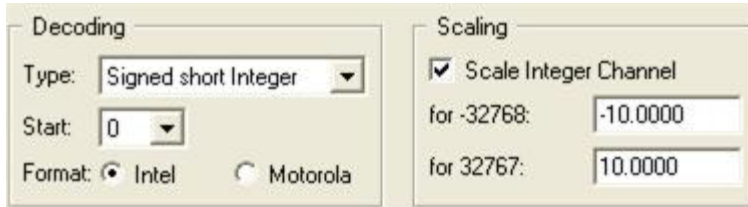


The image shows a software configuration window titled "CAN Port / Specification". It is divided into several sections:

- CAN Port / Specification:** Includes a dropdown for "Channel (Port)" set to "CAN0", radio buttons for "11 Bit (2.0A)" (selected) and "29 Bit (2.0B)", and a text field for "Telegram Number (Arbitration ID)" set to "100H".
- Telegram Parameter:** Includes radio buttons for "Manual Selection" (selected) and "Import from", and a "CANdb..." button.
- Decoding:** Includes a dropdown for "Type" set to "Unsigned short Integer", a dropdown for "Start" set to "2", and radio buttons for "Format" set to "Intel" (selected) and "Motorola".
- Scaling:** Includes a checkbox for "Scale Integer Channel" (unchecked), and text fields for "for 0:" set to "0" and "for 65535:" set to "65535".

In Decoding frame, the “Type” combo box decides the decoding method of received message. There are seven kinds of integer data type and two kinds of float types, such as single bit, signed byte, unsigned byte, signed short integer, unsigned short integer, signed long integer, unsigned long integer, 32 bit IEEE and double 64-bit IEEE. The “Start” combo box can select the byte, which the DASyLab will decode the message from. For example, if type is unsigned short integer and Start filed is set to 2, the receive channel will output the unsigned short integer value which is decoded from the 3rd and 4th bytes of received CAN message. The Scaling parameters are used to mapping the received data to the physical value. The original scaling range is corresponding to the Type filed. For example, if the type is signed short integer and Start filed is set to 0, the original

range is from -32768 to 32767. The mapping range is according to user's application. If users application need to obtain the voltage from -10V~10V, the mapping ranges are -10 and 10. After setting the scaling, the -32768 ~ 32767 raw data will be mapped to the -10V~10V physical value automatically.

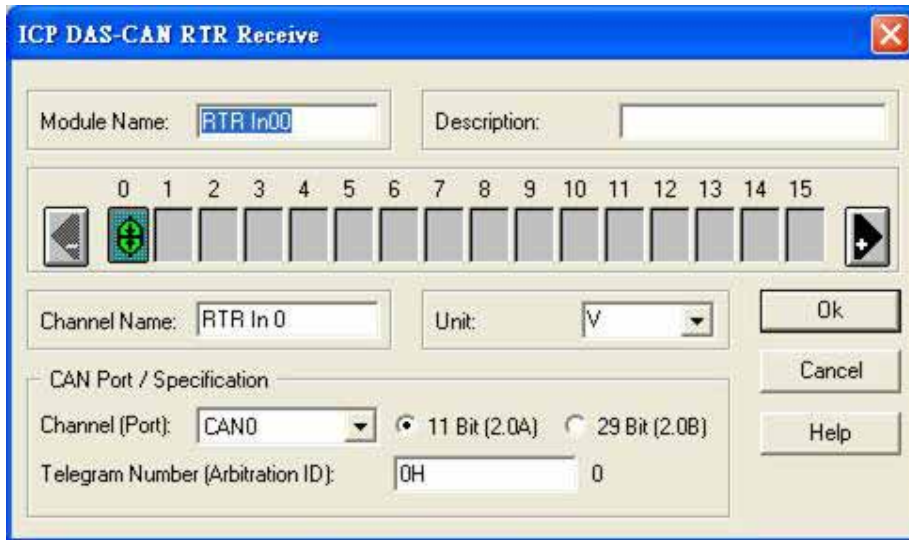


### 3.2.2 CAN RTR Receive

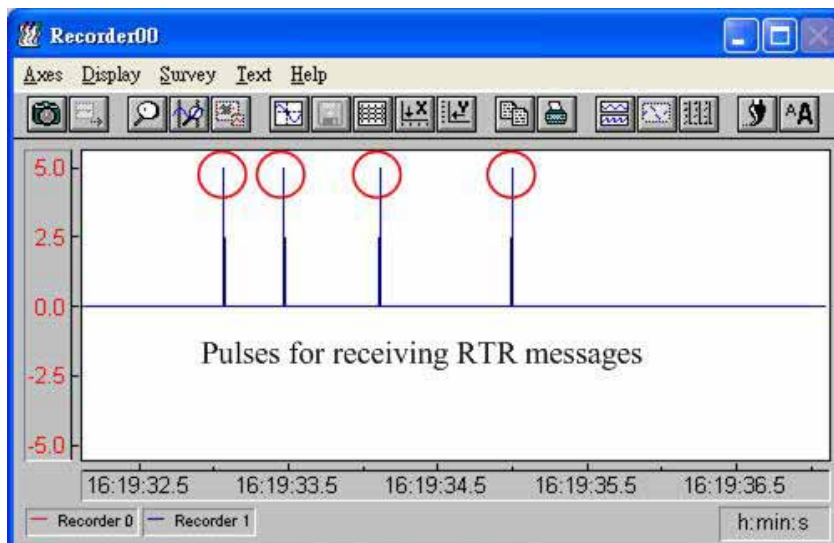
Drag and drop CAN RTR Receive module on the DASyLab worksheet.



