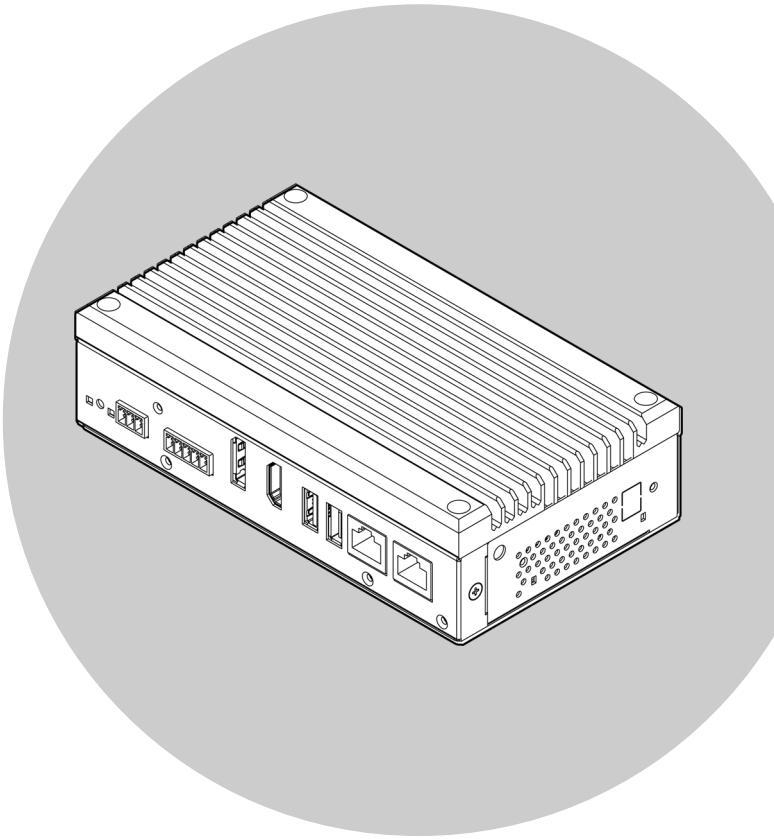
CONTEC

Reference Manual Software

(Ubuntu 18.04.5 LTS)

Industrial Edge AI Computer

DX-U1200 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 18.04.5 LTS on the preinstalled model is based on the Sample Root Filesystem for Jetson Xavier™ provided by NVIDIA®. CONTEC's preinstalled models perform customization to build the OS based on a configuration determined in advance.

In this manual, you will find basic information on the installed OS, as well as explanations of setup procedures and recovery procedures.

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

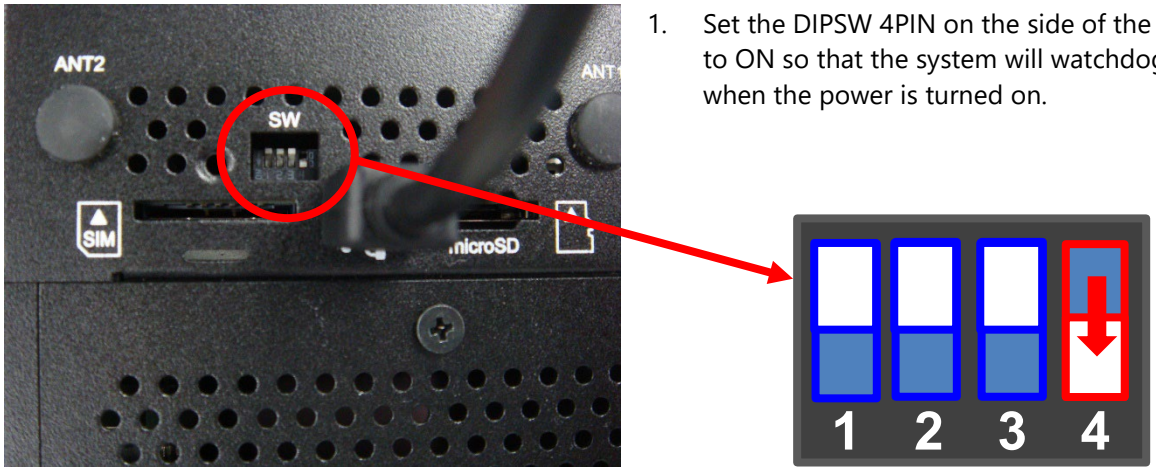
This manual describes the setup procedure that a user needs to perform after unpacking the product with a pre-installed operation system.
The setup of Ubuntu is performed interactively.

