I-2534 & I-5534-M

Industrial 4-port CAN bus switch

User Manual

Warranty

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

Warning

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Revision

Version	Firmware Version	Date	Author	Description
1.2	1.1	2015 08/13	Ives	CAN-ID Mapping.
1.1	1.0	2012 09/14	Johney	Update errata.
1.0	1.0	2012 05/25	Johney	New release.

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1 Introduction

The I-2534 and I-5534-M are both CAN switch used to establish a connection among four CAN bus sub-networks. In order to solve the problem of the star topology within the CAN network, the I-2534 and I-5534-M are specially designed for integrating four CAN networks or solving the star topology. They are not only the same as CAN repeater, but also have more important features.

(1) Extends the CAN bus working distance.
(2) Connects four CAN sub-networks with the different baud rate.
(3) Enhances the capacity of CAN network.
(4) I-5534-M provides higher stability and reliability especially in harsh environment.

The limitation of the CAN bus transmission distance on each CAN port is independent, which means the total CAN network distance can be extended by the routing mechanism as the figure 1-1.

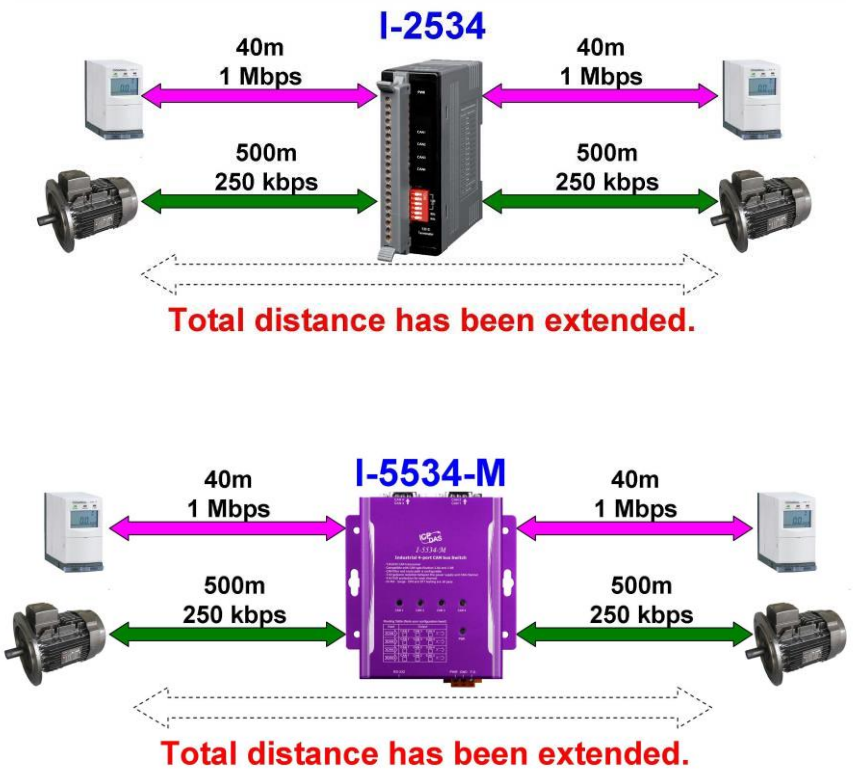


Figure 1-1**:** Application to extern the transmission distance

The I-2534 and I-5534-M could transfer the CAN messages among four independent CAN networks. When the CAN bus system on one port of the I-2534 or I-5534-M has some errors (e.g. short circuit), it will not affect the system on the other three ports. Besides, the I-2534 and I-5534-M both provide the message filters; this feature is useful while there are different bus loadings and baud rates on these CAN ports. The baud rate of four CAN ports can be different for highly flexibility as shown in the figure 1-2.

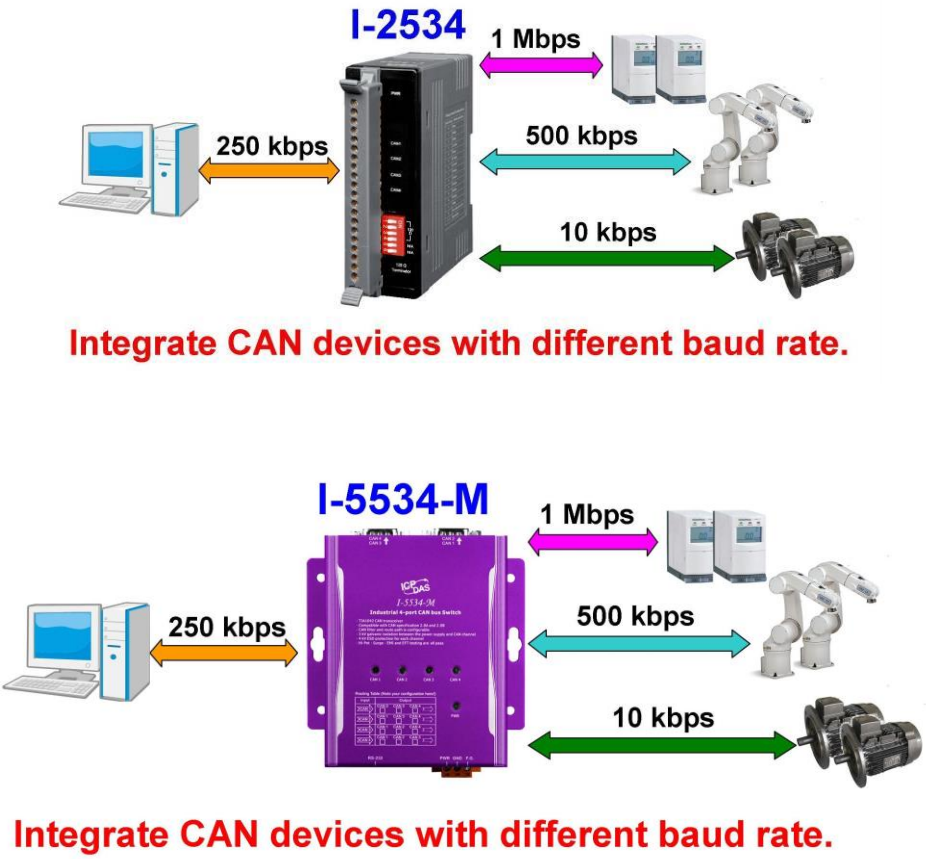


Figure1-2: Application to integrate the devices with the different baud rates.

The I-2534 and I-5534-M could combine the different CAN sub-networks, so it enhances the maximum capacity in the single CAN network. The application likes figure 1-3.

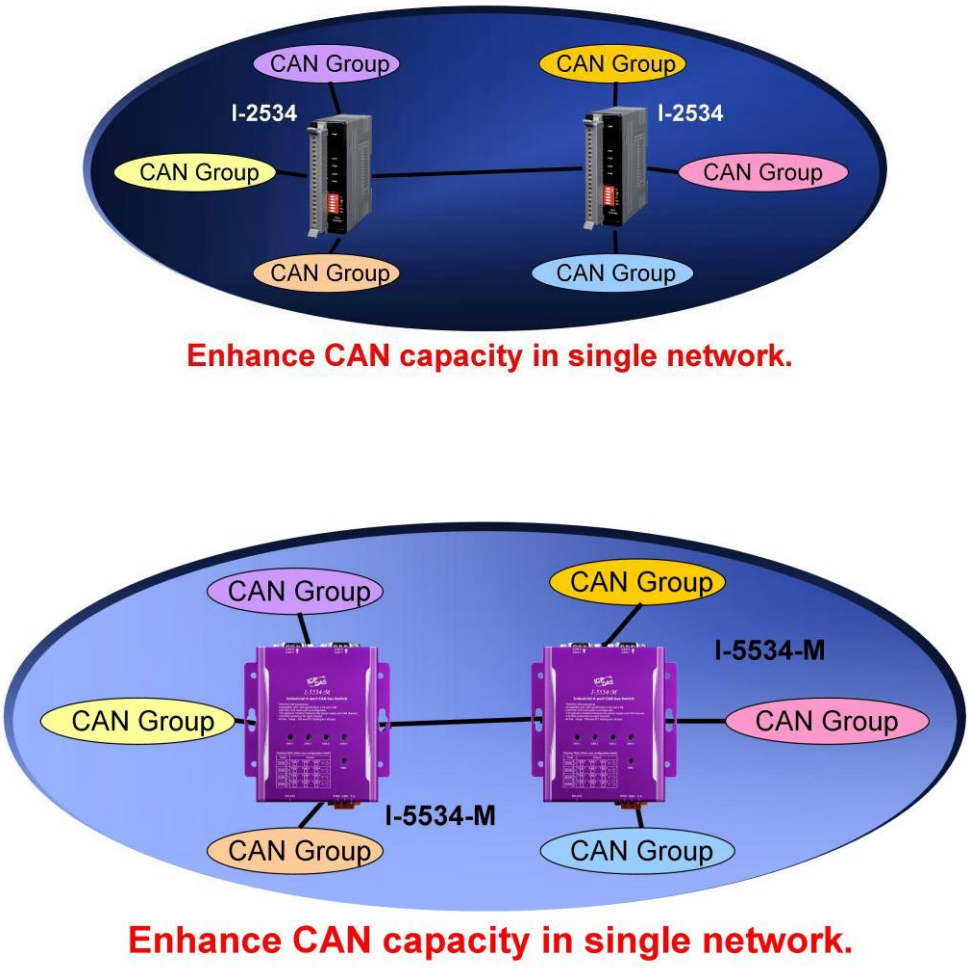


Figure1-3: Application to enhance the capacity of the CAN network.

1.1 Specifications

Module Name	I-2534	I-5534-M
CAN Interface		
Transceiver	NXP TJA1042	
Channel number	4	
Specification	ISO-11898-2, CAN 2.0A and CAN 2.0B	
Baud Rate (bps)	5k, 10 k, 20 k, 33.3 k, 50 k, 62.5 k, 83.3 k, 125 k, 250 k, 500 k, 800 k, 1 M bps and user-defined	
Baud Rate Selection	Selectable by rotary switch	
Isolation	3000 V_{DC} for DC-to-DC, 2500 Vrms for photo-couple	
Terminator Resistor	Selectable 120Ω terminator resistor by DIP switch	Selectable 120Ω terminator resistor by internal jump
CAN Connector	3-pin screwed terminal with CAN_L, CAN_H, CAN_GND	9-pin male D-Sub with CAN_GND, CAN_SHLD, CAN_H, CAN_L
CAN Filter	Configurable by user	
RS-232 Configuration Interface		
RS-232 Connector	3-pin screwed terminal block (TxD, RxD, GND)	9-pin female D-Sub with (TxD, RxD, GND)
Power		
Input range	Unregulated +10 ~ +30 VDC	
Consumption	3W	1.5W
Mechanism		
Installation	DIN-Rail	Wall-Mounting
Casing	Flame-Resistant plastic case	aluminum metallic case
Dimensions (W x L x H)	32.3 x 99 x 77.5 mm	116.5 x 127 x 61.3 mm
Environment		
Operating Temp.	-25 ~ 75 ℃	
Storage Temp.	-30 ~ 80 ℃	
Humidity	10 ~ 90% RH, non-condensing	
ESD protection	4 kV Contact for each channel	
EFT protection	500V for signal, 1000V for power	
EMI certification	30M ~ 1G pass	
Hi-pot protection	1kV pass	
Surge protection	1kV pass	

1.2 I-2534 & I-5534-M Features

- 4 CAN communication ports with screw terminal connector for I-2534 or with 9-Pin D-Sub connector for I-5534-M.
- Flame-Resistant plastic case (I-2534) or aluminum metallic case (I-5534-M).
- TJA1042 CAN transceiver.
- Compatible with CAN specification 2.0A and 2.0B.
- Fully compatible with the ISO 11898-2 standard.
- Baud rate : 5 k, 10 k, 20 k, 33.3 k, 50 k, 62.5 k, 83.3 k, 125 k, 250 k, 500 k, 800 k, 1 M bps and user-defined.
- Configurable CAN message filter.
- Configurable CAN message route path.
- Max. CAN-ID mapping data up to 32 for each CAN channel. (v1.10 firmware)
- 100-frame buffer for each CAN channel.
- Max data flow up to 2500 fps for total CAN channels.
- Selectable baud rate by the rotary switch.
- 120Ω terminator resistors selected by the DIP switch (I-2534) or by the jumper (I-5534-M).
- LED indication for the CAN status.
- Utility tool for the CAN filter, route path, user-defined rate and mapping CAN-ID(v1.10 firmware) configuration.
- 2500 Vrms isolation on the CAN side
- 3 kV galvanic isolation between the power supply and CAN channel
- 4 kV ESD protection for each CAN channel

1.3 Product Check List

The package of the I-2534 includes the following items:

- □ I-2534 module;
- □ Software CD ROM;
- □ Quick Start manual;
- □ Release Note

The package of the I-5534-M includes the following items:

- □ I-5534-M module;
- □ Software CD ROM;
- □ Quick Start manual;
- □ Release Note

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

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

2 Technical data

2.1 Block Diagram

The figure 2-1 is the block diagram illustrating the functions of the I-2534 and I-5534-M module.

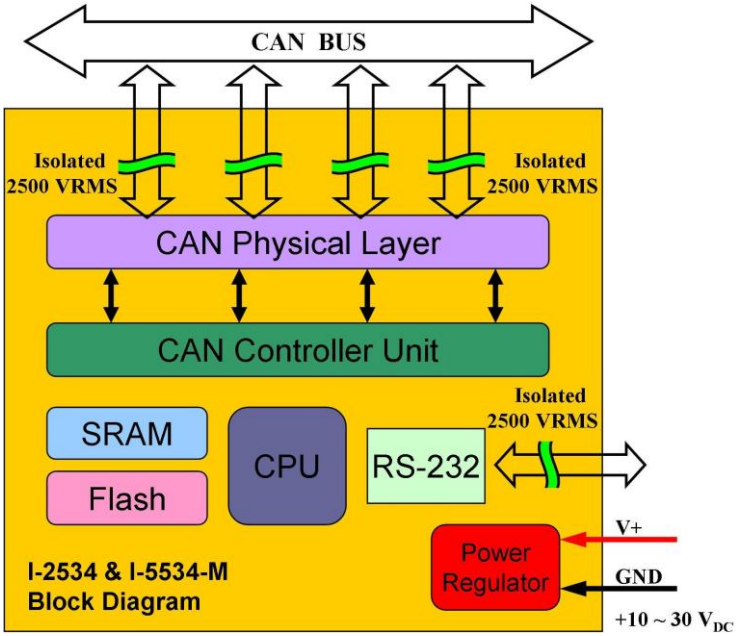


Figure 2-1 Block Diagram of the I-2534 & I-5534-M

2.2 CAN bus Pin Assignment of the I-2534

The figure 2-2 illustrates the CAN bus pins.

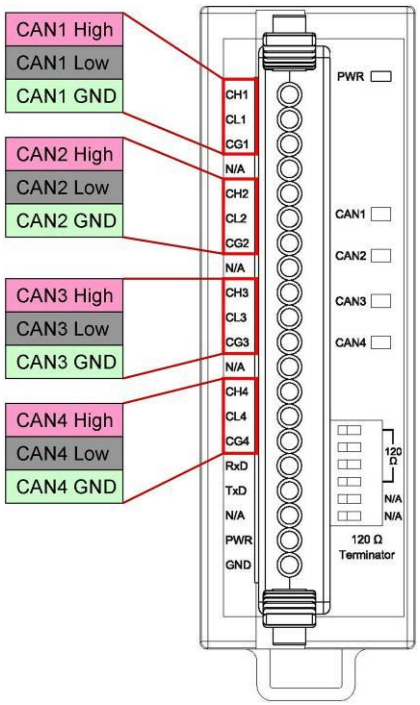


Figure 2-2 CAN bus pins of the I-2534

Name	Port	Description
CH1	1	CAN_High, signal line of CAN port.
CL1		CAN_Low, signal line of CAN port.
CG1		CAN_Ground, ground voltage level of CAN port.
CH2	2	CAN_High, signal line of CAN port.
CL2		CAN_Low, signal line of CAN port.
CG2		CAN_Ground, ground voltage level of CAN port.
CH3	3	CAN_High, signal line of CAN port.
CL3		CAN_Low, signal line of CAN port.
CG3		CAN_Ground, ground voltage level of CAN port.
CH4	4	CAN_High, signal line of CAN port.
CL4		CAN_Low, signal line of CAN port.
CG4		CAN_Ground, ground voltage level of CAN port.

2.3 CAN bus Pin Assignment of the I-5534-M

The figure 2-3 illustrates the CAN bus pins.

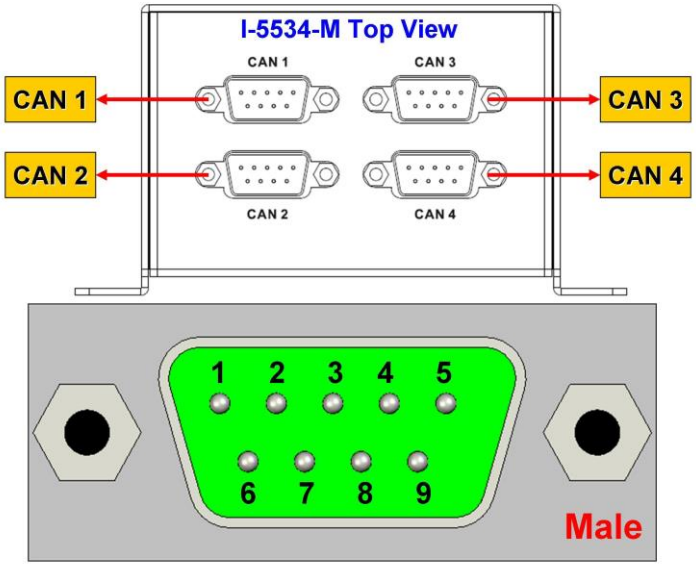


Figure 2-3 CAN bus pins of the I-5534-M

Port	Pin	Description
CAN1	2	CAN_Low, signal line of CAN port.
	3	CAN_Ground, ground voltage level of CAN port.
	5	CAN_Shield which connected to the F.G.
	7	CAN_High, signal line of CAN port.
CAN2	2	CAN_Low, signal line of CAN port.
	3	CAN_Ground, ground voltage level of CAN port.
	5	CAN_Shield which connected to the F.G.
	7	CAN_High, signal line of CAN port.
CAN3	2	CAN_Low, signal line of CAN port.
	3	CAN_Ground, ground voltage level of CAN port.
	5	CAN_Shield which connected to the F.G.
	7	CAN_High, signal line of CAN port.
CAN4	2	CAN_Low, signal line of CAN port.
	3	CAN_Ground, ground voltage level of CAN port.
	5	CAN_Shield which connected to the F.G.
	7	CAN_High, signal line of CAN port.

2.4 Power & RS-232 Pin Assignment of the I-2534

The figure 2-4 shows the pin assignment of the power and the RS-232 port. Take a note that the GND pin of the RS-232 port and CAN 4 share one GND pin.

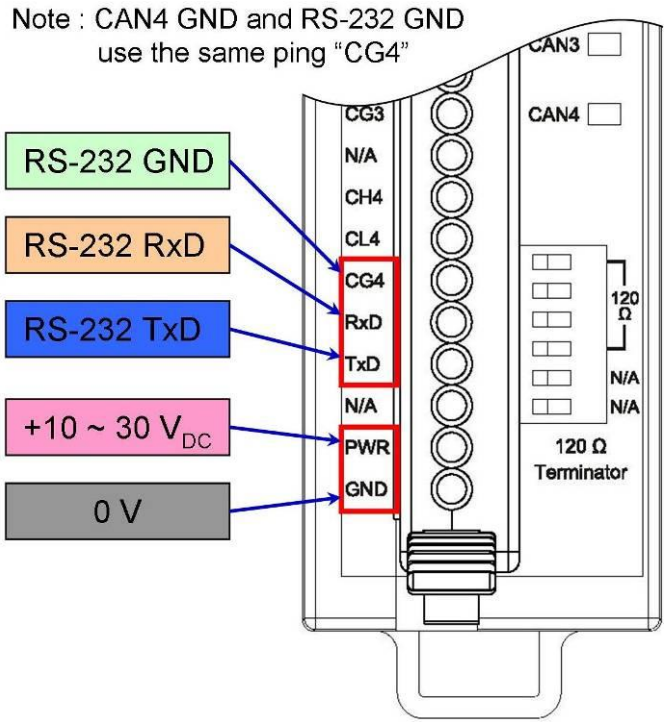


Figure 2-4 RS-232 and Power pin assignment of the I-2534

Name	Description
TxD	TXD pin of RS-232 port.
RxD	RXD pin of RS-232 port.
CG4(GND)	SG (or GND) pin of RS-232 port. CAN4 GND and RS-232 GND use the same pin "CG4".

Name	Description
PWR	Voltage Source Input. +10V_{DC} ~ +30V_{DC}.
GND	Power Ground.

2.5 Power & RS-232 Pin Assignment of the I-5534-M

The figure 2-5 shows the pin assignment of the power and the RS-232 port.