Double click this CAN RTR Receive module to go into the configure window.



All parameters of this module are the same as CAN Data Receive module, except the Telegram Parameter frame, Decoding frame, and Scaling frame. The CAN RTR Receive module don't have these three frame. This module is used to receive the RTR message from CAN bus. When the RTR message is obtained, the CAN RTR Receive module will output the value 5.



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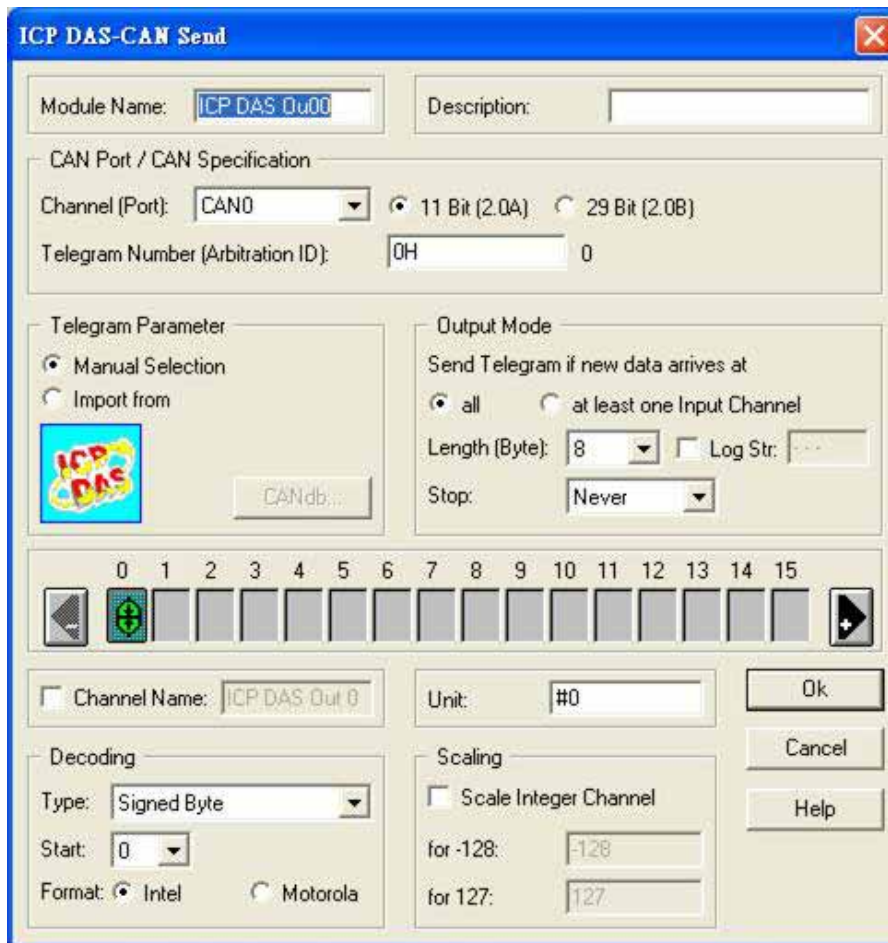
## 3.3 Send

### 3.3.1 CAN Data Send

Drag and drop CAN Data Send module on the DASyLab worksheet.

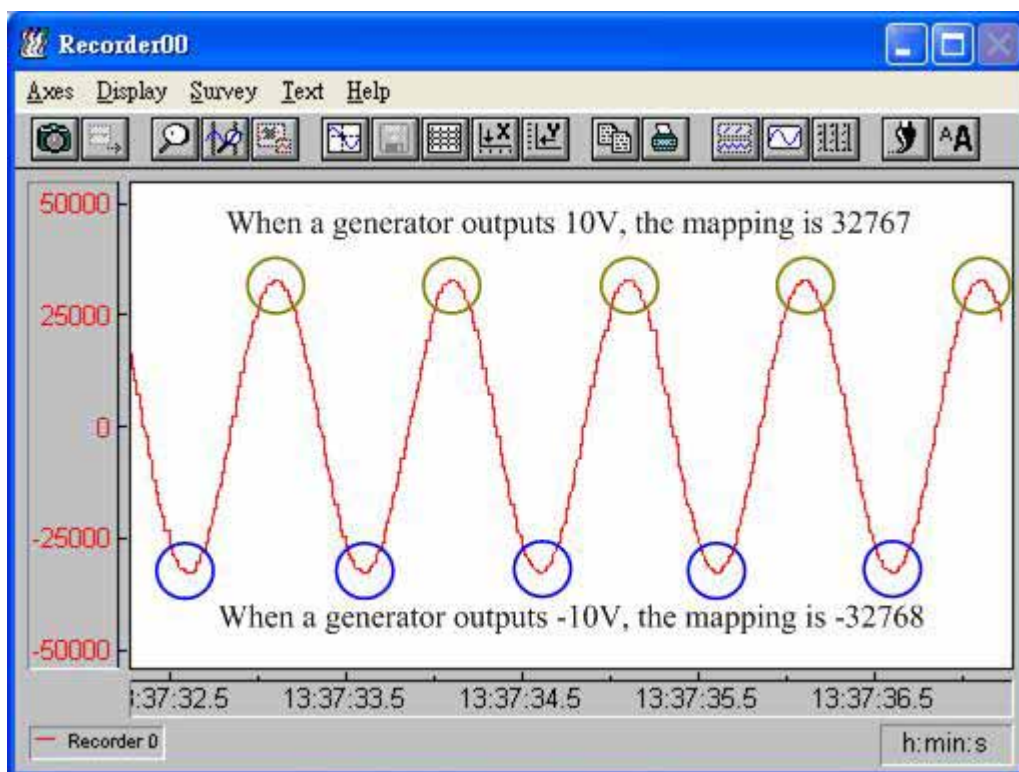
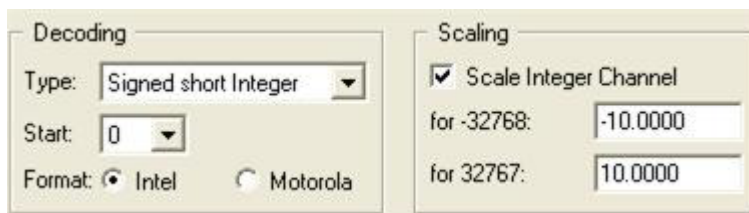


