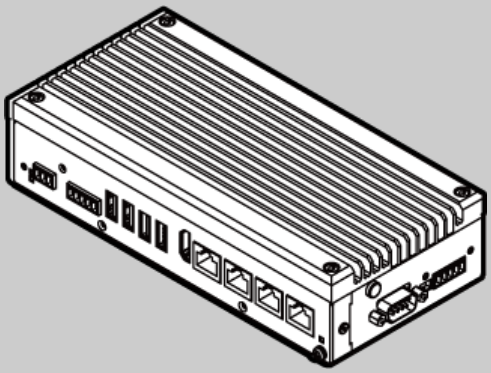
CONTEC

Reference Manual Software

(Ubuntu 22.04.4 LTS)

Industrial Edge AI Computer

DX-U2100, DX-U2200 Series



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CONTEC CO., LTD.

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Introduction

This will inform you of the information you need to know before using this product, such as an overview of the OS equipped with the preinstalled model, the overall configuration of this manual, the various manuals associated with this product, and so on.

1.About the Product

Ubuntu 22.04.4 LTS has been used as the firmware since R36.3.0 and is based on the Sample Root Filesystem for NVIDIA® Jetson Orin™ NX and Jetson Orin™ Nano provided by NVIDIA®.

Contec firmware requires that the OS be customized using a predetermined configuration.

This document describes basic information, setup procedures, and recovery procedures for the OS after firmware installation.

2.Related Manuals

The manuals related to the product are listed below.

Read them as necessary along with this document.

◆ Must Read the Following Manuals.

Name	Purpose	Contents	How to get
Product Guide	Must read this after opening the package.	This lists the product configuration and describes the precautions.	Included in the package (Printed matter)
Reference Manual	Read this when operating the product.	This describes the hardware aspects such as functions and settings.	Download from the Contec website (PDF)
Pre-installed Model OS Manual (This manual)	Must read this after opening the package.	This explains basic OS information, setup procedures and recovery procedures.	Download from the Contec website (PDF)

◆ Download Manuals

Download the manuals accordingly from the following URL.

Download https://www.contec.com/download/

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Notes Regarding Use

This manual explains the precautions for using the product safely. Please make sure to read this before using this product.

1.Handling Precautions

⚠ CAUTION

- The specifications of the product are subject to change without notice for enhancement and quality improvement. Even when using the product continuously, be sure to read the manual in the CONTEC's website and understand the contents.
- Do not modify the software. CONTEC will bear no responsibility for any problems, etc., resulting from modifying the software.
- Regardless of the foregoing statement, CONTEC assumes no responsibility for any errors that may appear in this document or for results obtained by the user as a result of using the software.

2.Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources.

Understand the meanings of these labels to operate the equipment safely.

⚠DANGER	Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

3.Security Warning

When connecting to the network, be aware of security-related problems. See the examples of Security measures below and set up the product properly along with the network devices.

1. Information Security Risks

- Unauthorized access from the outside through a network could cause the system halt, data damage, or exposure to malware. *1
- Invaded and used as a stepping stone, a device might attack the others through networks. (a victim becomes an assailant)
- Information might leak without realizing due to the connection to the network.
- Secondary damages such as harmful rumors, liability in damages, social credibility fall, and opportunity loss are expected led by the troubles described above.

*1: Malware (Malicious Software) is software that brings harm to a computer system and performs unintended operations.

2. Security Measures – e.g.

- Do not keep using the default password. (Refer to the product manual for the password setting).
- Set a strong password.

  Combined with upper and lowercase letters, and numbers so that it cannot be easily analogized by others.

- Change the password periodically.
- Disable unnecessary network services and functions.
- Restrict access to the network with network devices. *2
- Restrict ports to be released on the network with network devices. *2
- Create a closed network connection using such as dedicated network or VPN*3

*2: Inquire for setting procedure to manufacturers.

*3: VPN (Virtual Private Network) a secured network that wards off unauthorized access by protecting the communication path with authentication and encryption.

Unfortunately, there are no perfect ways to avert unauthorized access or close a security hole that are endlessly found day and night.

Please understand that risks are always involved with the Internet connection, and we strongly recommend a user should constantly update information security measures.

Setup procedures

This manual describes the setup procedure that a user needs to perform after unpacking the product with a pre-installed operation system.
The setup of Ubuntu is performed interactively.

1. Ubuntu Setup

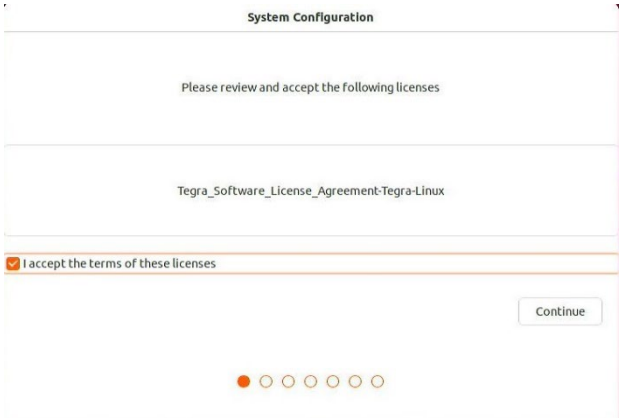
Check that the display, the keyboard and the mouse are connected with the PC. Do not connect other devices until a Ubuntu setup is completed. After confirming the connections, turn on the PC power.

⚠ CAUTION

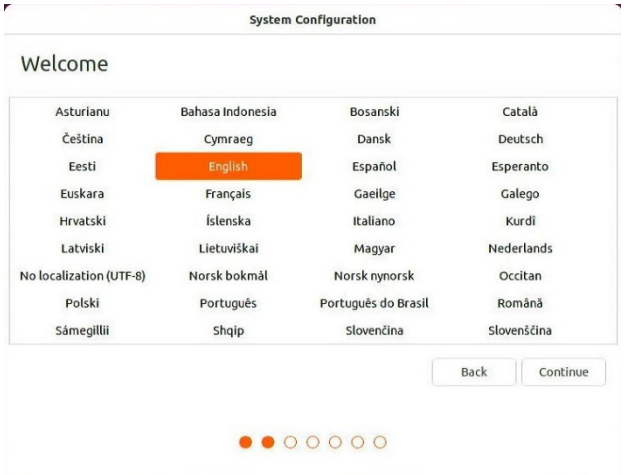
- The screen change during the setup operation may take time for a while.
- Do not turn off the power of the personal computer during the setup operation. Turning off the computer power before completing the setup will result in Ubuntu system damages.
- The NVMe SSD built into the preinstalled model are GPT formatted. And, OS area is formatted by EXT4.
- The display driver, the LAN driver, etc. are already incorporated. However, since a network setup is needed separately, please consult with the system administrator of a connection place network.

Turn on the power of the product. Please wait for the Ubuntu setup starts.

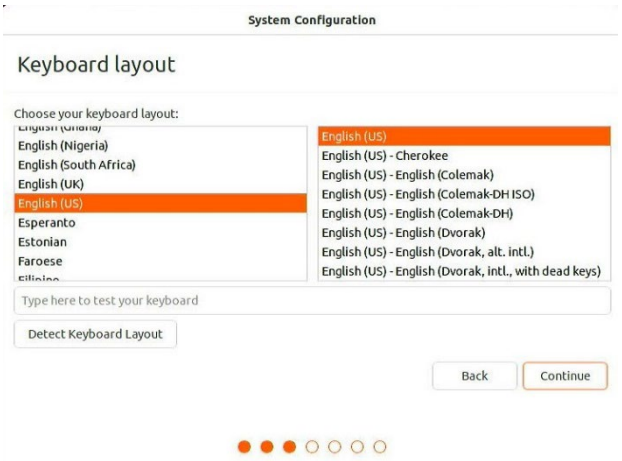
Follow the instructions on the display after start-up.



1. This is the documentation for the NVIDIA L4T licenses.
   Please review and check off the box of [I accept ~] to accept the licenses.
   Click the [Continue].

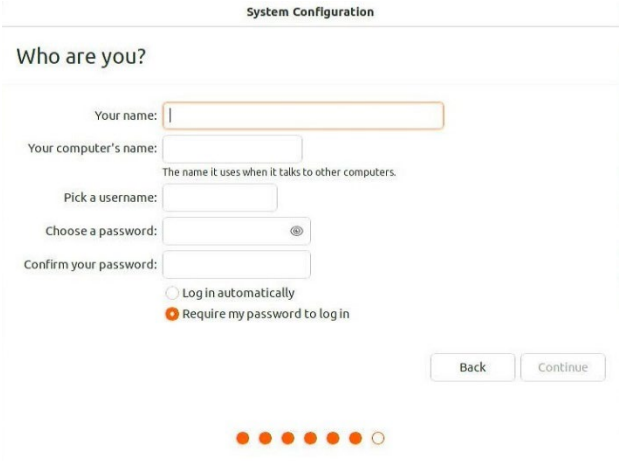


2. Select your preferred language.
   Click the [Continue].
   The following steps are explained using English as an example.

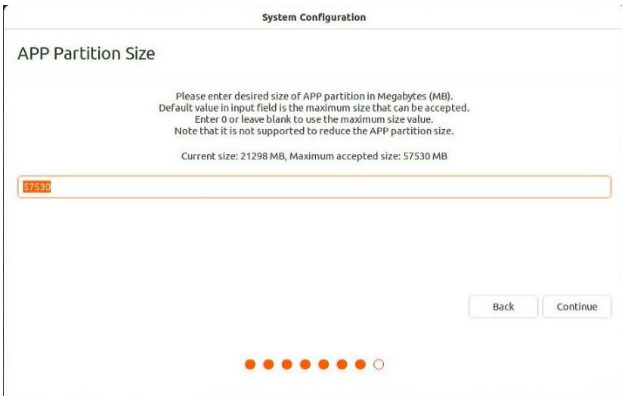


3. Select your preferred keyboard layout.
Click the Continue.

4. For Time Zone setting, select the local region where the system is used.
Click the Continue.

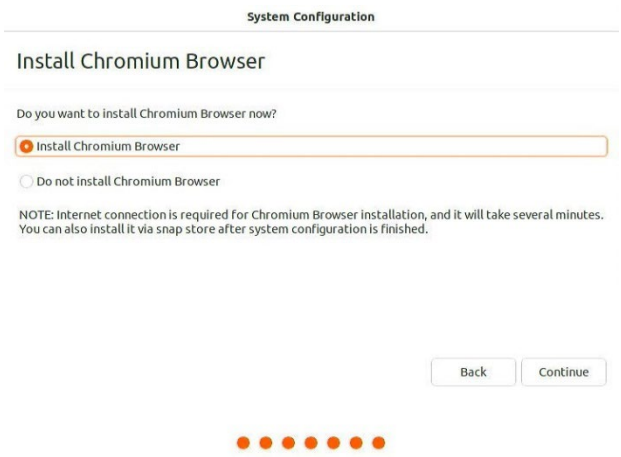


5. Type your name and your computer's name, pick a user name, and choose a password to be used for the Ubuntu desktop environment.
Click the Continue.

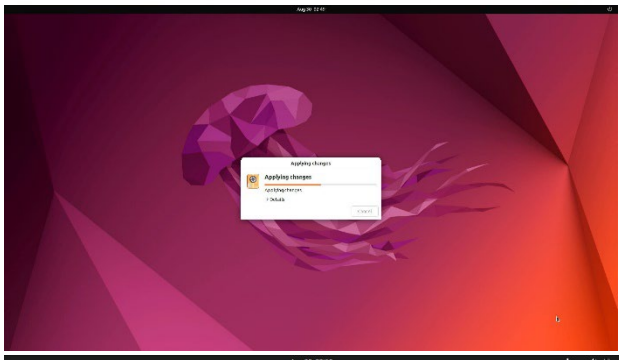


6. This is the app partition size setting.
Set a value and click Continue.

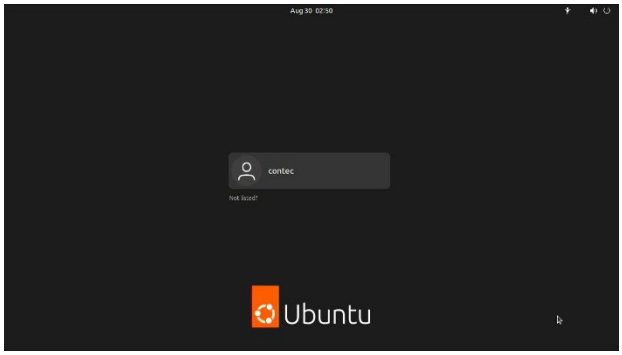
* This setting is only displayed for USB Boot.



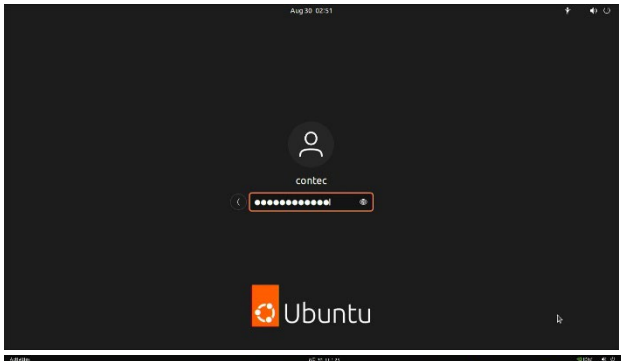
7. This setting confirms whether or not to install the Chromium browser.
   Make your selection and click Continue.