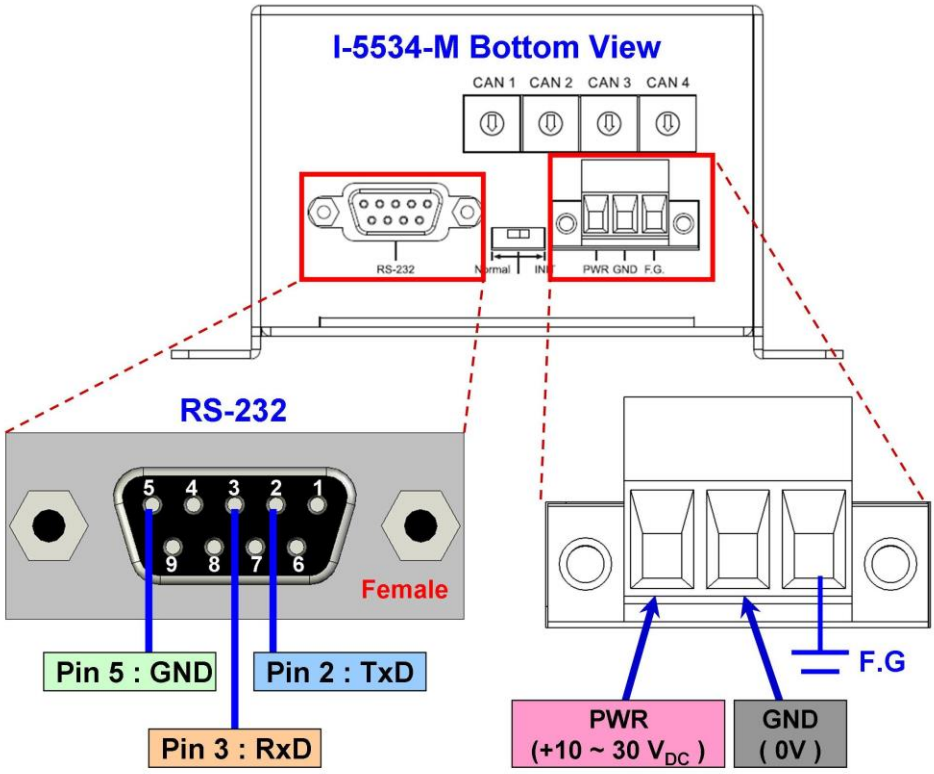


Figure 2-5 RS-232 and Power pin assignment of the I-5534-M

Name	Description
TxD	RS-232 TXD pin of the I-5534-M. Connect to PC's RxD pin.
RxD	RS-232 RXD pin of the I-5534-M. Connect to PC's TxD pin.
GND	RS-232 GND pin of the I-5534-M. Connect to PC's GND pin.

Name	Description
PWR	Voltage Source Input. +10V_{DC} ~ +30V_{DC}.
GND	Power Ground.
F.G	Frame Ground.

2.6 LED Indicator of the I-2534

The figure 2-6 shows the names and statuses of the LEDs.

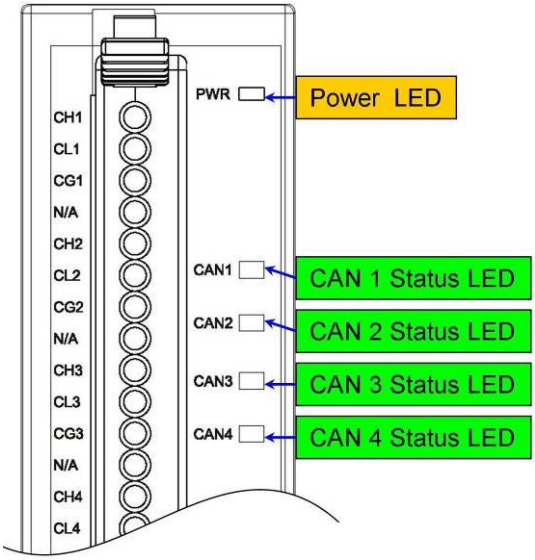


Figure 2-6 CAN LED and Power LED of the I-2534

LED Name	LED Color	Description
PWR LED	OFF	The I-2534 has no power.
	RED	The I-2534 has power.

LED Name	LED Color	CAN Status Description
CAN1 CAN2 CAN3 CAN4	OFF	The CAN port doesn't transmit or receive message now.
	GREEN	The CAN port is transmitting or receiving message now.
	RED	The CAN port have some errors when transmitting message.

Note: In the initial mode, the CAN1 ~ CAN4 LEDs will be all twinkled once per second.

2.7 LED Indicator of the I-5534-M

The figure 2-7 shows the LED name and its status.

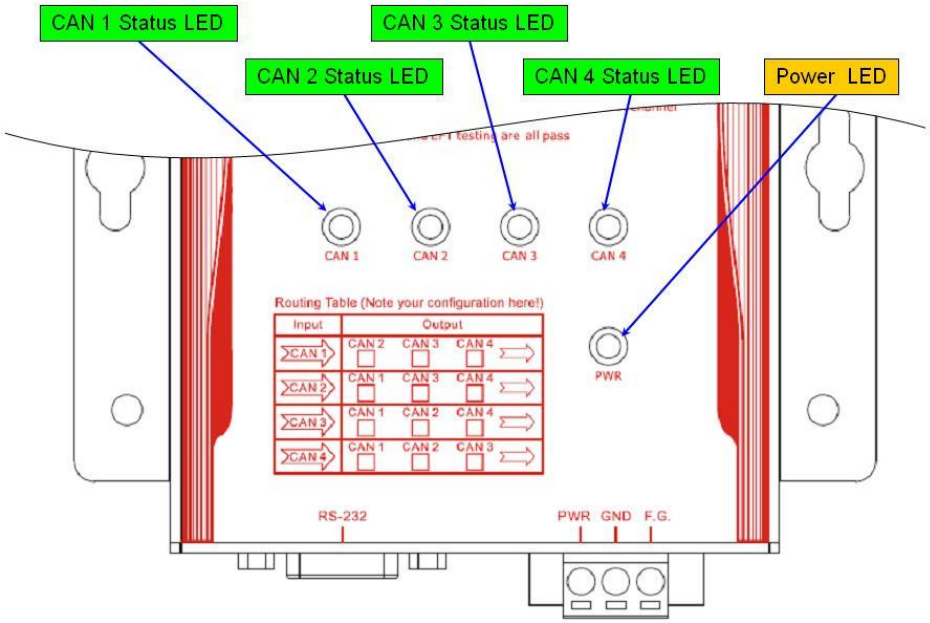


Figure 2-7 CAN LED and Power LED of the I-5534-M

LED Name	LED Color	Description
PWR LED	OFF	The I-5534-M has no power source.
	RED	The I-5534-M has power.

LED Name	LED Color	CAN Status Description
CAN1 CAN2 CAN3 CAN4	OFF	The CAN port doesn't transmit or receive message now.
	GREEN	The CAN port is transmitting or receiving message now.
	RED	The CAN port have some errors when transmitting message.

Note: In the initial mode, the CAN1 ~ CAN4 LEDs will be all twinkled once per second.

2.8 Terminal Resistors to the I-2534

Each CAN port of the I-2534 includes one built-in 120Ω terminal resistor, users can decide whether it is enable or not. The DIP switch for terminal resistor is shown in the figure 2-8.

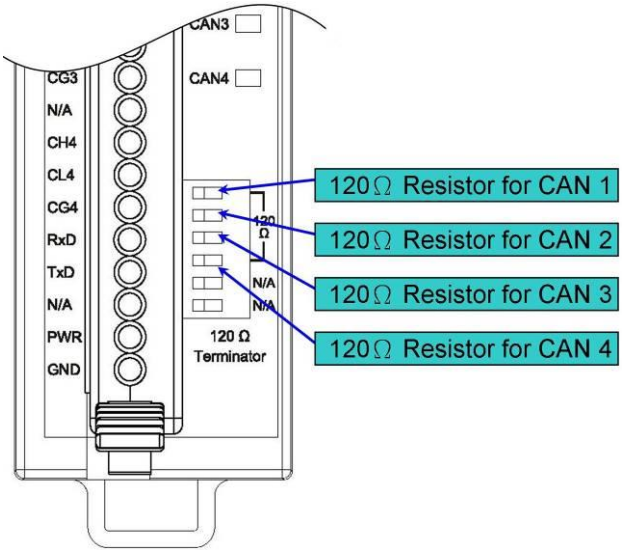


Figure 2-8 120Ω terminal resistors of the I-2534

DIP No.	Switch status	CAN bus resistor status
1	ON	CAN 1 with 120Ω terminal resistor.
	OFF	CAN 1 without terminal resister.
2	ON	CAN 2 with 120Ω terminal resister.
	OFF	CAN 2 without terminal resister.
3	ON	CAN 3 with 120Ω terminal resister.
	OFF	CAN 3 without terminal resister.
4	ON	CAN 4 with 120Ω terminal resister.
	OFF	CAN 4 without terminal resister.
5	N/A	Not Available
6	N/A	Not Available

2.9 Terminal Resistor to the I-5534-M

Each CAN port of the I-5534-M includes one built-in 120Ω terminal resistor, users can decide whether it is enable or not. After removing the upper cover, the jumpers of the terminal resistors are shown in the figure 2-9 and figure 2-10.

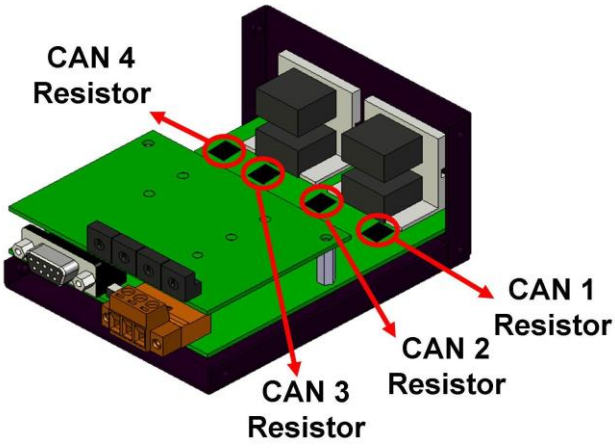


Figure 2-9 120Ω terminal resistors of the I-5534-M

Jump No.	CAN bus120Ω resistor
JP3	CAN 1 terminal resistor.
JP4	CAN 2 terminal resistor.
JP5	CAN 3 terminal resistor.
JP6	CAN 4 terminal resistor.

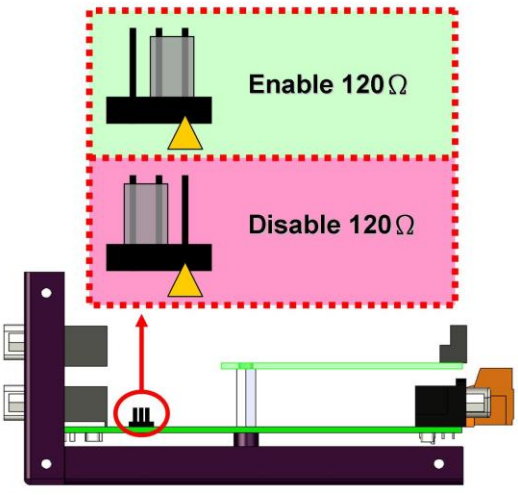


Figure 2-10 Enable / Disable 120Ω terminal resistors of the I-5534-M

In order to reduce the reflection effects on the CAN bus line, the CAN bus line has to be terminated at both ends by two terminator resistors. According to the ISO 11898-2 spec, each terminator resistor is 120Ω (or between 108Ω~132Ω). The bus topology and the positions of these terminator resistors are shown as the figure 2-11.

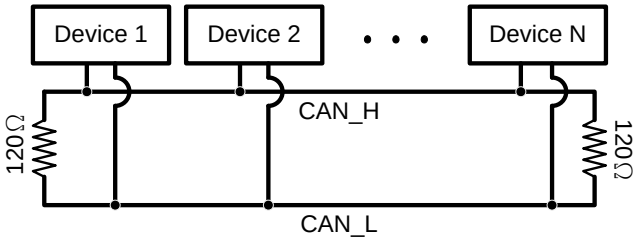


Figure 2-11 120Ω terminal resistor position

Generally, if your application is as the figure 2-12, we recommend you to enable the terminator resistor.

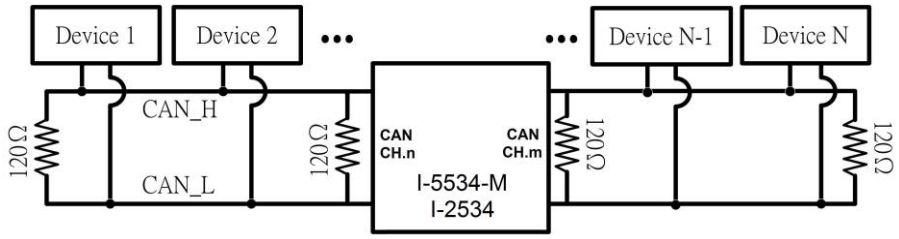


Figure 2-12 Enable the 120Ω terminal resistors of the I-2534 / I-5534-M

If your application is like the structure as the figure 2-13, the terminator resistor is not needed.

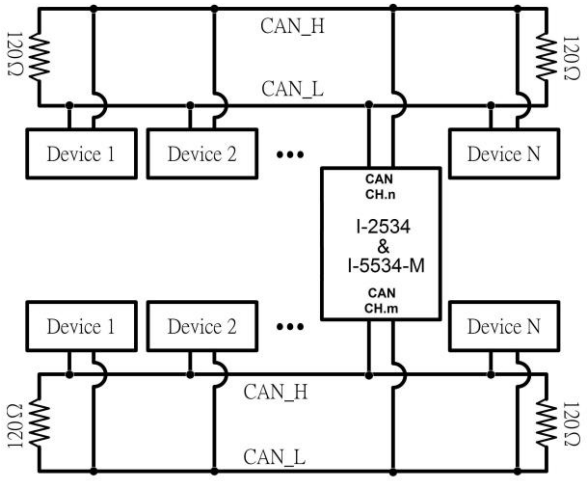


Figure 2-13 Disable the 120Ω terminal resistors of the I-2534 / I-5534-M

2.10 Rotary Switch & CAN Baud Rate of the I-2534

The figure 2-14 illustrates where to set the CAN bus baud rate of four CAN ports in the I-2534 module.

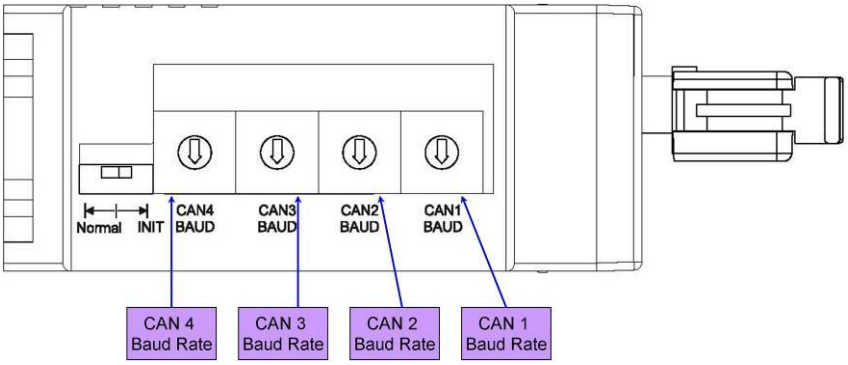


Figure 2-14 CAN baud rate configuration

Switch Value	CAN bus Baud Rate
0	5 kbps
1	10 kbps
2	20 kbps
3	33.3 kbps
4	50 kbps
5	62.5 kbps
6	83.3 kbps
7	100 kbps
8	125 kbps
9	250 kbps
A	500 kbps
B	800 kbps
C	1 Mbps
D	User-defined baud rate.
E~F	Not available

2.11 Rotary Switch & CAN Baud Rate of the I-5534-M

The figure 2-15 illustrates where to set the CAN bus baud rate of four CAN ports in the I-5534-M module.

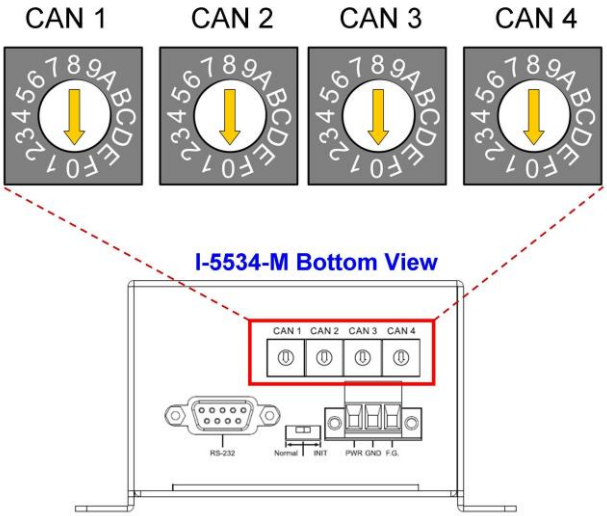


Figure 2-15 CAN baud rate configuration

Switch Value	CAN bus Baud Rate
0	5 kbps
1	10 kbps
2	20 kbps
3	33.3 kbps
4	50 kbps
5	62.5 kbps
6	83.3 kbps
7	100 kbps
8	125 kbps
9	250 kbps
A	500 kbps
B	800 kbps
C	1 Mbps
D	User-defined baud rate.
E~F	Not available

2.12 Normal / Initial Mode Switch of the I-2534

The figure 2-16 illustrates the mode of the I-2534 module. In general usage, users should take care about the position of this switch.

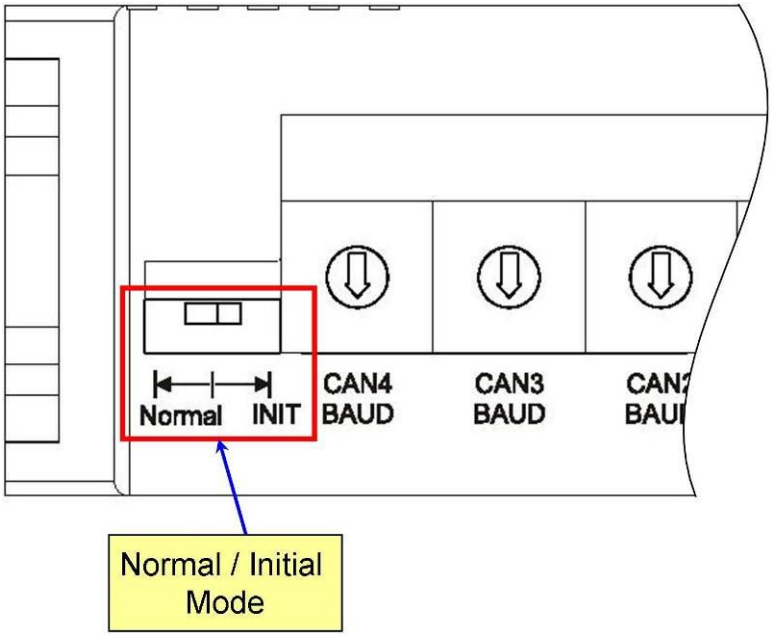


Figure 2-16 Operation Mode of the I-2534 module

Mode Name	The I-2534 Status Description
Normal	The I-2534 is in the normal mode.
Initial	The I-2534 is in the configurable status. Users could use the “I2534_Utility” to configure the route path, CAN filter or user-defined CAN baud rate. In the initial mode, the CAN1 LED ~ CAN4 LED will be all twinkled once per second.

2.13 Normal / Initial Mode Switch of the I-5534-M

The figure 2-17 illustrates the mode of the I-5534-M module. In general usage, users should take care about the position of this switch.

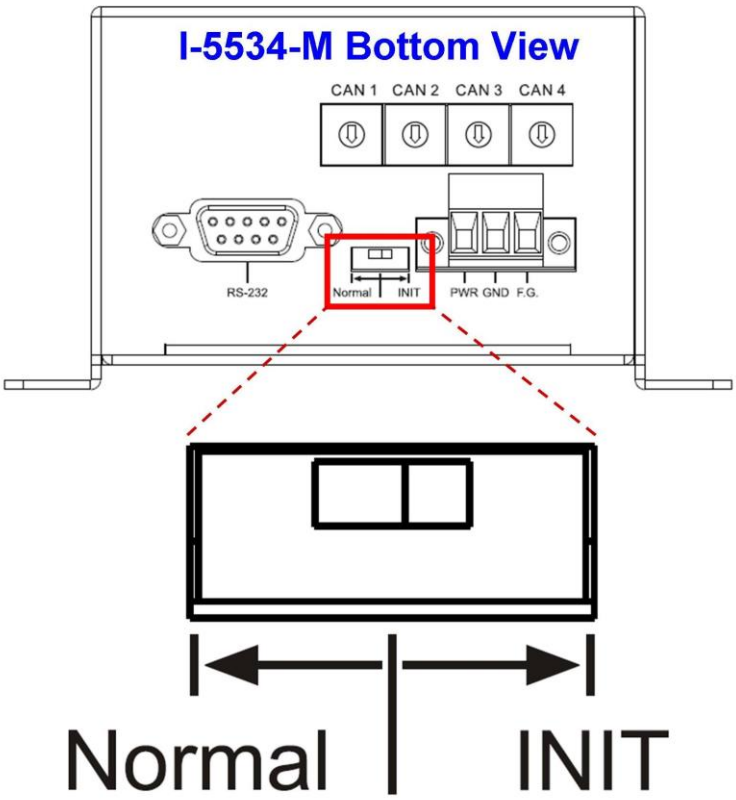


Figure 2-17 Operation Mode of the I-5534-M module

Mode Name	The I-5534-M Status Description
Normal	The I-5534-M is in the normal mode.
Initial	The I-2534 is in the configurable status. Users could use the “I2534_Utility” to configure the route path, CAN filter or user-defined CAN baud rate. In the initial mode, the CAN1 LED ~ CAN4 LED will be all twinkled once per second.

