

Industrial CAN FD Series Control Board

User Manual

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Safety Information

1. Keep this User's Manual for future reference.
2. Always read the safety information carefully.
3. Keep this equipment away from direct sunlight, or in humid or damp places.
4. Do not place this equipment in an unstable position, or on vibrating surface before setting it up.
5. Do not use or place this equipment near magnetic fields, televisions, or radios to avoid electronic interface that affects device performance.



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1. Hardware Installation

1-1 PCI Express CAN FD Card

The hardware installation of PCI Express Industrial I/O Control Board is easy to carry out. Before inserting the card into the PCIe bus, please follow the detailed steps given below to install the board in your computer.



SAFETY FIRST

To avoid damaging to the computer, make sure to remove any power connection before card installation.

Step 1: Turn your PC's power off, and shut off the power to any peripheral.

Step 2: Remove the power plug from the plug socket.

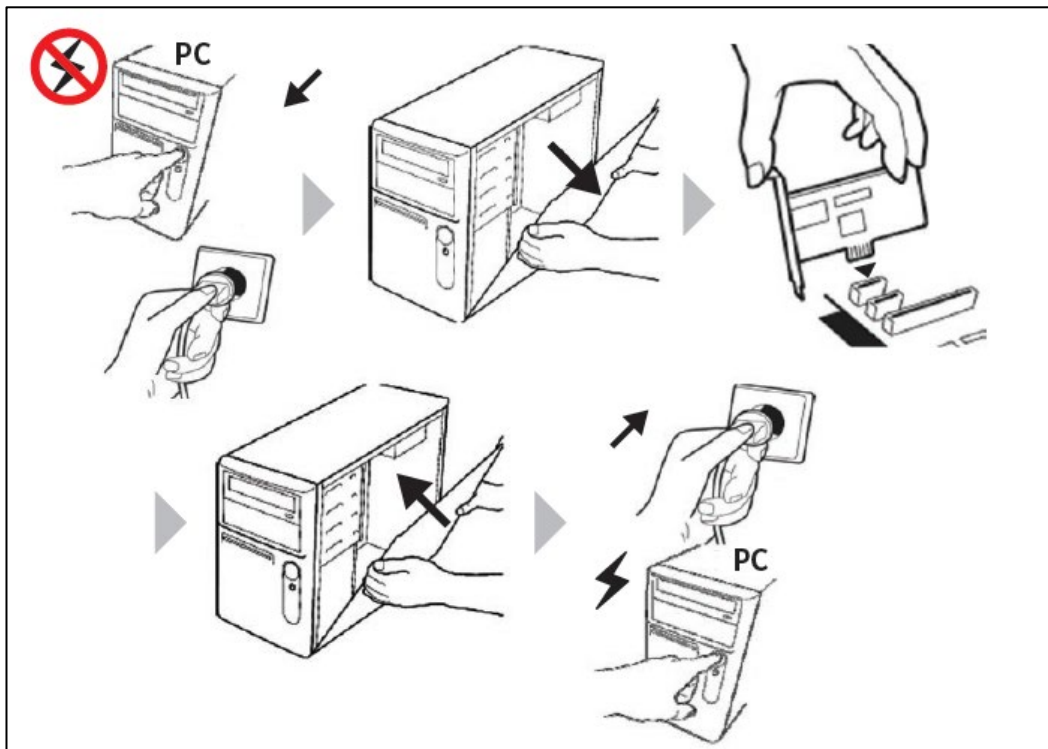
Step 3: Remove the cover from the computer case.

Step 4: If fitted. Remove the metal cover plate on the rear of a free PCIe slot.

Step 5: Insert PCI Express Industrial I/O Control Board into the free PCIe slot and screw it firmly on the bracket side.

Step 6: Place the cover back onto the computer.

Step 7: Insert the plug into the plug socket.



1-2 M.2 PCIe CAN FD Card

The hardware installation of M.2 PCI Express Industrial I/O Control Board is easy to carry out. Before inserting the card into M.2 slot, please follow the detailed steps given below to install the boards in your computer.



SAFETY FIRST

To avoid damaging to the computer, make sure to remove any power connection before card installation.

Step 1: Remove the screw attached to the motherboard.

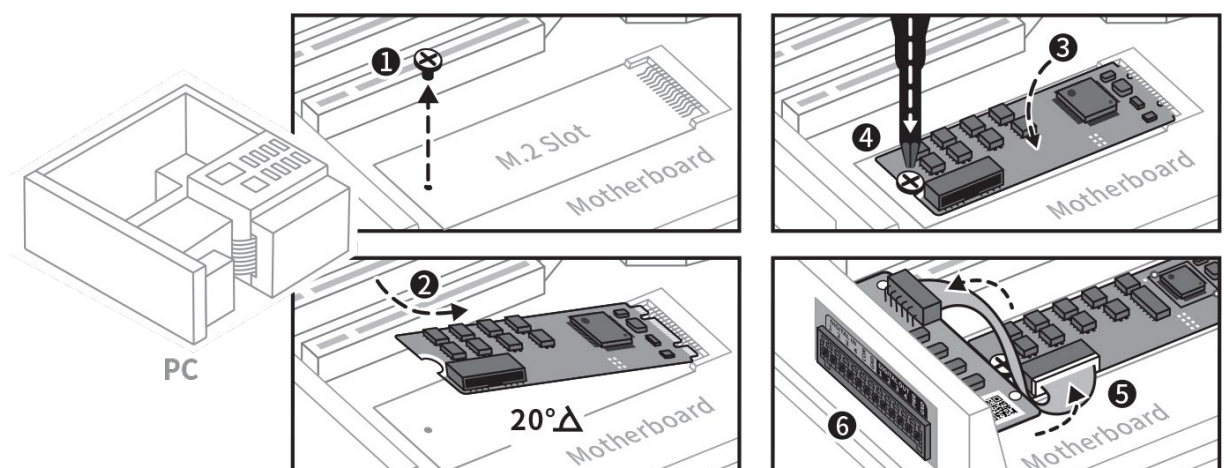
Step 2: Insert M.2 Card tightly into the M.2 slot with 20° angle. (SUNIX M.2 Card supports Key-M and Key-B slot)

Step 3: Push the M.2 card down to the screw hole.

Step 4: Lock screw on M.2 card that you remove from motherboard in step1.

Step 5: Connect ribbon cable

Step 6: Secure the extension board to PC chassis.



1-3 Mini PCIe CAN FD Card

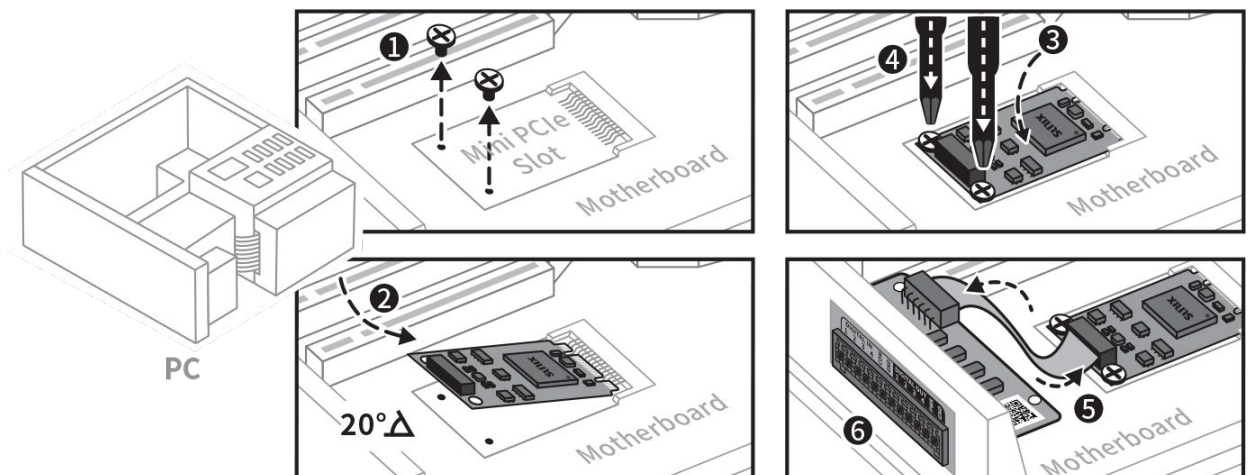
The hardware installation of Mini PCI Express Industrial I/O Control Board is easy to carry out. Before inserting the card into Mini PCI-E slot, please follow the detailed steps given below to install the boards in your computer.