Double click this CAN Data Send module to go into the configure window.



The most functions of parameters are the same as CAN Data Receive module except the Decoding frame, Scaling frame, and Output Mode frame. Every CAN Data Send module can only output one kind of arbitration ids even this module has more than one channels. The Decoding frame and Scaling frame of CAN Data Send modules means the scaling from physical data to raw data. The situation is inverse than it in the CAN Data Receive module. Take an example. In the following figure, the Type is set to signed short integer, the Start

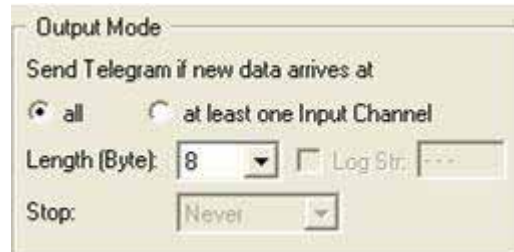
is 0, the range is from -32768 to 32767 and mapping range is from -10 to 10. It means that “users need to send the physical data with range -10~10, and this physical data will be mapped to the value with range -32767~32768 by using signed short integer started from byte 0 of CAN message”. Take a note that the mapping range is according to user’s application. If users application need to output the physical value from -5~5, the mapping range is -5~5.





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In Output Mode frame, the "Length (Byte)" parameter is used to set the output data length of the sent CAN message. The range is from one byte to eight bytes.



The function "all" and "at least one Input Channel" check boxes are used for synchronizing the output data. For example, there is a output module which use 3 channels . If "all" check box is checked, the CAN message will not be snet until all of these three channels have data to output. So, if only two channels have data to output, the module will not output these data until third channel get the output data. When "at least one Input Channel" is checked, the module will output the CAN message if at least one of these three channels has output data. The "Stop" parameter is useless in this DASYLab CAN driver version.

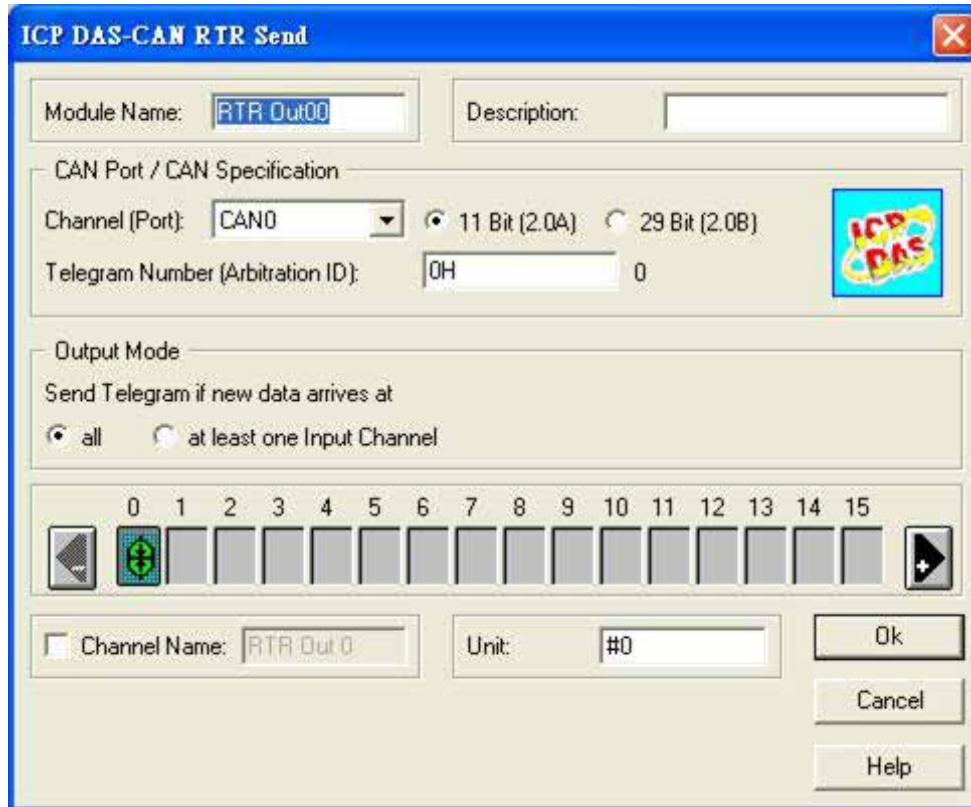
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### 3.3.2 CAN RTR Send

Drag and drop CAN RTR Send module on the DASYLab worksheet.