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.

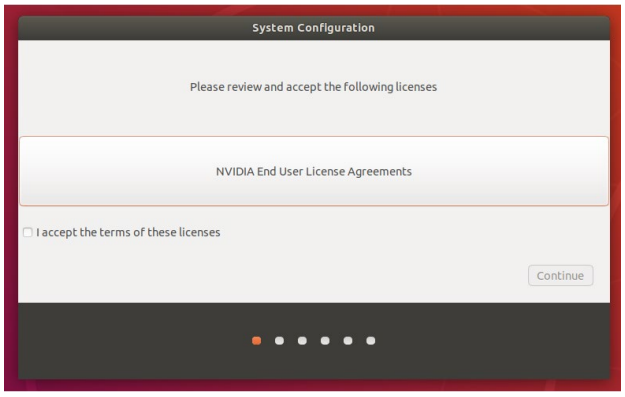
⚠ CAUTION

- 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 eMMC 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.

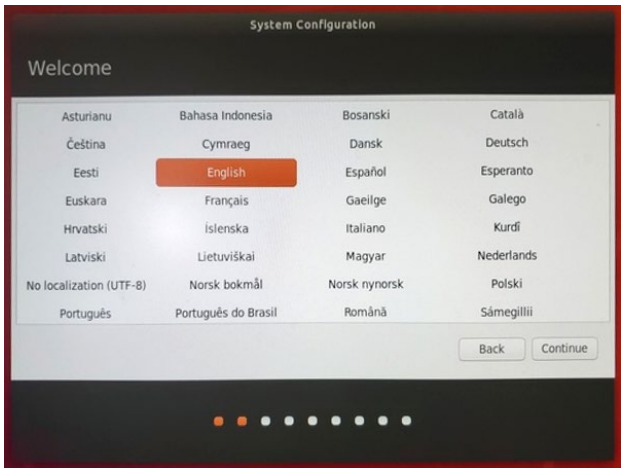


1. Set the DIPSW 4PIN on the side of the chassis to ON so that the system will watchdog-off when the power is turned on.

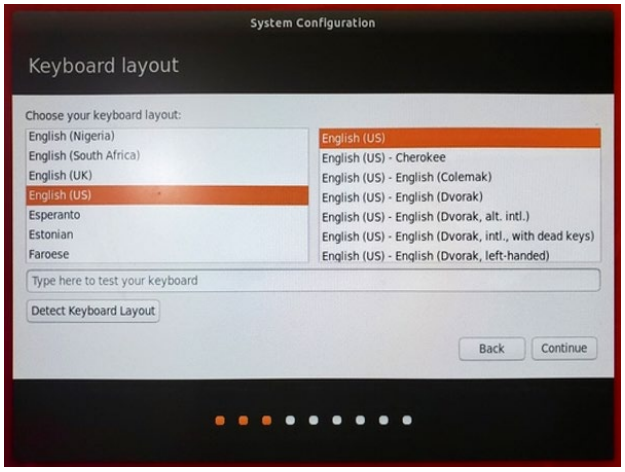
Turn on the power of the product. Please wait for the Ubuntu setup starts.
Follow the instructions on the display after start-up.