SAFETY FIRST

To avoid damaging to the computer, make sure to remove any power connection before card installation.

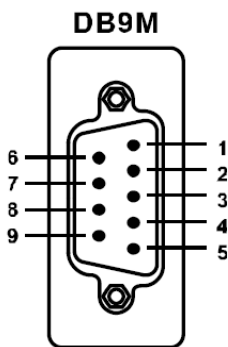
- Step 1: Remove the screw attached to the motherboard.
- Step 2: Insert Mini PCI-E Card tightly into the Mini PCI-E slot.
- Step 3: Push the Mini PCI-E card down to the screw hole.
- Step 4: Lock screw on Mini PCI-E card that you remove from motherboard in step1.
- Step 5: Connect ribbon cable
- Step 6: Secure the extension board to PC chassis.



2. Pin Assignment

PCI Express / M.2 / Mini PCIe Series

DB9 Pin define

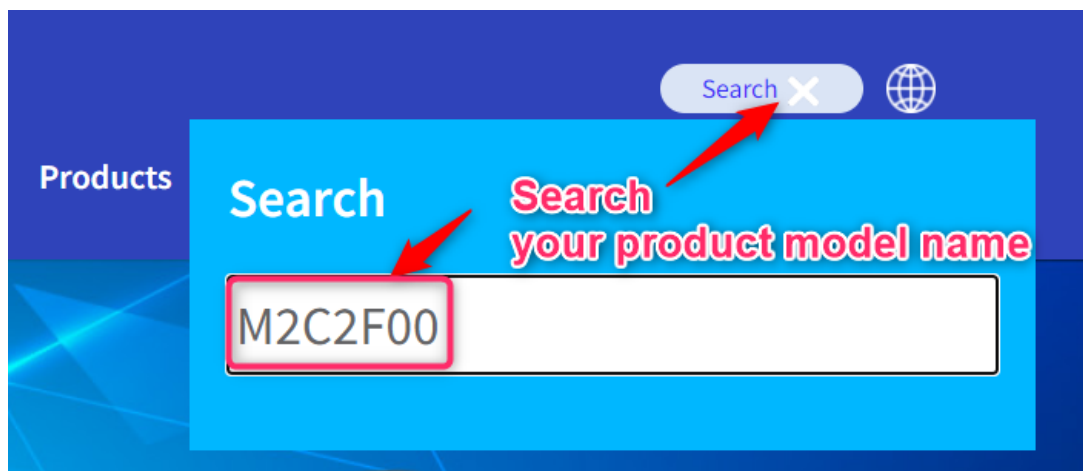


PIN	Signal
1	-
2	CAN L
3	GND
4	-
5	-
6	GND
7	CAN H
8	-
9	-

3. Driver Installation

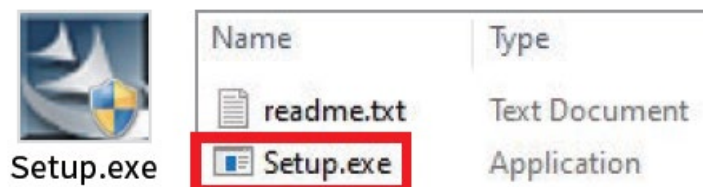
3-1 Windows Platform

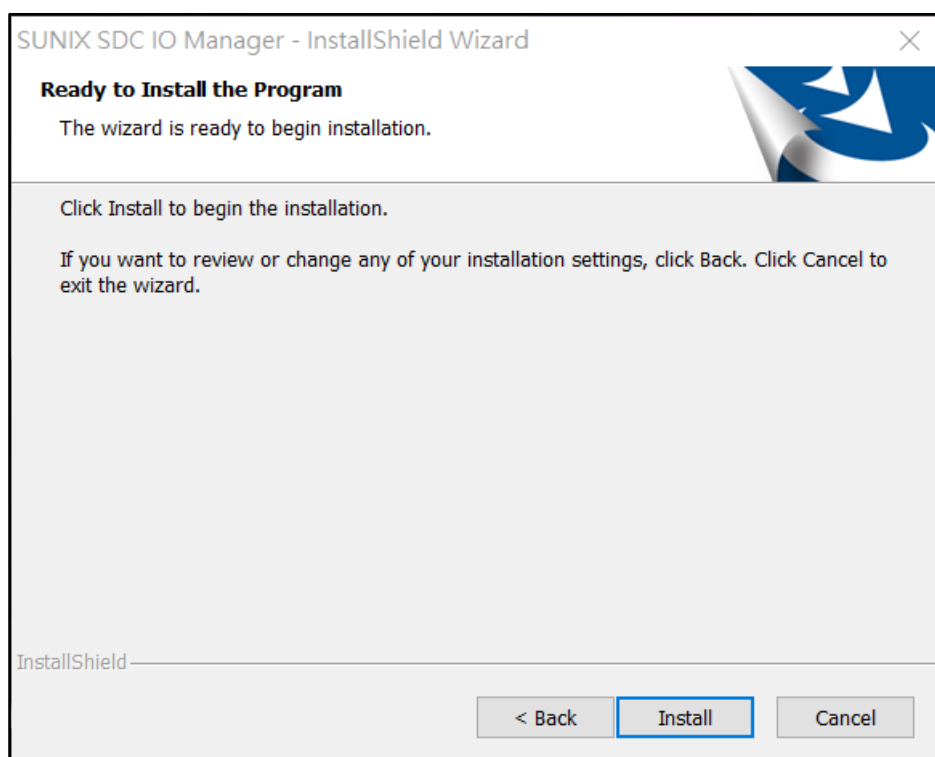
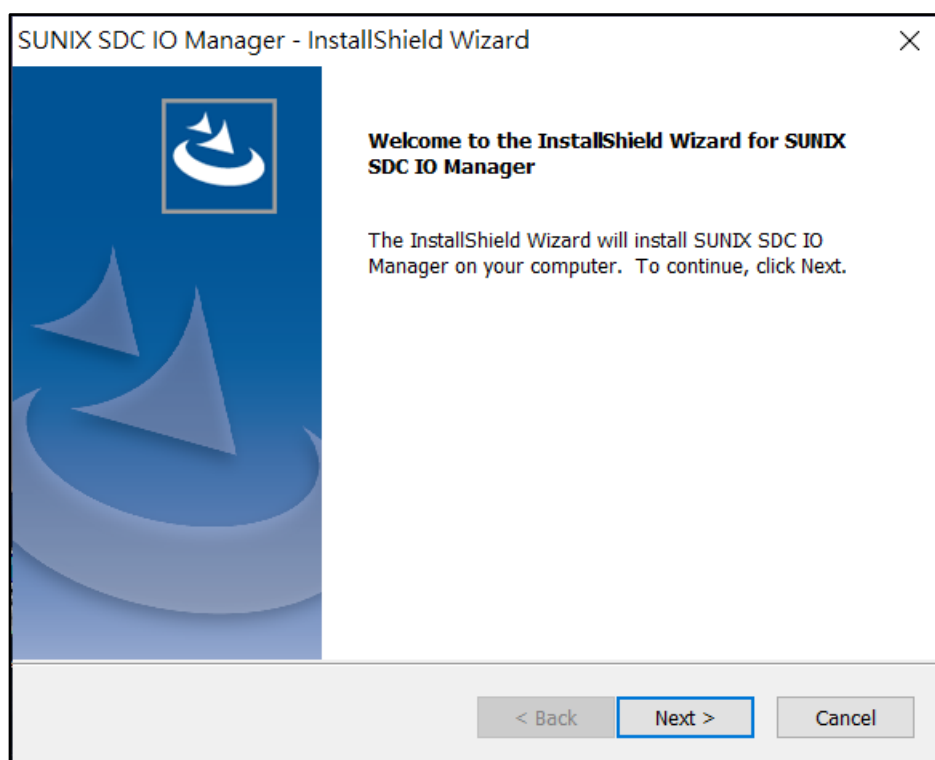
- (1) You can download the latest driver from SUNIX official website (<http://www.sunix.com>)