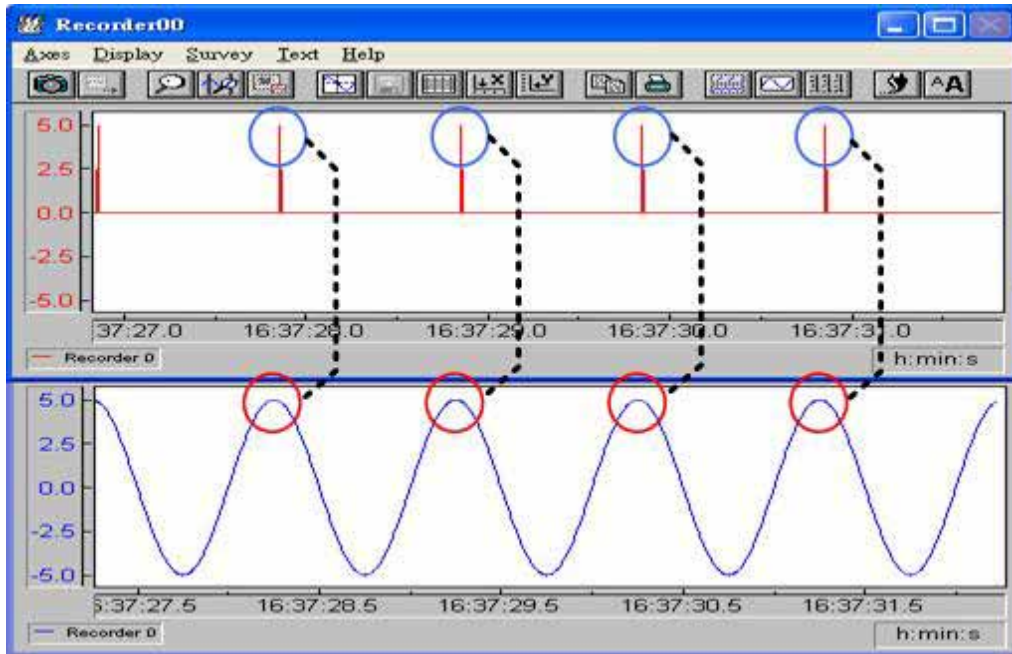


Double click this module to go into the configure window



All parameters of this module are the same as CAN Data Send module. The CAN RTR Send module module is used to send the RTR message to CAN bus. Please refer to the CAN Data Send module for more information.

For example, when a sine wave generator connects to a CAN RTR Send module and outputs a sine wave with offset 0 and amplitude 5, the output curve is shown as the lower one. The upper curve shows the real output status of CAN RTR Send module. Only the +5 value of this sine wave can trigger the CAN RTR Send module to send a CAN RTR message.



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## 3.4 Help

Click this button to show the help information of DASyLab CAN driver. These help information is divided into five parts, Description of installation for DASyLab, ICP DAS-CAN Experiment Setup, ICP DAS-CAN Receive Module, ICP DAS-CAN RTR Receive Module, and ICP DAS-CAN Send Module. Users can use Help to know the DASyLab CAN driver information and operation methods.

## 3.5 About ICP DAS-CAN

There are some information about this DASyLab CAN driver in the About Window, such as driver version information, company information and so forth.



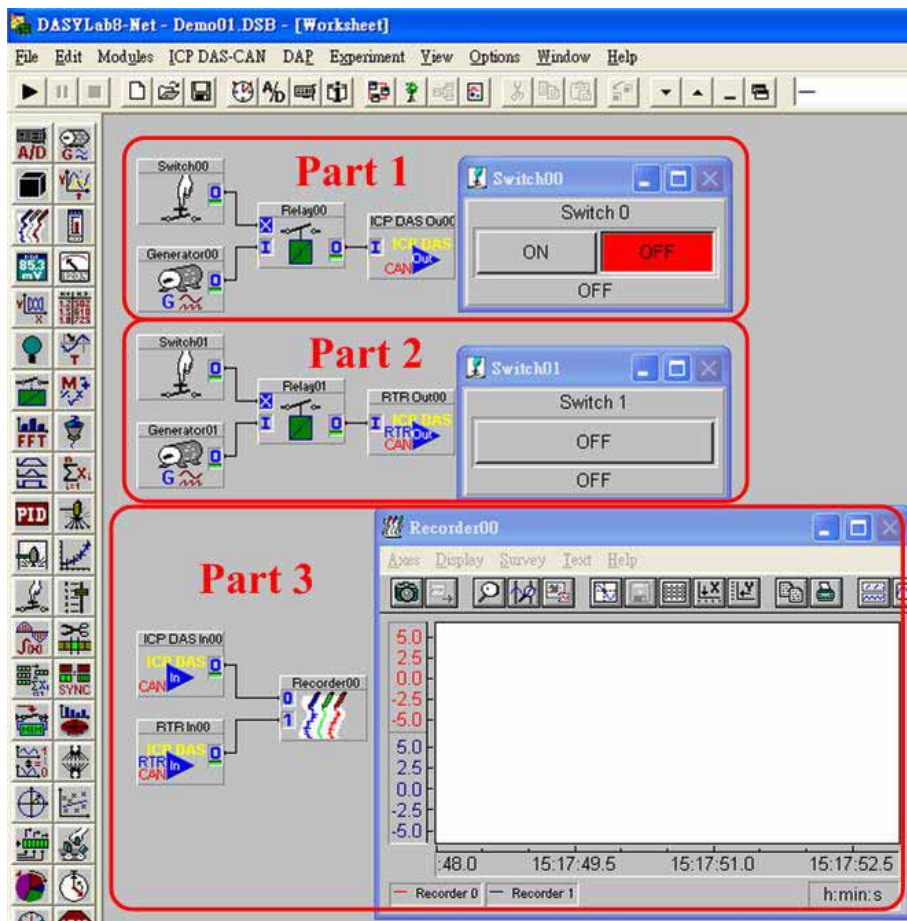
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## 4 Demo Program for Window

This section displays the demo program contours and the operation procedure for the demo programs. After installing the DASyLab CAN driver correctly, users can see the demo programs in the folder [DAQPro\PISO-CAN\DASyLab\\_CAN\Demo\](#). Here, a step-by-step demo procedure is given to demonstrate how to use the DASyLab CAN driver in DASyLab environment. In the following description, only one demo is displayed. If users want to check other demos, please refer to the demo folders in the demo path. Before using this demo, the CAN port 0, CAN port 1, and CAN port 2 of PCI CAN card need to connect with each other.