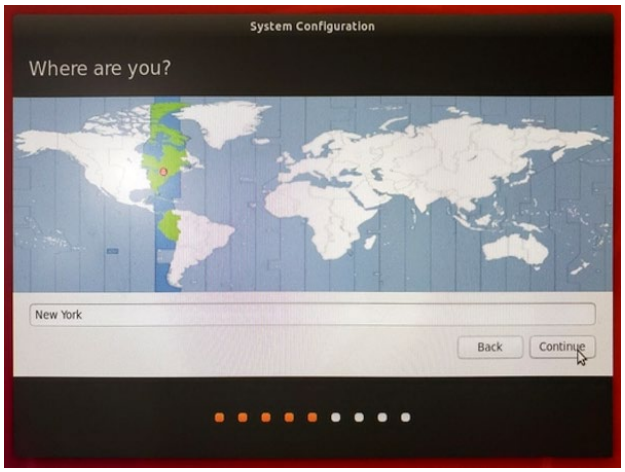
2. This is the documentation for the NVIDIA L4T licenses.
Please review and check off the box of [I accept ~] to accept the licenses.
Click the [Continue].



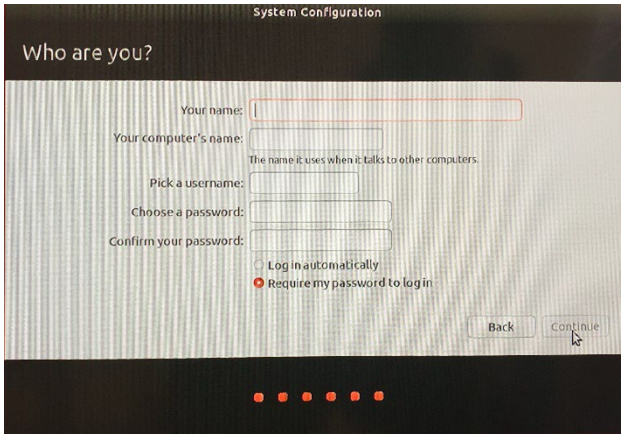
3. Select your preferred language.
Click the Continue.
The following steps are explained using English as an example.



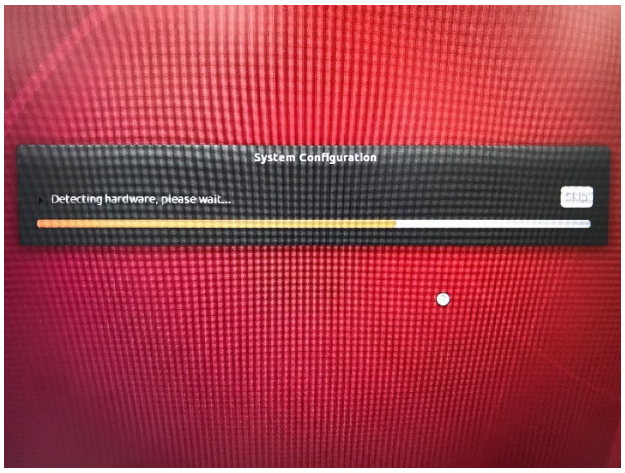
4. Select your preferred keyboard layout.
Click the Continue.



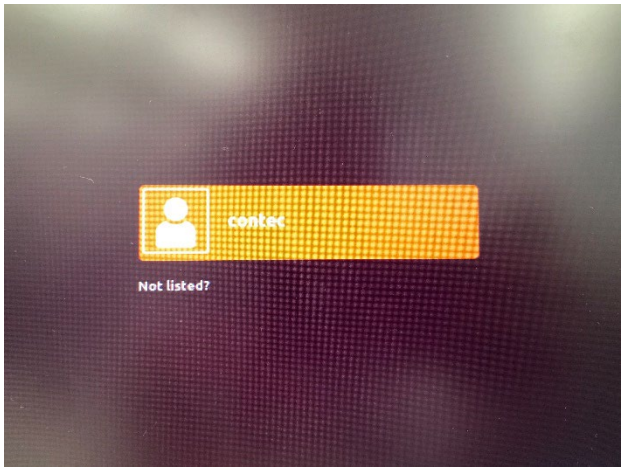
5. For Time Zone setting, select the local region where the system is used.
Click the Continue.