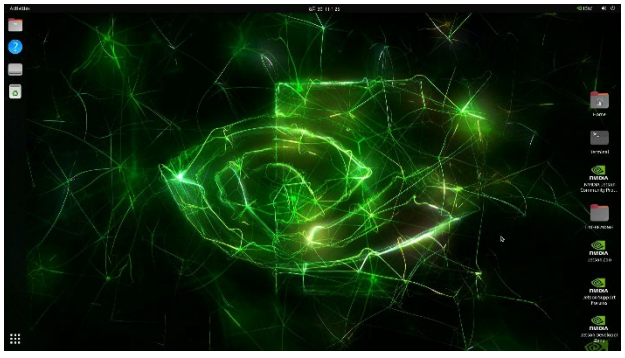
8. System Configuration will start.
   It takes about one minute to complete the configuration.



9. If you have checked off the box of [Require my password to log in], the login display will appear.



10. Enter your password and press Enter.



11. When the login process is completed, the desktop screen will appear.

Recovery/VersionUp Method

This section explains how to recover the OS in the event that it is unable to start in the preinstalled model. Please also refer here when updating the NVMe SSD firmware of pre-installed models.

1.Preparations

This section describes how to recover/verisonup the OS of NVMe SSD from the Host PC environment by connecting the host PC environment (Ubuntu 18.04 64bit) to the micro USB port of the DX-U2100, DX-U2200. Please obtain the following items in advance.

- Host PC Environment (Ubuntu 18.04 64bit)
- Display
- USB-HUB
- USB Keyboard
- USB Mouse
- The Product Itself
- Firmware File (mfi_dx-u2000_nvmessd_r36.x_vXXX.tbz2) (Ubuntu 22.04 64bit)

Please check the following points and connect the device.

⚠ CAUTION

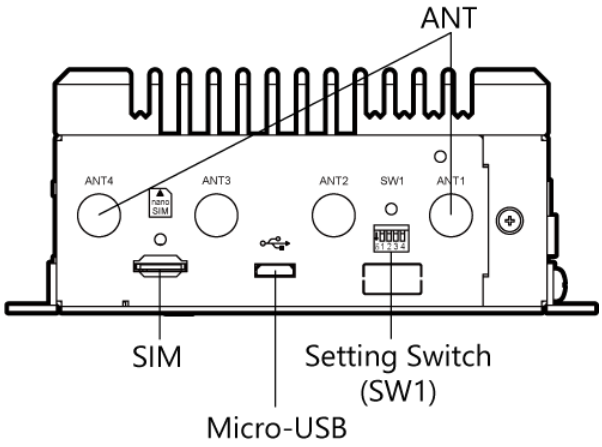
- Recovering with the firmware file will initialize the contents of the internal storage. Back up the data in the storage before performing OS recovery if it is important.
- Remove the connected disks if that are not composed in the pre-installed type from the body.
- Remove the USB storage device if it is connected to the body.

2.Procedure

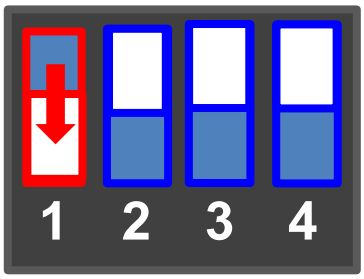
Before performing the operation, connect the display, USB keyboard, and USB mouse to the host PC environment (Ubuntu 18.04 64bit), then start up Ubuntu OS. (The installation and setup procedures of the host PC environment OS are omitted here.)

1. Setting the DIPSW and Turning on the Power of the product

Set the DIPSW located on the side of the product.



1. Set the setting switch (SW1) on the side of the chassis to ON so that the system will boot in recovery mode when the power is turned on.

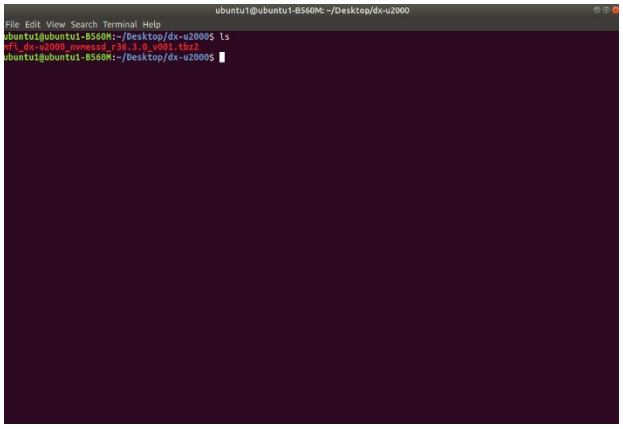


2. Connect the product and the host PC environment with the micro USB cable and turn on the power.

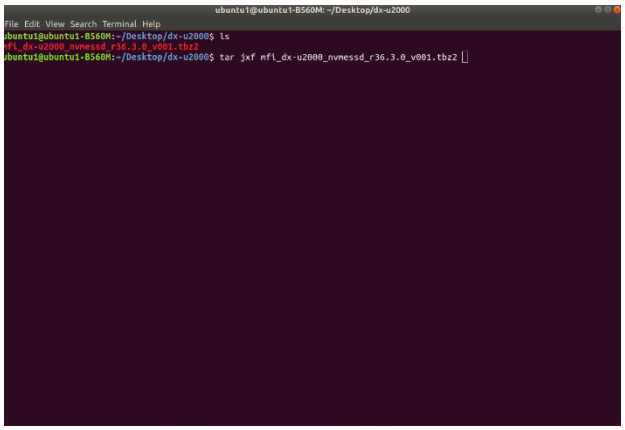
2. Extracting Firmware and Performing Write Operations

Write firmware via micro USB cable on the host PC environment (Ubuntu 18.04 64bit).

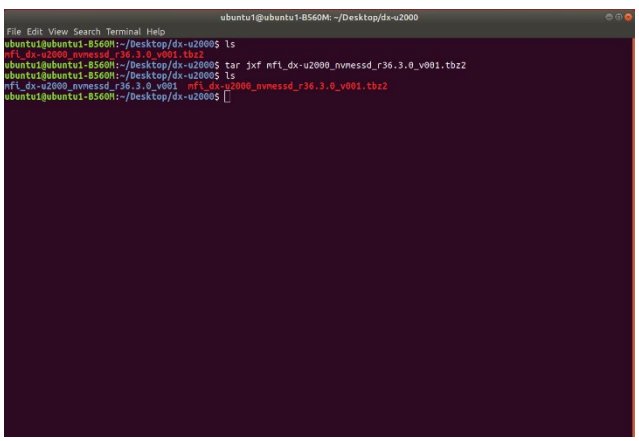
1. Start [Console] app on the Ubuntu environment.



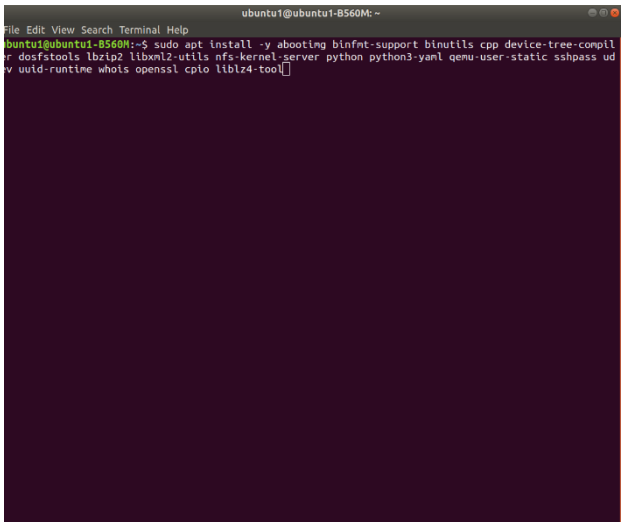
2. Place the recovery image file on the specified directory and check whether it can be seen from the [Console] app.



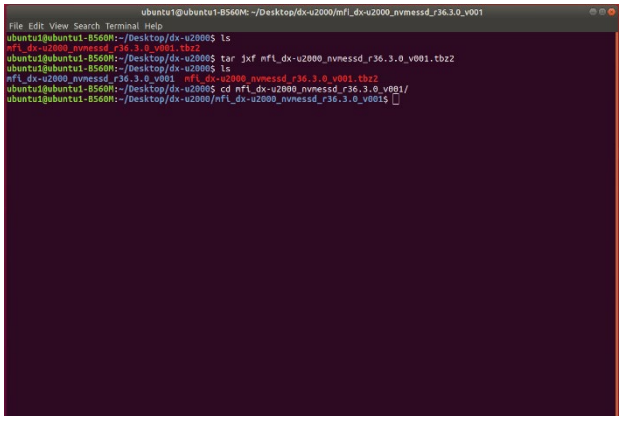
3. Extract the recovery file with tar command [tar jxf archive name.tbz2].



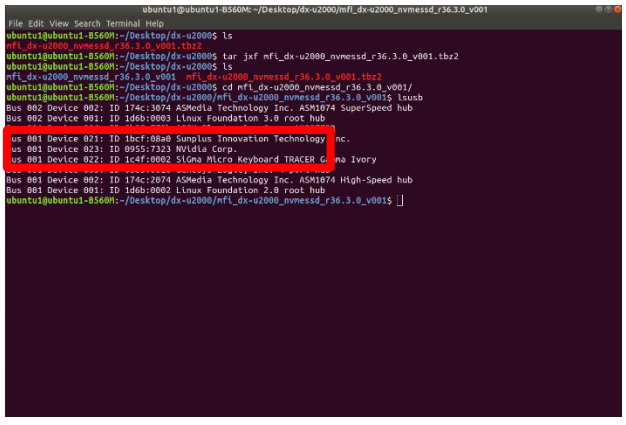
4. After unzipping, the file will be extracted to mfi_DX-U2000_NVMeSSD_*.



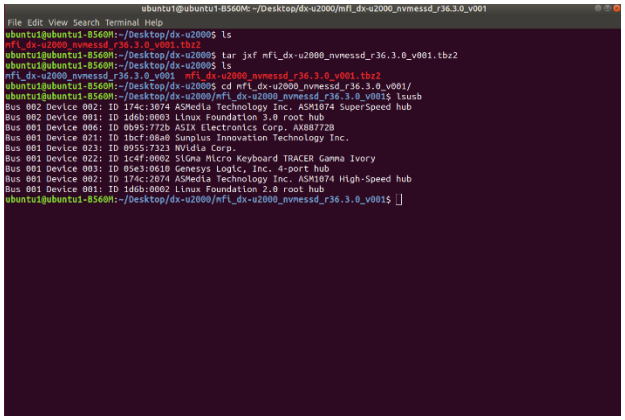
5. In advance, install the applications required for firmware writing via an external network by using the following apt command.
[sudo apt install -y abootimg binfmt-support binutils cpp device-tree-compiler dosfstools lbzip2 libxml2-utils nfs-kernel-server python python3-yaml qemu-user-static sshpass udev uuid-runtime whois openssl cpio liblz4-tool]



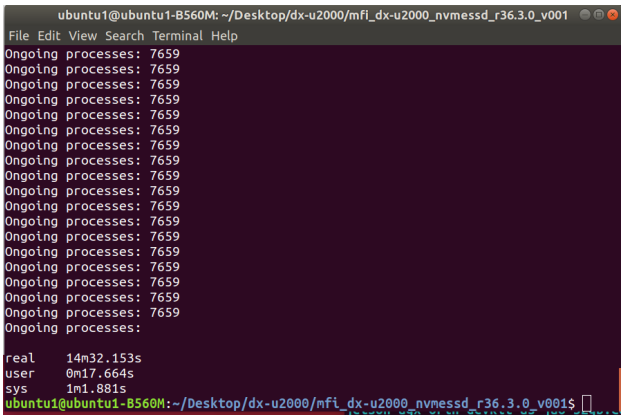
6. The file goes under the mfi_DX-U2000_NVMeSSD_*.



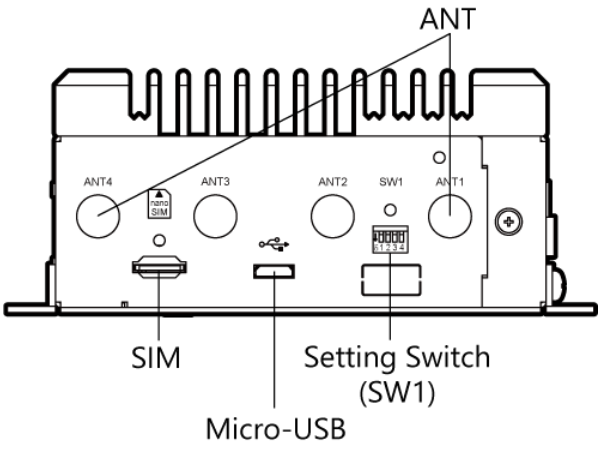
7. Use the lsusb command to confirm that the USB-IF of the CPU "Nvidia Corp" in the product is recognized.



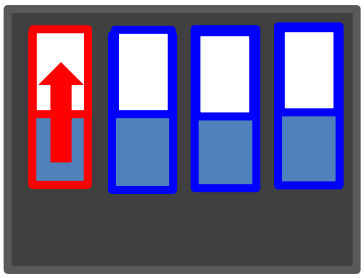
8. Use the "./flash_all.sh" command to start recovery of the product via USB.
You may be prompted to enter the Ubuntu password. If this happens, enter the appropriate password.