### 4.1 1xCAN\_1xRTR DASyLab Program of Demo

Start DASyLab and open the Demo01.DSB. There are three parts of this demo shown below.



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## Experiment Setup of ICP DAS-CAN:

First, open the experiment setup window to configure the DASyLab CAN driver as follow.

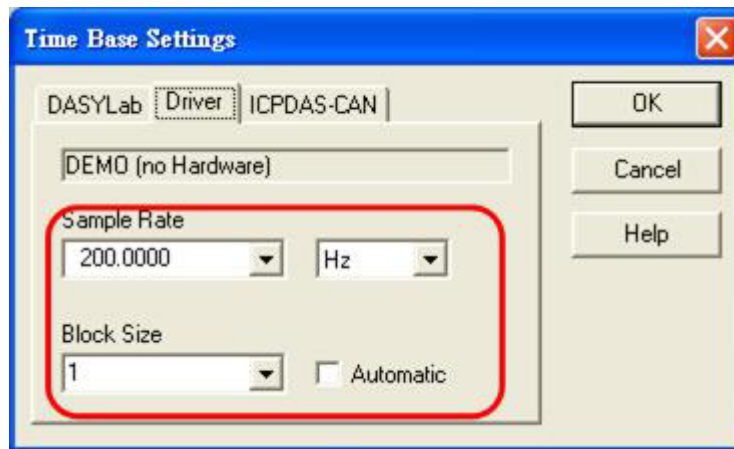


The sample rate of CAN receive frame is 200Hz, and the block size is 1. The baud rate of CAN0, CAN1, CAN2, and CAN3 are 500KBit.

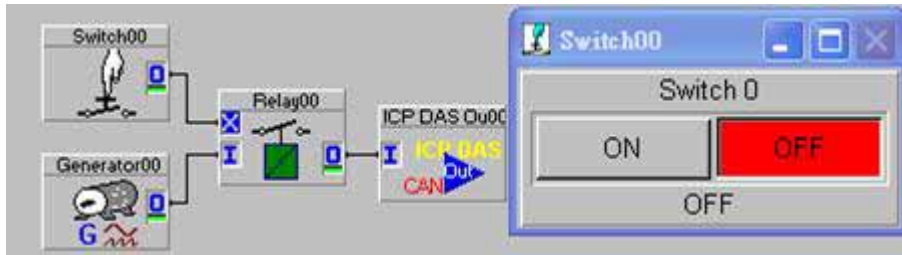


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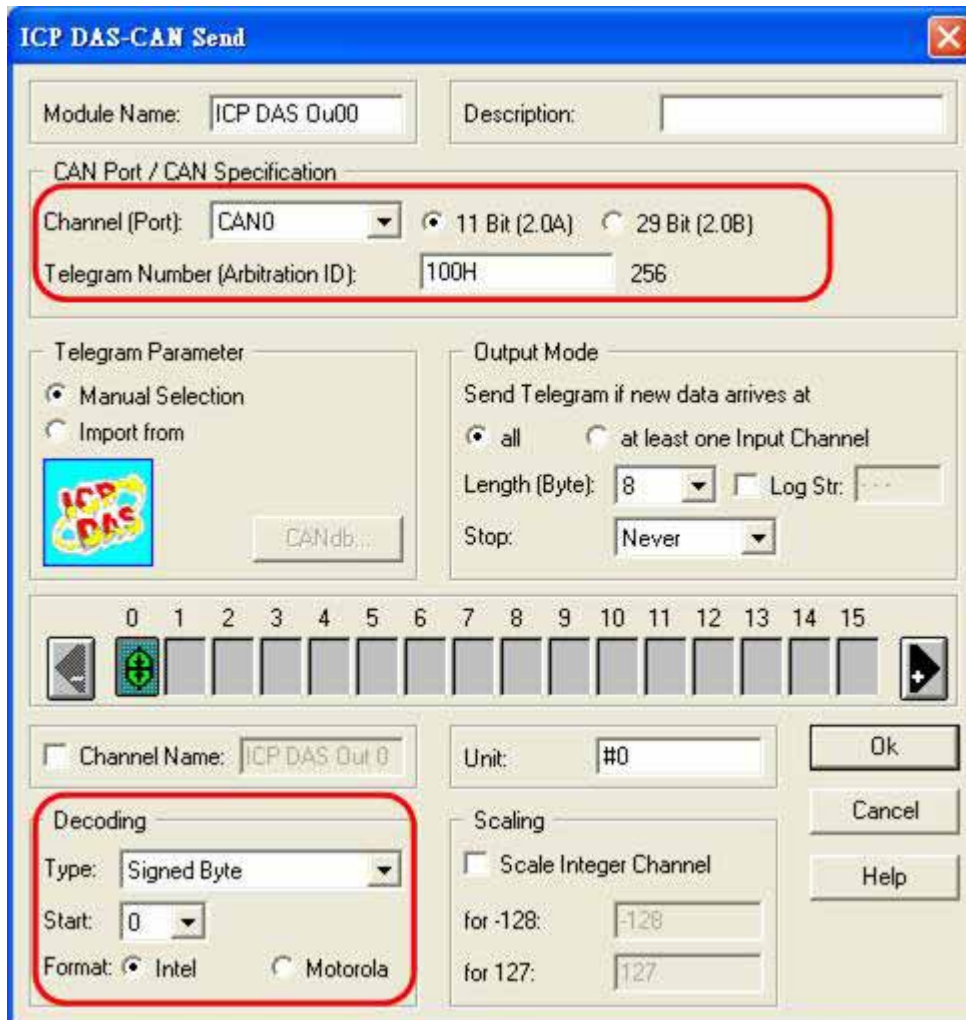
In the "Time Base Settings" window, the sample rate of "Driver" is 200Hz, and the block size is 1.