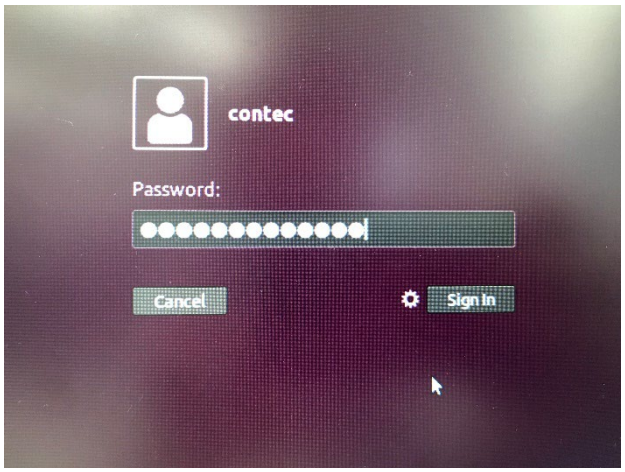
6. Type your name and your computer's name, pick a user name, and choose a password to be used for the Ubuntu desktop environment.
Click the Continue.



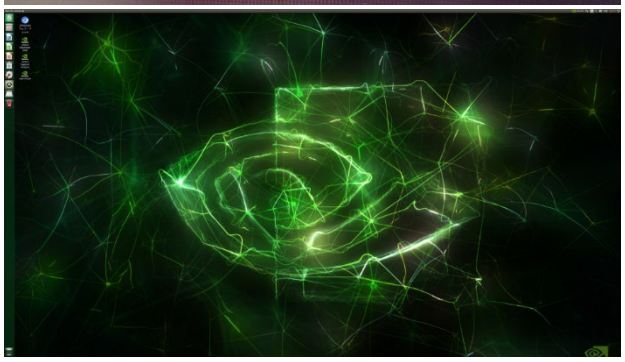
7. System Configuration will start.
It takes about one minute to complete the configuration.



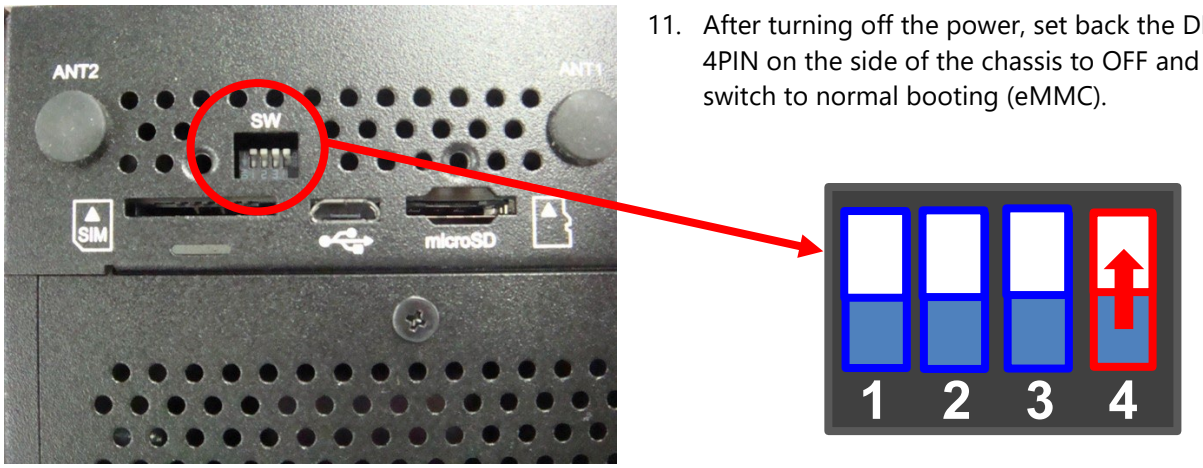
8. If you have checked off the box of [Require my password to log in], the login display will appear.



9. Type your password.
Click the Sign In.



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



11. After turning off the power, set back the DIPSW 4PIN on the side of the chassis to OFF and switch to normal booting (eMMC).

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 eMMC firmware of pre-installed models.

1.Preparations

This section describes how to recover/verisonup the OS of eMMC from the Host PC environment by connecting the host PC environment (Ubuntu 18.04 64bit) to the micro USB port of the DX-U1200.

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_jetson-nano-emmc_R32.x.x.tbz2)

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.