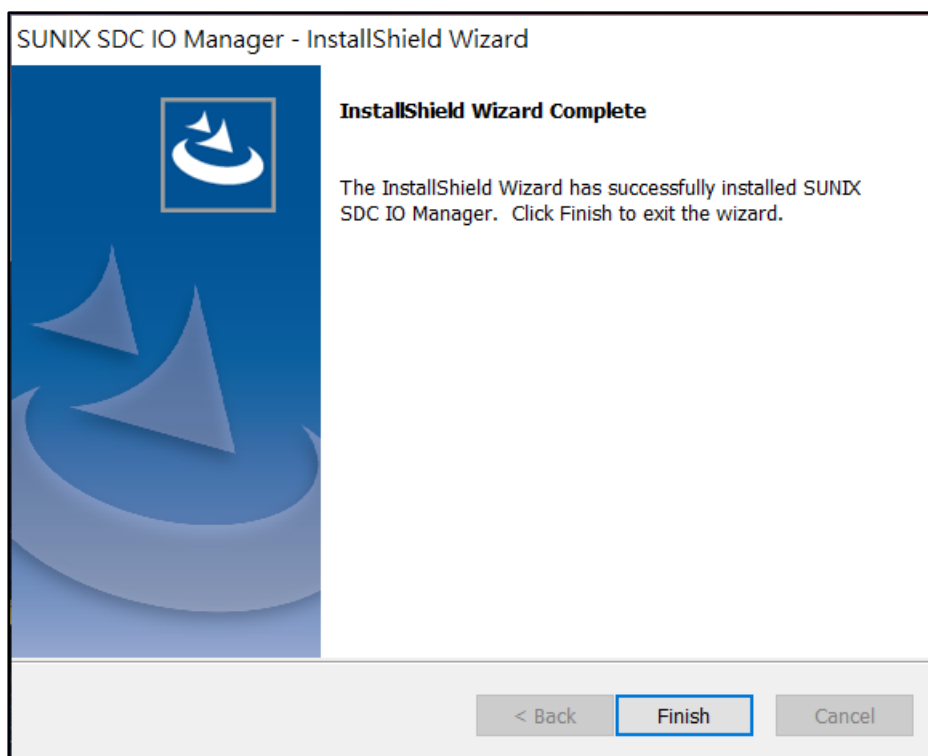
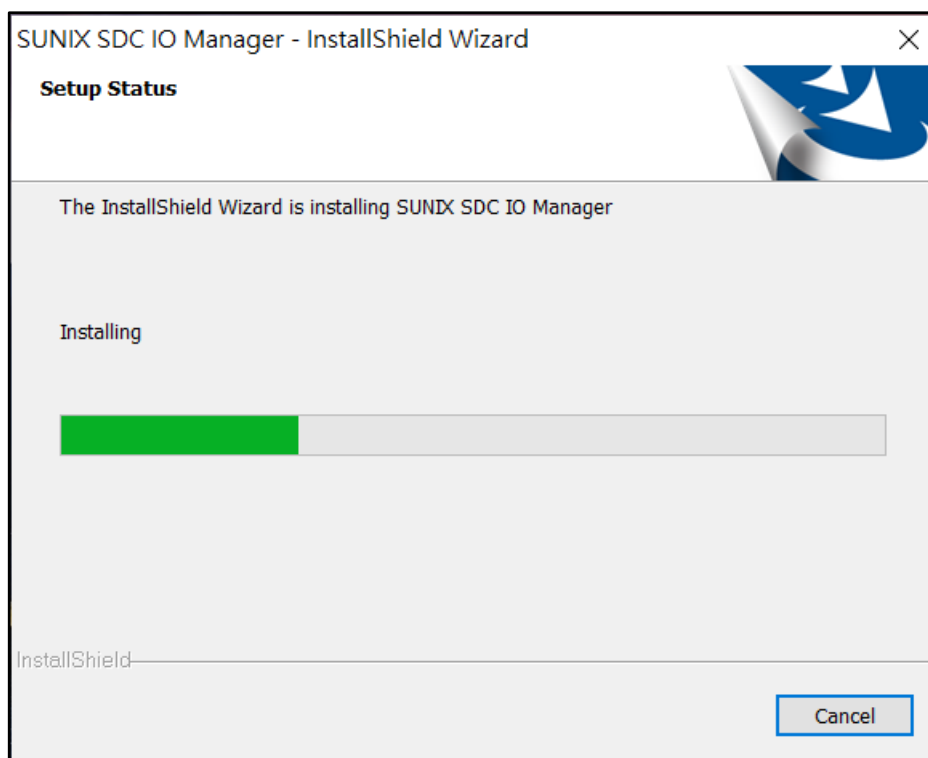


- (2) Please execute Setup.exe to install driver. Driver InstallShield Wizard will show up and please wait for driver install procedure running.

Please plug the board in an available I/O slot first, before installing the driver.
Unzip the software file and run setup.exe under Windows operating system.