**Part 1:**

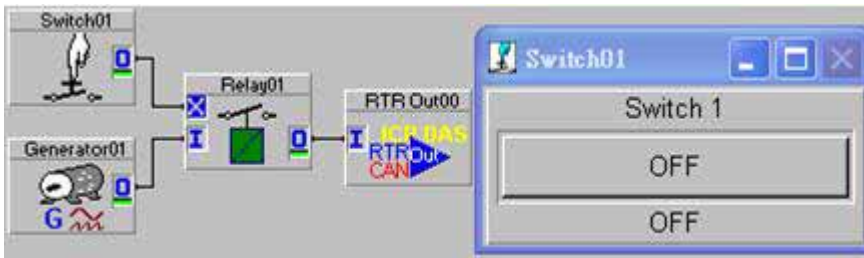


This is a "CAN Data Send" output structure. When push the "ON" button, the "CAN Data Send" module will start to send out data from CAN port 0. The CAN data is a sine wave with 4 produced from generator, and its arbitration id is 0x100. The following picture is the setting of CAN Data Send module.

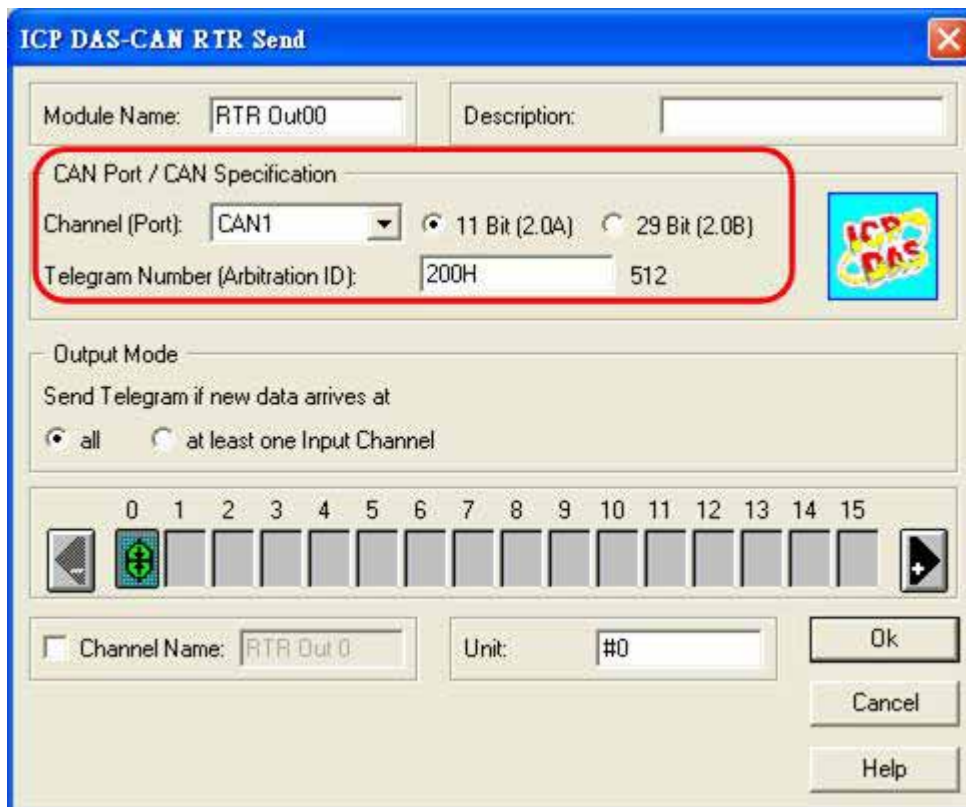




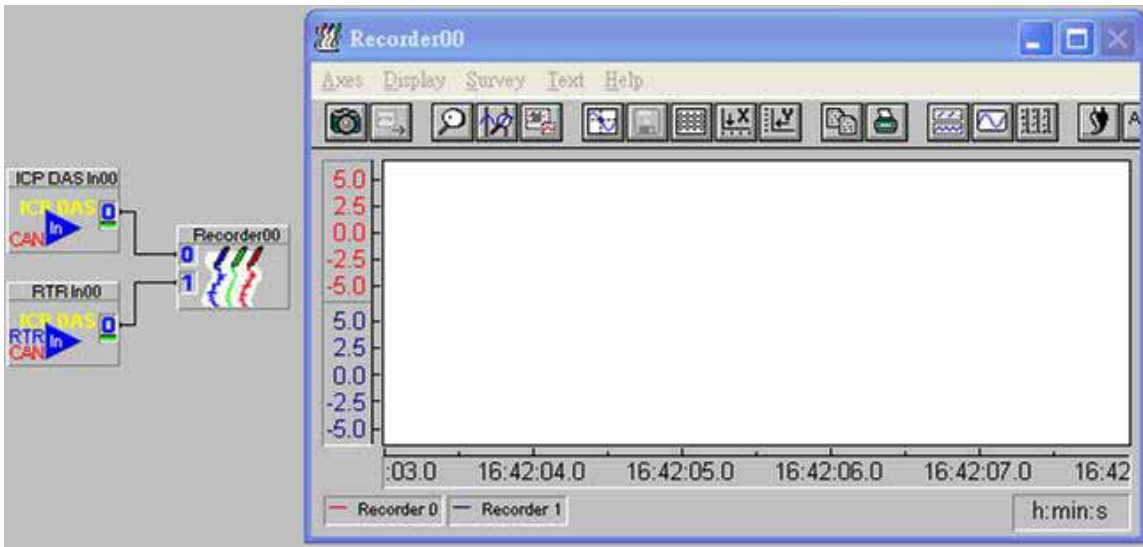