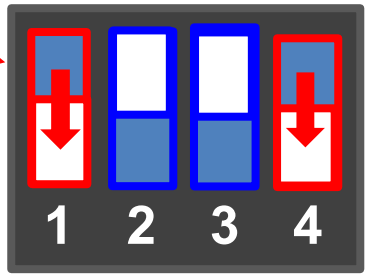
2.Procedure

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 DIPSW 1PIN on the side of the chassis to ON so that the system will boot in recovery mode when the power is turned on. Also set the DIPSW 4PIN to ON so that the system will boot with watchdog-off.

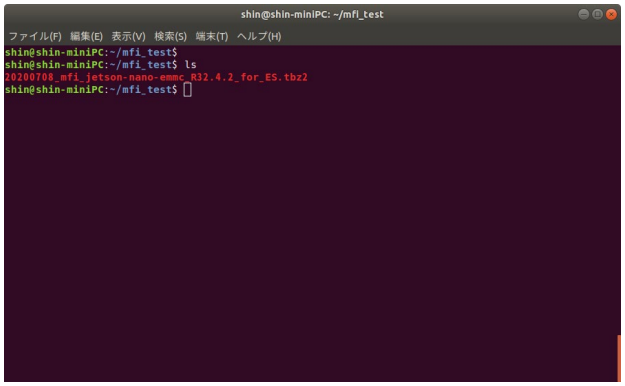


2. Connect the product and the host PC environment with the micro USB cable and turn on the power.

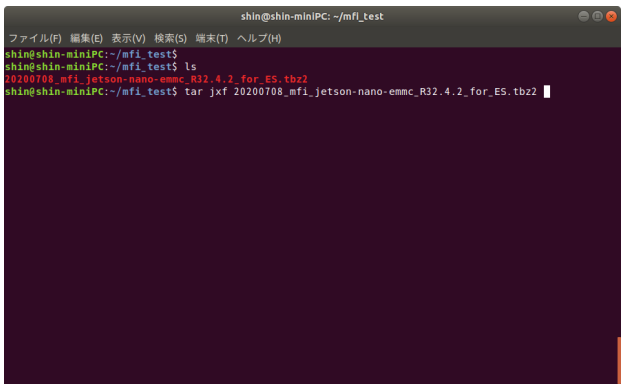
2. Extracting Firmware and Performing Write Operations

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

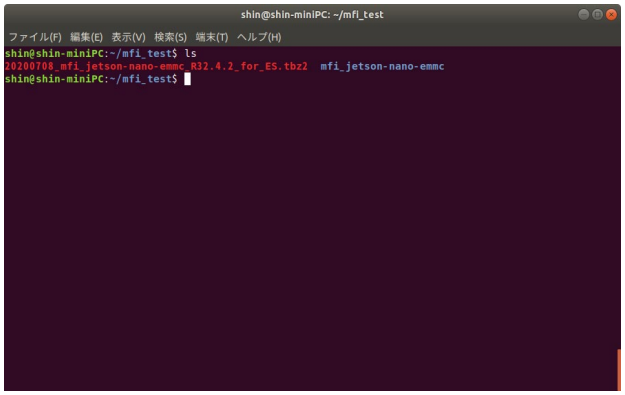
1. Start [Console] app on the Ubuntu environment.



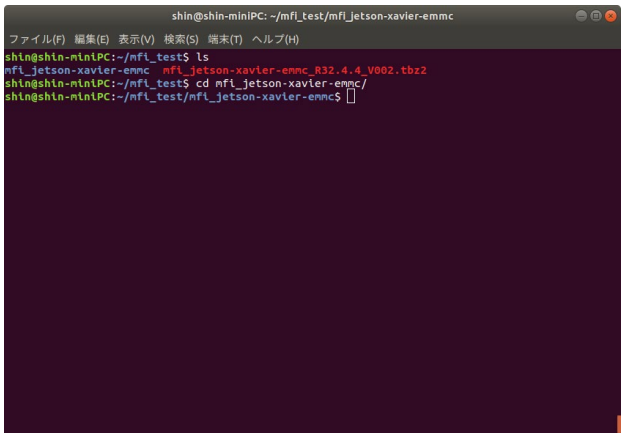
2. Place the recovery image file on the specified directory and check whether it can be seen from the [Console] app.