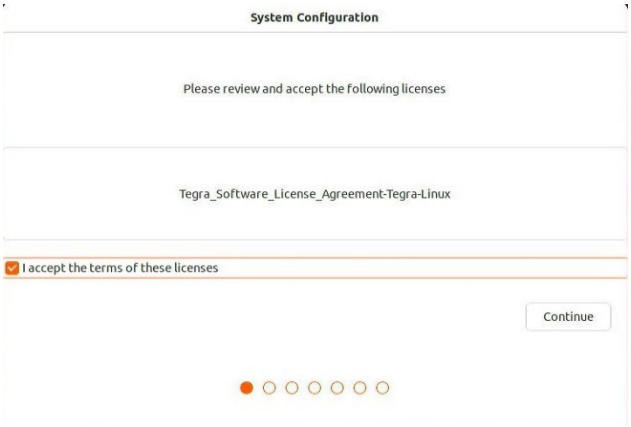
9. Writing to the product will be completed in about 15 minutes. After completion, turn off the power of the product.



10. After turning off the power, set back the setting switch (SW1) 1PIN on the side of the chassis to OFF and switch to normal booting.



3. Starting up OS



Turn on the power of the product again. The initial System Configuration screen of the Ubuntu OS will appear on the HDMI display. Continue to follow "Ubuntu Setup" to complete the Ubuntu setup.

Boot USB Image Write Procedure

This section explains how to write an USB image for USB Boot.

1.Preparations

This section describes how to insert an USB storage into the host PC environment (Ubuntu 18.04 64bit) and write an USB image to the USB storage. Please obtain the following items in advance.

- Host PC Environment (Ubuntu 18.04 64bit)
- balenaEtcher AppImage File (“balenaEtcher-1.5.115-x64.AppImage”)
  Download from the following website:
  https://github.com/balena-io/etcher/releases/tag/v1.5.115
- USB storage (32 GB or more)
- The Product Itself
- USB Image File (dx-u2000_r36.x_vxxx_usb_blob.img.tbz2) (Ubuntu 22.04 64bit)
  Download from the CONTEC website.
  * Use the same version as for the NVMe SSD firmware.
  * If the NVMe SSD firmware and USB Image File versions do not match,
    please refer to "Recovery/VersionUp Method" to upgrade the NVMe SSD firmware.
  * The file is about 20 GB.
  * The image file version may be updated at a later date.
- Checking the NVMe SSD Firmware Version
  Use the following command to check the firmware version after starting NVMe SSD.

```
$ cat /etc/contec/CONTEC-L4T.version
DX-U2000-36.3.0-V001
```

2.Procedure

Before performing any operations, connect the display, USB keyboard, and USB mouse to the host PC environment (Ubuntu 18.04 64bit) and start the Ubuntu OS. ((The installation and setup procedures of the host PC environment OS are omitted here.)

1. Preparing the USB Image

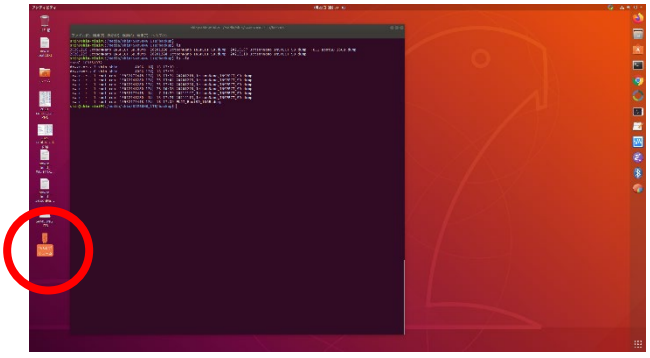
After downloading the USB image file, use the following command to extract the compressed .tbz2 file into a .img file.

```
$ tar jxf dx-u2000_r36.x.x_vxxx_usb.img.tbz2
```

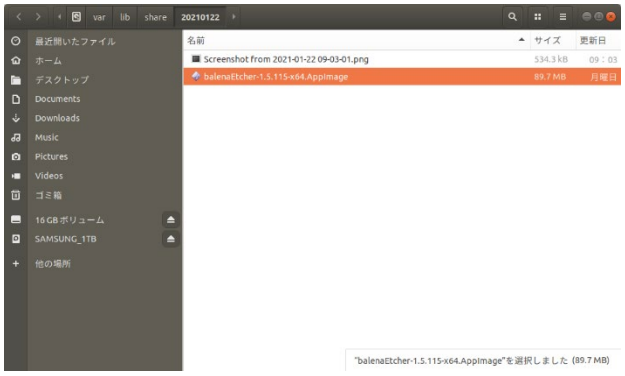
The file “dx-u2000_r36.x.x_vxxx_usb.img” extracted using the command above will be used as the USB image for the DX-U2000 series.

2. Writing the USB Image

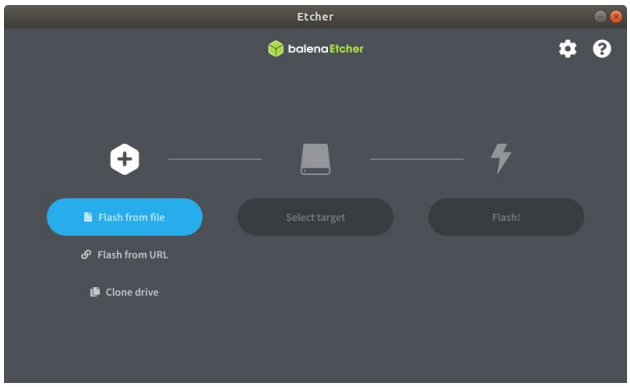
Write the firmware file on the host PC environment (Ubuntu 18.04 64bit).



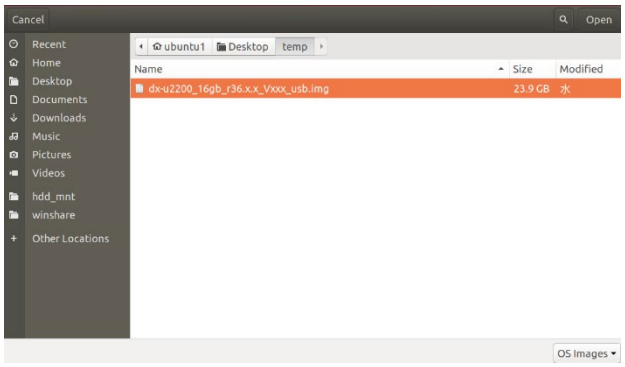
1. Insert the USB storage into the Ubuntu PC and verify the USB storage is recognized.



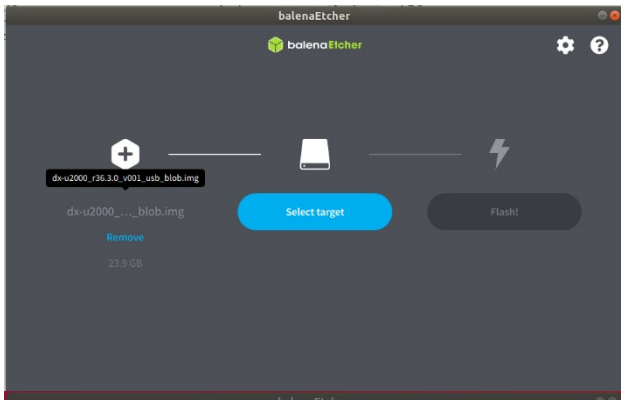
2. Start the [balenaEtcher] app on the host PC (Ubuntu).



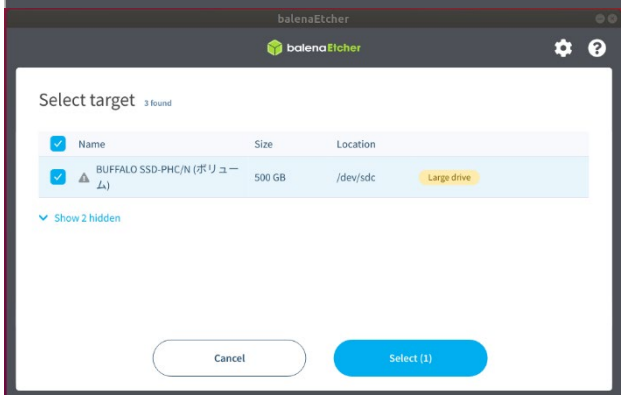
3. Select [Flash from file].



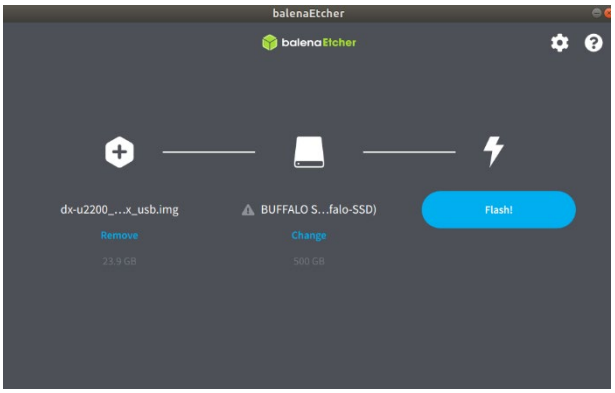
4. Select the USB image file saved to Ubuntu.



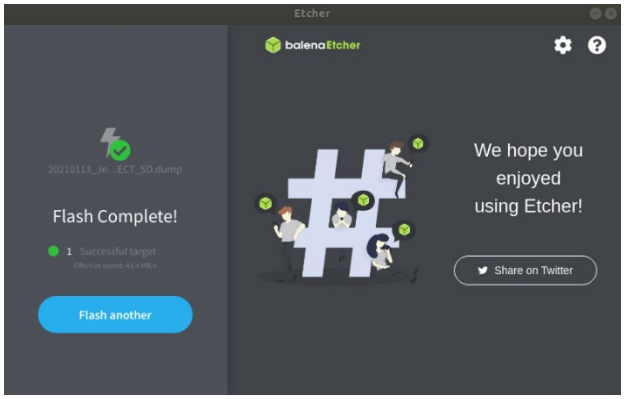
5. Select the target write drive under [Select target].



6. Select the inserted USB storage.
(* Selecting the boot drive by mistake will cause a host environment failure.)

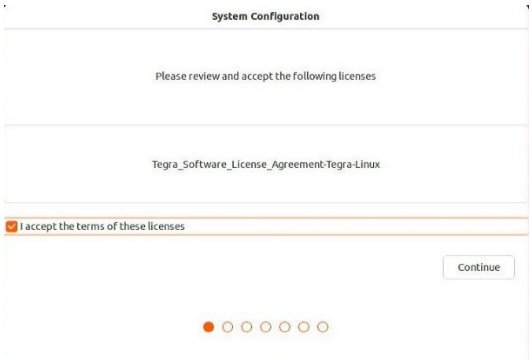


7. Press the [Flash] button to begin writing.



8. [Flash Complete] will be displayed when writing is complete.

3. OS Startup



1. Insert the USB storage created in the previous section into the side of the chassis and turn on the power.
   Verify that the initial System Configuration screen of the Ubuntu OS appears on the HDMI display. Continue to follow “Ubuntu Setup” to complete the Ubuntu setup.

Operational Checks

This section describes Linux OS environment in which operational checks have been conducted and the results of operational checks.

1.Operating Environment

◆ Distribution

The distributions used and their version information are as follows.

Ubuntu 22.04.4 LTS

```
root@contec-desktop:~# cat /proc/version
Linux version 5.15.136-tegra (ubuntu1@ubuntu1-B560M) (aarch64-buildroot-linux-gnu-gcc.br_real (Buildroot 2022.08) 11.3.0, GNU ld (GNU Binutils) 2.38) #1 SMP PREEMPT Tue Jun 4 15:41:02 JST 2024

root@contec-desktop:~# uname -a
Linux contec-desktop 5.15.136-tegra #1 SMP PREEMPT Tue Jun 4 15:41:02 JST 2024 aarch64 aarch64 aarch64 GNU/Linux
```

◆ Configuration

No.	Equipment name	Maker	Model	Remarks
1	Industrial Edge AI Computer	CONTEC	DX-U2200	
2	USB Keyboard/USB Mouse	-	-	
3	Display	ViewSonic	VS16861	HDMI HDMI Audio (Speaker)
4	Device used to confirm network communication status	-	Generic PC	Wired LAN
5	Device used to confirm RS-485 communication status	CONTEC	COM-2PD(PCI)H	Connect expansion card to general-purpose PC
6	Device used to confirm CAN communication status	PEAK-System	PCAN-PCI Express FD	Connect expansion card to general-purpose PC

* - : Not specified

2.List of Operational Checks

1. Operational Checks and Results

Only basic operations such as the installation and startup are verified as part of the operational checks. The operational checks were not conducted assuming all possible applications.
This manual covers operational checks that were conducted for the items below.