2.14 CAN bus Wire Connection of the I-2534

The CAN bus wire connection of the I-2534 is displayed in the figure 2-18.

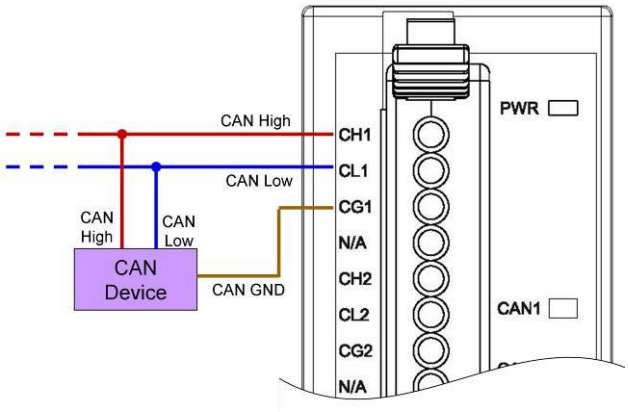


Figure 2-18 CAN bus wire connection with the I-2534 module

The I-2534 has a metallic board attached to the back of the plastic frame. When users mount the I-2534 onto a metal DIN-Rail, users can connect the DIN-Rail to Earth Ground. The figure 2-19 shows the detail.

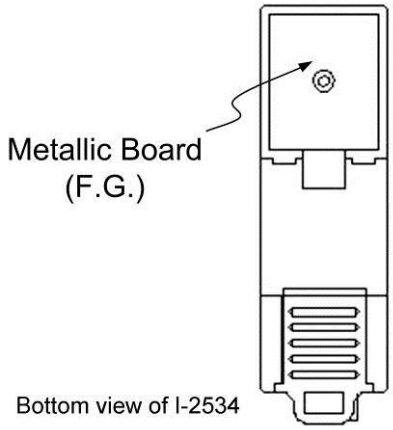


Figure 2-19 Metallic Board at Back of the I-2534

2.15 CAN bus Wire Connection of the I-5534-M

The CAN bus wire connection of the I-5534-M is displayed in the figure 2-20.

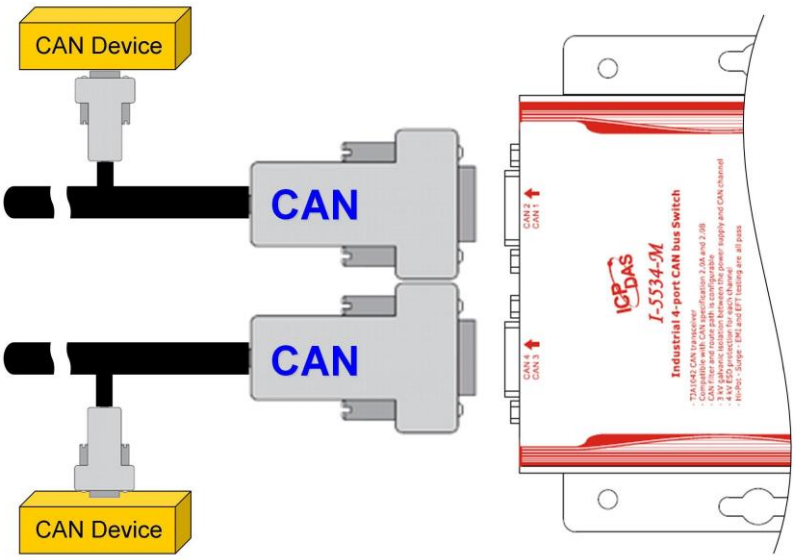


Figure 2-20 CAN bus wire connection with the I-5534-M module

3 Network Deployment

3.1 Driving Capability

Before introducing the driving capability of the I-2534 or I-5534-M, some characteristics of copper cable must be assumed. The AC parameters are 120Ω impedance and 5 ns/m line delay, and the DC parameter follows the table shown below.

Table 3-1 Recommended DC parameters for CAN Bus Line

Wire Cross-Section [mm^2]	Resistance [Ω/km]
~0.25 (AWG23)	< 90
~0.5 (AWG20)	< 50
~0.8 (AWG18)	< 33
~1.3 (AWG16)	< 20

Under the conditions described above, users can refer to the following table to know the maximum node numbers in each segment and the maximum segment length when using different type of wire.

Table 3-2 Driving Capability

Wire Cross-Section [mm2]	The maximum segment length [m] under the case of specific node number in this segment			
	16 Nodes	32 Nodes	64 Nodes	100 Nodes
~0.25 (AWG23)	< 220	< 200	< 170	< 150
~0.5 (AWG20)	< 390	< 360	< 310	< 270
~0.8 (AWG18)	< 590	< 550	< 470	< 410
~1.3 (AWG16)	< 980	< 900	< 780	< 670

3.2 Star / Tree Topology

In general, users use the daisy-chain method to connect all CAN devices in their applications. In some cases, the “Star” or “Tree” topology may be needed. The I-2534 or I-5534-M which has four independent CAN ports could solve the topology problem of the CAN network. The figure 3-1 shows the CAN network with “Star” topology and the figure 3-2 illustrates “Tree” topology.

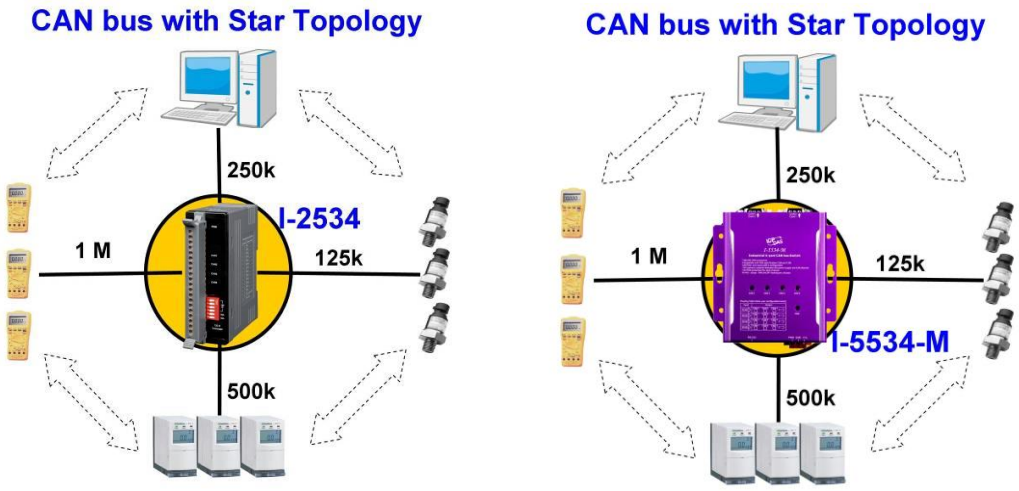


Figure 3-1 Star topology with the I-2534 & I-5534-M

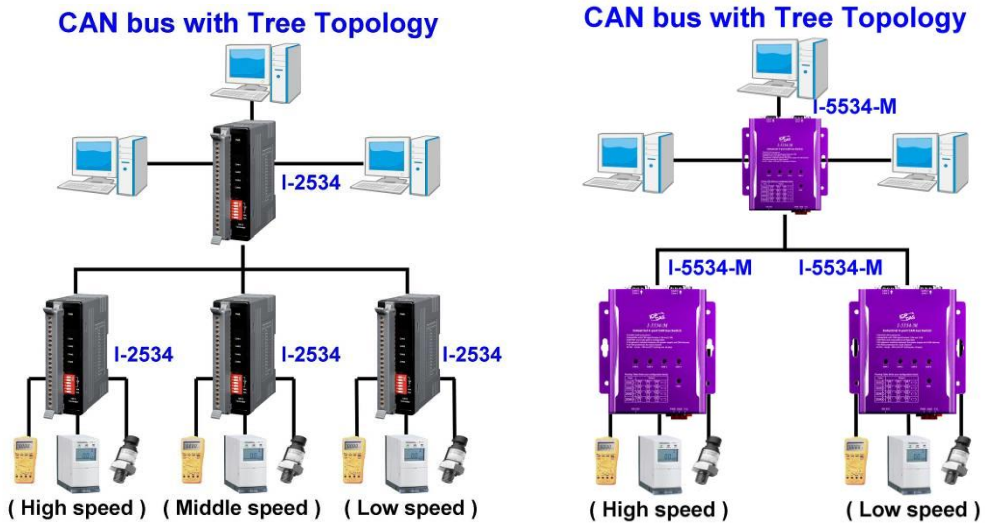


Figure 3-2 Tree topology with the I-2534 and I-5534-M

3.3 I2534_I5534M Utility Tool & RS-232 Cable

The I2534_I5534M utility tool can be free downloaded from the following web site or get it in the product CD :

CD ->path:CAN\Converter\i-2534_and_i-5534-m\
Web->
http://www.icpdas.com/root/product/solutions/industrial_communication/fieldbus/can_bus/repeater/i-2534_i-5534-m.html

After getting the utility tool, please follow the following steps to set up the communication between the utility and the I-2534 or I-5534-M.

Step0: Power off the I-2534 or I-5534-M.

Step1: Set the Normal / Initial mode switch to the “INIT” position. The figure 3-3 and 3-4 show the detail.

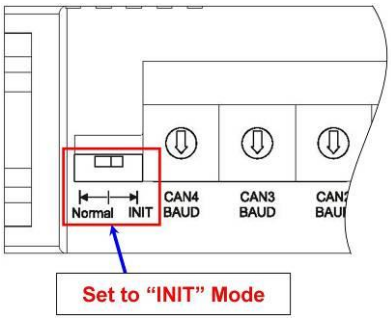


Figure 3-3 Set the I-2534 into the initial mode

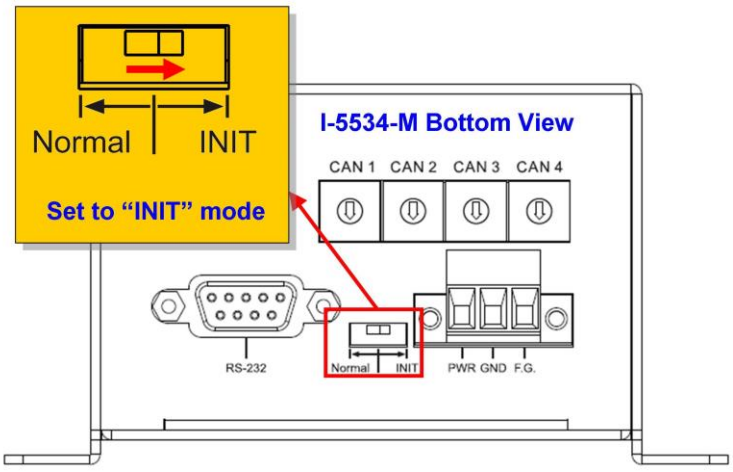


Figure 3-4 Set the I-5534-M into the initial mode

Step2: Connect the PC available COM port with the COM port of the I-2534 or I-5534-M. When connecting to the COM port of the I-2534, the TxD pin of the cable is connected to the TxD pin of the I-2534, RxD pin of the cable is connected to the RxD pin of the I-2534, and GND pin of the cable is connected to the CG4 pin of the I-2534. The figure 3-5 and 3-6 illustrates the detail.

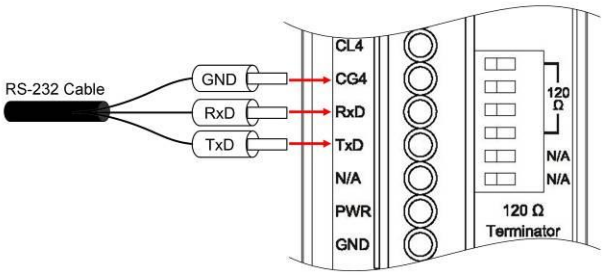


Figure 3-5 RS-232 wire connection of the I-2534

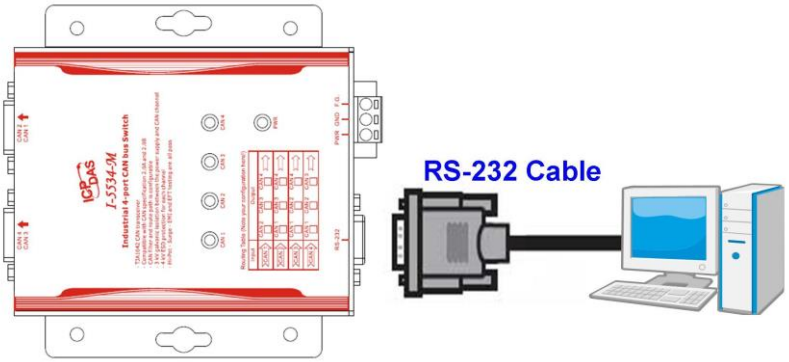


Figure 3-6 RS-232 wire connection of the I-5534-M

Step3: Power on the I-2534 or I-5534-M. Then, the CAN 1~ CAN 4 LEDs are all twinkled once per second.

Step4: Execute the I2534_I5534M_Utility.exe.

3.4 Route Path Configuration

The I-2534 or I-5534-M is an intelligent CAN bus switch module. Users could configure the route path of each CAN port. The route path could be imaged as pipe line. Users could configure where the pipe line connects to in different applications. The figure 3-7 illustrates the abstract idea.

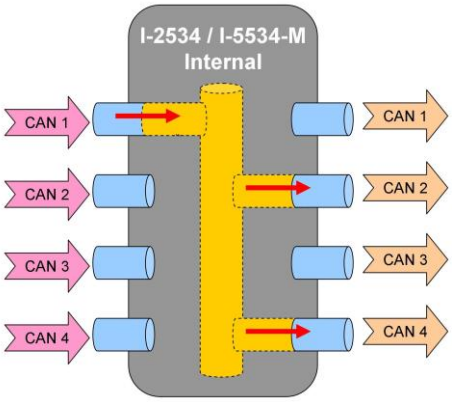
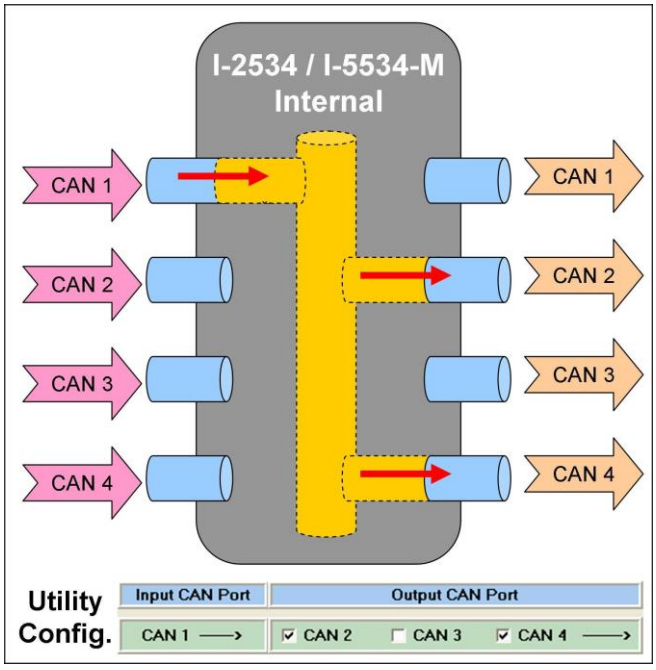
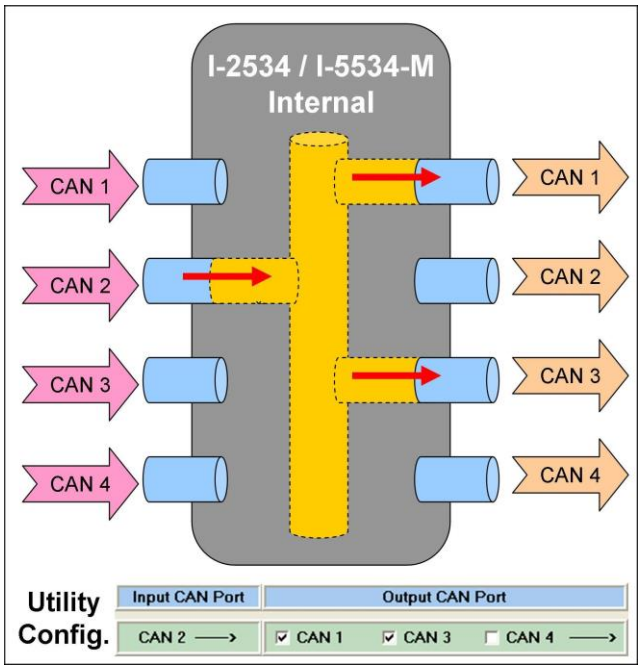


Figure 3-7 Abstract idea of the route path within the I-2534 or I-5534-M

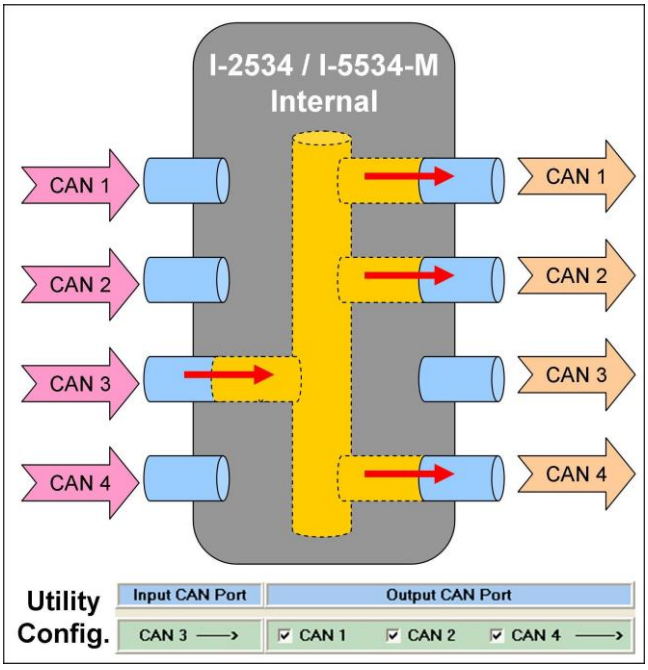
The figure 3-7 illustrates that the CAN message from CAN port 1 transfers to CAN port 2 and CAN port 4. Users could configure each CAN port by the “I2534_I5534M_Utility”. Take a look at an example. We assume that users want the follow setting.