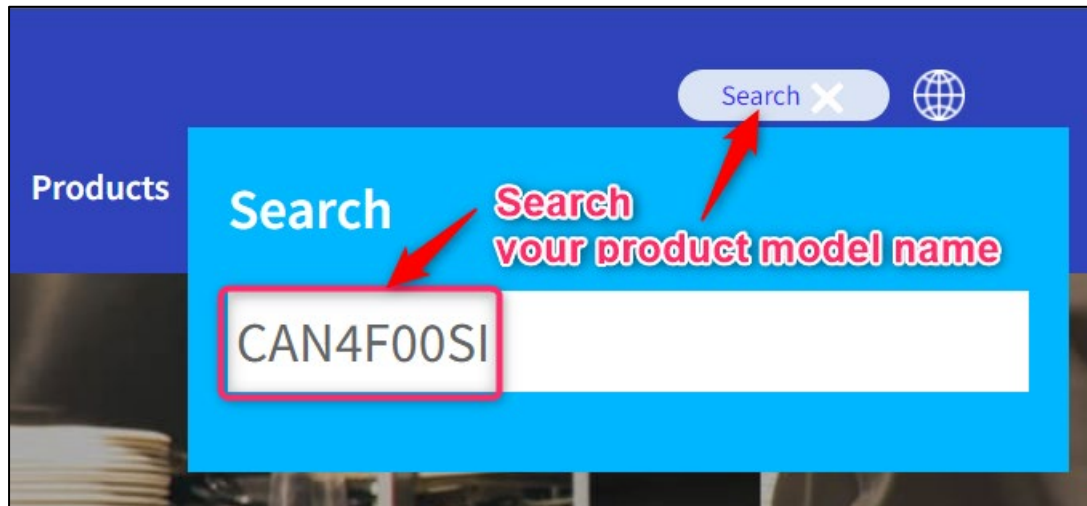




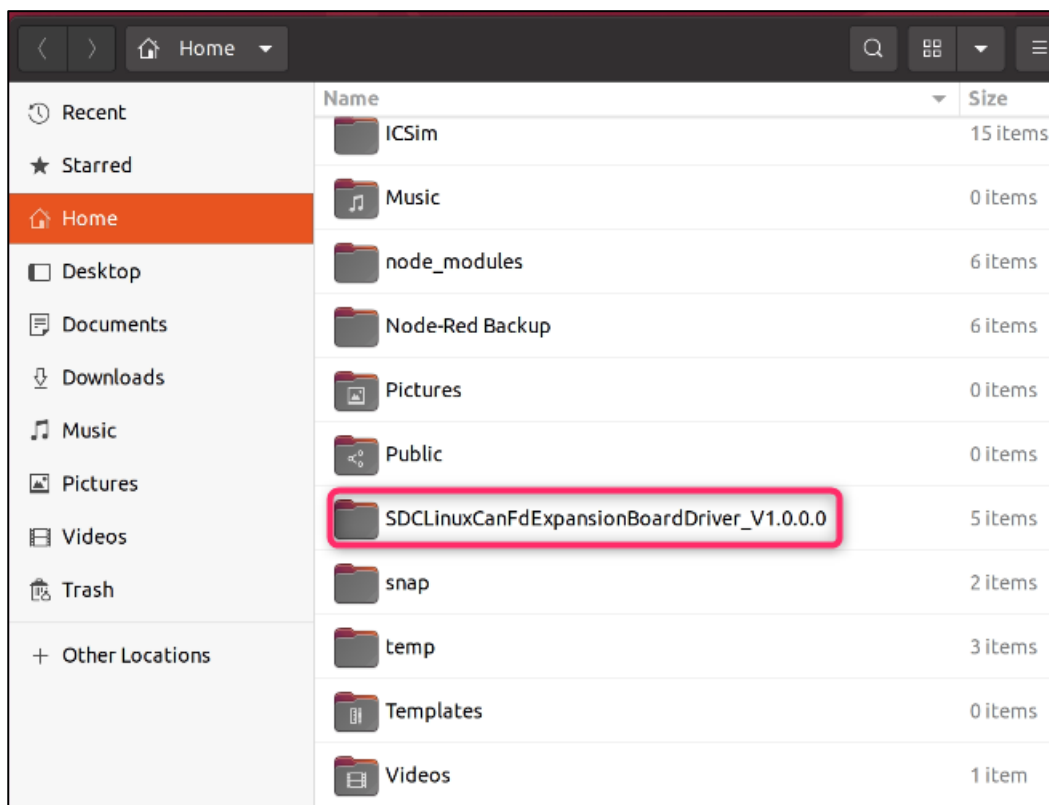


3-2 Linux Platform

(3) You can download the latest driver from SUNIX official website (<http://www.sunix.com>)



(2) Please plug the board in an available I/O slot first, before installing the driver.
Unzip the software file under Ubuntu Linux operating system.



SocketCAN Driver installation

- 1). Confirm that the card is detected by the system by type “**lspci -v**”

```
# lspci -v
```

```
05:00.0 Communication controller: SUNIX Co., Ltd. Device 2000 (rev 01)
Subsystem: SUNIX Co., Ltd. Device 0001
Flags: fast devsel, IRQ 255, IOMMU group 24
Memory at fc802000 (32-bit, non-prefetchable) [disabled] [size=2K]
I/O ports at d000 [disabled] [size=64]
Memory at fc800000 (32-bit, non-prefetchable) [disabled] [size=8K]
Capabilities: [40] Power Management version 3
Capabilities: [60] Express Legacy Endpoint, MSI 00
```

- 2). Enter the driver directory and compile the SocketCAN driver.

```
# ./SDCLinuxCanFdExpansionBoardDriver_V1.x.x.x/Driver
```

```
# make CFLAGS_MODULE=-DNETCAN
```

```
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver
/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver# make CFLAGS_MODULE=-DNETCAN
```

- 3). Move kernel module to kernel module directory.

```
# make install
```

```
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver
:/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver# make install
```

- 4). Mount and install related modules and utilities.

```
# ./driver_op -i
```

```
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver
:/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver# ./driver_op -i
```

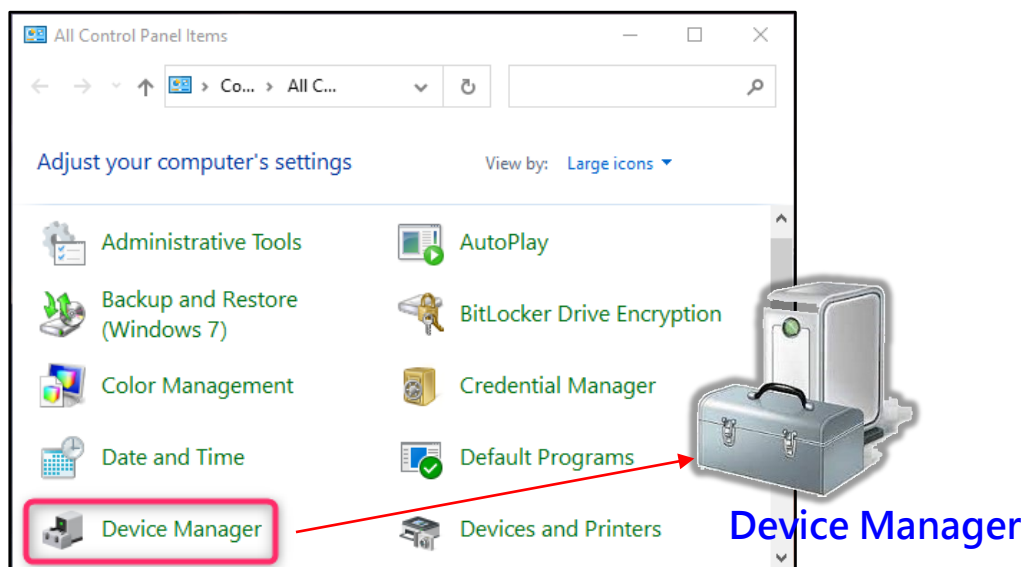
4. Driver Verification

4-1 Windows Platform

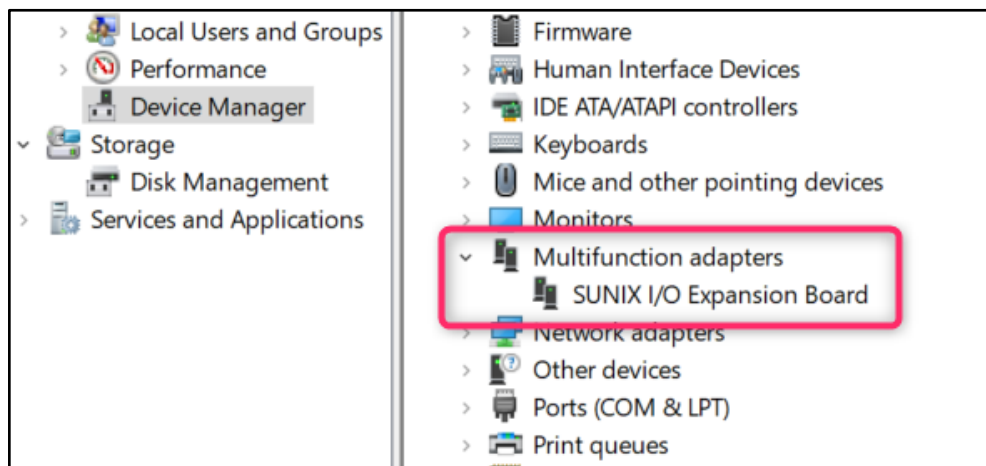
You can use Windows “**Device Manager**” to verify proper installation.