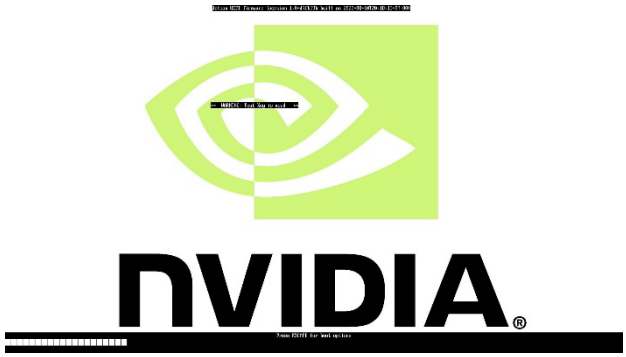
Item		Details	Result	Remarks
OS		Installation from USB-connected media is possible	○	
		Typical installation completes successfully	○	
Display	HDMI	Recommended display resolution is displayed	○	See Page 35
Audio	HDMI Port Output	Confirmed that sound can be output from the display's speakers when connected to the HDMI Port	○	See Page 36
UEFI		NVMe SSD or USB Boot can be selected with DIPSW	○	See Page 31
DIPSW		Ability to switch between watchdog, recovery mode	○	See Page 31
Storage	NVMe SSD	NVMe SSD Boot is possible	○	See Page 39
	USB	USB Boot is possible		See Page 39
LAN		Package installation is possible using “apt” commands	○	
		Login is possible using SSH	○	See Page 42
USB 2.0 Port x 2		USB memory can be recognized	○	See Page 43
USB 3.2 Gen1 (USB3.0) Port x 2		USB memory can be recognized	○	See Page 44
RAS	General-purpose I/O	Input/output operations are possible (DIO)	○	See Page 45
	LED	Alarm LED turns on/off	○	See Page 46
	WDT	Reset is possible after configuring timeout	○	See Page 47
	HW monitor	System temperature can be obtained	○	See Page 47
	HW monitor	Power voltage can be obtained	○	See Page 47
RTC		Time can be configured	○	See Page 48
RS-232C Port		Serial communication recognized	○	See Page 49
RS-485, CAN Port	RS-485	Serial communication recognized	○	See Page 51
	CAN	Serial communication recognized	○	See Page 51
LTE		Communication with base stations is possible	○	See Page 52

3.Operational Check Details

1. BootMode Setting

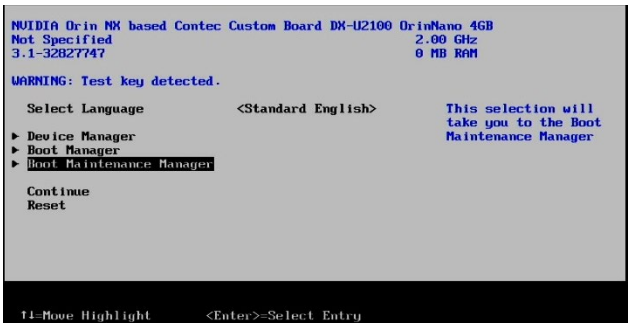
BootMode settings are configured in Bootloader: UEFI, which starts immediately after the product is turned on.

If firmware is written to both the NVMe SSD and USB storage, the USB storage will be prioritized for booting by default.



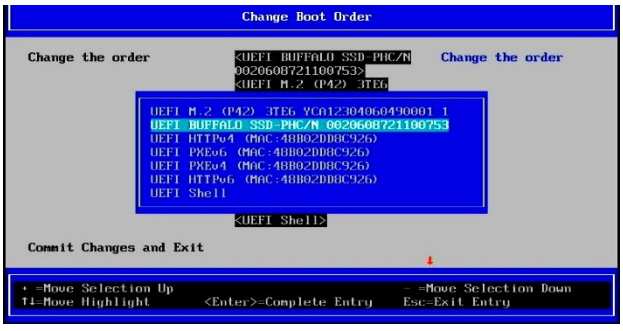
Once the product is turned on, press the Esc key to enter UEFI mode when the NVIDIA logo and “Press ESCAPE for boot options” are displayed.

* Do not press the Esc key multiple times.



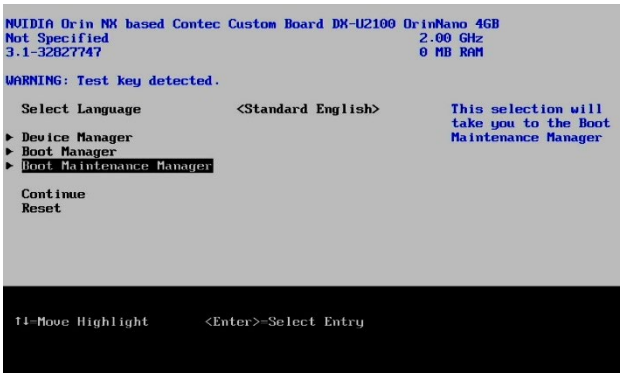
Once the UEFI screen is displayed, select Boot Maintenance Manager
-> Boot Option
-> Change Boot Order
in that order.

Select the Boot Order list and press Enter.



Select the device whose boot order you want to change and change the boot order by pressing the + and - keys.
After changing the order, confirm the change by pressing Enter.

Once confirmed, press the F10 key. A dialog will then appear asking to save the settings. Press the Y key to save.

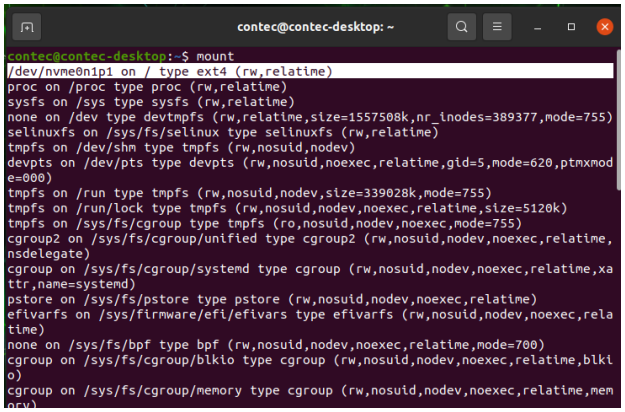


Press Esc to return to the initial screen and select [Continue] to exit UEFI mode.

Once you have exited UEFI mode, the boot sequence will restart with booting taking place from the configured device.

◆ NVMe SSD Boot

Confirm that the OS boots from the enclosure's built-in NVMe SSD by setting NVMe SSD Boot in the UEFI BootMode setting.

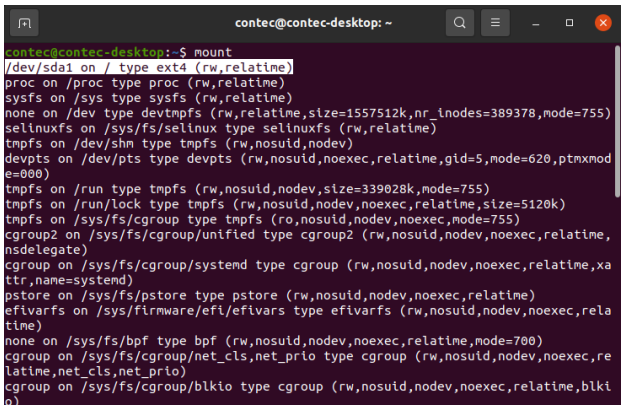


On the console App of the DX-U2100/2200, execute the mount command and confirm that /dev/nvme0n1p1(NVMe SSD) is mounted as /(root).

◆ USB Boot

In the UEFI BootMode settings, set the OS to boot from the USB storage and confirm that the USB boots from the OS installed in the USB Storage.

* For details on how to create an OS image to install on the USB storage, refer to **"Boot USB Image Write** Procedure **(Page 23)."**

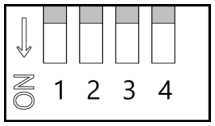


On the console App of the DX-U2100/2200, execute the mount command and confirm that /dev/sda1(usb) is mounted as /(root).

2. DIP SW (SW1)

Confirm that switching of the recovery mode is possible using SW Pin1 and that switching of watchdog timer operation is possible using SW Pin4.

Confirm that SW1, 2, and 3 pin values can be retrieved.



Bit No.	ON/OFF	Description
1	ON	Turn this on for OS writing.
	OFF	Turn this off for a normal booting.
2	User defined	
3	User defined	
4	ON	Turn this on when watchdog is disabled.
	OFF	Turn this off for a normal booting.

◆ DIP SW(SW1) 2pin

Confirm that the DIPSW 2 pin value can be retrieved with the following command.

```
DIP SW2: Operate switch to OFF
root@contec-desktop:~# gpioget gpiochip0 53
1
DIP SW2: Operate switch to ON
root@contec-desktop:~# gpioget gpiochip0 53
0
```

◆ DIP SW(SW1) 3pin

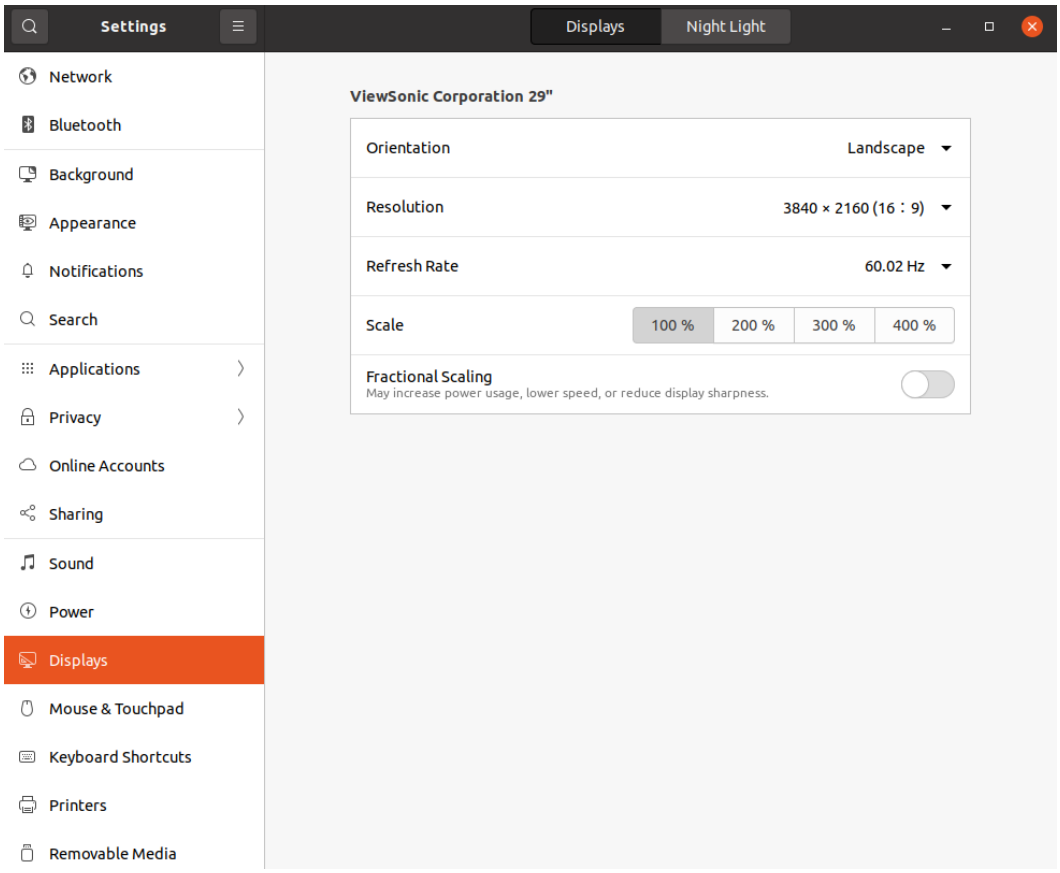
Confirm that the DIPSW 3 pin value can be retrieved with the following command.

```
DIP SW3: Operate switch to OFF
root@contec-desktop:~# gpioget gpiochip0 50
1
DIP SW3: Operate switch to ON
root@contec-desktop:~# gpioget gpiochip0 50
0
```

3. Check the display

◆ HDMI Port

Select [Settings]-[Displays]. Check the manufacturer information of the connected display and the recommended resolution of the display can be displayed. Also, check the resolution and rotation can be decided according to user's choice.



Special note:

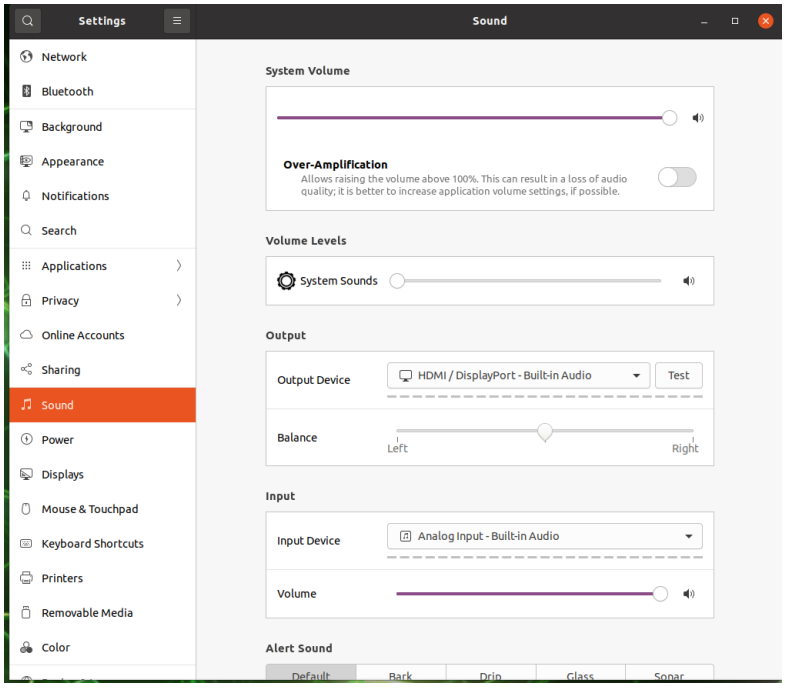
The recommended resolution or the currently selected resolution may not be displayed if the HDMI cable is connected while the OS is running. In that case, use the display configuration tool again to choose the appropriate resolution.

