Please visit <a href="https://www.sunix.com">https://www.sunix.com</a> with product model for detail and latest manual/driver update

#### Introduction

SUNIX industrial high speed CANFD communication card is designed for Edge Computer that enables CANFD and CAN bus data communication capability for electric vehicle industry application. This board built-in SUNIX Digital-I/O controller, OiuNiu, and also built with many of SUNIX advanced features and technologies. In addition, SUNIX provides SocketCAN driver, allowing users to program under Linux operating systems. SUNIX CANFD Card enriches CAN / CANFD interface expandable capacity; it's the best CAN bus communication solution for electric vehicle and AVG/AMR applications.

## 1. Hardware Installation



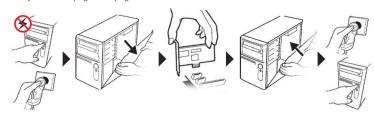
#### SAFETY FIRST

To avoid damages, please make sure to remove any power connection before card installation, and follow the detailed steps given below before inserting the card into your computer.

#### 1-1 PCI Express CANFD Card

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

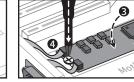
- Step 2: Remove the power plug from the plug socket.
- Step 3: Remove the cover from the computer case.
- Step 4: If fitted. Remove the metal cover plate on the rear of a free PCIe slot.
- Step 5: Insert PCI Express Industrial I/O Control Board into the free PCIe slot and screw it firmly on the bracket side.
- Step 6: Place the cover back onto the computer.
- Step 7: Insert the plug into the plug socket.

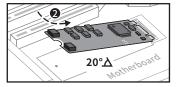


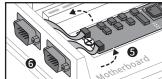
### 1-2 M.2 PCIe CANFD Card

- 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 between M.2 card and extension board.
- Step 6: Secure the extension board to PC chassis.



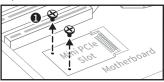


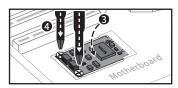




#### 1-3 Mini PCIe CANFD Card

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









## 2. Pin Assignment

D-Sub 9-pin male with nuts on cable.



ı		1	2	3	4	5	6	7	8	9
ı	Signal	-	CANL	GND			GND	CAN H		

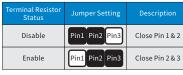
## 3. Terminal Resistor Settin

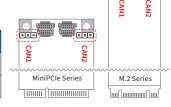
### 3-1. PCIe Series card

Windows platform: Terminal Resistor enable by software API (default disable) Linux platform: Terminal Resistor Always disable

## 3-2. M.2 PCIe & Mini PCIe Series card

Terminal Resistor jumper default is disable





## 4. Driver Installation

- 1) You can download the latest driver from SUNIX official website (https://www.sunix.com)
- 2) Please plug the card into the available I/O slot before installing any driver

## 4-1. Windows platform

Unzip the software file and run setup, exe under Windows OS.







#### 4-2. Linux platform

## Driver installation

1) Confirm the Kernel version is 4.11 or above, include 5.x and 6.x. 2) Confirm the following packages



3) Verify that the system detects the card by "Ispci"

# lspc	system-Product-Name lspci -v -s '0000:05:00.0'							
0310010	osystem: SUNIX Co., Ltd. Device 0001 igs: medium devsel, IRQ 255							
	Memory at 84c02000 (32-bit, non-prefetchable) [disabled] [ I/O ports at 4000 [disabled] [size=64]							
1	Memory at 84c00000 (32-bit, non-prefetchable) [disabled] [Capabilities: [40] Power Management version 3							

- have been installed
- ▶make ▶gcc ▶gcc-12 ▶ncurses.h If these packages are not installed, please confirm Chapter 9 Troubleshooting.

- 4) Unzip "SDCLinuxExpansionBoardDriver VX.X.X.X.zip".
- ot@test-System-Product-Name:/home/ unzip SDCLinuxExpansionBoardDriver\_V2.1.0.0.zip
- 5) Enter "SDCLinuxExpansionBoardDriver VX.X.X.X/driver" driver directory.
- Use "make" and "make install" to build and install driver.



6) Reboot system, confirm the module is mounted

```
$Ispci-v-s"0000:xx:xx.x"
5:00.0 Communication controller: SUNIX Co., Ltd. Device 2000 (rev 01)
Subsystem: SUNIX Co., Ltd. Device 0001
              Flags: medium devsel, IRQ 16
Plags: medium devsel, IRQ 16
Nemory at 84c02000 (32-blt, non-prefetchable) [size=2K]
I/O ports at 4000 [size=64]
Nemory at 84c00000 (32-blt, non-prefetchable) [size=8K]
Canabillties: [40] Power Management version 3
               Kernel driver in use: sunix_sdc
Kernel modules: sunix sdc
```

7) Check the SDC device nodes in /dev dev.