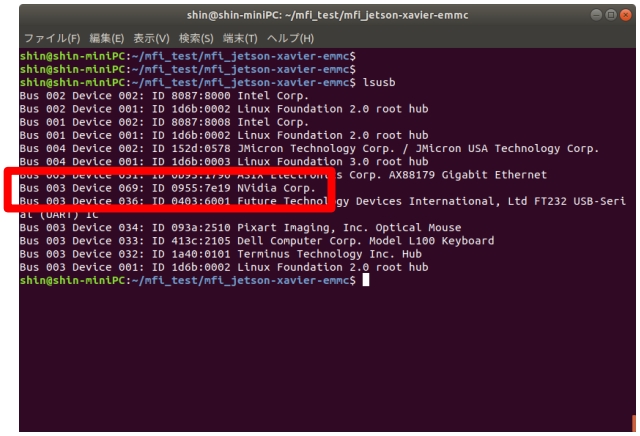
3. Extract the recovery file with tar command [tar jxf archive name.tbz2].



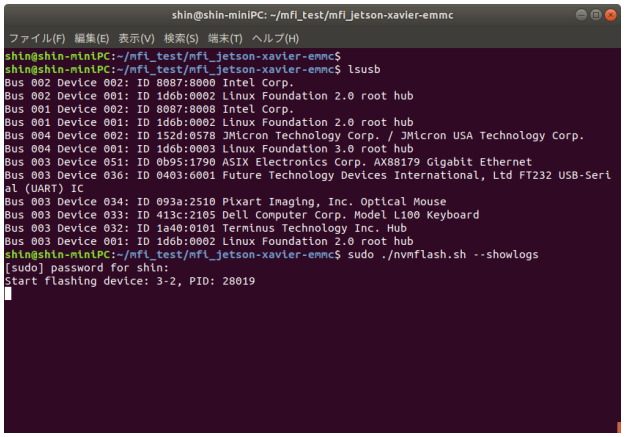
4. After unzipping, the file will be extracted to mfi_jetson-nano-emmc.



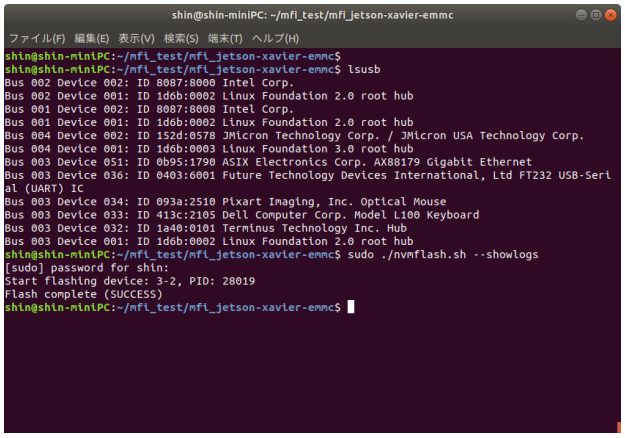
5. The file goes under the mfi_jetson-nano-emmc.



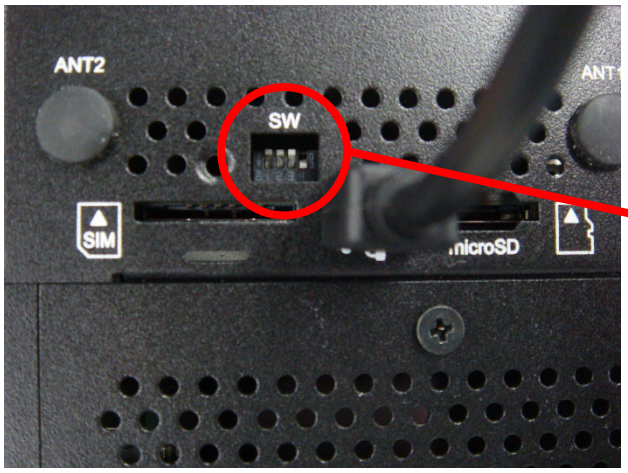
6. Use the lsusb command to confirm that the USB-IF of the CPU "Nvidia Corp" in the product is recognized.