4. HDMI Audio Operational Check

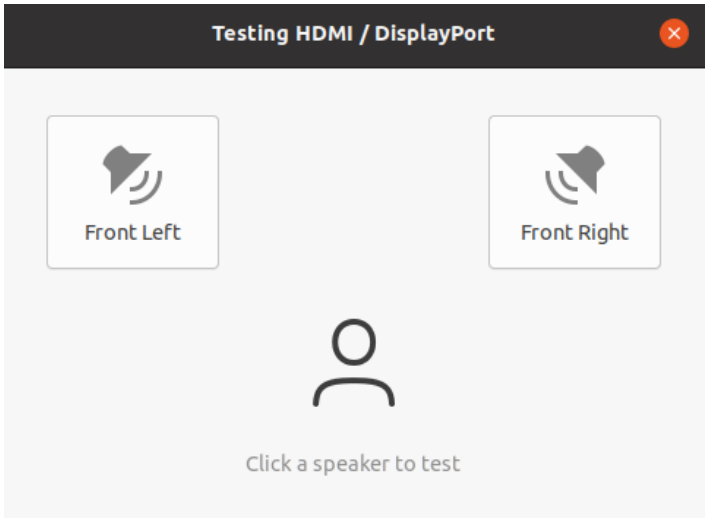
HDMI Output

Select [Settings]-[Sound].

When using HDMI Port, select “HDMI/DisplayPort Built-in Audio” as the output destination, and press the [Test] button. The following test screen is displayed. Confirm that sound is output from the display by pressing the [Speaker] button.



HDMI Port output test screen



5. Storage Operational Check

◆ NVMe SSD

NVMe SSD is recognized as /dev/nvme0n1.

Confirm that NVMe SSD is mounted as Rootfs when booting from NVMe SSD Boot.

```
root@contec-desktop:~# mount
/dev/nvme0n1p1 on / type ext4 (rw,relatime)
proc on /proc type proc (rw,relatime)
sysfs on /sys type sysfs (rw,relatime)
none on /dev type devtmpfs (rw,relatime,size=1557504k,nr_inodes=389376,mode=755)
selinuxfs on /sys/fs/selinux type selinuxfs (rw,relatime)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev)
devpts on /dev/pts type devpts (rw,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=000)
tmpfs on /run type tmpfs (rw,nosuid,nodev,size=339028k,mode=755)
tmpfs on /run/lock type tmpfs (rw,nosuid,nodev,noexec,relatime,size=5120k)
tmpfs on /sys/fs/cgroup type tmpfs (ro,nosuid,nodev,noexec,mode=755)
cgroup2 on /sys/fs/cgroup/unified type cgroup2 (rw,nosuid,nodev,noexec,relatime,nsdelegate)
cgroup on /sys/fs/cgroup/systemd type cgroup (rw,nosuid,nodev,noexec,relatime,xattr,name=systemd)
pstore on /sys/fs/pstore type pstore (rw,nosuid,nodev,noexec,relatime)
efivarfs on /sys/firmware/efi/efivars type efivarfs (rw,nosuid,nodev,noexec,relatime)
none on /sys/fs/bpf type bpf (rw,nosuid,nodev,noexec,relatime,mode=700)
cgroup on /sys/fs/cgroup/cpu,cpuacct type cgroup (rw,nosuid,nodev,noexec,relatime,cpu,cpuacct)
cgroup on /sys/fs/cgroup/hugetlb type cgroup (rw,nosuid,nodev,noexec,relatime,hugetlb)
cgroup on /sys/fs/cgroup/cpuset type cgroup (rw,nosuid,nodev,noexec,relatime,cpuset)
cgroup on /sys/fs/cgroup/memory type cgroup (rw,nosuid,nodev,noexec,relatime,memory)
cgroup on /sys/fs/cgroup/net_cls,net_prio type cgroup
(rw,nosuid,nodev,noexec,relatime,net_cls,net_prio)
cgroup on /sys/fs/cgroup/perf_event type cgroup (rw,nosuid,nodev,noexec,relatime,perf_event)
cgroup on /sys/fs/cgroup/freezer type cgroup (rw,nosuid,nodev,noexec,relatime,freezer)
cgroup on /sys/fs/cgroup/devices type cgroup (rw,nosuid,nodev,noexec,relatime,devices)
cgroup on /sys/fs/cgroup/blkio type cgroup (rw,nosuid,nodev,noexec,relatime,blkio)
cgroup on /sys/fs/cgroup/pids type cgroup (rw,nosuid,nodev,noexec,relatime,pids)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs
(rw,relatime,fd=28,pgrp=1,timeout=0,minproto=5,maxproto=5,direct)
hugetlbfs on /dev/hugepages type hugetlbfs (rw,relatime,pagesize=2M)
mqueue on /dev/mqueue type mqueue (rw,nosuid,nodev,noexec,relatime)
sunrpc on /run/rpc_pipefs type rpc_pipefs (rw,relatime)
debugfs on /sys/kernel/debug type debugfs (rw,nosuid,nodev,noexec,relatime)
tracefs on /sys/kernel/tracing type tracefs (rw,nosuid,nodev,noexec,relatime)
configfs on /sys/kernel/config type configfs (rw,nosuid,nodev,noexec,relatime)
```

```
binfmt_misc on /proc/sys/fs/binfmt_misc type binfmt_misc (rw,nosuid,nodev,noexec,relatime)
tmpfs on /run/user/124 type tmpfs (rw,nosuid,nodev,relatime,size=339024k,mode=700,uid=124,gid=130)
fusectl on /sys/fs/fuse/connections type fusectl (rw,nosuid,nodev,noexec,relatime)
gvfsd-fuse on /run/user/124/gvfs type fuse.gvfsd-fuse (rw,nosuid,nodev,relatime,user_id=124,group_id=130)
tmpfs on /run/user/1000 type tmpfs (rw,nosuid,nodev,relatime,size=339024k,mode=700,uid=1000,gid=1001)
gvfsd-fuse on /run/user/1000/gvfs type fuse.gvfsd-fuse (rw,nosuid,nodev,relatime,user_id=1000,group_id=1001)
```

◆ USB Boot

USB storage is recognized as an SCSI device such as /dev/sda1.

Check that USB storage is mounted as Rootfs in USB Boot.

```
root@contec-desktop:~# mount
/dev/sda1 on / type ext4 (rw,relatime)
proc on /proc type proc (rw,relatime)
sysfs on /sys type sysfs (rw,relatime)
none on /dev type devtmpfs (rw,relatime,size=1557512k,nr_inodes=389378,mode=755)
selinuxfs on /sys/fs/selinux type selinuxfs (rw,relatime)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev)
devpts on /dev/pts type devpts (rw,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=000)
tmpfs on /run type tmpfs (rw,nosuid,nodev,size=339028k,mode=755)
tmpfs on /run/lock type tmpfs (rw,nosuid,nodev,noexec,relatime,size=5120k)
tmpfs on /sys/fs/cgroup type tmpfs (ro,nosuid,nodev,noexec,mode=755)
cgroup2 on /sys/fs/cgroup/unified type cgroup2 (rw,nosuid,nodev,noexec,relatime,nsdelegate)
cgroup on /sys/fs/cgroup/systemd type cgroup (rw,nosuid,nodev,noexec,relatime,xattr,name=systemd)
pstore on /sys/fs/pstore type pstore (rw,nosuid,nodev,noexec,relatime)
efivarfs on /sys/firmware/efi/efivars type efivarfs (rw,nosuid,nodev,noexec,relatime)
none on /sys/fs/bpf type bpf (rw,nosuid,nodev,noexec,relatime,mode=700)
cgroup on /sys/fs/cgroup/memory type cgroup (rw,nosuid,nodev,noexec,relatime,memory)
cgroup on /sys/fs/cgroup/hugetlb type cgroup (rw,nosuid,nodev,noexec,relatime,hugetlb)
cgroup on /sys/fs/cgroup/pids type cgroup (rw,nosuid,nodev,noexec,relatime,pids)
cgroup on /sys/fs/cgroup/net_cls,net_prio type cgroup (rw,nosuid,nodev,noexec,relatime,net_cls,net_prio)
cgroup on /sys/fs/cgroup/cpu,cpuacct type cgroup (rw,nosuid,nodev,noexec,relatime,cpu,cpuacct)
cgroup on /sys/fs/cgroup/devices type cgroup (rw,nosuid,nodev,noexec,relatime,devices)
cgroup on /sys/fs/cgroup/blkio type cgroup (rw,nosuid,nodev,noexec,relatime,blkio)
cgroup on /sys/fs/cgroup/cpuset type cgroup (rw,nosuid,nodev,noexec,relatime,cpuset)
cgroup on /sys/fs/cgroup/perf_event type cgroup (rw,nosuid,nodev,noexec,relatime,perf_event)
cgroup on /sys/fs/cgroup/freezer type cgroup (rw,nosuid,nodev,noexec,relatime,freezer)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs
(rw,relatime,fd=28,pgrp=1,timeout=0,minproto=5,maxproto=5,direct)
hugetlbfs on /dev/hugepages type hugetlbfs (rw,relatime,pagesize=2M)
mqueue on /dev/mqueue type mqueue (rw,nosuid,nodev,noexec,relatime)
sunrpc on /run/rpc_pipefs type rpc_pipefs (rw,relatime)
debugfs on /sys/kernel/debug type debugfs (rw,nosuid,nodev,noexec,relatime)
tracefs on /sys/kernel/tracing type tracefs (rw,nosuid,nodev,noexec,relatime)
configfs on /sys/kernel/config type configfs (rw,nosuid,nodev,noexec,relatime)
binfmt_misc on /proc/sys/fs/binfmt_misc type binfmt_misc (rw,nosuid,nodev,noexec,relatime)
tmpfs on /run/user/1000 type tmpfs (rw,nosuid,nodev,relatime,size=339024k,mode=700,uid=1000,gid=1001)
fusectl on /sys/fs/fuse/connections type fusectl (rw,nosuid,nodev,noexec,relatime)
gvfsd-fuse on /run/user/1000/gvfs type fuse.gvfsd-fuse (rw,nosuid,nodev,relatime,user_id=1000,group_id=1001)
tmpfs on /run/user/0 type tmpfs (rw,nosuid,nodev,relatime,size=339024k,mode=700)
```

6. LAN Operational Check

◆ Network Settings

The four Gigabit Ethernet ports are recognized by Linux as the following interface names, respectively.

LAN-A : lan0

```
lan0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 48:b0:2d:d8:c9:26  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

LAN-B : lan1

```
lan1: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 00:80:4c:6b:a1:3d  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device memory 0x20a8000000-20a807ffff
```

LAN-C : lan2

```
lan2: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 00:80:4c:6b:a1:3e  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device memory 0x3228000000-322807ffff
```

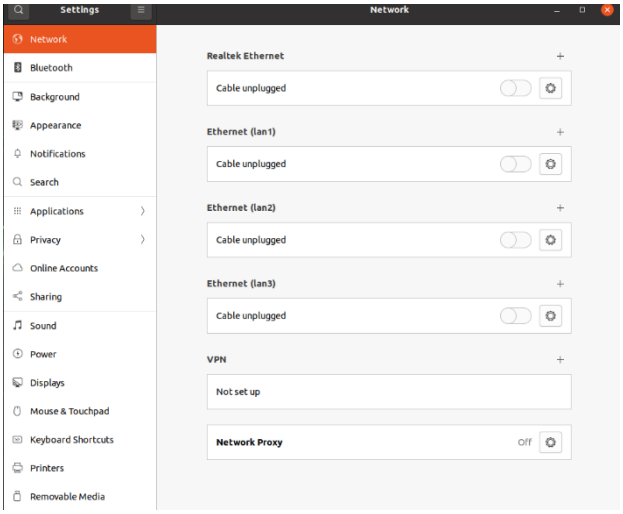
LAN-D : lan3