## 4-2. Linux platform

## 2 Tool installation

- 1) Complete driver installation.
- 2) Enter "./SDCLinuxExpansionBoardDriverVX.X.X.X/tools tools" directory.
- 3) Enter the following commands in order.
- \$cp /x86-64/sdc-config /usr/sbin or cp /arm64/sdc-config /usr/sbin
- \$cp /x86-64/sdc-uart-config /usr/sbin or cp /arm64/sdc-uart-config /usr/sbin

4) Enter "./SDCLinuxExpansionBoardDriverVX.X.X.X/script/Ubuntu",

or "./SDCLinuxExpansionBoardDriverVX.X.X.X/script/Kylin" directory

```
$cp sdc-board -cfg.sh /etc/init.d
$update-rc.d sdc-board-cfg.sh defaults
$/etc/init.d/sdc-board-cfg.sh start
$sdc-uart-cfg -s
```

oard-cfg.sh (via systemcti): sdc-board-cfg.service. um-Product-Name:/home/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/script/Ubuntum\_sdc-uart-cfg -s

# 4-2. Linux platform

## 3 Terminal tool snxterm installation

- 1) Enter "./SDCLinuxExpansionBoardDriverVX.X.X.X/snxterm" directory
- 2) Use "make install" to build and install snxterm.

Smake install sten-Product-Name:/home/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/snxterm make install gcc -02 -pthread -pipe -o snxterm snxterm.c -incurses

3) snxtermis a terminal tool, the tool could test serial port communication, Enter "snxterm" to execute the application.



#### 5. Driver Verification

#### 5-1. Windows platform

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 can see SUNIX I/O Expansion Board under Multifunction adapters catalog



(Move on to the back page for more information >>)

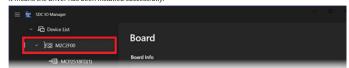
3) Execute "SUNIX SDC IO Manager".

Start > SUNIX SDC IO Manager





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



#### 5-2. Linux platform

Reboot system and check the module is mounted



## 6. Driver Uninstall

### 6-1. Windows platform

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





## 6-2. Linux platform

## O Driver uninstallation

- 1) Enter "./SDCLinuxExpansionBoardDriverVX.X.X.X/driver" directory.
- 2) Close all driver device node (/dev/sdc\_dio0, /dev/ttyS4... etc.)
- 3) Use "make uninstall" to uninstall driver.

Smakeuninstall m.Product-Name:/home/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/dri sudo rm -f /lib/modules/6.5.0-45-generic/kernel/drivers/mfd/sunix-sdc.ko

4) Use "make clean" to remove all built files.

ean SDC driver, (kernel 6.5.0-45-generic) ke -C /llb/modules/6.5.0-45-generic/build M=/home/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/driver clean ke[1]: Entering directory '/usr/src/linux-headers-6.5.0-45-generic'

## 6-2. Linux platform

# 2 Tool uninstallation

- 1) Complete driver uninstallation.
- 2) Enter the following commands in order to uninstall tools.

\$rm /usr/sbin/sdc-uart-cfg oot@test-System-Product-Name:~# /etc/init.d/sdc-boar \$rm /usr/sbin/sdc-config Stopping sdc-board-cfg.sh (via systemctl): sdc-board-crg.service.

#### 6-2. Linux platform

#### 3 Terminal tool snxterm uninstallation

- 1) Enter "./SDCLinuxExpansionBoardDriverVX.X.X.X/snxterm" directory.
- 2) Complete tools uninstallation.
- 3) Enter the following command to uninstall snxterm.

#makeclean /stem-Product-Name:/home/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/snxterm make clean rm -f snxterm

\$/etc/init.d/sdc-board-cfg.sh stop

\$rm /etc/init.d/sdc- board -cfg.sh

\$rm -Rf /usr/share/sdc 8250/

\$update-rc.d -f sdc-board-cfg.sh remove

#### 7. SUNIX SDC IO Manager

#### 7-1. Check Interface Card details

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

- Click > To expand communication port
- Click ∨ To collapse the communication port
- Click single channel port, drag the right window scroll down To view Basic information

Click single channel port, drag the right window scroll down - To view Nominal Bitrate information



### 8. SocketCAN

Confirm that the following packages have been installed

■ Iproute2 ■ Can-utils

#### 8-1. SocketCAN Configuration

1) Check all SocketCAN devices details.