(1) Select Device Manager in the in the Windows Control Panel.

Controller Panel > All Control Panel Items > Device Manager



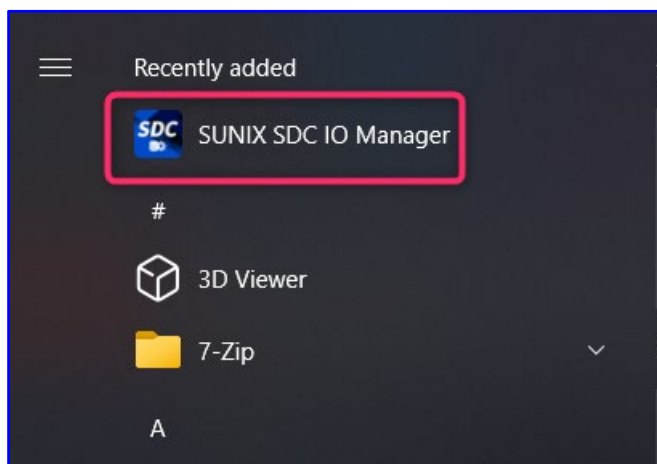
(2) In the Device Manager window, you would read **SUNIX I/O Expansion Board** under **Multifunction adapters** catalog



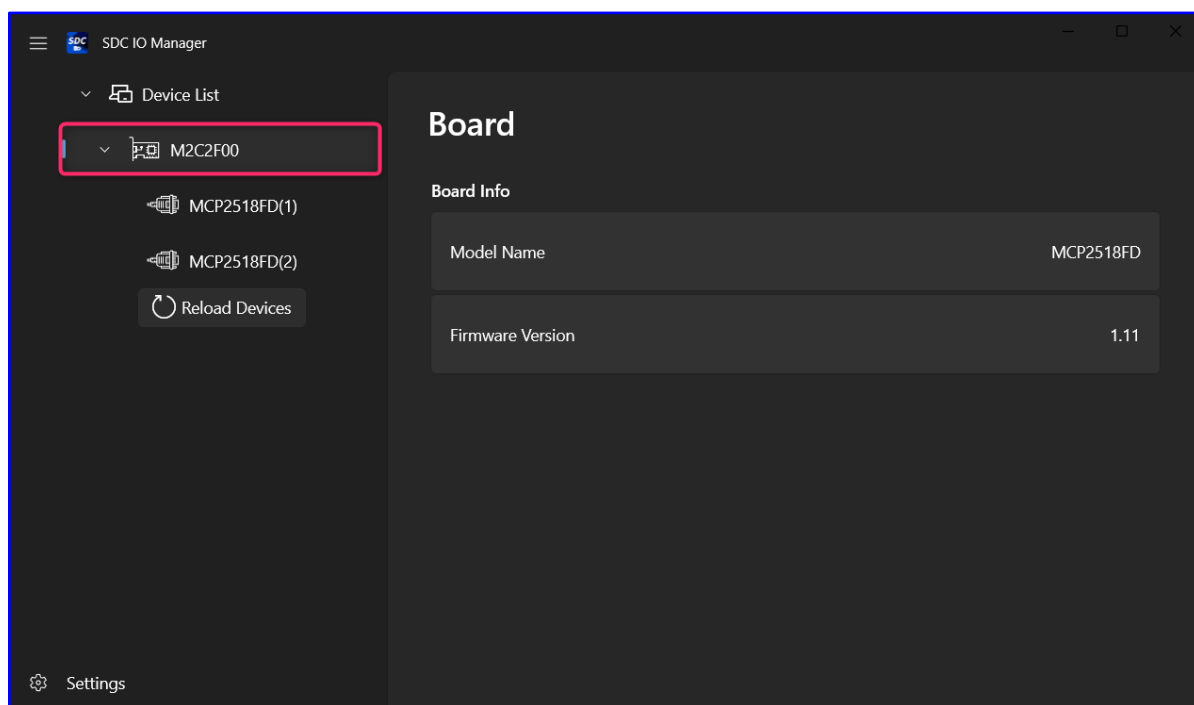
(3) Execute “**SUNIX SDC IO Manager**”.



Start > SUNIX SDC IO Manager



Check the “**Device List window**”. If the interface card appears, it means the driver has been installed successfully.



4-2 Linux Platform

Reboot system and check the module is mounted.

```
# lspci -v
```

```
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver
/home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver# lspci -v

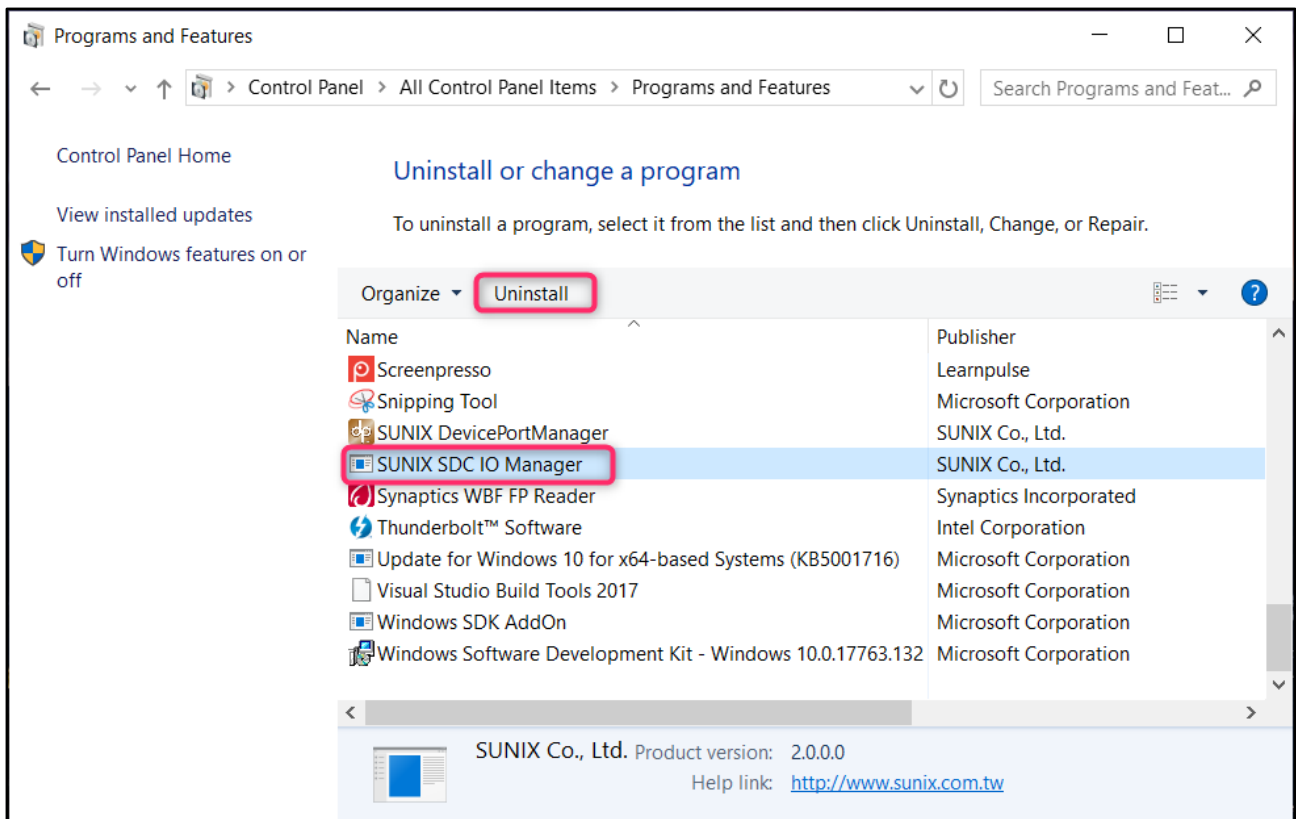
01:00.0 Communication controller: SUNIX Co., Ltd. Device 2000 (rev 01)
Subsystem: SUNIX Co., Ltd. Device 0001
Flags: bus master, fast devsel, latency 0, IRQ 16
Memory at 91102000 (32-bit, non-prefetchable) [size=2K]
I/O ports at 3000 [size=64]
Memory at 91100000 (32-bit, non-prefetchable) [size=8K]
Capabilities: [40] Power Management version 3
Capabilities: [60] Express Legacy Endpoint, MSI 00
Kernel driver in use: sunix_sdc
Kernel modules: sunix_sdc

root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver#
```