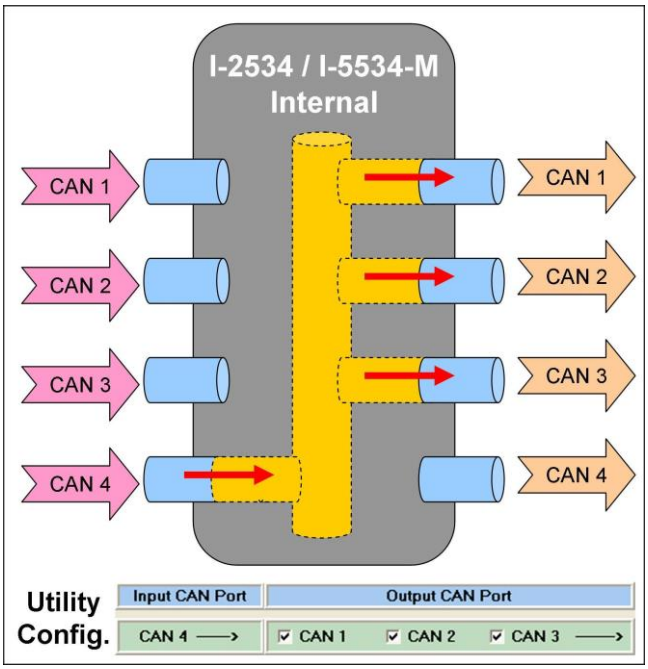
CAN 1


I-2534 / I-5534-M
Internal
CAN 1
CAN 2
CAN 3
CAN 4
CAN 1
CAN 2
CAN 3
CAN 4
Utility
Config.
Input CAN Port
Output CAN Port
CAN 2
CAN 1
CAN 3
CAN 4

CAN 2


I-2534 / I-5534-M
Internal
CAN 1
CAN 2
CAN 3
CAN 4
CAN 1
CAN 2
CAN 3
CAN 4
Utility
Config.
Input CAN Port
Output CAN Port
CAN 3
CAN 1
CAN 2
CAN 4

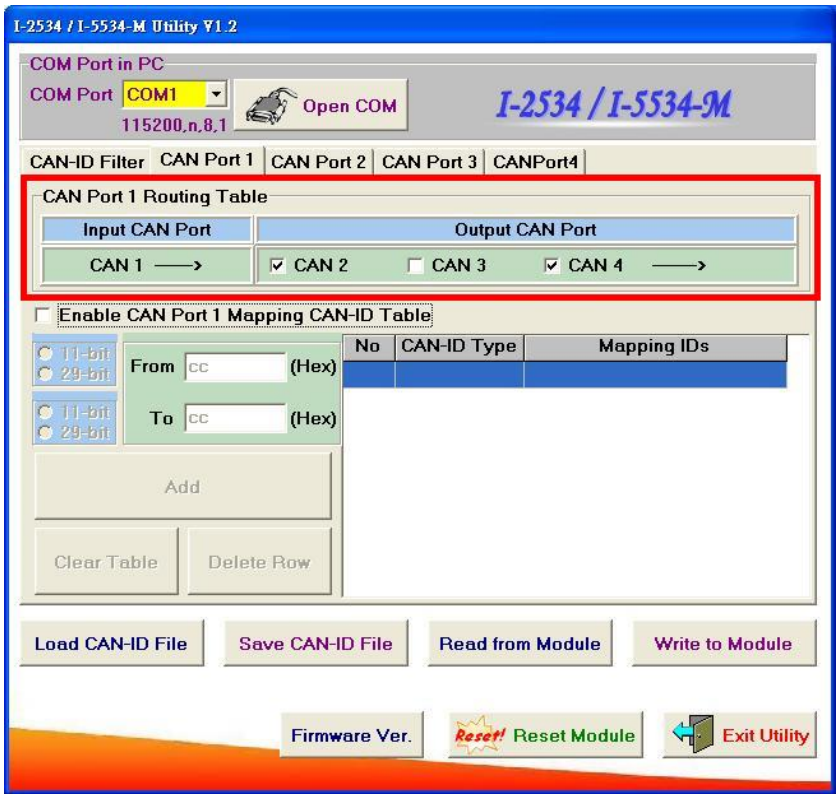
CAN 3



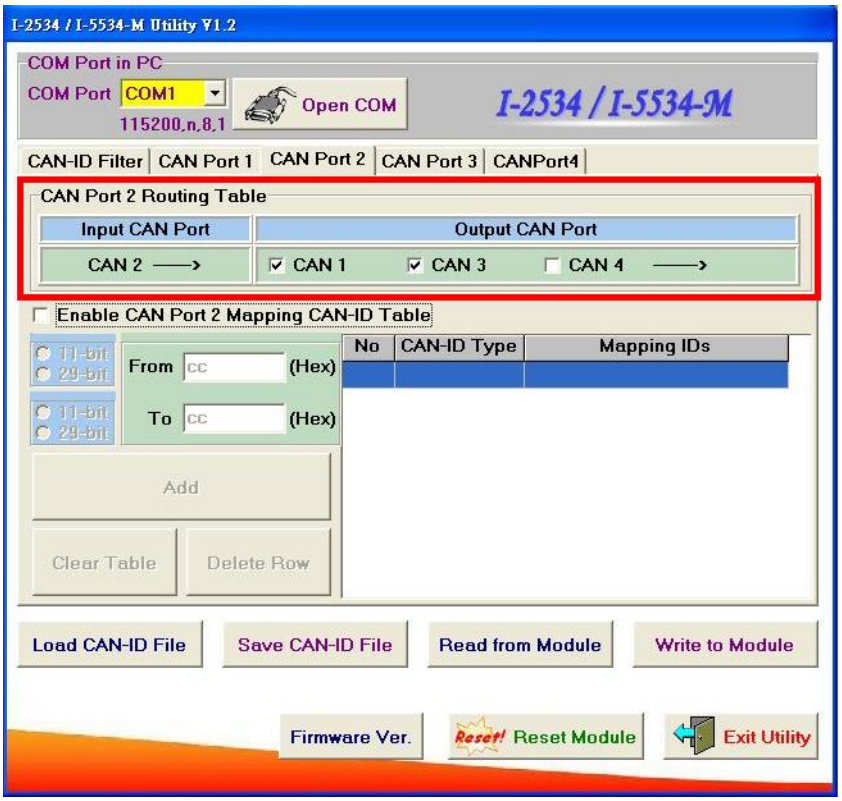
CAN 4

Figure 3-8 Example of the route path

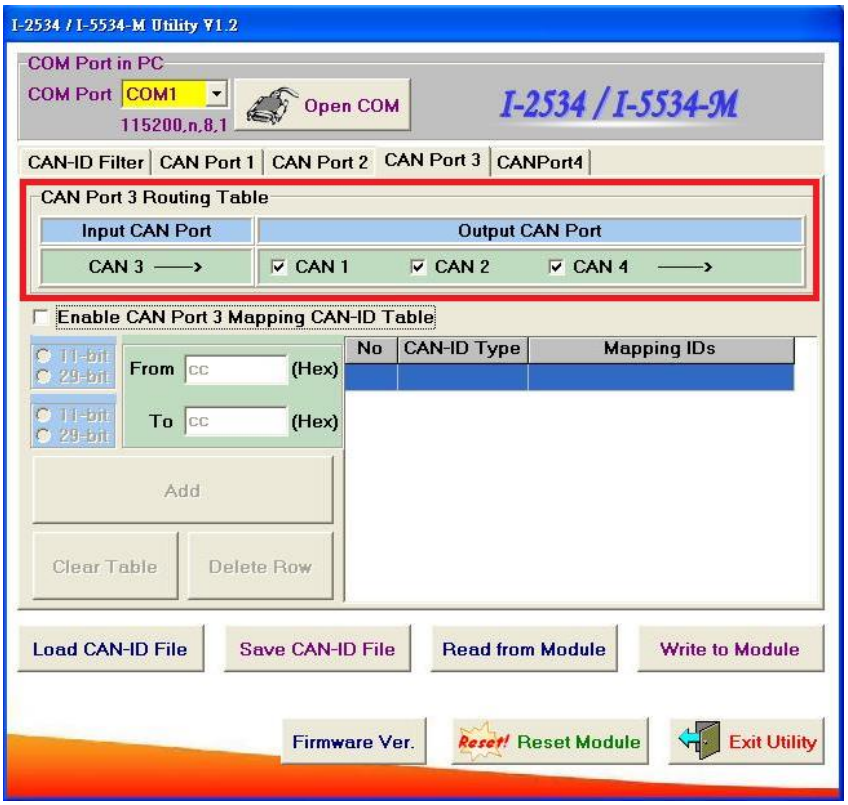
After finishing the wire connection as the section 3.3, users could set the configuration in the “I2534_I5534M_Utility”. The figure3-9 below shows the corresponding setting.



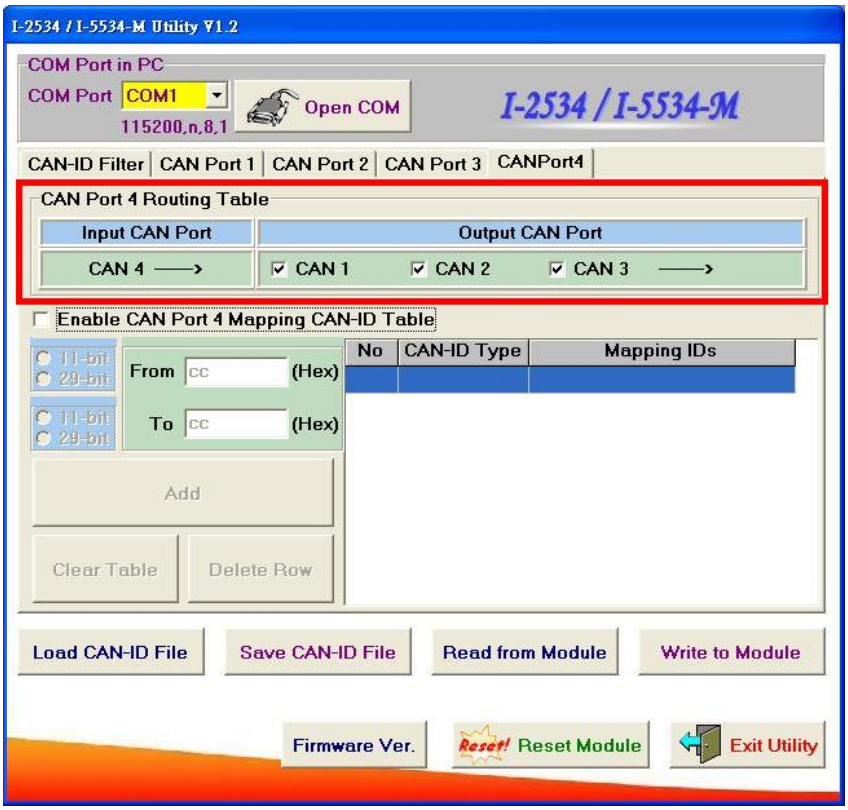
CAN1


I-2534 / I-5534-M Utility V1.2
COM Port in PC
COM Port
COM1
115200,n,8,1
Open COM
I-2534 / I-5534-M
CAN-ID Filter
CAN Port 1
CAN Port 2
CAN Port 3
CANPort4
CAN Port 2 Routing Table
Input CAN Port
Output CAN Port
CAN 2 ——>
CAN 1
CAN 3
CAN 4
——>
Enable CAN Port 2 Mapping CAN-ID Table
11-bit
29-bit
From
cc
(Hex)
To
cc
(Hex)
No
CAN-ID Type
Mapping IDs
Add
Clear Table
Delete Row
Load CAN-ID File
Save CAN-ID File
Read from Module
Write to Module
Firmware Ver.
Reset!
Reset Module
Exit Utility

CAN2


I-2534 / I-5534-M Utility V1.2
COM Port in PC
COM Port
COM1
115200,n,8,1
Open COM
I-2534 / I-5534-M
CAN-ID Filter
CAN Port 1
CAN Port 2
CAN Port 3
CANPort4
CAN Port 3 Routing Table
Input CAN Port
Output CAN Port
CAN 3 ——>
CAN 1
CAN 2
CAN 4
——>
Enable CAN Port 3 Mapping CAN-ID Table
11-bit
29-bit
From
cc
(Hex)
To
cc
(Hex)
No
CAN-ID Type
Mapping IDs
Add
Clear Table
Delete Row
Load CAN-ID File
Save CAN-ID File
Read from Module
Write to Module
Firmware Ver.
Reset!
Reset Module
Exit Utility

CAN3



CAN4

Figure 3-9 Example of the route path configuration

After setting the route table, users should click the “Write to Module” button to save all the route path and CAN-ID mapping(Section 3.7) to the I-2534 or I-5534-M. Users can reset the module to enable the configuration by clicking the “Reset Module” button or turning it off and then turning it on. If users want to review the configuration, click “Read from Module” button to read back the information.

3.5 CAN User-defined Baud Rate Configuration

The I-2534 or I-5534-M allows users to set the special CAN baud rate by using the “User-defined CAN Baud Rate” field of the Utility. Before configuring the user-defined baud, turn off the I-2534 or I-5534-M, adjust the rotary switch of baud to ‘D’ position, and then turn on it. After building the connection between the Utility and the I-2534 or I-5534-M, fill your expected baud in the field of User Define CAN Baud Rate. For example, fill the value “33.2” in the “CAN 1” field for setting the baud of “CAN 1” to 33.2 kbps, and click the “Download User Baud Rate” button to save into the I-2534 or I-5534-M. Then, Users can reset the module to enable the configuration by clicking the “Reset Module” button or turning it off and then turning it on. If users want to review the configuration, click “Read from Module” button to read back the information.

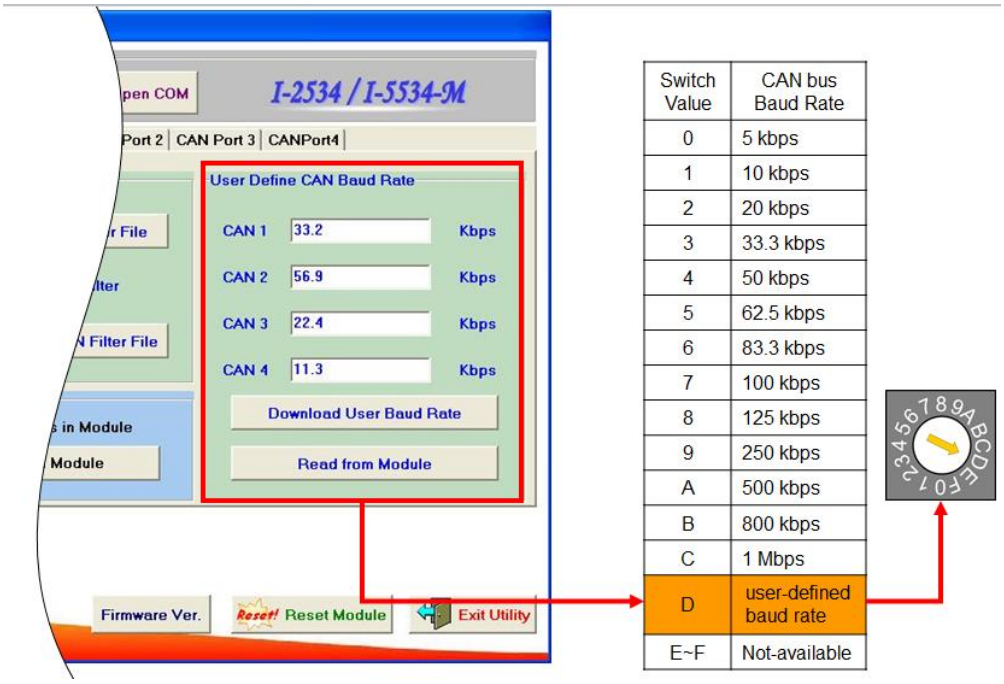


Figure 3-10 CAN user-defined baud rate configuration

3.6 CAN Filter Configuration

There are two parts of CAN filter configuration. One is “Download CAN Filter” which functions as setting the CAN filter and downloading the configuration to the I-2534 or I-5534-M. Another is “Read CAN Filter” which provides read back the CAN filter configuration form the I-2534 or I-5534-M module.

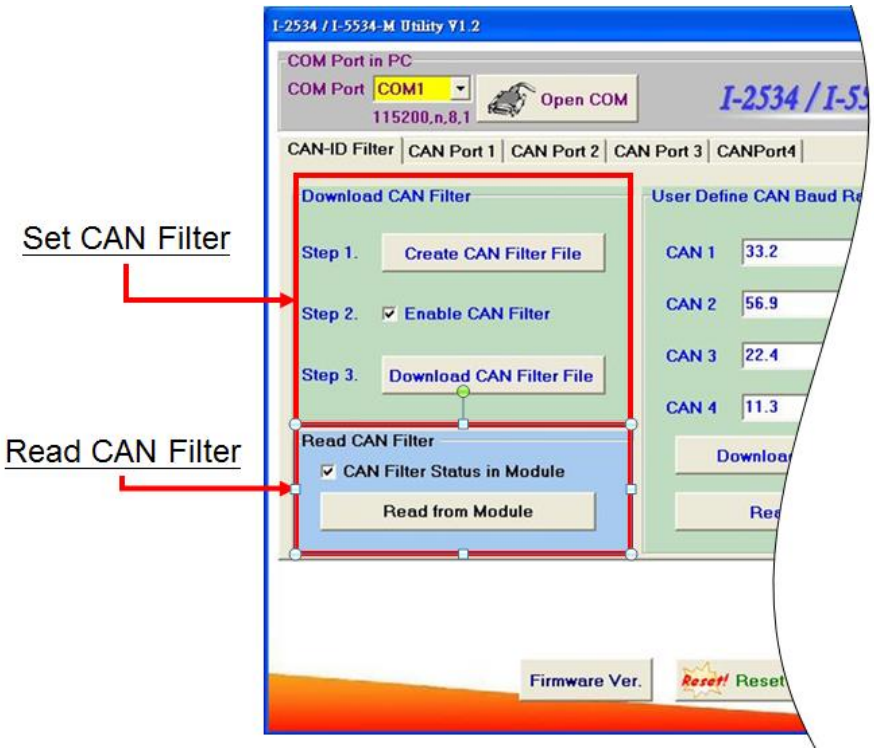


Figure 3-11 Set and read the CAN filter configuration

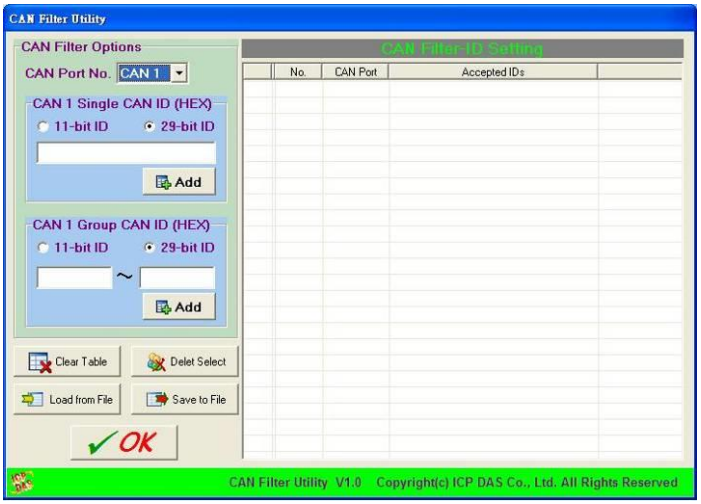


Figure 3-12 CAN filter configuration dialog

3.6.1 Apply a New CAN Filter to I-2534 or I-5534-M

When users set the CAN filter first time, they need use “Download CAN Filter” field.

Step 1: Click the “Create CAN Filter File” button to start setting CAN filter.

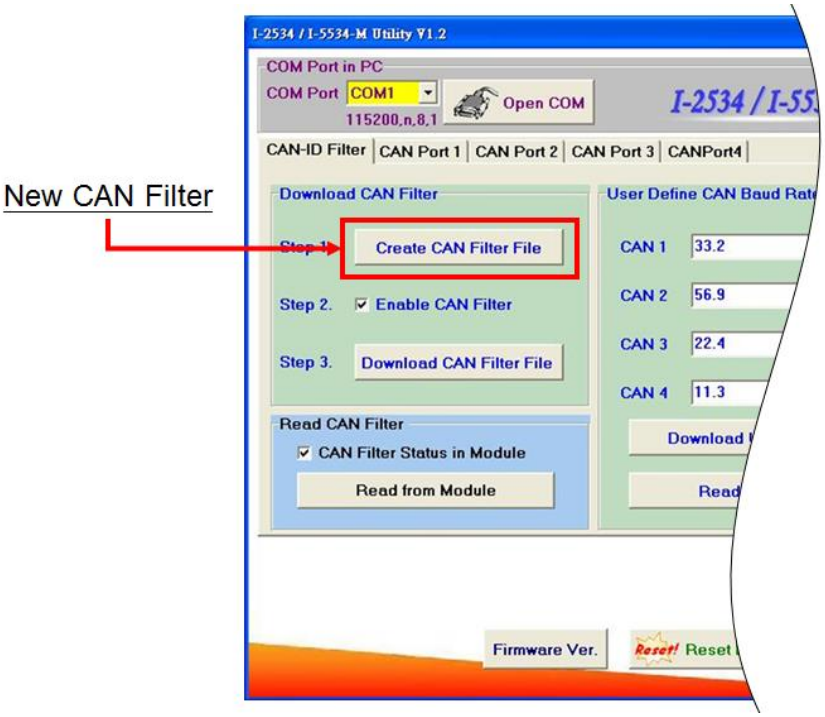


Figure 3-13 Create CAN filter file

Users would see the following window.

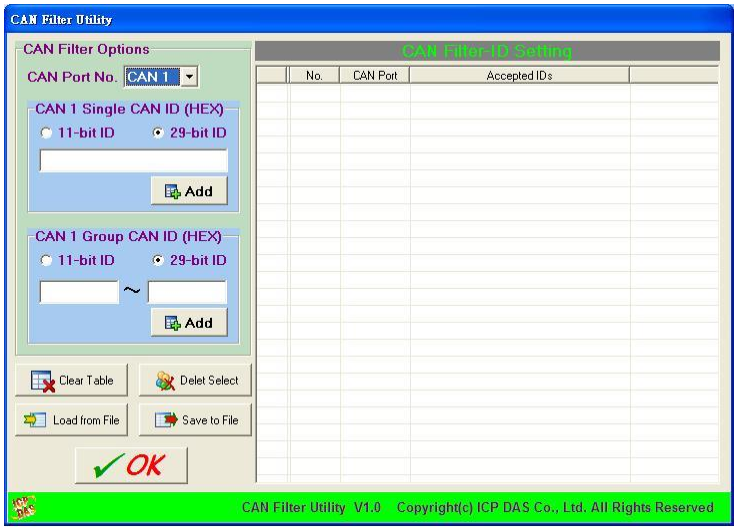


Figure 3-14 An new CAN filter configuration dialog

Step 2: Select the CAN port which users want to configure the CAN filter on.

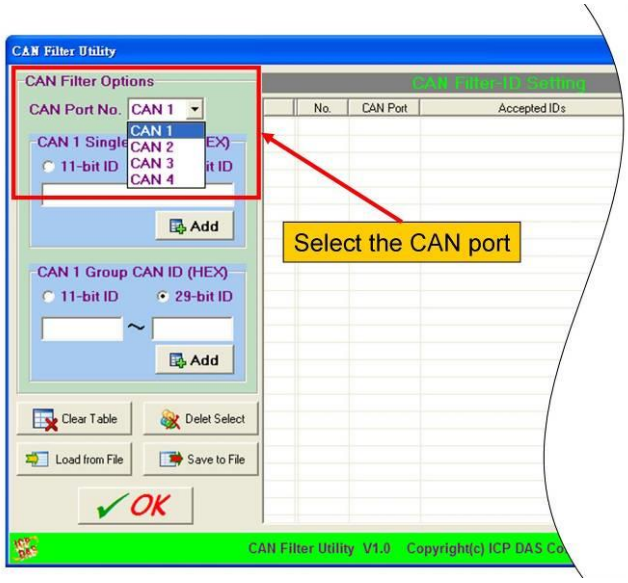


Figure 3-15 Select desired CAN port

Step 3: Add the CAN filter with single CAN ID or group of CAN ID. The CAN message with the ID in the list will be received, otherwise it will be dropped.