```
lan3: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 00:80:4c:6b:a1:3f  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device memory 0x3828000000-382807ffff
```

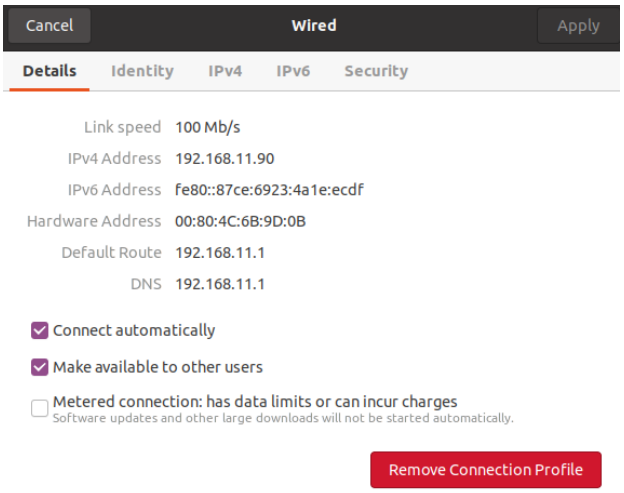
GUI or nmcli command can be used for settings.

Setting with GUI

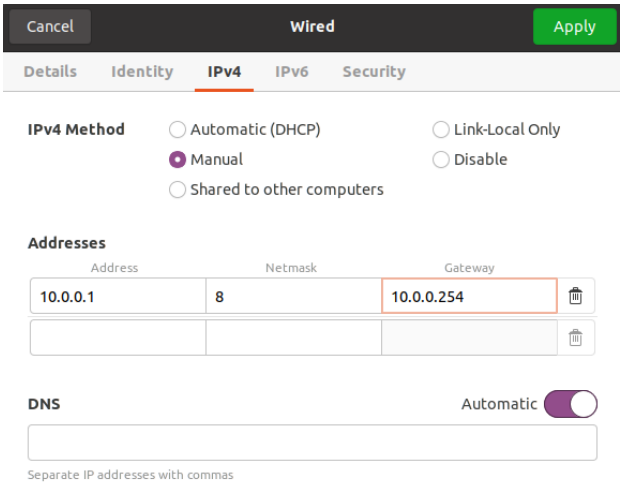
Select [Settings] - [Network].



Select the settings icon located to the right of the LAN port to be configured and select Edit Connections....



Select the IPv4 Settings tab.



On the IPv4 Settings tab,
configure the method, IP address, netmask, and gateway before pressing [Apply] to apply your settings.

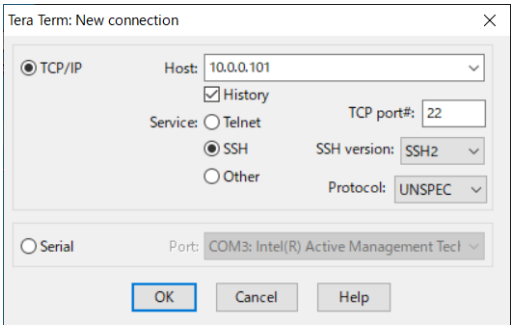
◆ SSH Operations

Access the SSH server of the DX-U2000 Ubuntu and confirm that remote login can be performed.

For Linux, start a terminal and use the SSH command to make the connection.

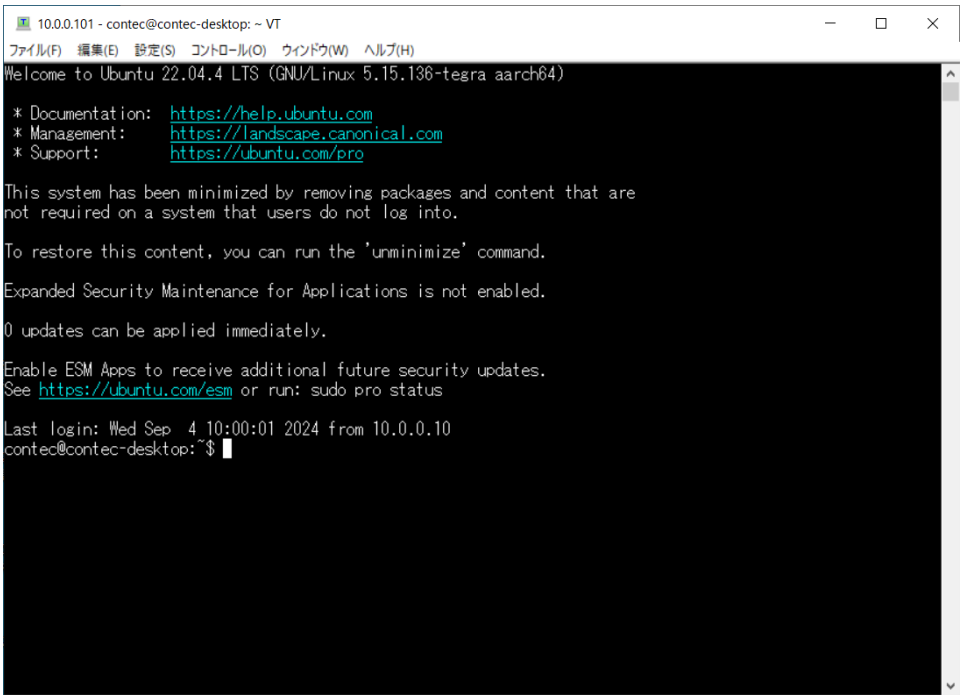
```
$ ssh user_name@ip_address
```

Use Tera Term on the Windows PC, enter the IP of the DX-U2000 to see whether connecting via SSH succeeds.



Enter the username and password used in the Ubuntu configuration.

If everything is in order, connection will be completed as below.



7. USB2.0 Port Operational Check

When a USB memory device is inserted into the USB2.0 Port, it will be recognized as shown below.

Before USB memory device is inserted

```
root@contec-desktop:~# lsusb -t
/:  Bus 02.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 10000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 480M
    |__ Port 2: Dev 2, If 0, Class=Hub, Driver=hub/4p, 480M
```

After USB memory device is inserted

```
root@contec-desktop:~# lsusb
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 005: ID 05e3:0749 Genesys Logic, Inc.
Bus 001 Device 002: ID 0424:2514 Microchip Technology, Inc. (formerly SMSC) USB 2.0 Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub

root@contec-desktop:~# lsusb -t
/:  Bus 02.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 10000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 480M
    |__ Port 2: Dev 2, If 0, Class=Hub, Driver=hub/4p, 480M
        |__ Port 1: Dev 5, If 0, Class=Mass Storage, Driver=usb-storage, 480M

root@contec-desktop:~# mount
/dev/nvme0n1p1 on / type ext4 (rw,relatime)
proc on /proc type proc (rw,relatime)
sysfs on /sys type sysfs (rw,relatime)
…
/dev/sda1 on /media/contec/e0764697-78c3-4f33-b8d9-07d942a570c4 type ext4
(rw,nosuid,nodev,relatime,uhelper=udisks2)
```

8. USB3.2 Gen1 (USB3.0) Port Operational Check

When a USB memory device is inserted into the USB3.2 Gen1 (USB3.0) Port, it will be recognized as shown below.

Before USB memory device is inserted

```
root@contec-desktop:~# lsusb -t
/:  Bus 02.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 10000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 480M
    |__ Port 2: Dev 2, If 0, Class=Hub, Driver=hub/4p, 480M
```

After USB memory device is inserted

```
root@contec-desktop:~# lsusb
Bus 002 Device 004: ID 0411:031e BUFFALO INC. (formerly MelCo., Inc.) SSD-PHC/N
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 002: ID 0424:2514 Microchip Technology, Inc. (formerly SMSC) USB 2.0 Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub

root@contec-desktop:~# lsusb -t
/:  Bus 02.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 10000M
    |__ Port 2: Dev 4, If 0, Class=Mass Storage, Driver=uas, 10000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/4p, 480M
    |__ Port 2: Dev 2, If 0, Class=Hub, Driver=hub/4p, 480M

root@contec-desktop:~# mount
/dev/nvme0n1p1 on / type ext4 (rw,relatime)
proc on /proc type proc (rw,relatime)
sysfs on /sys type sysfs (rw,relatime)
…
/dev/sda1 on /media/contec/volume type ext4
(rw,nosuid,nodev,relatime,uid=1000,gid=1001,fmask=0022,dmask=0022,iocharset=utf8,errors=remount-
ro,uhelper=udisks2)
```

9. RAS Operational Check

The following section describes how to check the operations of the pre-installed RAS sample application.

* For the latest version of the RAS driver CORAS (LNX), see the Contec website.

◆ General-purpose I/O Operations

Launch a console window. Execute the DIO sample (ras_dio) as follows. The result is displayed.

```
root@contec-desktop:~# ras_dio
BUILD_DATE=Nov 14 2023:16:02:20
./ras_dio [-i|-o] [portnum] [value]
-i [portnum] : get port state
-o [portnum] [value] : set port state to [value]
+----------+-----+-----+-----+
|          | DI  | DIO |     |
+----------+-----+-----+-----+
|          | 1 0 | 1 0 | COM |
+----------+-----+-----+-----+
| portnum | 0 1 | 2 3 |     |
+----------+-----+-----+-----+

Read the status of DI1 Port
root@contec-desktop:~# ras_dio -i 0
1

Write the DIO1 Port
root@contec-desktop:~# ras_dio -o 2 1
```

Process overview:

Run the DIO sample to see that you can get the input state and change the output state.

◆ POWER LED Operations

Launch a console window. Run the ras_misc sample as follows, and see that the POWER LED turns off all lights, turns solid red, flashes red, and turns solid green.

Refer to the RAS-API document for details about the API.

```
#all lights off
root@contec-desktop:~# ras_misc -s 0
Set LED Status mode
MT_SetLEDStatus End

#solid red
root@contec-desktop:~# ras_misc -s 1
Set LED Status mode
MT_SetLEDStatus End

#flash red
root@contec-desktop:~# ras_misc -s 2
Set LED Status mode
MT_SetLEDStatus End

#solid green
root@contec-desktop:~# ras_misc -s 4
Set LED Status mode
MT_SetLEDStatus End
```

Process overview:

Confirm that the POWER LED turns on, turns off, and flashes.

◆ Watchdog Timer Operations

Launch a console window. Execute the WDT sample as follows, and confirm that the system is reset after WDT timeout. Refer to the contents of the RAS-API documentation for details about the API.

```
root@contec-desktop:~# ras_wdt -s 30
enter start WDT mode
MT_SetWDT End
MT_StartWDT End
```

Process overview:

In the execution example, the system will be reset about 30 seconds after executing the WDT sample.

(*If ras_wdt is already running, the WDT may not work properly.

Please make sure that there are no other ras_wdt processes running when you check the WDT operations.)

◆ Hardware Monitor Operational Check

Launch a console window. Execute the ras_misc sample as follows, and confirm that system temperature and the system's power-supply voltage can be retrieved. Refer to the contents of the RAS-API documentation for details about the API.

```
# retrieve system temperature
root@contec-desktop:~# ras_misc -t
enter stop WDT mode
ftemp = 45.444687

# retrieve power-supply voltage
root@contec-desktop:~# ras_misc -l
enter WDT mode Setting
fvol = 24.043430
```

10. RTC Operational Check

Confirm that the date and time can be manually changed by entering the timedatectl command on the console screen.

```
root@contec-desktop:~# timedatectl set-ntp false    #Stop the systemd-timesynced.service
root@contec-desktop:~# timedatectl set-time "2022-09-08 12:00:00"       #Set the time
root@contec-desktop:~# timedatectl status     #Check the status
root@contec-desktop:~# timedatectl set-time "2023-09-08 12:00:00"
root@contec-desktop:~# timedatectl status
                      Local time: Fri 2023-09-08 12:00:03 JST
                  Universal time: Fri 2023-09-08 03:00:03 UTC
                        RTC time: Fri 2023-09-08 03:00:03
                       Time zone: Asia/Tokyo (JST, +0900)
System clock synchronized: no
                    NTP service: inactive
                RTC in local TZ: no
```

In addition, confirm that the RTC keeps the time even after the power is turned OFF->ON.

```
root@contec-desktop:~# timedatectl status
                      Local time: Fri 2023-09-08 12:01:41 JST
                  Universal time: Fri 2023-09-08 03:01:41 UTC
                        RTC time: Fri 2023-09-08 03:01:41
                       Time zone: Asia/Tokyo (JST, +0900)
System clock synchronized: no
                    NTP service: inactive
                RTC in local TZ: no
```

This is the procedure for synchronizing the time using the systemd-timesyncd service.
Set the server settings for time synchronization according to your environment.

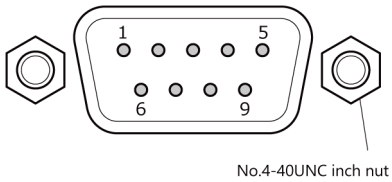
```
root@contec-desktop:~# timedatectl set-ntp true       #Start the systemd-timesynced.service
root@contec-desktop:~# timedatectl status     #Check the status
                      Local time: Fri 2023-09-08 12:03:31 JST
                  Universal time: Fri 2023-09-08 03:03:31 UTC
                        RTC time: Fri 2023-09-08 03:03:31
                       Time zone: Asia/Tokyo (JST, +0900)
System clock synchronized: no
                    NTP service: active
                RTC in local TZ: no
root@contec-desktop:~# vi /etc/systemd/timesyncd.conf       #Edit the setting file
root@contec-desktop:~# systemctl restart systemd-timesyncd       #Restart the service (Reflect the settings)
root@contec-desktop:~# timedatectl status    #Check the status
                      Local time: Tue 2023-06-13 09:35:24 JST
                  Universal time: Tue 2023-06-13 00:35:24 UTC
                        RTC time: Tue 2023-06-13 00:35:25
                       Time zone: Asia/Tokyo (JST, +0900)
System clock synchronized: yes
                    NTP service: active
                RTC in local TZ: no
```

11. RS-232C Port Operational Check

The RS-232C Port is located on the side of the DX-U2000 product model.

RS-232C Port Pin Assignment

Connector used on the product	9-pin D-SUB (MALE)



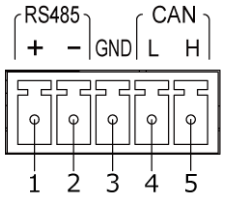
Pin No.	Signal Name	Description	Direction
1	DCD	Carrier detect	Input
2	RD	Received data	Input
3	TD	Transmitted data	Output
4	DTR	Data terminal ready	Output
5	GND	Signal ground	-----
6	DSR	Data set ready	Input
7	RTS	Request to send	Output
8	CTS	Clear to send	Input
9	RI	Ring indicator	Input

It is confirmed that TX/RX and RTS/CTS are looped back and can send/receive by linux-serial-test.