**Part 2:**



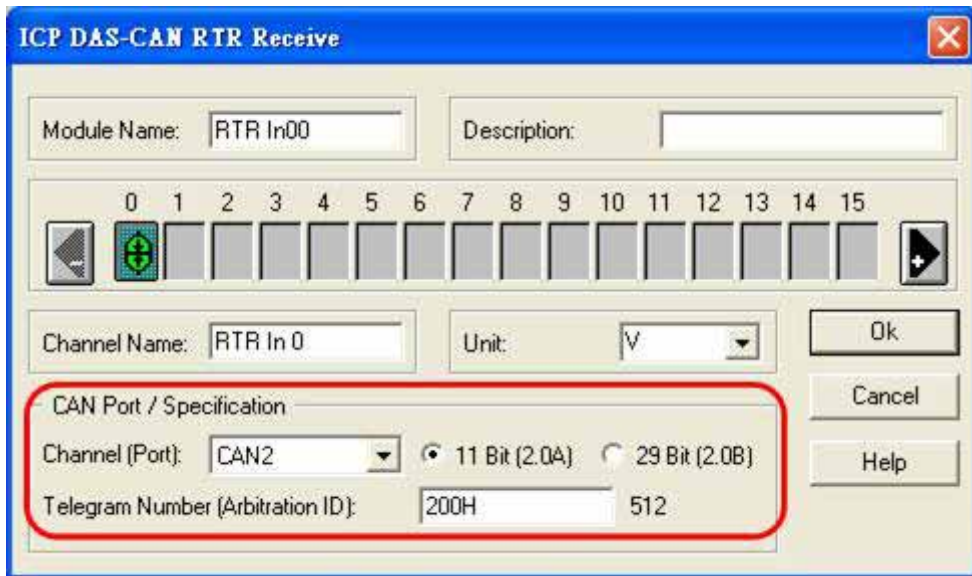
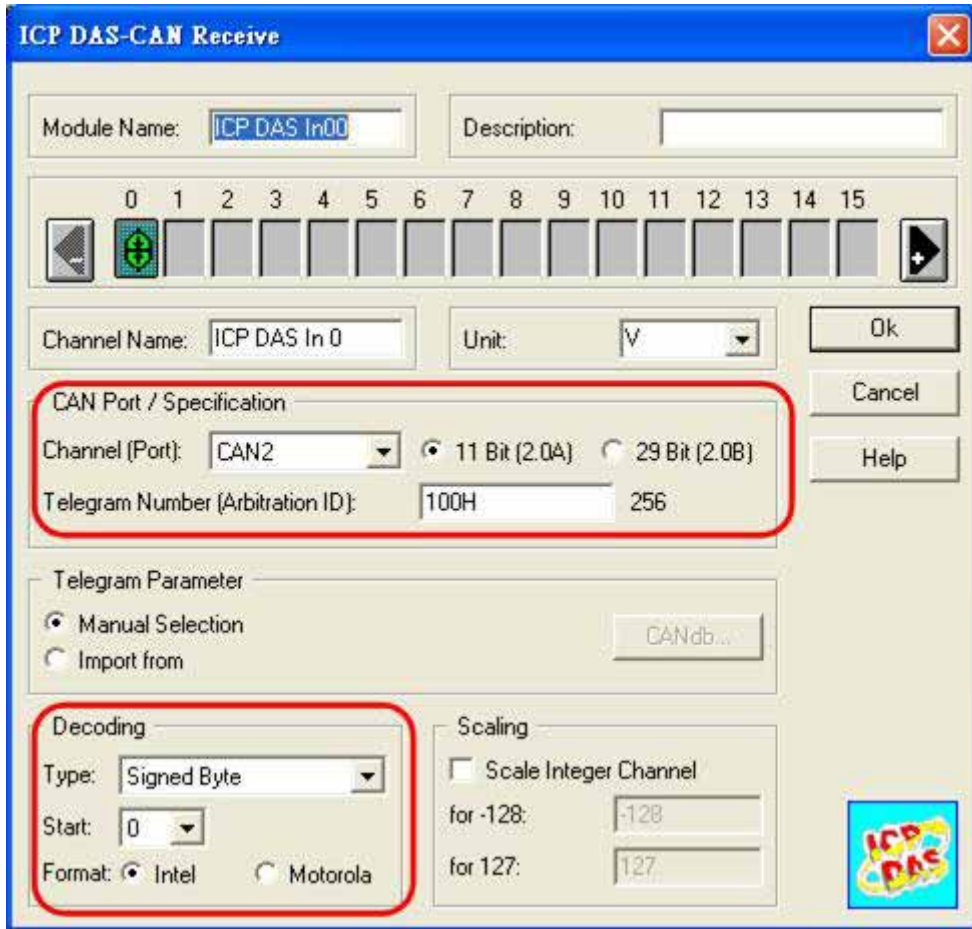
This is a "CAN RTR Send" output structure. In this structure, the generator is always output constant value 5 to RTR out module. When push the "One Shot Switch", the relay will be opened at a short time and the CAN RTR Send module will get a pulse with 5 amplitude, and send a CAN message to CAN port 1 with arbitration id 0x200. The following picture is the setting of CAN RTR Send module.