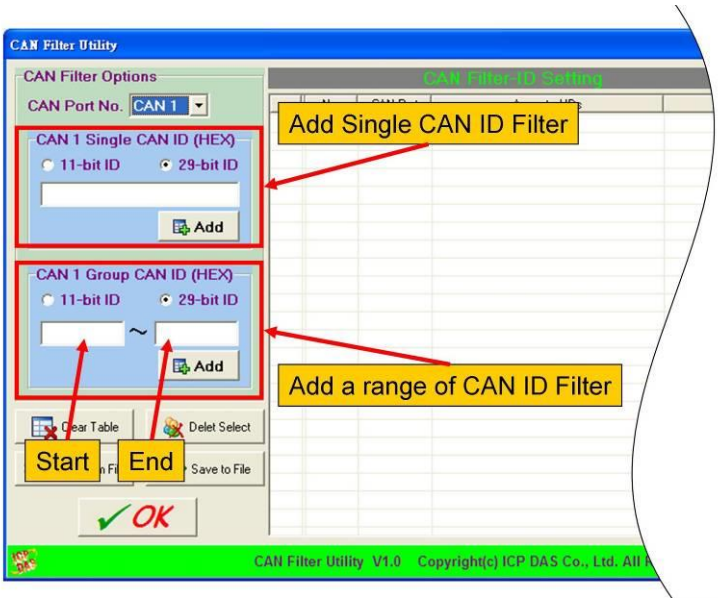


Figure 3-16 Add single or group of CAN filter

For example, if users want to pass the CAN port 1 with CAN ID 0x07F in the CAN 2.0B specification. Firstly, select “29-bit ID” item in the “CAN x Single CAN ID” field. Secondly, fill the value “7F” in the edit box. Finally, click “Add” button in the “CAN x Single CAN ID” field.

Moreover, if users want to pass the CAN 2.0A messages with CAN ID 0x04 ~ 0x15 while these messages are received by the CAN port 1 Firstly, select “11-bit ID” item in the “CAN x Group CAN ID” field. Secondly, fill the value “4” in the “Start” field and the value “15” in the “End” field. Finally, click “Add” button in the “CAN x Group CAN ID” field.

After completing those two examples, users could see the follow picture.

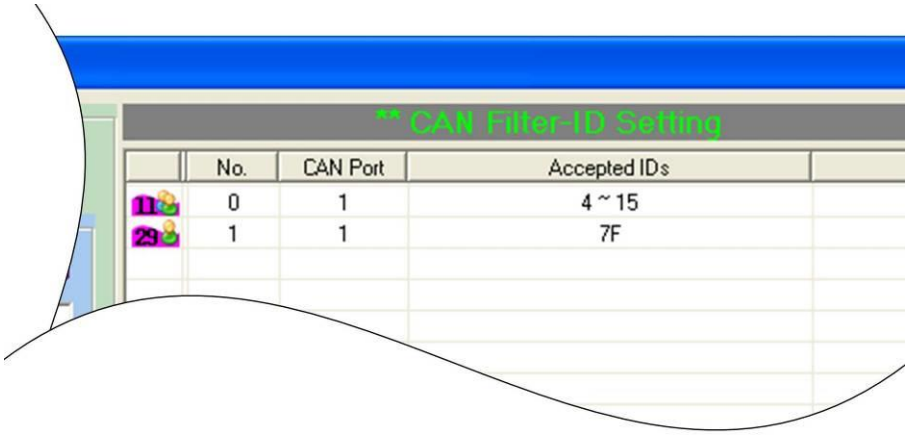


Figure 3-17 Two CAN filter data

The “No.” field shows the sequential number for each record of the CAN filter configuration.
The “CAN Port” field indicates the record is belong to which CAN port.
The “Accepted IDs” field displays that which CAN ID would be received.
An icon in the head of the line may represent the following information.

: This record is the CAN filter of 11-bit and single CAN ID.

: This record is the CAN filter of 11-bit and group CAN ID.

: This record is the CAN filter of 29-bit and single CAN ID.

: This record is the CAN filter of 29-bit and group CAN ID.

Step 4: When completing the CAN filter configuration, click the “Save to File” button to save it by using a record file with “*.FLT” extension file name.

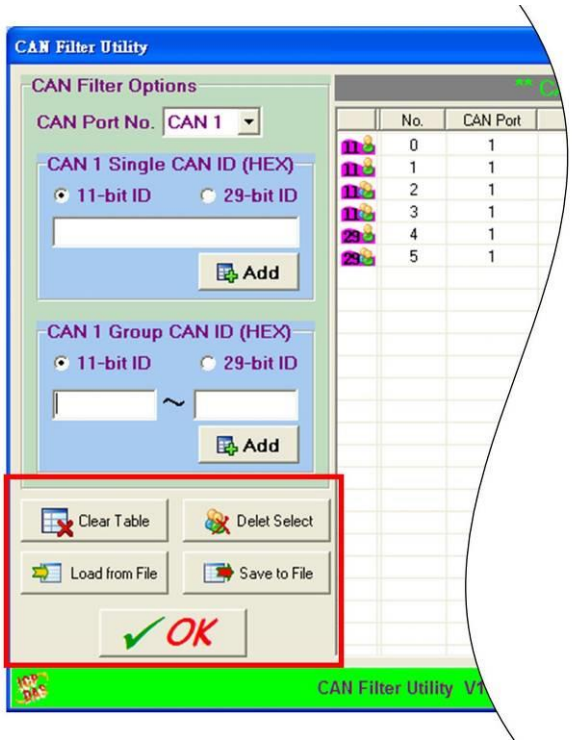


Figure 3-18 Five buttons in CAN filter configuration dialog

There are more five buttons to help users configuring the CAN filter.

1. “Clear Table” would delete all CAN filter records in the list.
2. “Delete Select” would delete the selected CAN filter record.
3. “Load from File” allow users to load the configuration from the existent CAN filter file (*.FLT).
4. “Save to File” provides the function to save the current CAN filter configuration into a file (*.FLT).
5. “OK” would exit the configuration dialog.

Step 5: Check the “Enable CAN Filter” item to make the CAN filter enable.

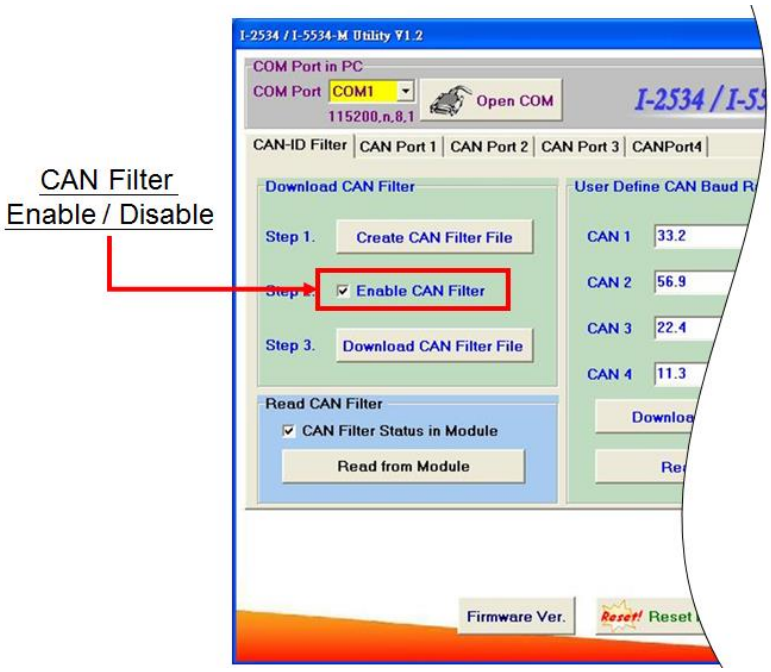


Figure 3-19 CAN filter status

Step 6: Click “Download CAN Filter File” to download the selected CAN filter file into the I-2534 or I-5534-M module.

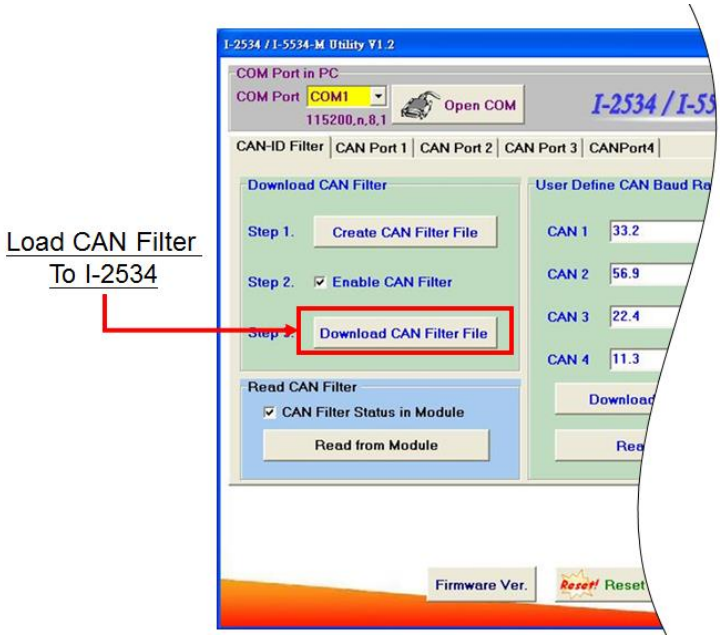


Figure 3-20 Download CAN filter data

After finishing all the steps above, users need to reset the module to enable the configuration by clicking the “Reset Module” button or turning it off and then turning it on. If users want to review the configuration, click “Read from Module” button to read back the information.

3.6.2 Set the I-2534 or I-5534-M by Configuration File

The steps are the same as step 5 and 6 of the section 3.6.1.

Step 1: Check the “Enable CAN Filter” item to make the CAN filter enable.

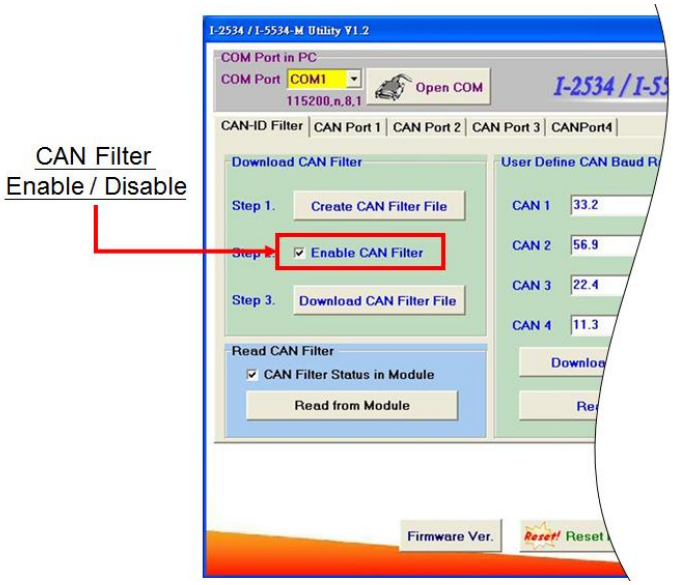


Figure 3-21 CAN filter status

Step 2: Click “Download CAN Filter File” to download the selected CAN filter file into the I-2534 or I-5534-M.

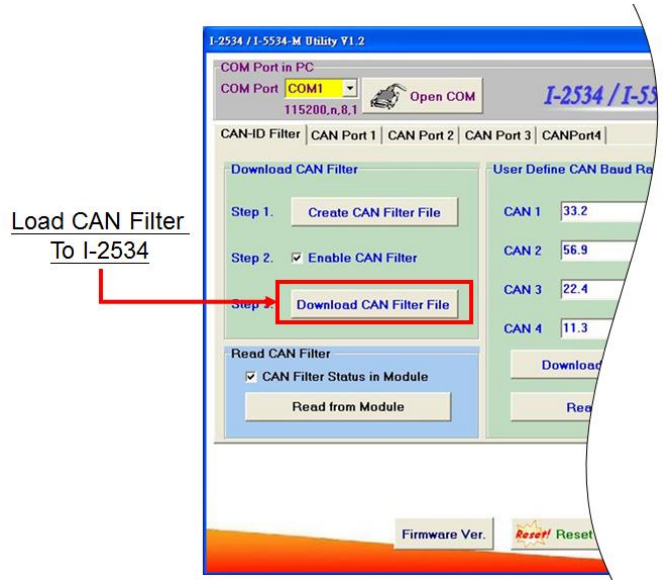


Figure 3-22 Download CAN filter data

Afterwards, users need to reset the module to enable the configuration by clicking the “Reset Module” button or turning it off and then turning it on. If users want to review the configuration, click “Read from Module” button to read back the information.

3.6.3 Read I-2534 or I-5534-M CAN Filter Configuration

Click the “Read from Module” to read the CAN filter setting from the I-2534 or I-5534-M.

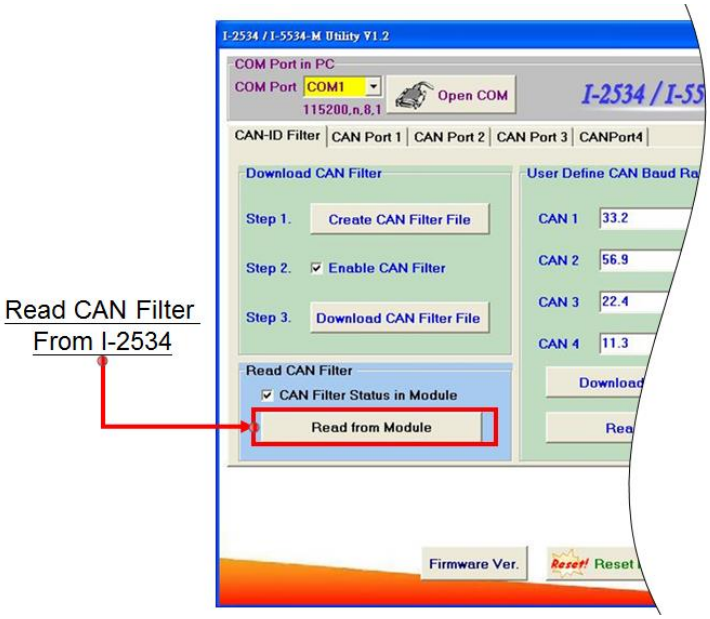


Figure 3-23 Read CAN filter form the I-2534 or I-5534-M

If reading the CAN filter data successfully, users would see whether the CAN filter setting is enable or not from the following figure 3-24.

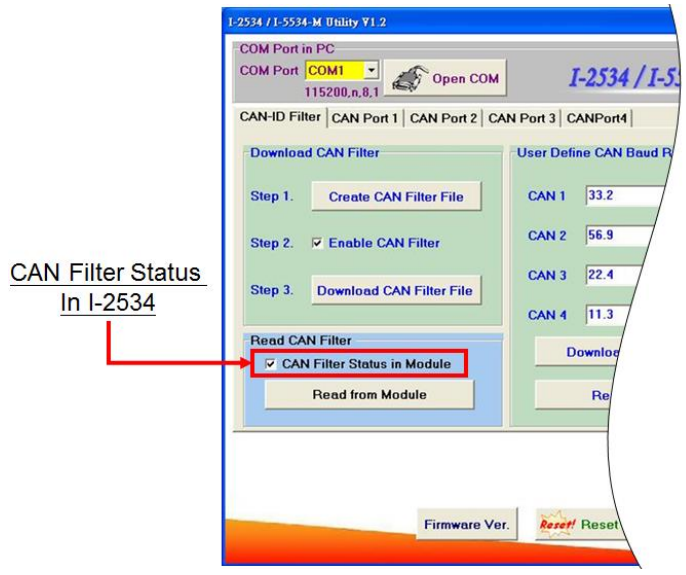


Figure 3-24 CAN filter status in the I-2534 or I-5534-M module

If the CAN filter status is enabled, users would see the configuration dialog such as “Create CAN Filter File”. Users can modify the CAN filter setting if necessary, or save it into a file.

3.7 CAN-ID Mapping Configuration

I-2534 and I-5534-M provide the function of CAN-ID mapping (firmware v1.10). It realizes the integration of multiple CAN devices which own the same CAN-ID in the same CAN network mainly.

There is a mapping table in the I-2534 and I-5534-M like below. The mapping mechanism is that the CAN-ID in the [Source CAN-ID] will be changed to the new CAN-ID in the [Forward CAN-ID]. For example with the table which the 0x123 in [Source CAN-ID] and the 0xABC in [Forward CAN-ID], every CAN message which CAN-ID is 0x123 comes to the I-2534 or I-5534-M. The I-2534 and I-5534-M will change the CAN-ID from 0x123 to the 0xABC before forwarding. The mapping table not only changes the CAN-ID but also changes the CAN-Mode (11-bit or 29-bit). Other CAN messages which CAN-ID does not exist in the [Source CAN-ID] will change nothing. Figure 3-25 is the mapping concept in CAN1. Figure 3-26 shows other CAN messages without changes.

Source CAN-ID	Forward CAN-ID
0x123 (11bits)	0xABC (29bits)
0x1122 (29bits)	0x2211 (29bits)

Table. Example of CAN-ID mapping

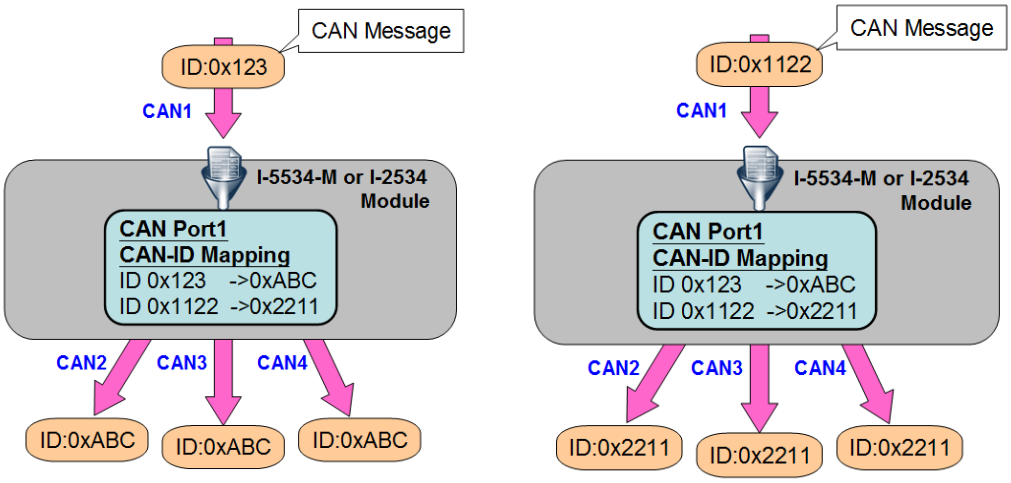


Figure 3-25 CAN-ID mapping for CAN1

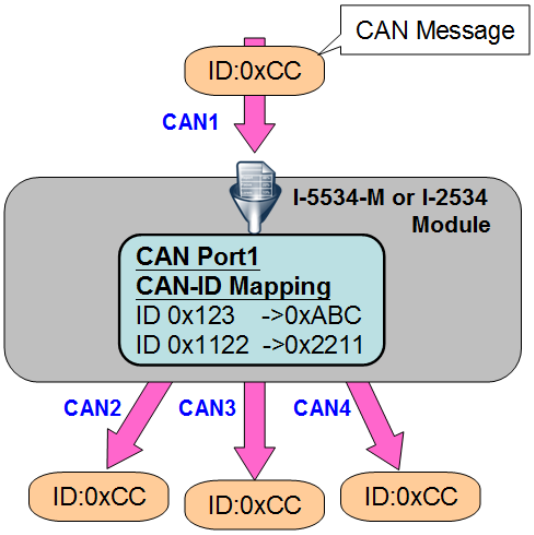


Figure 3-26 General bypass for CAN1

The utility could enable or disable CAN-ID mapping table on each CAN port (Each CAN port provides 32 mapping messages at most). After configuring the mapping table, the utility supports to export as mapping file and import from existing mapping file.

Users can use I2534_I5534M_Utility to configure the CAN-ID mapping.

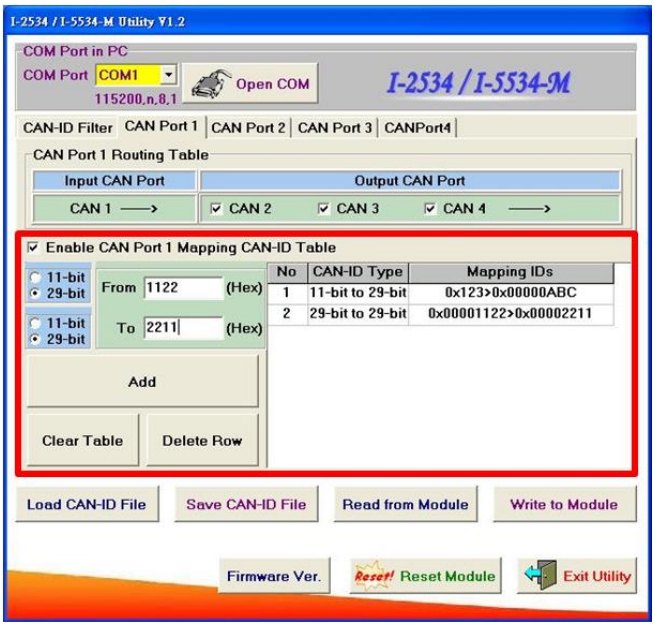
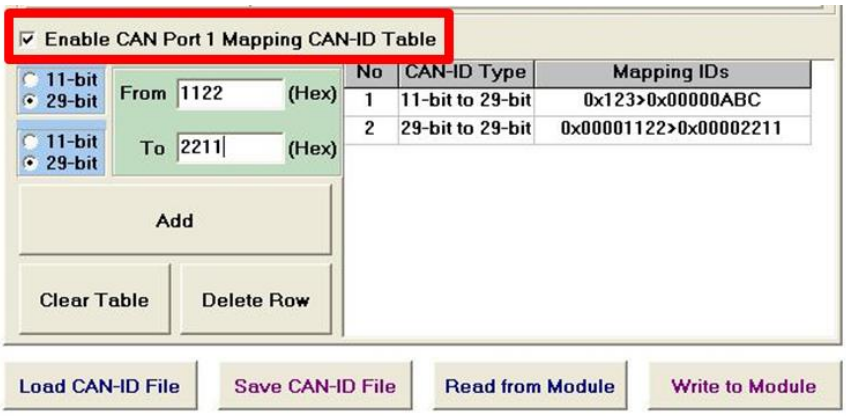


Figure 3-27 Example of the CAN-ID mapping for CAN port 1 configuration

3.7.1 Configuration Steps

(1) "**Enable CAN Port　Mapping CAN-ID Table**":

Enable/Disable CAN Port 1/2/3/4 Mapping CAN-ID Table.