5. Driver Uninstall

5-1 Windows Platform

- (1) Open Control Panel -> Programs and Features.
- (2) Select "SUNIX SDC IO Manager".
- (3) Click "Uninstall" to uninstall driver.



5-2 Linux Platform

- 1). Enter the driver directory and compile the SocketCAN driver and then unmount the related modules and remove related utilities.

```
# ./SDCLinuxCanFdExpansionBoardDriver_V1.x.x.x/Driver
```

```
# ./driver_op -u
```

```
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver  
t/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver# ./driver_op -u
```

- 2). Remove related module from kernel module directory.

```
# make uninstall
```

```
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver  
t/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver# make uninstall
```

- 3). Remove object files.

```
# make clean
```

```
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver  
/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver# make clean
```

- 4). Reboot system and make sure the module is unmounted.

```
# lspci -v
```

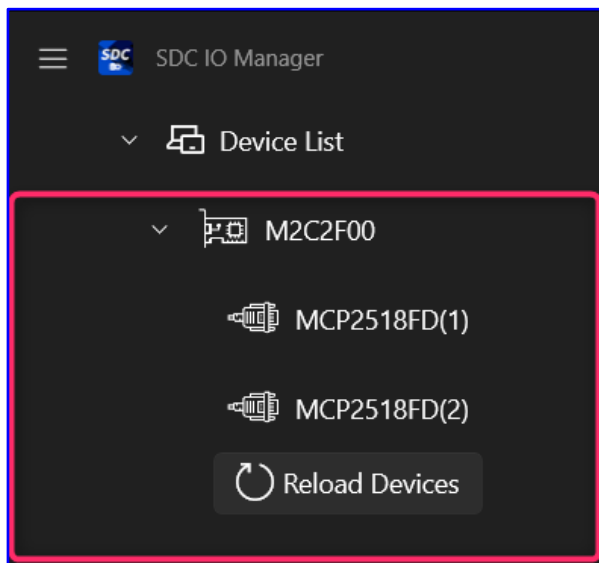

6. SUNIX SDC IO Manager

Note : for Windows platform only

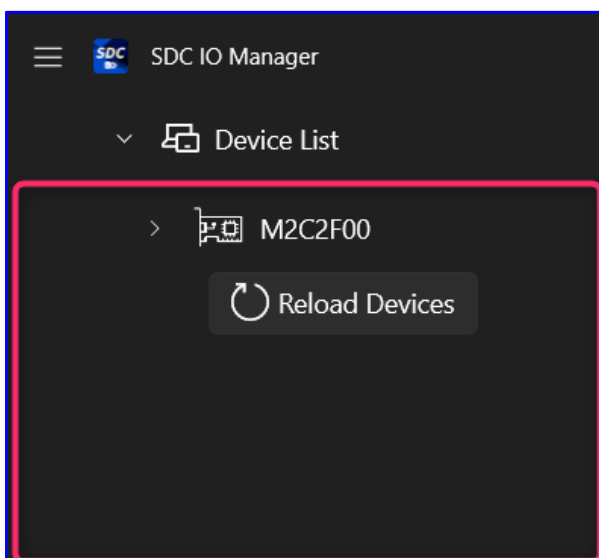
6-1 Check Interface Card details.

After clicking on the interface card, the **Model Name** and **Firmware Version** will appear in the right window.

Click **>** : you can to expand communication port

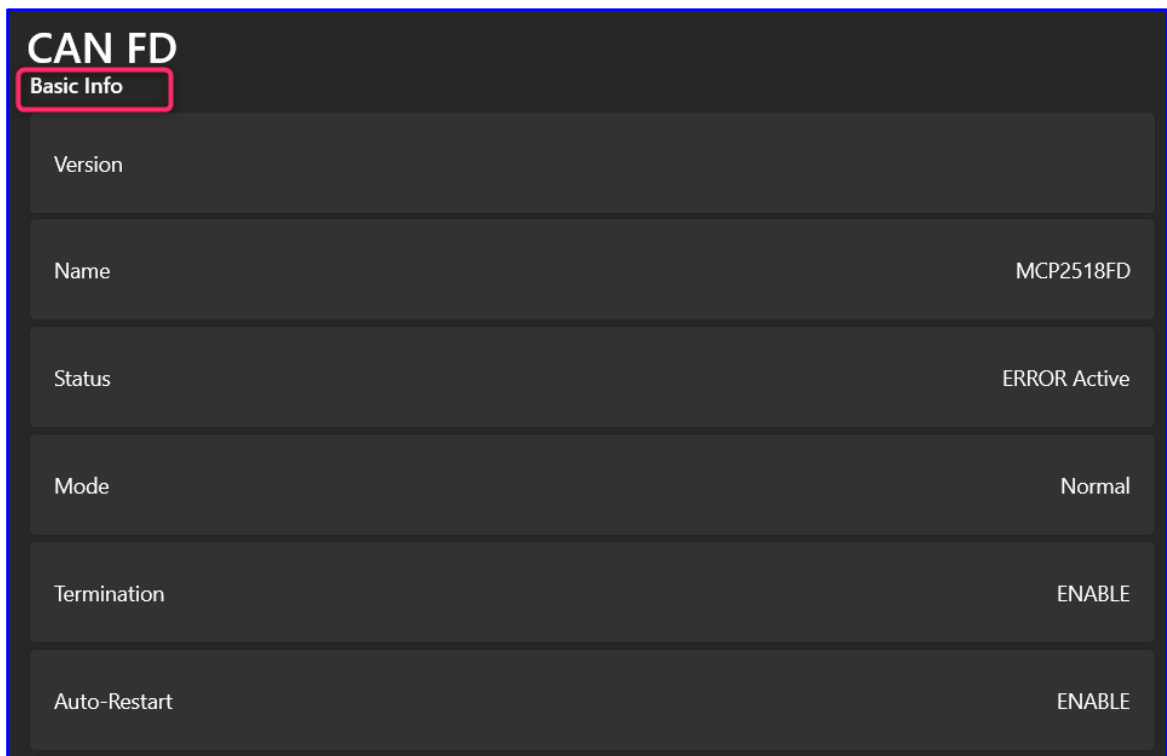
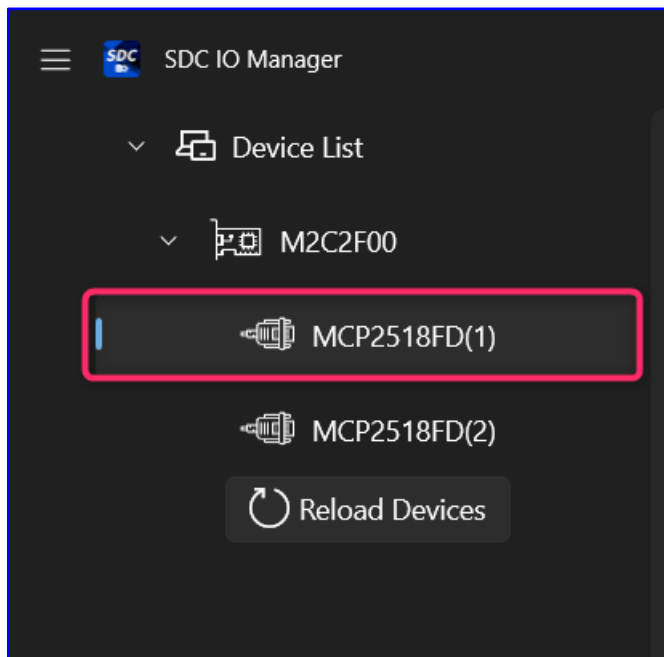