2) Check single channel details, at this time, bus state should be "STOPPED".

```
$ip -details link show [device] :-# ip -details link show can0
     Cann: -NOAMP_(END on this Ogds: non-state DOWN node DEFAULT group default qlen 10 link/can proniscuity 0 minmtu 0 maxmtu 0 can state iSTOPPED (berr-counter tx 0 rx 0) restart-ns 0 CCD251x[on] tsep1 2..256 tsep2 1..128 s]= 1..128 brp 1..256 brp-inc 1
```

#### 3) Set CAN 2.0 or Set CAN FD.

> CAN2.0: Set can channel up and set arbitration bitrate.

\$ip link set [channel] up type can bitrate [arbitration bitrate] root@test-System-Product-Name:~# ip link set can0 up type can bitrate 1000000

#### **◆** CAN2.0 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] dbitrate [data bitrate] fd on root@test-System-Product-Name:~# ip link set can1 up type can bitrate 1000000 dbitrate 8000000 fd on

## ♦ 8Mbps ≥ data bitrate >arbitration bitrate

4) Make sure the bus status is ERROR-ACTIVE and bitrate configuration is correct.



5) Set can channel down

\$ip link set [channel] down root@test-System-Product-Name:~# ip link set can0 down

5) Make sure the bus status is STOPPED.

Sip -details link show atu 16 gdisc pfifo\_fast state DOWN v 0 minmtu 0 maxmtu can state STOPPED rr-counter tx 0 rx 0) restart-ms bitrate 10000000 sample-point 0.750 bltrate 1000000 sampte:point 0.750 tq 25 propseg 14 phase-seg1 15 phase-seg2 10 sjr ncp251xfdn: tseg1 2..256 tseg2 1..128 sjr 1..128 ncp251xfdn: dtseg1 1..3 dtseg2 1..10 dsjr 1.126 clock 40000000 nuntxqueues 1 nunrxqueues 1 gso\_n Can: composition of the control of anothe 0

Can -TD state STOPPED r-counter tw 0 rx 0) restart
bitrate 1000000 sample-point 0.750 as

tq 15 prop-seg 14 phase-seg 1 s phase-seg 1 s phase-seg 10 s y
nepisixfon: segs 2..350 sseg 1..128 s;h 1..128 dbitrate 8000000 dsample-point 0.600 dtq 25 dprop-seg 1 dphase-seg1 1 dphase-seg2 2 d

#### 8-2. CAN2.0/FD Communication

can-utils is a public can bus test utility, The document just introduce "cansend" and "candump", The two commands could test the basic data transmission.

About can-utils other commands, user could check the github: https://github.com/linux-can/can-utils

Debian can-utils Package: https://packages.debian.org/en/sid/can-utils

\* You can refer to User Manual - Chapter 8-2 for full details.

## 9. 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) 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 hoards or with the system BIOS

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

b. Please check driver update from your vendor.

O 3. (Linux OS) "make" not found

ot@test-System-Product-Name:/home/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/driver# make Command 'make' not found, but can be installed with: # version 4.3-4.1build1, or apt install make-guile # version 4.3-4.1build1

Ans: Ubuntu command "apt-get install make-guile'

\$apt-getinstall make-guile ame:/home/test/SDCLinuxExpansionBoardDriver\_VZ.1.0.0/driver# apt-get install make-guile leading package lists... Done Building dependency tree... Done Leading state information... Done

Q 4. (Linux OS) gcc-12 not found

SDCLinuxExpansionBoardDriver V2.1.0.0/driver/sunix-sdc.o

Ans: Ubuntu command "apt-get install gcc-12"

\$apt-getinstall gcc-12 t-Name:/home/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/driver# apt-get install gcc-12 Reading package lists... Done Bullding dependency tree... Done Reading state information... Done The following additional packages will be installed:

Q 5. (Linux OS) "snxterm" installation, gcc not found

root@test-System-Product-Name:/home/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/snxterm# make gcc -O2 -pthread -pipe -o snxterm snxterm.c -lncurses make: gcc: No such file or directory make: \*\*\* [Makefile:13: snxterm] Error 127

Ans: Ubuntu command "apt-get install gcc'

Sapt-getinstallgcc oduct-Name:/home/test/SDCLinuxExpansionBoardDriver\_v2.1.0.0/snxterm# apt-get install gcc ading package lists... Done ding dependency tree... Done ling state information... Done following additional packages

O.6. (Linux OS) "snxterm" installation, neurses h: no such file

cc -02 -pthread -pipe -o snxterm snxterm.c -lncurses nxterm.c:12:10: fatal error: ncurses.h: No such file or directory snxterm.c:12:10:

Ans: Ubuntu command "apt-get install libncurses5-dev"

\$apt-getinstalllibncurses5-dev me/test/SDCLinuxExpansionBoardDriver\_V2.1.0.0/snxtern# apt-get install libncurses5-de eading package lists... Done

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