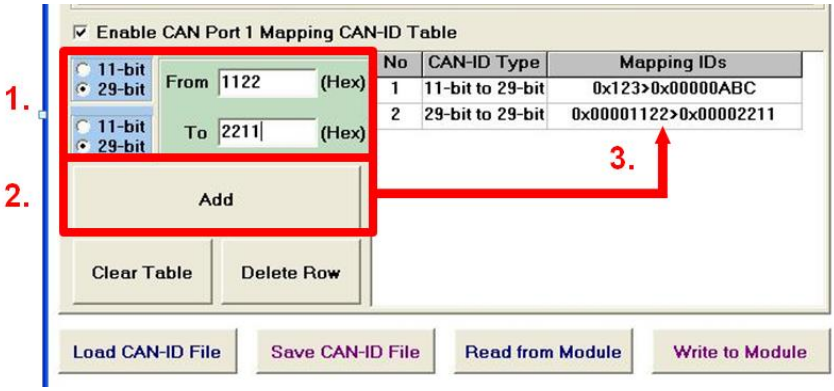
(2) "**Add**":

1. Configure the source CAN-ID and CAN-Mode that you prepare to forward.

2. Click "Add".

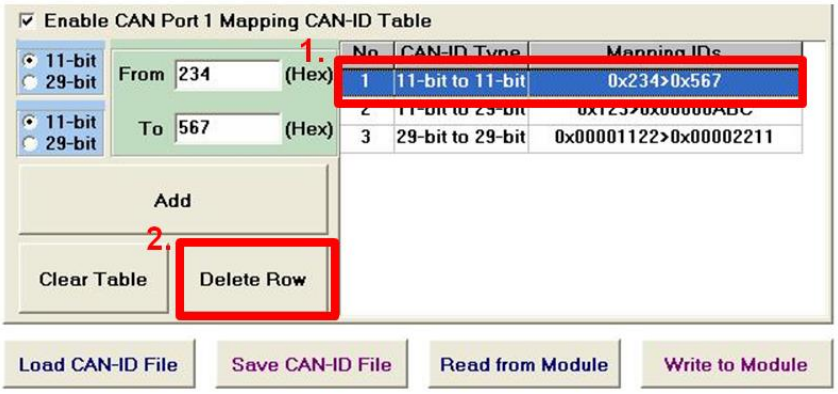
3 The result will be shown.

Note: The same CAN-ID could only be configured once.



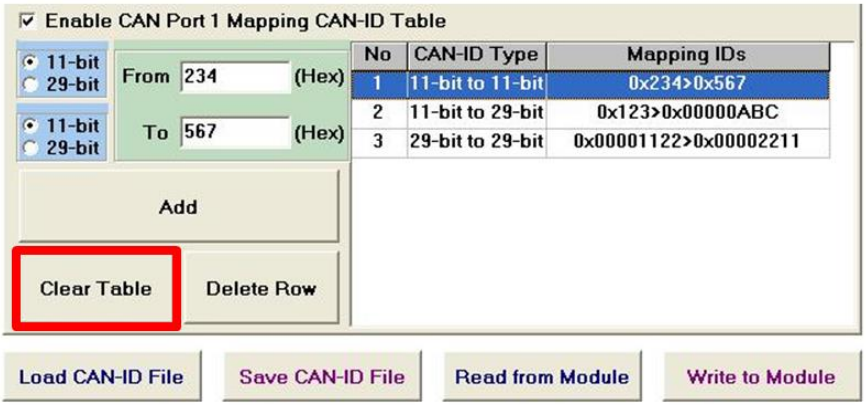
(3) “**Delete Row**”:

1. Choose the item that you want to delete.
2. Click “Delete raw” to delete the chosen item.



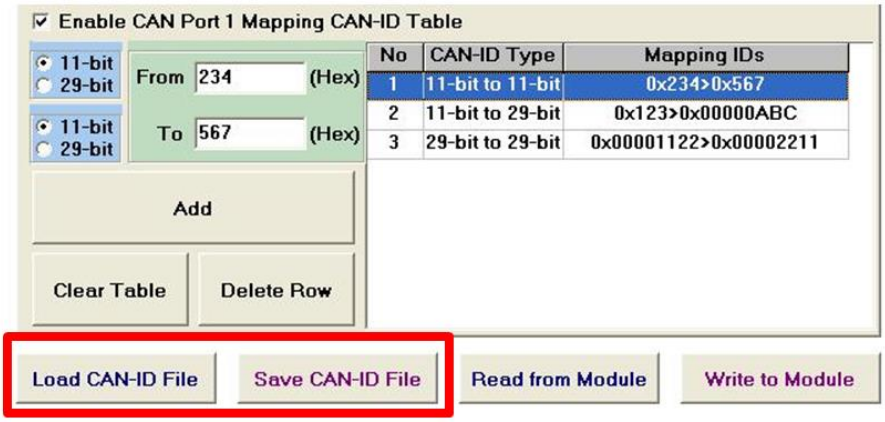
(4) “**Clear Table**”:

Clear all the configured CAN-ID mapping.



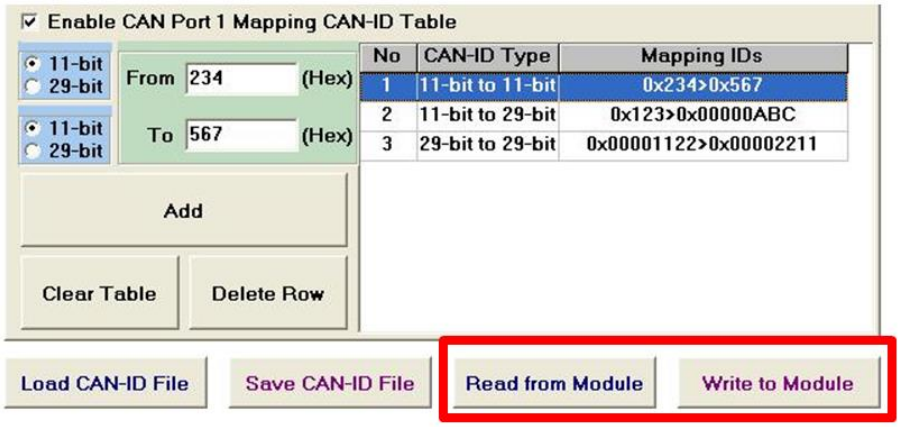
(5) “**Load CAN-ID File**” and “**Save CAN-ID File**”:

For the convenience, the utility provides the saving and loading function to export and import the CAN-ID table.



(6) “**Write to Module**” and “**Read from Module**”:

Users click “Write to Module” to save the route path and the CAN-ID mapping to the I-2534 or I-5534-M. If users want to check the configuration again, click “Read from Module” to read from the module. After configuring, the users need to click “Reset Module” to reboot the module and apply the new configuration.



4 Propagation Delay of the I-2534 and I-5534-M

We used the longest CAN data which the CAN ID is 29-bit and carries 8 bytes data. Here shows the different propagation delay in different CAN baud rate.

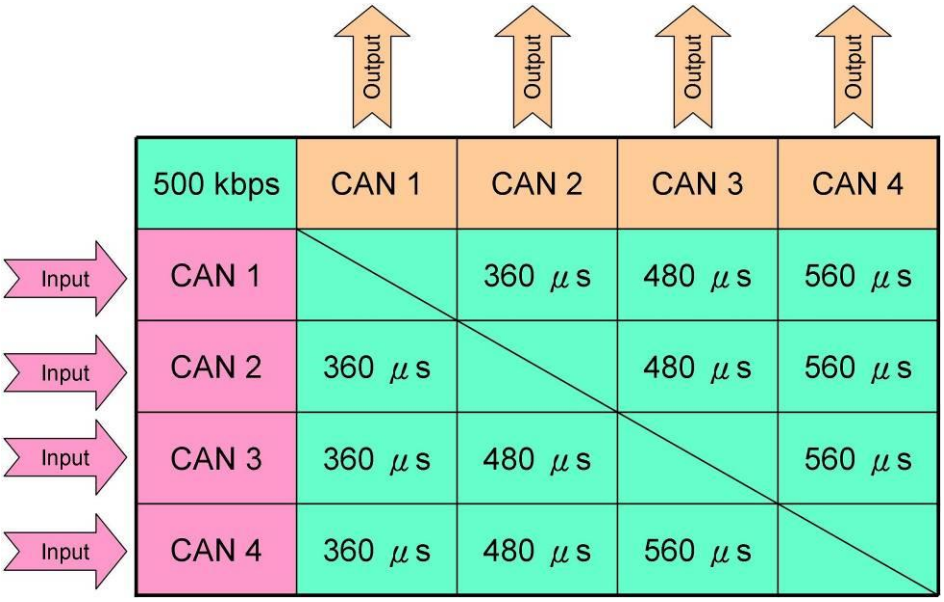
CAN Baud Rate is 125k bps. The table below shows the delay time is between 1120μs and 1360μs.

	Output	Output	Output	Output
125 kbps	CAN 1	CAN 2	CAN 3	CAN 4
Input CAN 1		1120 μs	1280 μs	1360 μs
Input CAN 2	1120 μs		1280 μs	1360 μs
Input CAN 3	1120 μs	1280 μs		1360 μs
Input CAN 4	1120 μs	1280 μs	1360 μs	

CAN Baud Rate is 250k bps. The table below shows the delay time is between 640μs and 880μs.

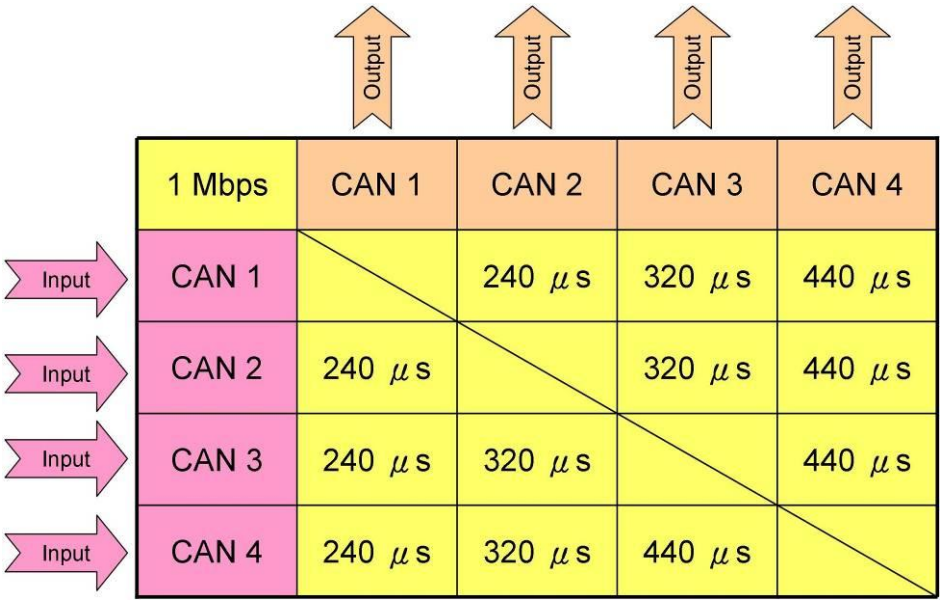
	Output	Output	Output	Output
250 kbps	CAN 1	CAN 2	CAN 3	CAN 4
Input CAN 1		640 μs	720 μs	880 μs
Input CAN 2	640 μs		720 μs	880 μs
Input CAN 3	640 μs	720 μs		880 μs
Input CAN 4	640 μs	720 μs	880 μs	

CAN Baud Rate is 500k bps. The table below shows the delay time is between 360μs and 560μs.



500 kbps	CAN 1	CAN 2	CAN 3	CAN 4
CAN 1		360 μs	480 μs	560 μs
CAN 2	360 μs		480 μs	560 μs
CAN 3	360 μs	480 μs		560 μs
CAN 4	360 μs	480 μs	560 μs	

CAN Baud Rate is 1M bps. The table below shows the delay time is between 240μs and 440μs.



1 Mbps	CAN 1	CAN 2	CAN 3	CAN 4
CAN 1		240 μs	320 μs	440 μs
CAN 2	240 μs		320 μs	440 μs
CAN 3	240 μs	320 μs		440 μs
CAN 4	240 μs	320 μs	440 μs	

5 Dimension of the I-2534

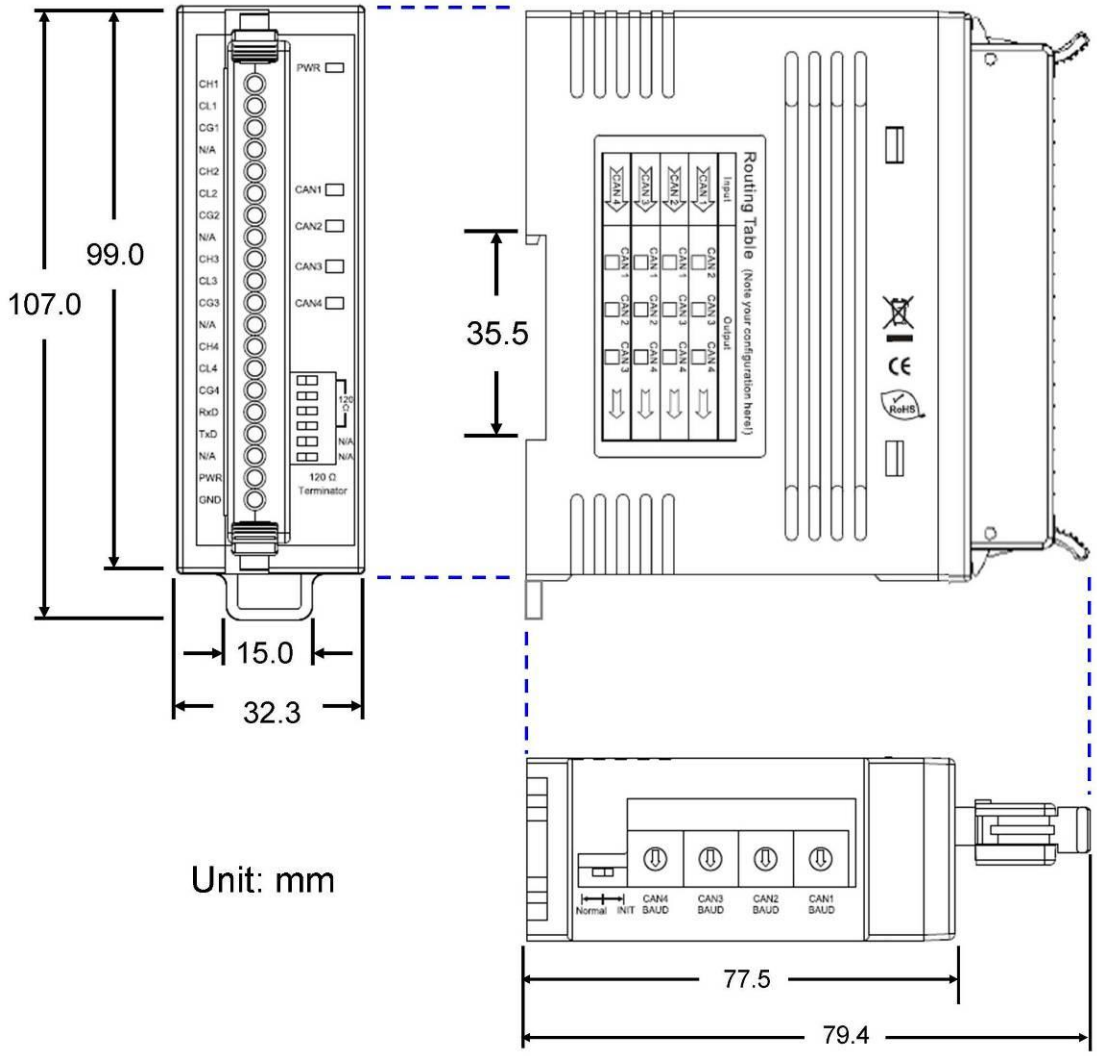
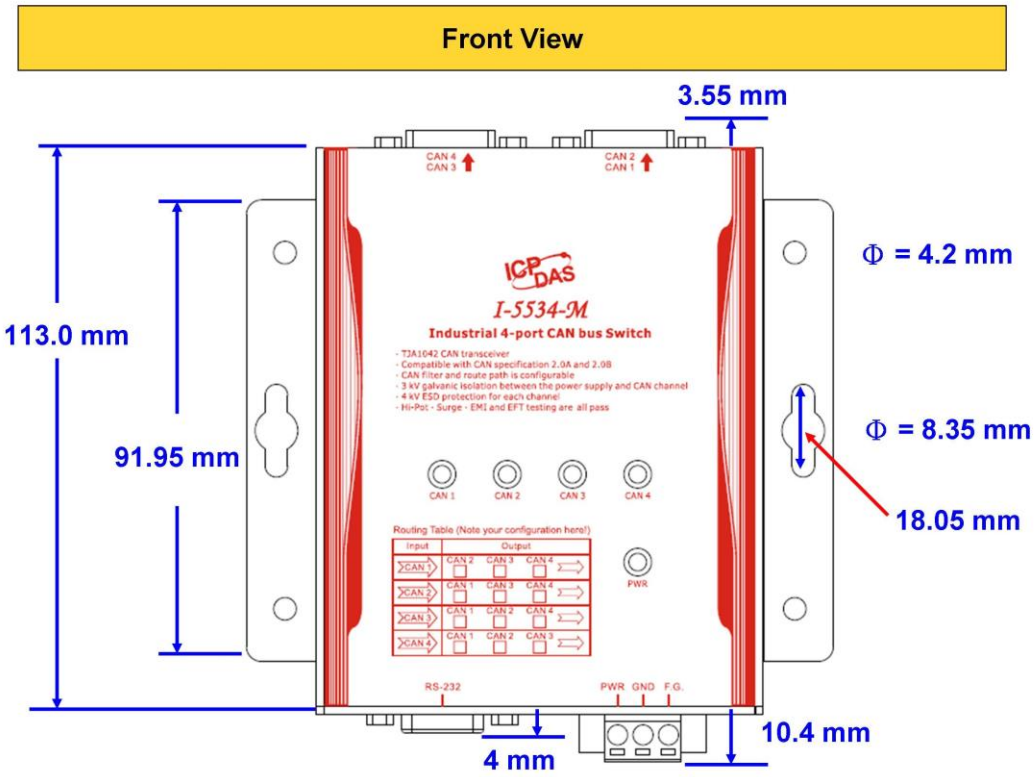
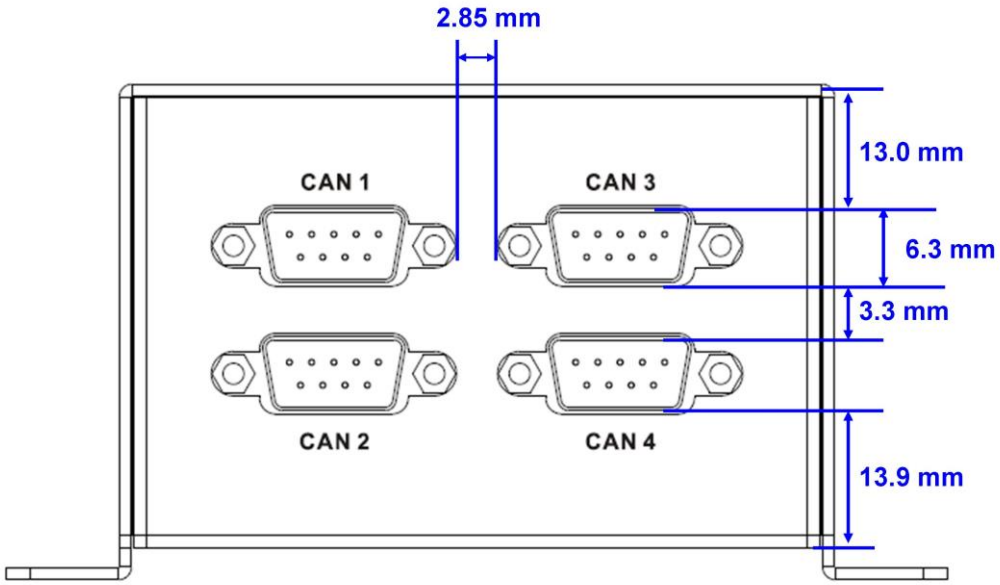