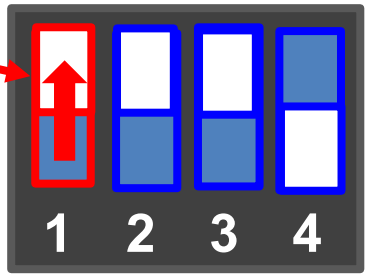
7. Use the "sudo . /nvmflash.sh --showlogs" command to start recovery of the product via USB.



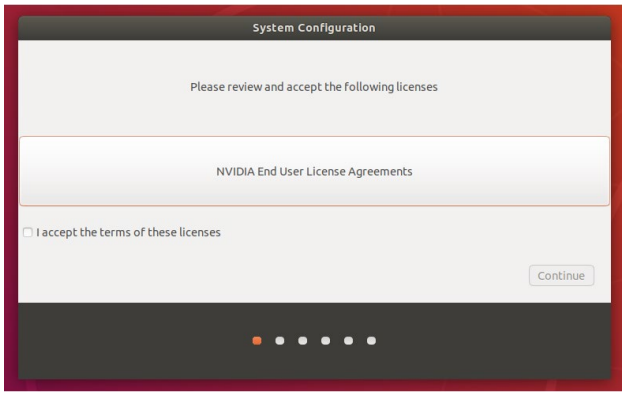
8. Writing to the product will be completed in about 10 minutes. After completion, turn off the power of the product.



9. After turning off the power, set back the DIP SW 1PIN on the side of the chassis to OFF and switch to normal booting (eMMC).



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 SD Write Procedure

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

1.Preparations

This section describes how to insert an SD card into the host PC environment (Ubuntu 18.04 64bit) and write an SD image to the SD card. 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 SD Card Reader
- microSD Card (SDHC, Class 10, 16 GB or more)
- The Product Itself
- SD Image File (XavierNX_R32.x.x_xxx_sd_blob.img.tbz2)

Download from the CONTEC website.
* Use the same version as for the eMMC firmware.
* If the eMMC firmware and SD Image File versions do not match,
  please refer to "Recovery/VersionUp Method" to upgrade the eMMC firmware.
* The file is about 16 GB.
* The image file version may be updated at a later date.

- Checking the eMMC Firmware Version

Use the following command to check the firmware version after starting eMMC.

```
$ cat /etc/contec/CONTEC-L4T.version
XAVIERNX-32.4.4-V002
```

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 SD Image

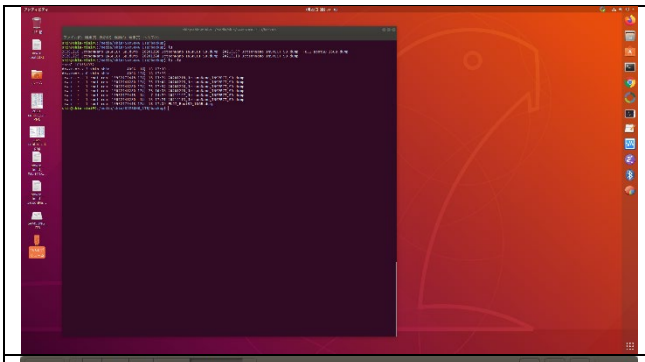
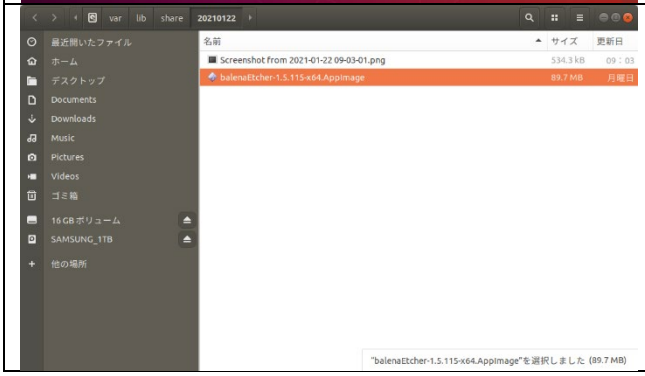
After downloading the SD image file, use the following command to extract the compressed .tbz2 file into a .img file.