```
root@contec-desktop:~# linux-serial-test -c -s -e -p /dev/ttyTHS0 -b 115200 -o 5 -i 7
Linux serial test app
Stopped transmitting.
/dev/ttyTHS1: count for this session: rx=57135, tx=57135, rx err=0
/dev/ttyTHS1: TIOCGICOUNT: ret=0, rx=57135, tx=830, frame = 0, overrun = 0, parity = 0, brk = 0, buf_overrun = 0
Stopped receiving.
/dev/ttyTHS1: count for this session: rx=57135, tx=57135, rx err=0
/dev/ttyTHS1: TIOCGICOUNT: ret=0, rx=57135, tx=830, frame = 0, overrun = 0, parity = 0, brk = 0, buf_overrun = 0
```

12. RS-485/CAN Port Operational Check

The product is equipped with a non-isolated RS-485 interface port and a non-isolated CAN interface port.

Connector used on the product		15EDGRC-THR-3.5-05P-13-00AH (DEGSON)
		
Pin No.	**Signal Name**	**Description**
1	RS-485+	RS-485 data sent/received (+)
2	RS-485-	RS-485 data sent/received (-)
3	GND	Signal GND
4	CAN-L	CAN data sent/received (Low)
5	CAN-H	CAN data sent/received (High)

The terminal can be switched by using the terminal switch (SW2).

For details, see the DX-U2100 and DX-U2200 Reference Manual Hardware Edition.

◆ RS-485 Port Operational Check

In the stty command, set the baud rate to 115200, and using the echo and cat commands, check that communication with the device (COM-2PD(PCI)H) is possible.

```
・ COM-2PD(PCI)H (teraterm)
abcdefghijklmnopqrstuvwxyz
abcdefghijklmnopqrstuvwxyz

・ DX-U2000
root@contec-desktop:~# stty -F /dev/ttyTHS1 115200
root@contec-desktop:~# echo abcdefghijklmnopqrstuvwxyz > /dev/ttyTHS1
root@contec-desktop:~# cat /dev/ttyTHS1
abcdefghijklmnopqrstuvwxyz
```

◆ CAN Port Operational Check

Using the cansend and candump commands, check that communication is possible with the PEAK-System CAN card (PCAN-PCI Express FD).

```
・ PCAN-PCI Express FD
ubuntu1@ubuntu1-B560M:~$ ip link set can0 type can bitrate 1000000
ubuntu1@ubuntu1-B560M:~$ ip link set can0 up
ubuntu1@ubuntu1-B560M:~$ candump can0
can0  00000123   [8]  12 34 56 78 90 ab cd ef
ubuntu1@ubuntu1-B560M:~$ cansend can0 124#1234567890abef

・ DX-U2000
root@contec-desktop:~# ip link set can0 type can bitrate 1000000
root@contec-desktop:~# ip link set can0 up
root@contec-desktop:~# cansend can0 123#1234567890abef
root@contec-desktop:~# candump can0
can0  00000124   [8]  12 34 56 78 90 ab cd ef
```

13. LTE Module Operational Check

This section describes how to perform an operation check of the LTE module (SIM7600G-H) equipped on the DX-U2100/2200 series LTE model.

The CPU module and LTE module are internally connected by GPIO/USB 2.0. The power supply PIN on the LTE module is controlled by GPIO, and the CPU module recognizes the LTE module as a USB device when the power is turned on.

* The wireless communication function of this product can only be used in Japan and requires a separate SIM card contract.

The following SIM card-related information must also be prepared in advance.

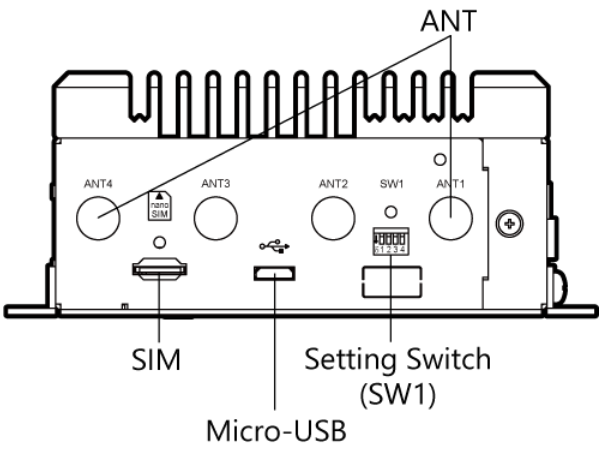
- APN, User name, Password

◆ Inserting a nanoSIM Card into the Product and Attaching the Antennas

With power to the DX-U2100/2200 off, insert a nanoSIM card into the SIM card slot on the side of the chassis.

Next, attach antennas to ANT1 and ANT4.

* For details, see the Reference Manual Hardware Edition.



◆ LTE Module USBMODE

The LTE module (SIM7600G-H) can be switched between multiple USBMODEs.

A different Linux Kernel Driver is used depending on the VID and PID of the USBMODE, as shown in the table below. The factory default USBMODE is "1e0e:9001."

To confirm operation, switch the USBMODE to "1e0e:9011," and check operations run by the RNDIS driver.

* USBMODE settings are saved to the LTE module after the power is turned off, and the module starts up in the previous USBMODE.

VID : PID	Linux Kernel Driver
1e0e:9001(Factory default setting)	SIMCOM wwan/QMI driver
1e0e:9003	MBIM driver
1e0e:9011	RNDIS driver

After turning on the LTE module in RNDIS USBMODE, it will be recognized as network interface usb1.

LTE: usb1

```
ether be:f9:22:78:c4:64    txqueuelen 1000    (Ethernet)
            RX packets 0    bytes 0 (0.0 B)
            RX errors 0    dropped 0    overruns 0    frame 0
            TX packets 0    bytes 0 0.0 B)
            TX errors 0    dropped 0 overruns 0    carrier 0    collisions 0
```

After turning on the power, the following virtual USB serial IF is also created between the DX-U2100/2200 ↔ LTE module.

Device File Name	Type	Applications
/dev/ttyUSB0	USB serial	Diagnostic Interface
/dev/ttyUSB1	USB serial	GPS NMEA Interface
/dev/ttyUSB2	USB serial	AT port Interface
/dev/ttyUSB3	USB serial	Modem port Interface
/dev/ttyUSB4	USB serial	USB Audio Interface

◆ LTE Module Settings/Setup

Using the AT command, perform setup and check that the ping command successfully reaches the external network.

∗ Execute the following with root privileges. ∗ apn, pass, and user are tentative values.

```
root@contec-desktop:~# /usr/local/bin/LTE_on.sh       # LTE module power-on

root@contec-desktop:~# lsusb       #Confirm LTE module startup
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 010: ID 1e0e:9001 Qualcomm / Option SimTech, Incorporated
Bus 001 Device 002: ID 0424:2514 Microchip Technology, Inc. (formerly SMSC) USB 2.0 Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub

root@contec-desktop:~# systemctl stop ModemManager    # Stop ModemManager

root@contec-desktop:~# minicom -D /dev/ttyUSB2        # Setup with AT command

ctrl+a e       #minicom     Enable local echo

AT+CUSBPIDSWITCH=9011,1,1    #LTE module Switch USBMODE

OK

# Switching the LTE module USBMODE restarts the LTE module, so end minicom first.
ctrl+a q       # End minicom

root@contec-desktop:~# lsusb     #Confirm that the LTE module starts up with VIDPID [1e0e:9011]
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 003: ID 1e0e:9011 Qualcomm / Option SimTech, Incorporated
Bus 001 Device 002: ID 0424:2514 Microchip Technology, Inc. (formerly SMSC) USB 2.0 Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub

root@contec-desktop:~# minicom -D /dev/ttyUSB2        # Re-setup with AT command

ctrl+a e       #minicom     Enable local echo

AT+CGDCONT=1,"IPV4V6","apn"              # APN setting

OK
AT+CGAUTH=1,3,"pass","user"         #USER,PASS setting

OK

AT+CNMP=2      # Change mode (automatic)

OK

ctrl+a q       # End minicom
root@contec-desktop:~# ifconfig usb1      # Network interface check
usb1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>    mtu 1500
          inet6 fe80::a134:8fa6:8501:10f4    prefixlen 64    scopeid 0x20<link>
          ether 82:7c:e2:73:ff:87    txqueuelen 1000    (Ethernet)
```

```
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

root@contec-desktop:~# ip addr flush dev usb1      # Delete cache
root@contec-desktop:~# dhclient -v usb1              # Acquire IP address
Internet Systems Consortium DHCP Client 4.4.1
Copyright 2004-2018 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

Listening on LPF/usb1/be:f9:22:78:c4:64
Sending on   LPF/usb1/be:f9:22:78:c4:64
Sending on   Socket/fallback
DHCPREQUEST for 192.168.225.23 on usb1 to 255.255.255.255 port 67 (xid=0xfc4b5f3)
DHCPACK of 192.168.225.23 from 192.168.225.1 (xid=0xf3b5c40f)
bound to 192.168.225.23 -- renewal in 20868 seconds.

root@contec-desktop:~# ping -c 4 -I usb1 www.google.com   # Execute ping command for Google
PING www.google.com (142.250.198.4) from 192.168.225.23 usb1: 56(84) bytes of data.
64 bytes from nrt12s58-in-f4.1e100.net (142.250.198.4): icmp_seq=1 ttl=118 time=48.3 ms
64 bytes from nrt12s58-in-f4.1e100.net (142.250.198.4): icmp_seq=2 ttl=118 time=50.6 ms
64 bytes from nrt12s58-in-f4.1e100.net (142.250.198.4): icmp_seq=3 ttl=118 time=49.4 ms
64 bytes from nrt12s58-in-f4.1e100.net (142.250.198.4): icmp_seq=4 ttl=118 time=44.0 ms

--- www.google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 44.041/48.088/50.640/2.483 ms
```

◆ LTE Module Auto Power-on

To automatically turn the LTE module on when starting DX-U2100/2200, execute the following commands.

* Execute the following with root privileges.

- LTE Module Auto Power-on
root@contec-desktop:~# **systemctl enable LTE_power**
Created symlink /etc/systemd/system/multi-user.target.wants/LTE_power.service →
/lib/systemd/system/LTE_power.service.

- Disable LTE module power-on
root@contec-desktop:~# **systemctl disable LTE_power**
Removed /etc/systemd/system/multi-user.target.wants/LTE_power.service.

◆ ModemManager

The DX-2000 series runs ModemManager as a standard Ubuntu service.

ModemManager regularly collects LTE information via /dev/ttyUSB2.

When directly sending and receiving AT commands by minicom, etc. to /dev/ttyUSB2, use the following command to stop ModemManager.

* If ModemManager is running, AT commands may not be sent and received properly.

```
- Start ModemManager
root@contec-desktop:~# # systemctl start ModemManager

- Stop ModemManager
root@contec-desktop:~# # systemctl stop ModemManager
```

To stop ModemManager at startup, set the service to disable in systemctl.

```
- Enable ModemManager startup
root@contec-desktop:~# # systemctl enable ModemManager

- Disable ModemManager startup
root@contec-desktop:~# # systemctl disable ModemManager
```

When ModemManager is running, you can use the mmcli command to retrieve LTE module and SIM card information.

The following is an output example when ping communication is possible after a SORACOM SIM card is inserted and set up.

− Check connection status

```
root@contec-desktop:~# mmcli -m 0
  ---------------------------------
  General   |                  path: /org/freedesktop/ModemManager1/Modem/0
            |            device id: 47ed04c34d65e328765403fa1bfc82fdf1ab68ba
  ---------------------------------
  Hardware  |          manufacturer: SIMCOM INCORPORATED
            |                 model: SIMCOM_SIM7600G-H
            |      firmware revision: LE20B01SIM7600G-H-M2
            |             supported: gsm-umts, lte
            |               current: gsm-umts, lte
            |          equipment id: 86882204027XXXX
  ---------------------------------
  System    |                device: /sys/devices/platform/3610000.xhci/usb1/1-3
            |               drivers: option, rndis_host
            |                plugin: simtech
            |          primary port: ttyUSB2
            |                 ports: ttyUSB0 (qcdm), ttyUSB2 (at), ttyUSB3 (at), usb1 (net)
  ---------------------------------
  Numbers   |                   own: 0200101162XXXX
  ---------------------------------
```

```
  Status    |          unlock retries: sim-pin (3), sim-puk (10), sim-pin2 (3), sim-puk2 (10)
            |                    state: registered // Connection Status
            |              power state: on
            |              access tech: lte
            |           signal quality: 100% (recent)
  --------------------------------
  Modes     |               supported: allowed: 2g; preferred: none
            |                          allowed: 3g; preferred: none
            |                          allowed: 2g, 3g; preferred: none
            |                          allowed: 2g, 3g; preferred: 2g
            |                          allowed: 2g, 3g; preferred: 3g
            |                current: allowed: any; preferred: none
  --------------------------------
  IP        |                supported: ipv4, ipv6, ipv4v6
  --------------------------------
  3GPP      |                      imei: 86882204027XXXX
            |              operator id: 44010
            |            operator name: NTT DOCOMO NTT DOCOMO
            |              registration: home
  --------------------------------
  3GPP EPS | ue mode of operation: csps-2
  --------------------------------
  SIM       |       primary sim path: /org/freedesktop/ModemManager1/SIM/0
```

− Display base station information

```
root@contec-desktop:~# mmcli -m 0 --location-get
  -------------------------
  3GPP |          operator mcc: 440
       |          operator mnc: 20
       | location area code: 8106
       | tracking area code: 000000
       |                cell id: 01FB405D
```

◆ Confirm/Reset LTE APN, USER, PASSWD Settings

- Confirm APN, USER, PASSWD settings

Use the following commands to confirm LTE module settings with the AT command.

* The following APN, USER, and PASSWD settings are saved after the LTE module is turned off or reset.
For details of AT command specifications, see the SIM7600G-H AT Command Reference Manual.
(https://techship.com/download/simcom-sim7500-and-sim7600-series-at-command-manual-v3-0/)

```
root@contec-desktop:~# systemctl stop ModemManager # stop ModemManager
root@contec-desktop:~# minicom -D /dev/ttyUSB2      #AT command IF open with the minicom command

ctrl+a e      # Enable minicom local echo

AT+CGDCONT? # Confirm APN setting

+CGDCONT: 1,"IPV4V6","soracom.io","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0
+CGDCONT: 2,"IPV4V6","","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0
+CGDCONT: 3,"IPV4V6","","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0
+CGDCONT: 4,"IPV4V6","","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0
+CGDCONT: 5,"IPV4V6","","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0
+CGDCONT: 6,"IPV4V6","","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0

OK

AT+CGAUTH? # Confirm USER/PASSWD settings

+CGAUTH: ,,"ctnet@mycdma.cn","vnet.mobi"(for CDMA1x-EvDo only)
+CGAUTH: 1,3,"sora","sora"
+CGAUTH: 2,0
+CGAUTH: 3,0
+CGAUTH: 4,0
+CGAUTH: 5,0
+CGAUTH: 6,0

OK
```

- Reset APN, USER, PASSWD settings

You can clear settings for each index by setting no arguments for AT+CGDCONT/AT+CGAUTH.