Figure 5-1 Dimension of the I-2534

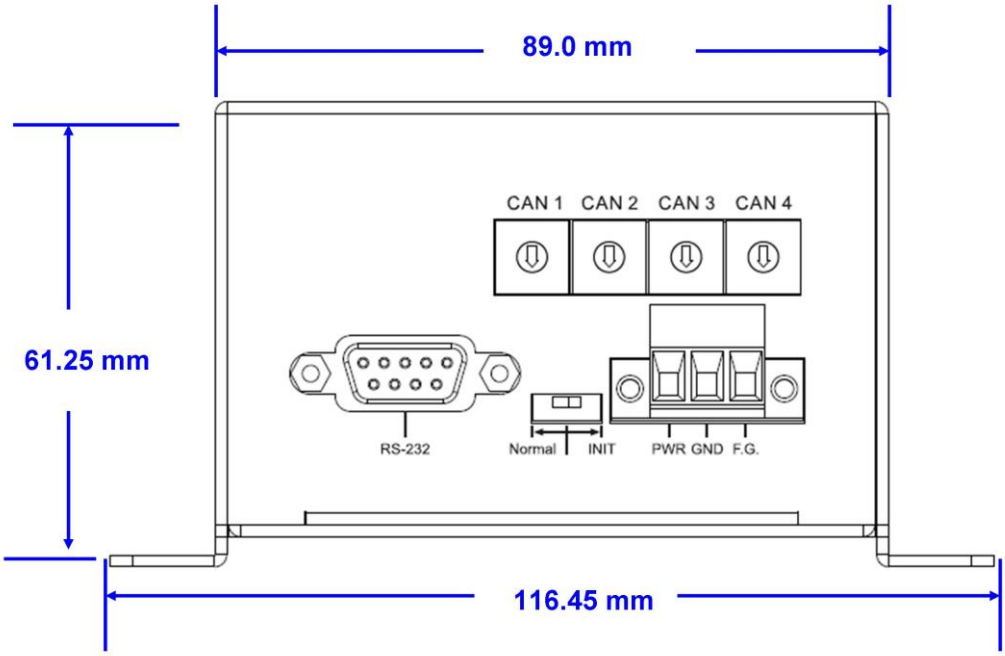
6 Dimension of the I-5534-M



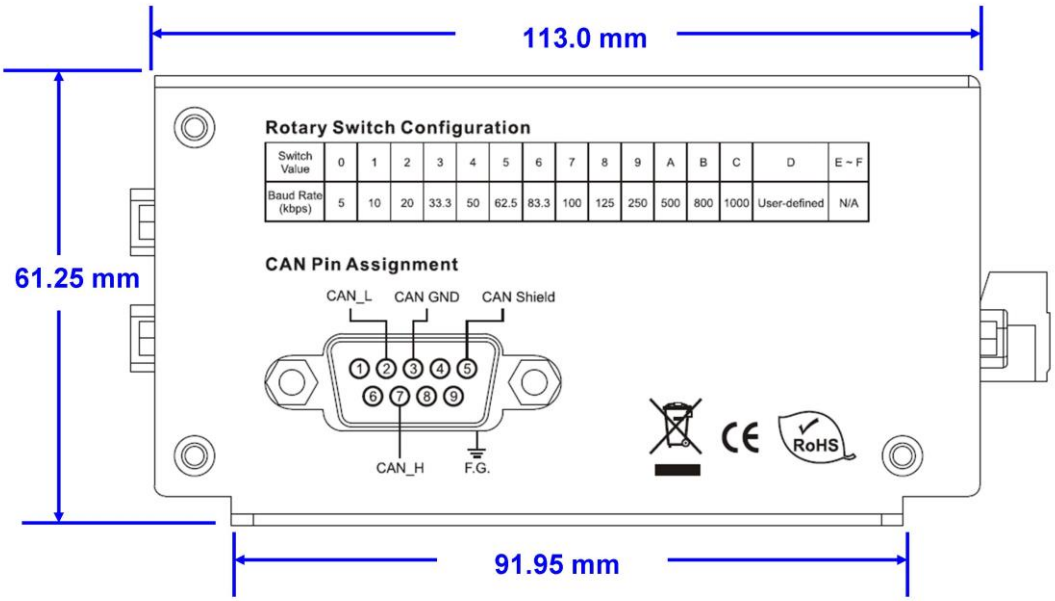
Top View



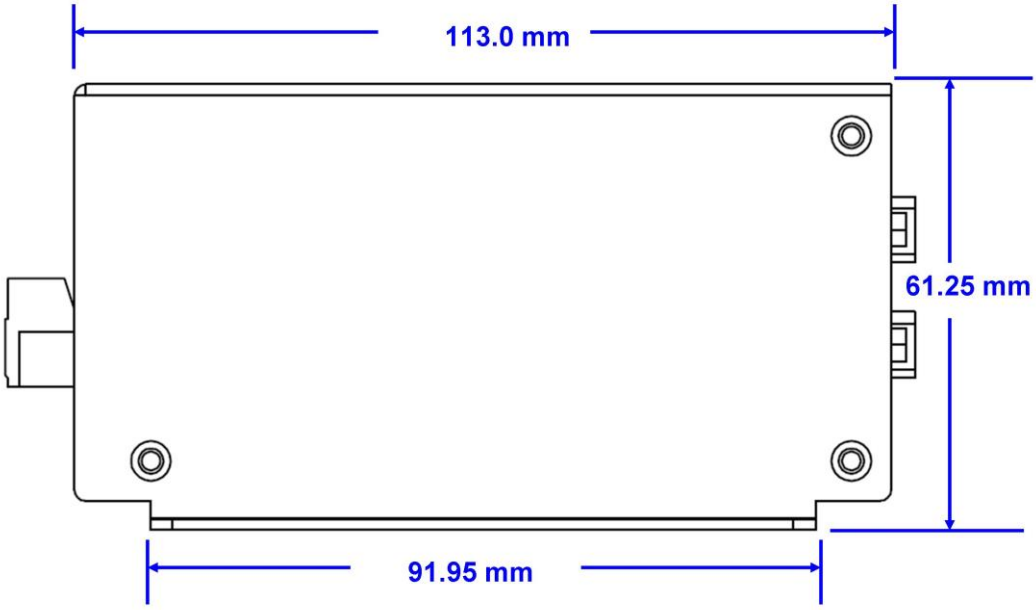
Bottom View



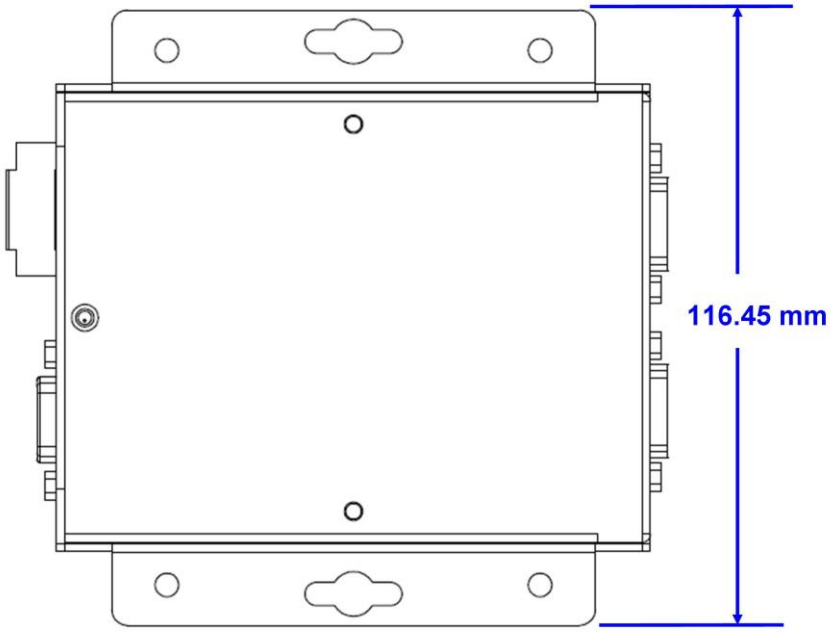
Left Side View



Right Side View



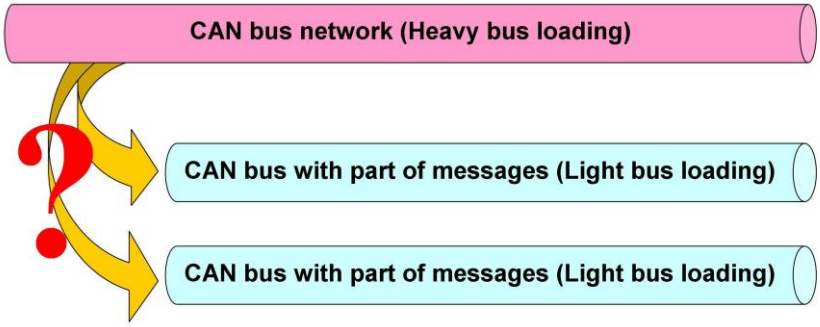
Rear Side View



7 Appendix A : Frequency Ask Questions

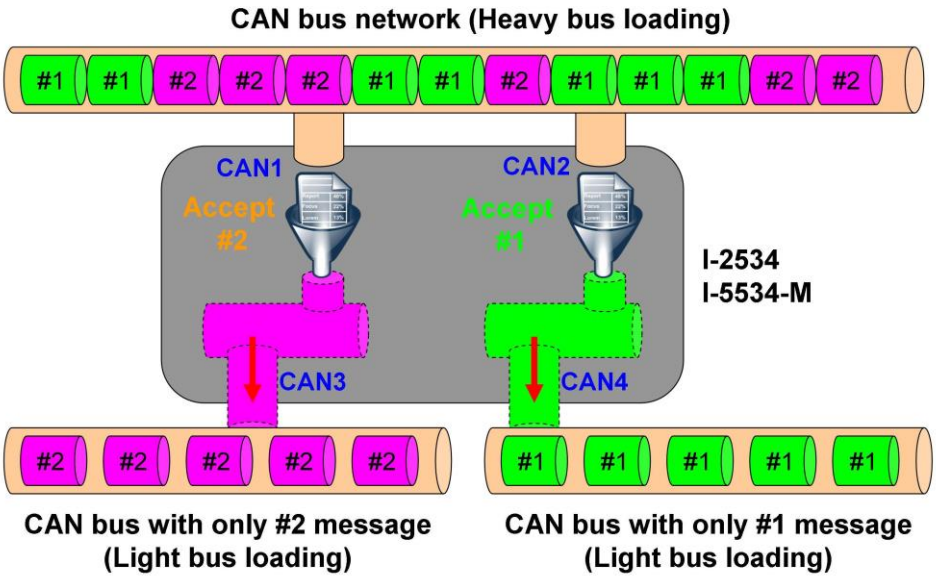
7.1 How to share the loading of the CAN bus?

The problem would be shown as the figure below.

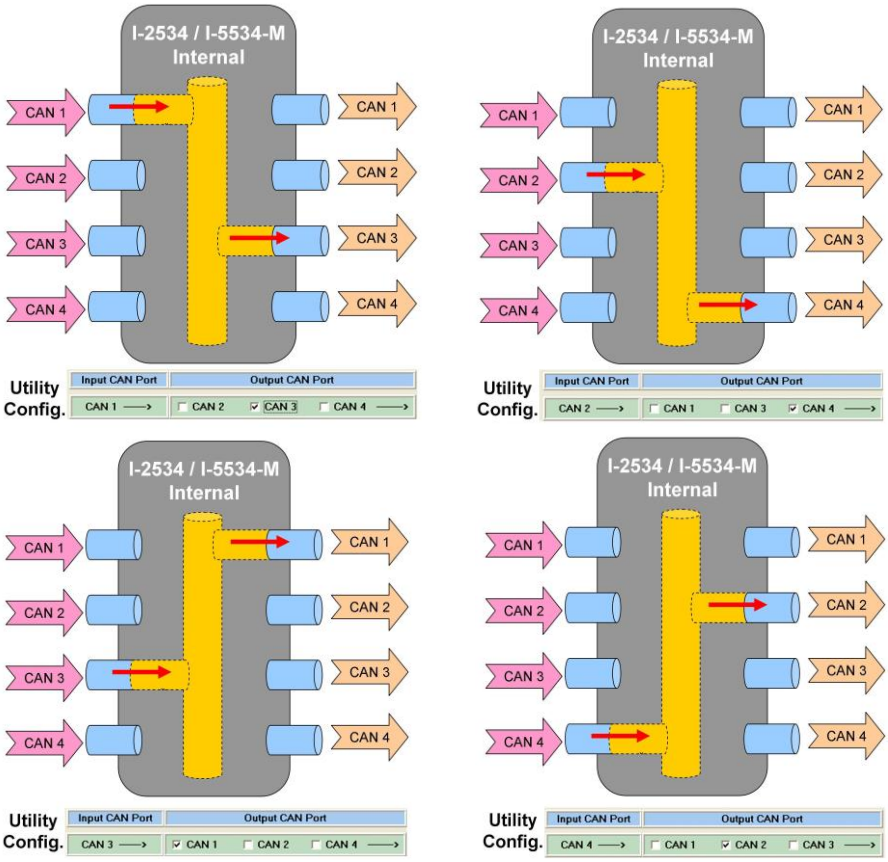


Solution:

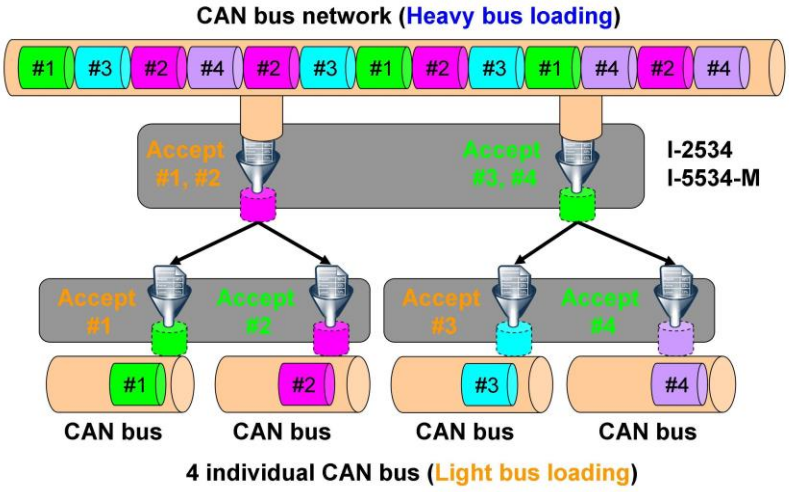
1. The users can divide those CAN messages which are in the heavy CAN bus into two groups (ex. Group #1 and Group #2).
2. Connecting the CAN bus to both CAN1 port and CAN2 port of the I-2534 or I-5534-M.
3. Configure the CAN filter of CAN1 port and CAN2 port as the figure below. CAN 1 port only accept the messages of the Group #2 and CAN 2 port only accept the messages of the Group #1.



4. The route path needs to be configured as CAN1 <-> CAN 3, CAN2 <-> CAN 4.
   Here shows the configurations of the route path.

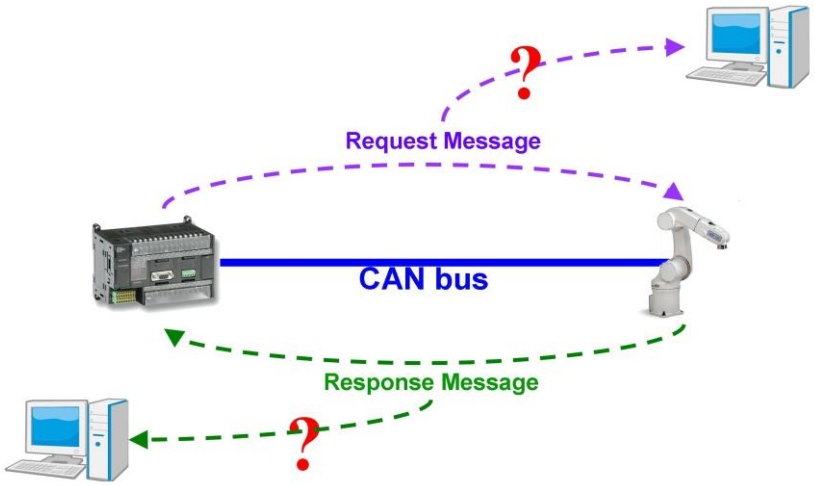


Furthermore, how to share the CAN bus into four or more CAN networks?
The users can use three I-2534 or I-5534-M modules to achieve this requirement. Here shows the figure.



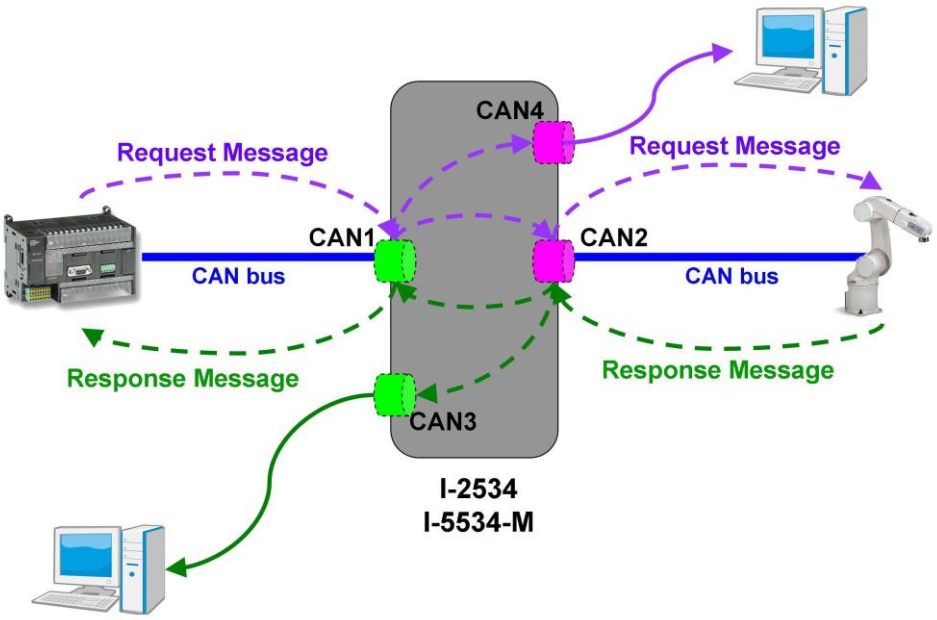
7.2 How to listen the single direction CAN messages?

The problem would be shown as the figure below.



Solution:

1. The users can put the I-2534 or I-5534-M between the controller and device.
2. Configure the route path as below to distinguish the request messages from response messages.

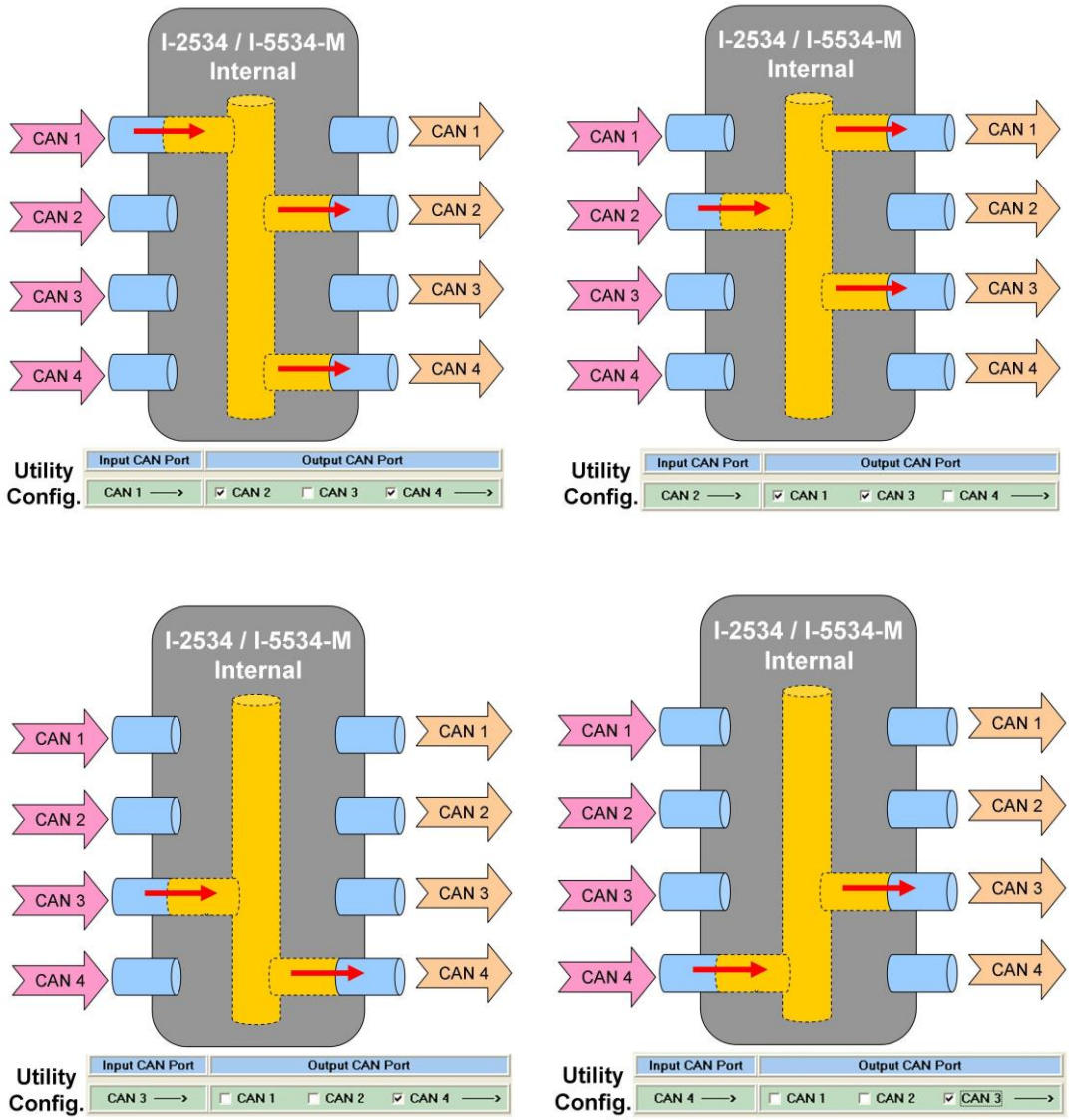


3. The route path needs to be configured as bellow

   CAN1 <--> CAN 2 and CAN 4

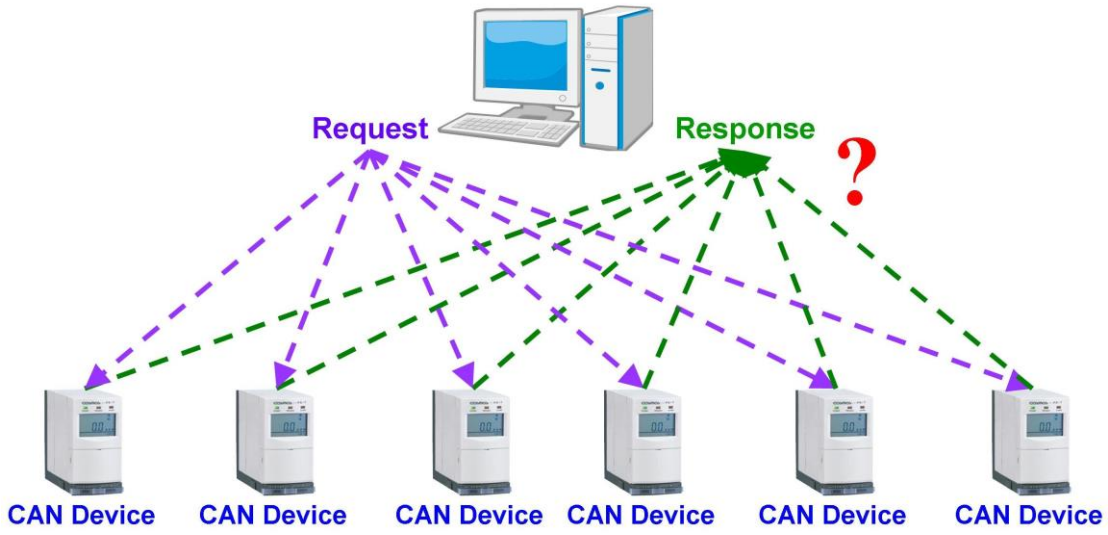
   CAN2 <--> CAN 1 and CAN 3.