Click **>** : you can to collapse the communication port



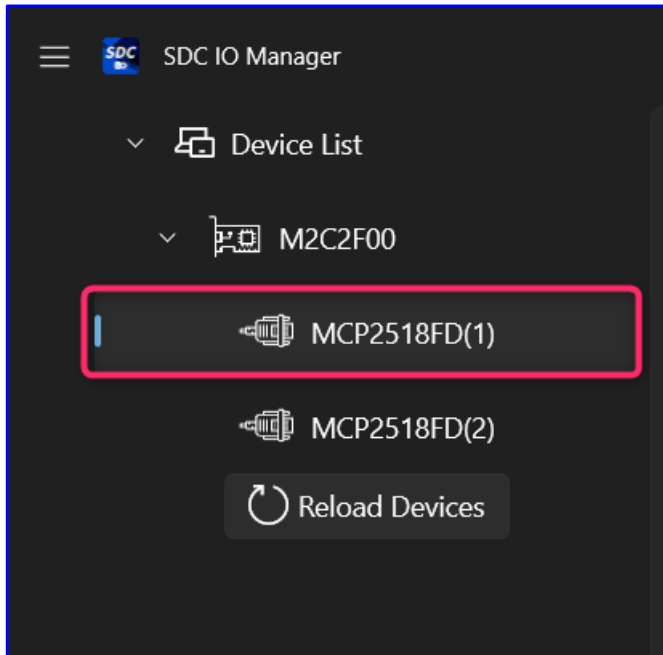
6-2 Check single channel Basic details

Click single channel port,
drag the right window scroll to view **Basic** information.



6-3 Check single channel Nominal Bitrate details

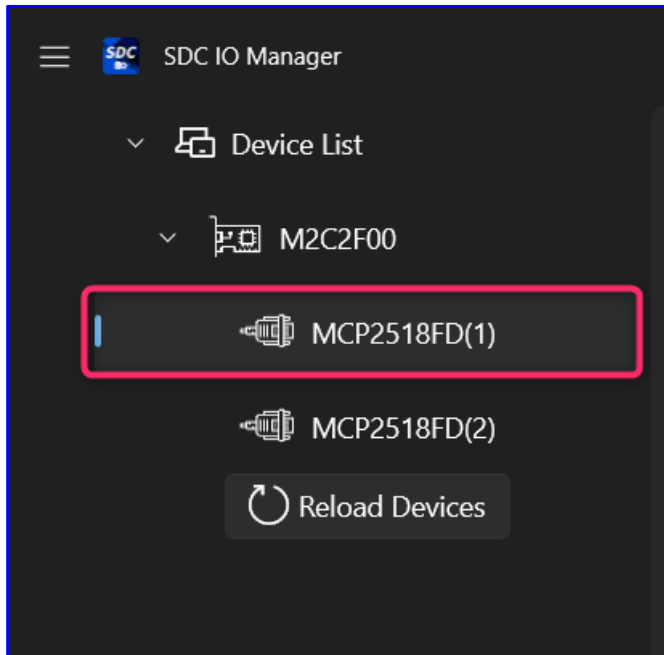
Click single channel port,
drag the right window scroll down to view **Nominal Bitrate** information.



CAN FD	
Nominal Bitrate Info	
Bitrate	1000000
Sample Point	750
SJW, Synchronization Jump Width	1
Error	0
TQ, Time Quantum	25
Propagation Time Segment	14

6-4 Check single channel Data Bitrate details

Click single channel port,
drag the right window scroll down to view **Data Bitrate** information.



CAN FD	
Data Bitrate Info	
Bitrate	1000000
Sample Point	750
SJW, Synchronization Jump Width	1
Error	0
TQ, Time Quantum	25
Propagation Time Segment	14