```
root@contec-desktop:~# systemctl stop ModemManager # stop ModemManager
root@contec-desktop:~# minicom -D /dev/ttyUSB2      # AT command IF open with the minicom command

ctrl+a e      # Enable minicom local echo

AT+CGDCONT=1   #APN setting index1 Delete

OK

AT+CGAUTH=1 # USER/PASSWD setting index1 Delete

OK
```

◆ Troubleshooting for Connection Failures

If you cannot connect to an external network via the LTE module for some reason, confirm the following AT command response results.

The following is an output example when ping communication is possible after a SORACOM SIM card is inserted and set up.

- Confirm that SIM card is inserted

```
AT+CPIN?

+CPIN: READY       #Confirm that SIM card is inserted
OK
```

- Confirm network mode settings

```
AT+CNMP?

+CNMP: 2    # Selected mode for connection method: Automatic
OK
```

− Confirm antenna strength

```
AT+CSQ

+CSQ: 23,99    # antenna strength: 23
OK
```

- Confirm carrier access

```
AT+COPS?

+COPS: 0,0,"NTT DOCOMO NTT DOCOMO",7
OK
```

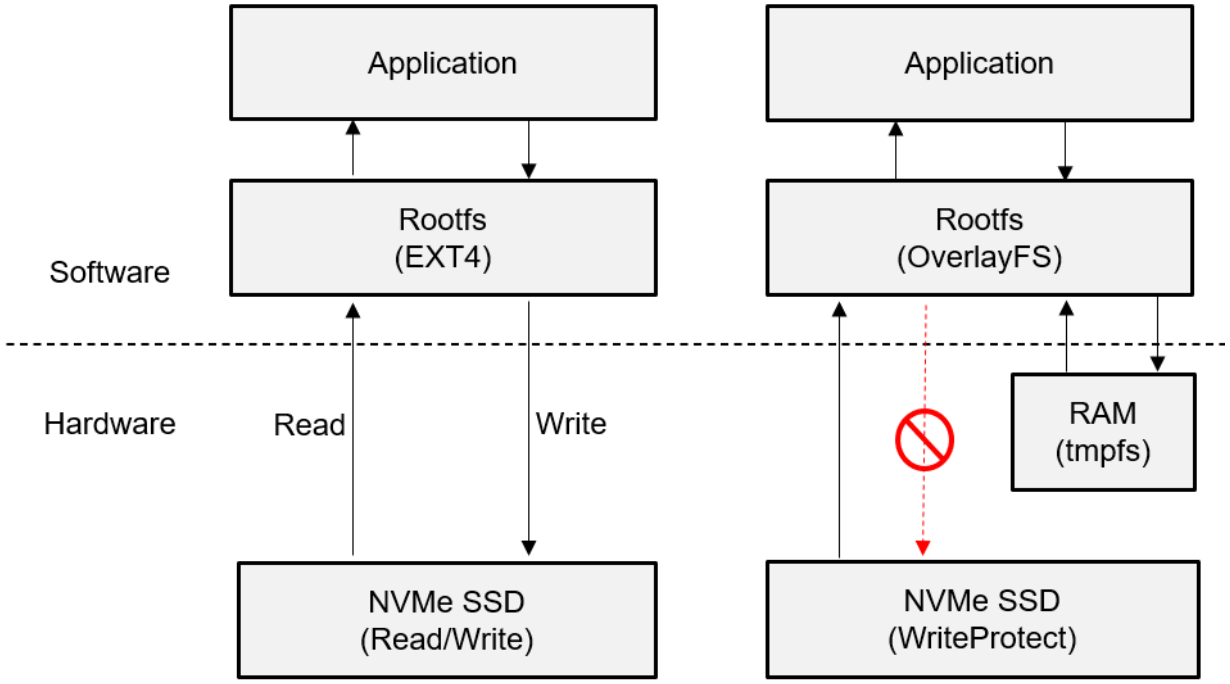
− Confirm Internet connection

```
AT+CPSI?

+CPSI: LTE,Online,440-10,0x637F,114529572,283,EUTRAN-BAND3,1850,5,5,-84,-757,-46
OK
```

14. Power Failure Protection Function

The DX-U2200 is equipped with the Power Failure Protection system that protects data and prohibits writing to storage in the event of a power failure. When the Power Failure Protection system is enabled, all writing data to the NVMe SSD is saved in RAM, and all writing data in RAM is discarded when the product is restarted.



Power Failure Protection system overview

* This function is supported only with version L4T R35.5.0 and later of the firmware for the DX-U2000 Series NVMe SSD.

* This function is supported for NVMe SSD Boot only. If using USB Boot, make sure this function is disabled before starting the product.

◆ Switching the Power Failure Protection System (Linux)

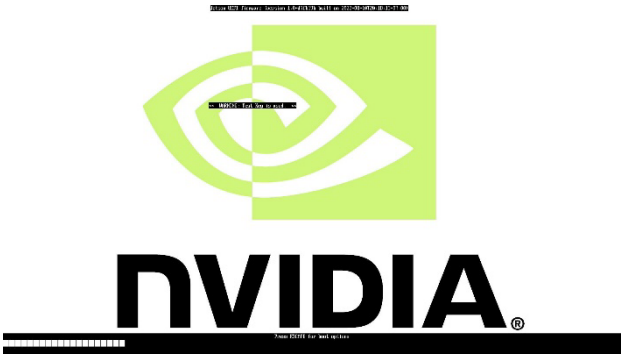
* Change the setting with the command and restart the product to apply the setting.

Enable the Power Failure Protection system
root@contec-desktop:~# **set_write_protect.sh -e**
Enable

Disable the Power Failure Protection system
root@contec-desktop:~# **set_write_protect.sh** -d
Disable

◆ Switching the Power Failure Protection System (UEFI)

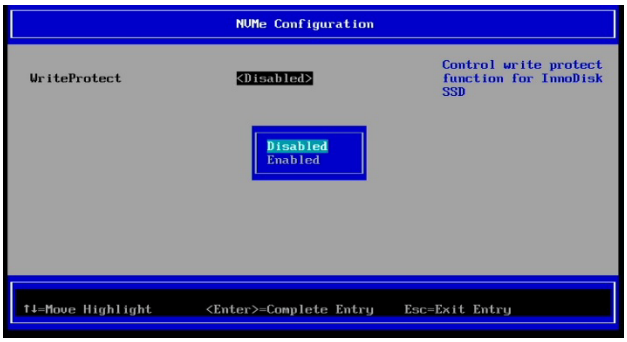
The Power Failure Protection system can be enabled and disabled from UEFI mode.



Once the product is turned on, press the Esc key to enter UEFI mode when the NVIDIA logo and "Press ESCAPE for boot options" are displayed.

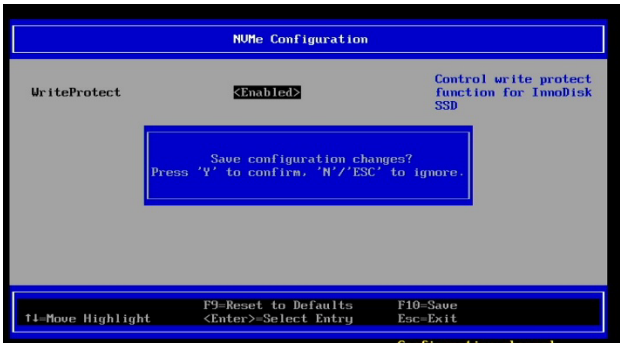
* Do not press the Esc key multiple times.

Once the UEFI screen is displayed, select Boot Device Manager
-> Contec Configuration
-> NVMe Configuration
in that order.

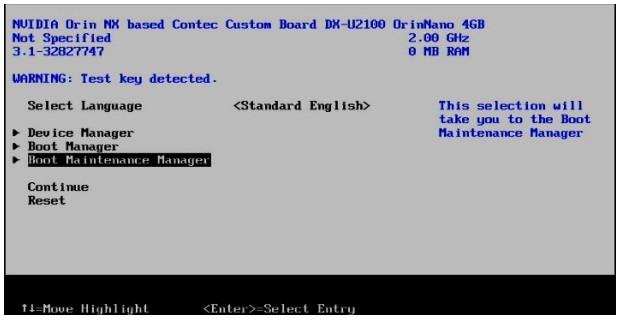


Select WriteProtect and set the desired value.

Disable : Disable the Power Failure Protection system
Enable : Enable the Power Failure Protection system



Once confirmed, press the F10 key. A dialog will then appear asking to save the settings. Press the Y key to save.



Press Esc to return to the initial screen and select [Continue] to exit UEFI mode.

Once you have exited UEFI mode, restart the product and the product will start according to the set value.

◆ Checking the Power Failure Protection System Setting

You can check the setting that will be applied the next time the product starts with the following command.

```
- Enable
root@contec-desktop:~# set_write_protect.sh -s
Enable

- Disable
root@contec-desktop:~# set_write_protect.sh -s
Disable
```

You can check whether the Power Failure Protection system is currently enabled or disabled with the mount command.

```
- Enable
root@contec-desktop:~# mount
overlayfs-root on / type overlay
(rw,relatime,lowerdir=/mnt/lower,upperdir=/mnt/rw/upper,workdir=/mnt/rw/work)

- Disable
root@contec-desktop:~# mount
/dev/nvme0n1p1 on / type ext4 (rw,relatime)
```

◆ Checking the Operation of the Power Failure Protection System

When the Power Failure Protection system is enabled, you can confirm that the data created on Rootfs will not be saved the next time the product starts.

```
root@contec-desktop:~# echo abcdefghijklmnopqrstuvwxyz >test     #Write test data
root@contec-desktop:~# sync                                      #Write data
root@contec-desktop:~# cat test                                  #Check data
abcdefghijklmnopqrstuvwxyz

root@contec-desktop:~# reboot
Restart

root@contec-desktop:~# cat test                                  #Check that data was discarded
cat: test: No such file or directory
```

◆ Precautions When Using the Power Failure Protection System Together with Docker

When the Power Failure Protection system is enabled and the Docker Storage Driver is overlay2, an error such as the following will occur in the kernel log and the Docker service will not run correctly.

```
root@contec-desktop:~# dmesg | grep overlayfs
[ 46.706749] overlayfs: filesystem on '/var/lib/docker/overlay2/check-overlayfs-support3736301870/upper' not supported as upperdir
```

In this situation, the error can be prevented by changing the Docker Storage Driver to fuse-overlayfs.

Add the text in bold to the following file and restart the product.

After the product restarts, the Storage Driver was correctly changed if the Storage Driver is reported as fuse-overlayfs.

* Set the Storage Driver when the Power Failure Protection system is disabled because writing is necessary to make this change.

```
root@contec-desktop:~# vim /etc/docker/daemon.json
{
    "storage-driver": "fuse-overlayfs",
    "runtimes": {
        "nvidia": {
            "path": "nvidia-container-runtime",
            "runtimeArgs": []
        }
    }
}

Restart

root@contec-desktop:~# docker info
Client:
 Version:    24.0.5
…

 Storage Driver: fuse-overlayfs
```

* When the Storage Driver is changed, the containers deployed in the Docker environment before the change will not run. In this case, deploy the containers again.

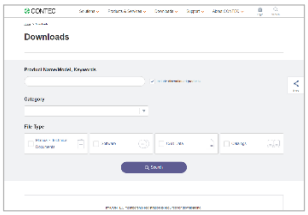
Customer Support and Inquiry

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably.

1.Services

CONTEC offers the useful information including product manuals that can be downloaded through the Contec website.

Download



https://www.contec.com/download/

You can download updated device driver, firmware, and differential manuals in several languages. Membership registration (myCONTEC) is required to use the services.

Revision History

MONTH YEAR	Summary of Changes
September 2024	The First Edition

CONTEC CO., LTD. 3-9-31, Himesato, Nishiyodogawa-ku, Osaka 555-0025, Japan

https://www.contec.com/

DX-U2100, DX-U2200 Reference Manual Software (Ubuntu 22.04.4 LTS)

NA10396 (LXDZ801) [09132024] September 2024 Edition