   Here shows the configurations of the route path.



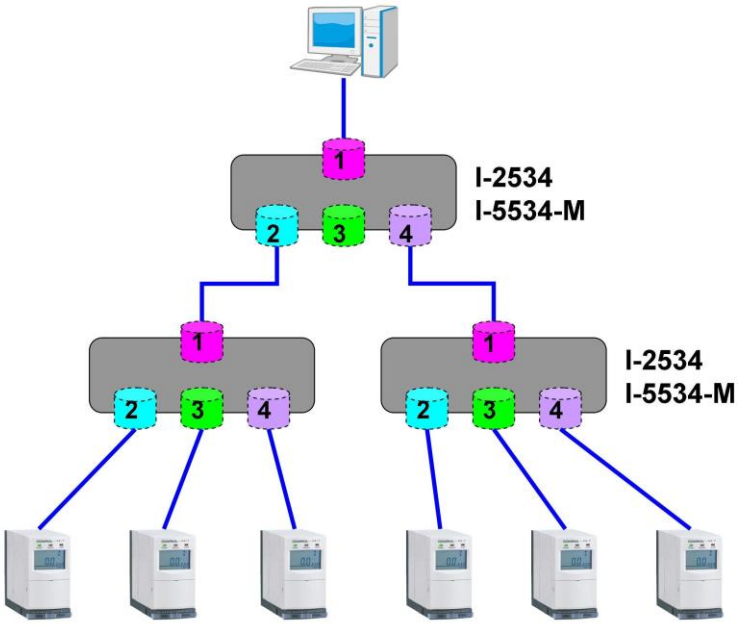
7.3 How to reduce the devices loading?

The problem would be shown as the figure below.

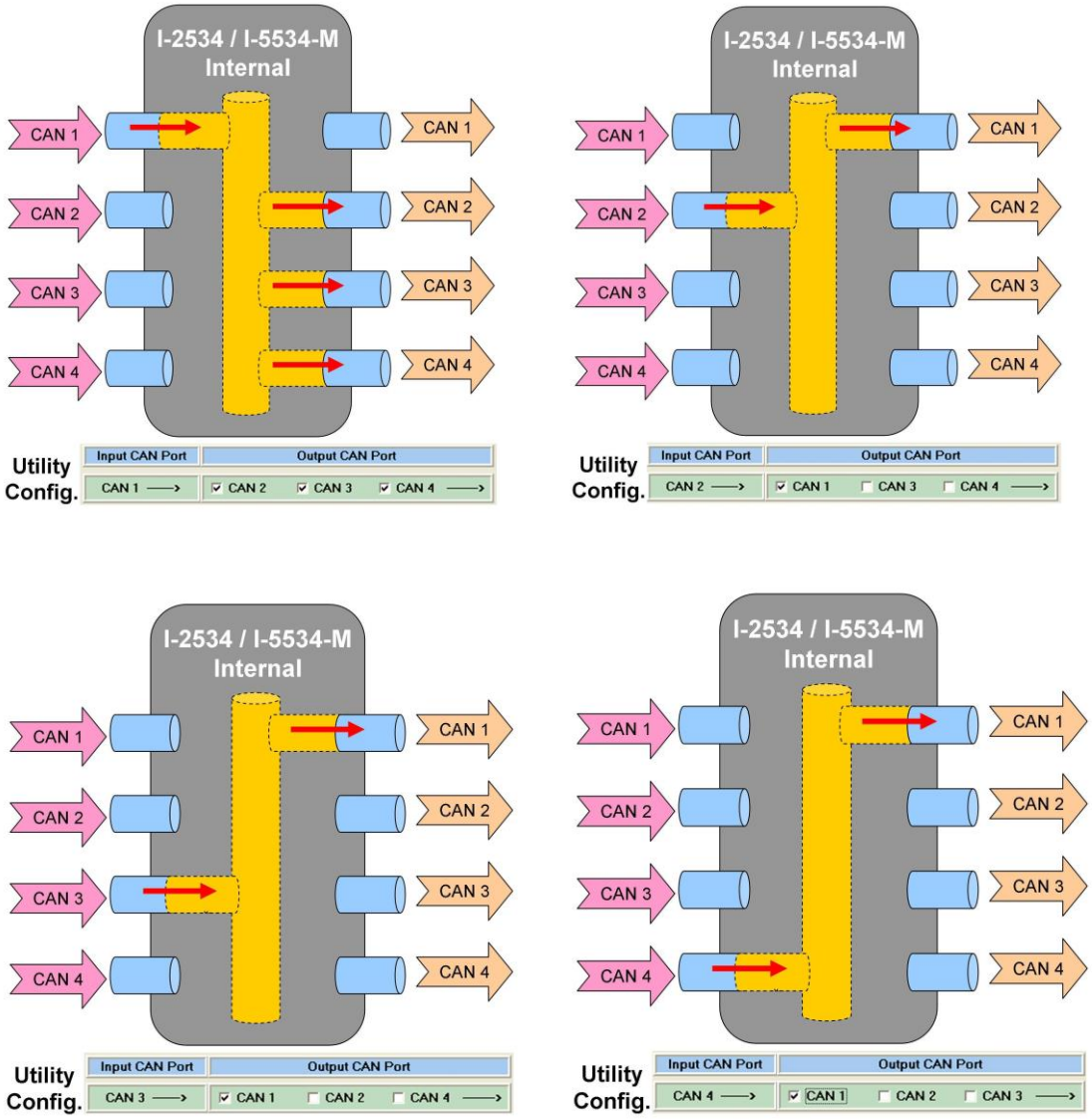


Solution:

1. Each CAN device should connect a single CAN bus to avoid processing the CAN messages from other slave devices. Using the I-2534 or I-5534-M is the efficient solution. The bus topology is shown below.



2. Configure the route path to make the response message only send to the PC side. All of the I-2534s or I-5534-Ms can be configured as follows.

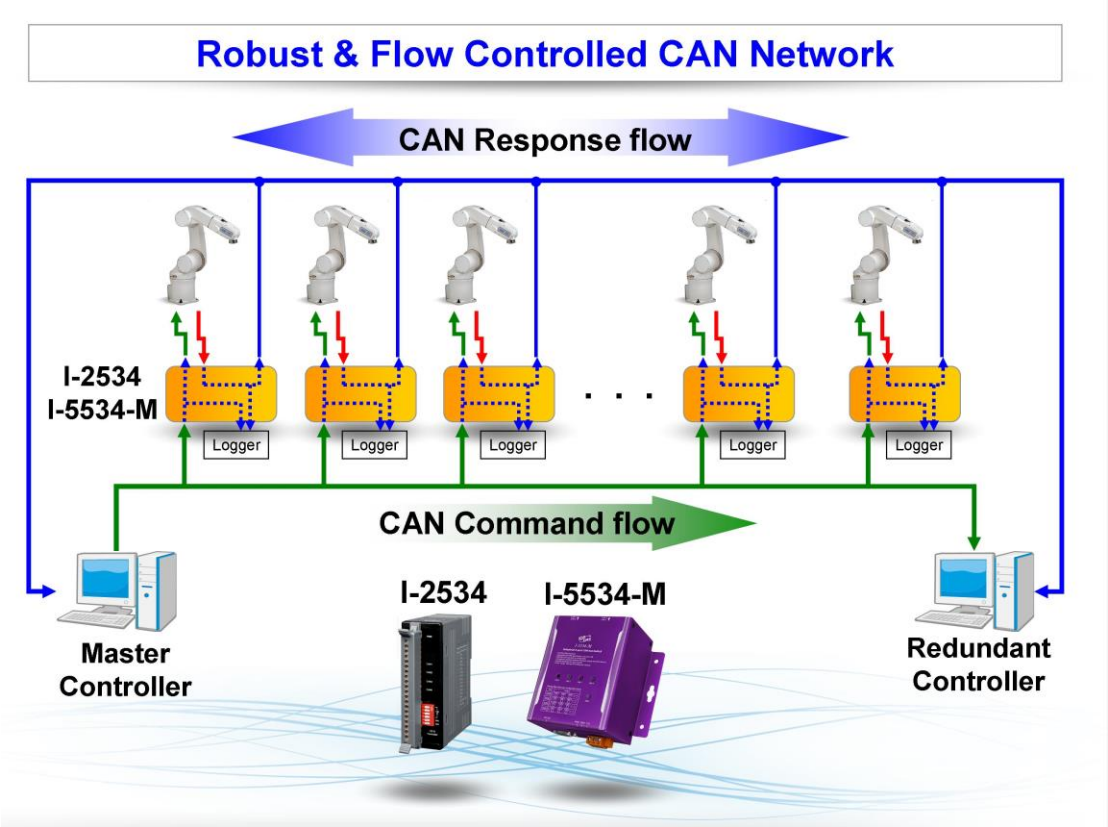


7.4 How to build robust and flow controlled CAN network?

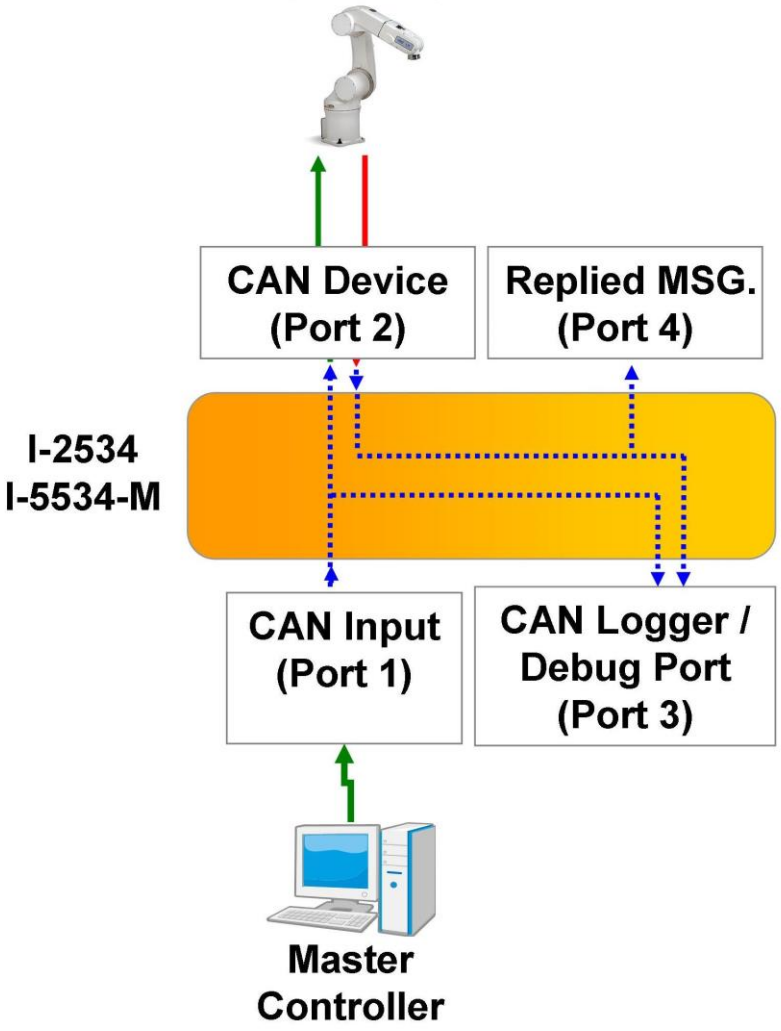
Here shows the typical solution.

Each CAN device could connect with the master controller by the I-2534 or

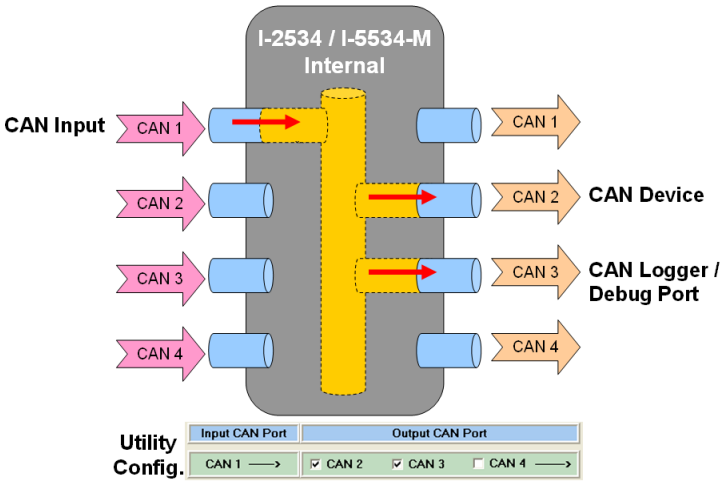
I-5534-M CAN switch. Every CAN device will receive the CAN command messages, like “SYNC” or “Bit-Strobe” message at the same time. It is easy to perform the real-time synchronize processes without any jitter. All replied CAN messages of the CAN devices would go to another CAN network and do not go back to the CAN command network. Those replied messages would not influence the CAN network which is transmitting the real-time synchronize commands. This robust architecture will make the synchronize commands more stable and realizable. Beside, the user could utilize another CAN port to log or control the individual CAN devices. When the network is on-line, the users could monitor or save the CAN messages of the CAN devices individually. When one CAN device has problems, it is easy for the engineer to debug and send control commands to the CAN device individually. Here shows the robust and flow controlled topology.

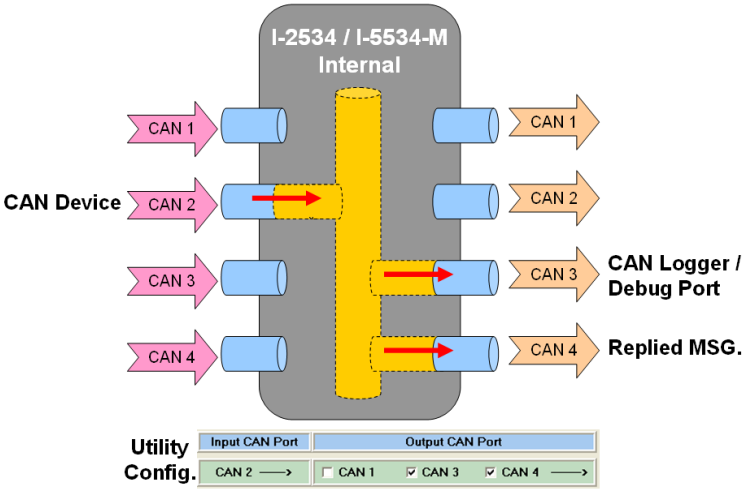


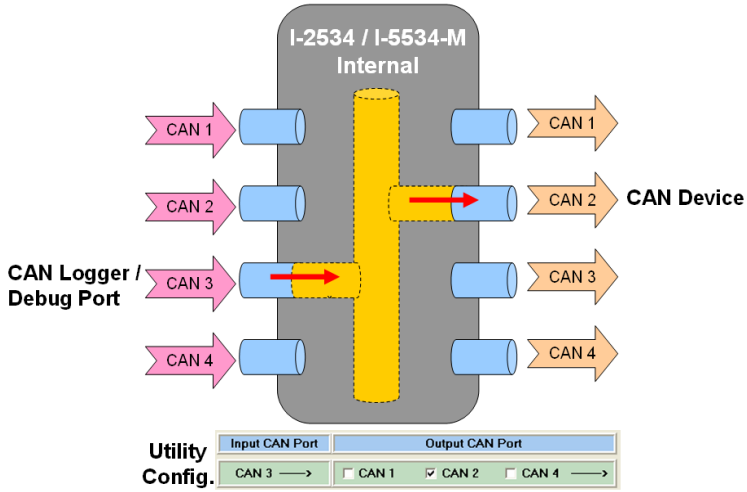
We could simply define the CAN port name and its functionality. Here shows the definition.

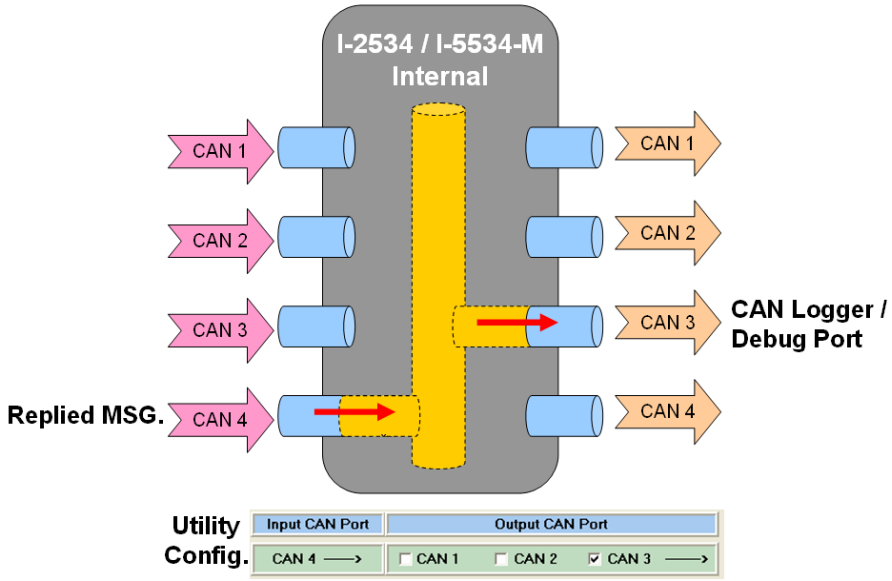


The configuration of the I-2534 or I-5534-M would be as follows.


I-2534 / I-5534-M
Internal
CAN Input
CAN 1
CAN 2
CAN 3
CAN 4
CAN 1
CAN 2
CAN Device
CAN 3
CAN Logger /
Debug Port
CAN 4
Utility
Config.
Input CAN Port
Output CAN Port
CAN 1
CAN 2
CAN 3
CAN 4


I-2534 / I-5534-M
Internal
CAN Device
CAN 1
CAN 2
CAN 3
CAN 4
CAN 1
CAN 2
CAN 3
CAN Logger /
Debug Port
CAN 4
Replied MSG.
Utility
Config.
Input CAN Port
Output CAN Port
CAN 2
CAN 1
CAN 3
CAN 4


I-2534 / I-5534-M
Internal
CAN 1
CAN 2
CAN Logger /
Debug Port
CAN 3
CAN 4
CAN 1
CAN 2
CAN Device
CAN 3
CAN 4
Utility
Config.
Input CAN Port
Output CAN Port
CAN 3
CAN 1
CAN 2
CAN 4


I-2534 / I-5534-M
Internal
CAN 1
CAN 2
CAN 3
CAN 4
CAN 1
CAN 2
CAN 3
CAN 4
CAN Logger /
Debug Port
Replied MSG.
Utility
Config.
Input CAN Port
Output CAN Port
CAN 4
CAN 1
CAN 2
CAN 3