7. SocketCAN Configuration

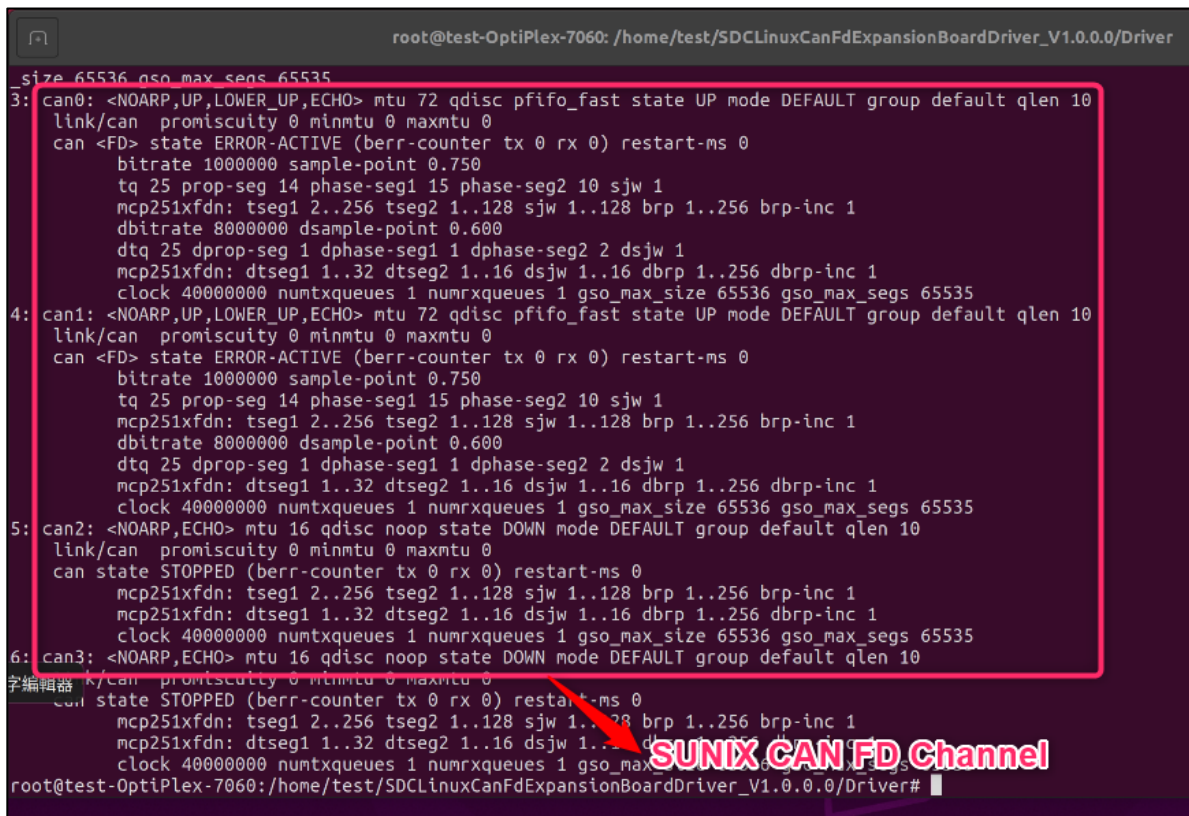
Note : for Linux platform only

Confirm tha the following packages have been installed

- Iproute2
- Can-utils

7-1 Check all SocketCAN devices details.

ip -details link show



```

root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver
size 65536 gso_max_segs 65535
3: can0: <NOARP,UP,LOWER_UP,ECHO> mtu 72 qdisc pfifo_fast state UP mode DEFAULT group default qlen 10
   link/can promiscuity 0 minmtu 0 maxmtu 0
   can <FD> state ERROR-ACTIVE (berr-counter tx 0 rx 0) restart-ms 0
        bitrate 1000000 sample-point 0.750
        tq 25 prop-seg 14 phase-seg1 15 phase-seg2 10 sjw 1
        mcp251xfd: tseg1 2..256 tseg2 1..128 sjw 1..128 brp 1..256 brp-inc 1
        dbitrates 8000000 dsample-point 0.600
        dtq 25 dprop-seg 1 dphase-seg1 1 dphase-seg2 2 dsjw 1
        mcp251xfd: dtseg1 1..32 dtseg2 1..16 dsjw 1..16 dbrp 1..256 dbrp-inc 1
        clock 40000000 numtxqueues 1 numrxqueues 1 gso_max_size 65536 gso_max_segs 65535
4: can1: <NOARP,UP,LOWER_UP,ECHO> mtu 72 qdisc pfifo_fast state UP mode DEFAULT group default qlen 10
   link/can promiscuity 0 minmtu 0 maxmtu 0
   can <FD> state ERROR-ACTIVE (berr-counter tx 0 rx 0) restart-ms 0
        bitrate 1000000 sample-point 0.750
        tq 25 prop-seg 14 phase-seg1 15 phase-seg2 10 sjw 1
        mcp251xfd: tseg1 2..256 tseg2 1..128 sjw 1..128 brp 1..256 brp-inc 1
        dbitrates 8000000 dsample-point 0.600
        dtq 25 dprop-seg 1 dphase-seg1 1 dphase-seg2 2 dsjw 1
        mcp251xfd: dtseg1 1..32 dtseg2 1..16 dsjw 1..16 dbrp 1..256 dbrp-inc 1
        clock 40000000 numtxqueues 1 numrxqueues 1 gso_max_size 65536 gso_max_segs 65535
5: can2: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default qlen 10
   link/can promiscuity 0 minmtu 0 maxmtu 0
   can state STOPPED (berr-counter tx 0 rx 0) restart-ms 0
        mcp251xfd: tseg1 2..256 tseg2 1..128 sjw 1..128 brp 1..256 brp-inc 1
        mcp251xfd: dtseg1 1..32 dtseg2 1..16 dsjw 1..16 dbrp 1..256 dbrp-inc 1
        clock 40000000 numtxqueues 1 numrxqueues 1 gso_max_size 65536 gso_max_segs 65535
6: can3: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default qlen 10
   link/can promiscuity 0 minmtu 0 maxmtu 0
   can state STOPPED (berr-counter tx 0 rx 0) restart-ms 0
        mcp251xfd: tseg1 2..256 tseg2 1..128 sjw 1..128 brp 1..256 brp-inc 1
        mcp251xfd: dtseg1 1..32 dtseg2 1..16 dsjw 1..16 dbrp 1..256 dbrp-inc 1
        clock 40000000 numtxqueues 1 numrxqueues 1 gso_max_size 65536 gso_max_segs 65535
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver#

```

SUNIX CAN FD Channel

7-2 Check single channel details

Check single channel details, at this time, bus state should be “STOPPED”

```
# ip -details link show [device]
```

```
root@test-OptiPlex-7060: /home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver
root@test-OptiPlex-7060:/home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver# ip -details link show can3
6: can3: <NOARP,ECHO> mtu 16 qdisc noop state DOWN mode DEFAULT group default qlen 10
    link/can promiscuity 0 minmtu 0 maxmtu 0
    can state STOPPED (berr-counter tx 0 rx 0) restart-ms 0
    mcp251xfd: tseg1 2..256 tseg2 1..128 sjw 1..128 brp 1..256 brp-inc 1
    mcp251xfd: dtseg1 1..32 dtseg2 1..16 dsjw 1..16 dbrp 1..256 dbrp-inc 1
    clock 40000000 numtxqueues 1 numrxqueues 1 gso_max_size 65536 gso_max_segs 65535
root@test-OptiPlex-7060:/home/test/SDCLinuxCanFdExpansionBoardDriver_V1.0.0.0/Driver#
```

7-3 Set CAN 2.0 or Set CAN FD

CAN 2.0 : Set can channel up and set arbitration bitrate.

```
# ip link set [channel] up type can bitrate [arbitration bitrate]
```

```
root@test-OptiPlex-7060: /
root@test-OptiPlex-7060:/# ip link set can0 up type can bitrate 1000000
```

※ CAN 2.0 arbitration bitrate ≤ 1Mbps

CAN FD : Set can channel up, set arbitration bitrate and data bitrate, set FD on.

```
# ip link set [channel] up type can bitrate [arbitration bitrate] dbitrte [data bitrate] fd on
```

```
root@test-OptiPlex-7060: /
root@test-OptiPlex-7060:/# ip link set can0 up type can bitrate 1000000 dbitrte 8000000 fd on
```

※ 8Mbps ≥ data bitrate > arbitration bitrate

8 Troubleshooting

Q 1. System fails to find the Industrial I/O Control Board.

Ans: It may cause by following issue:

- a. The board is not properly plugged into the PCIe (M.2/Mini PCIe) slot.
- b. Please clean the golden finger.
- c. The M.2 slot is defective. Please try other slots until you find one that works.
- d. The mainboard does not have an available IRQ for the
PCIe (M.2/Mini PCIe) series board.

Enter the PC's BIOS and make sure an IRQ setting is available in the PCI/PnP settings.

- e. The board itself might be defective.

You can try another mainboard testing this board working or not.

Q 2. There is a blue screen when I entry operation system.

Ans: It may cause by following issue:

- a. The possible reason is an IRQ or I/O address conflict with other PCIe bus adapters, such as LAN or serial boards, or with the system BIOS.

Refer to the corresponding problem in the previous FAQ for solutions.

- b. Please check driver update from your vendor.