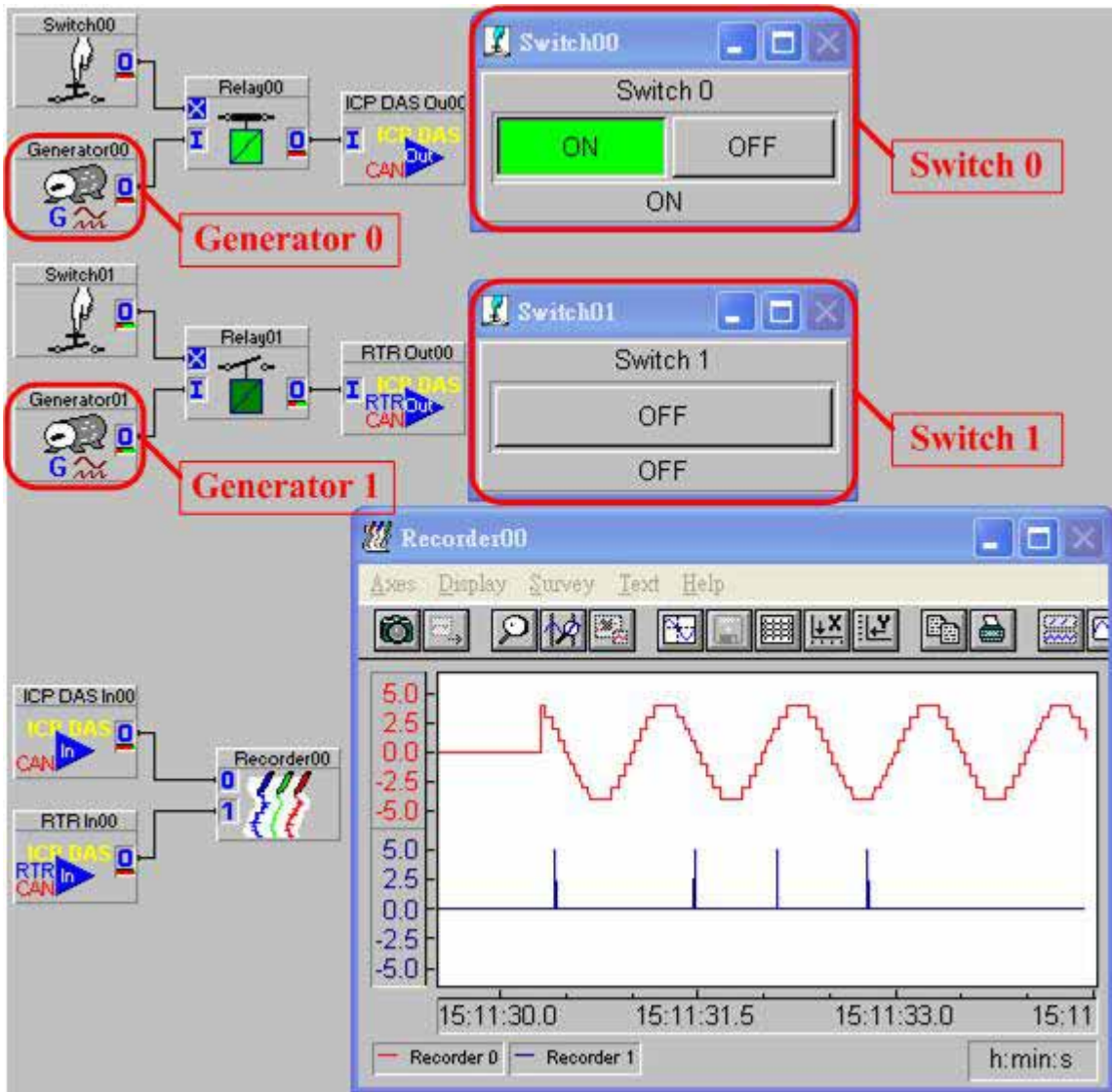
### Part 3:



There are two receive modules, CAN Data Receive and CAN RTR Receive, in this part. The arbitration id of CAN Data Receive module and CAN RTR Receive module is 0x100 and 0x200 respectively. If some CAN message is coming from CAN port 2 and its arbitration id is 0x100 or 0x200, it will be shown on the recorder. The settings of CAN Data Receive and CAN RTR Receive are as follows.



**Start to run the demo program:**



When running the demo, push the switch 0 to "ON" and the generator 0 will produce a 1Hz sine wave with 4 amplitude to CAN Data Send module. If user push the switch 1, the generator 1 will send a pulse with 5 amplitude to CAN RTR Send module. The CAN Data Receive module will receive the sine wave with id 0x100 and show the data by using red curve. The CAN RTR Receive module will receive these pulse with id 0x200 and show the data by using blue curve.