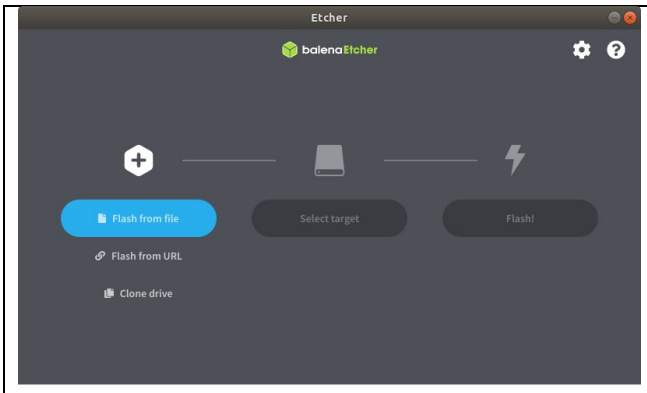
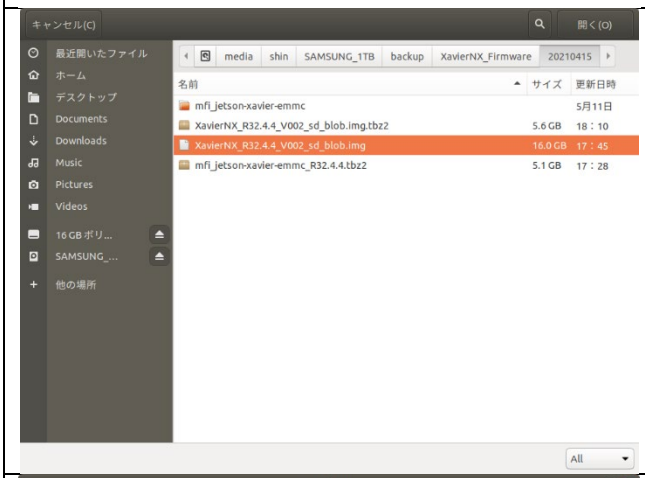
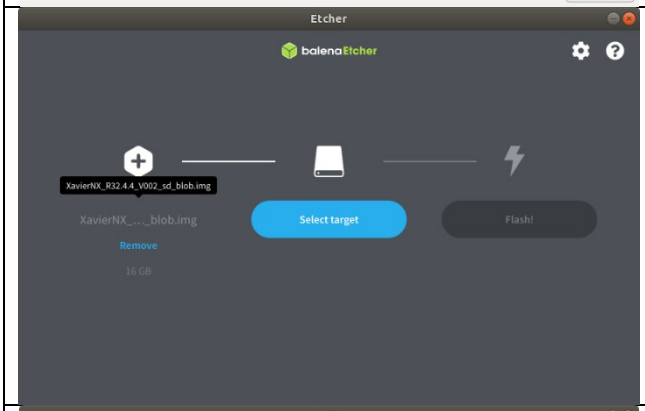
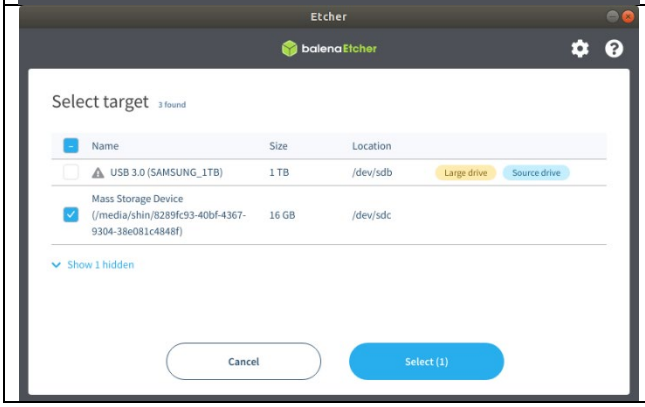
```
$ tar jxf XavierNX_R32.x.x_Vxxx_sd_blob.img.tbz2
```

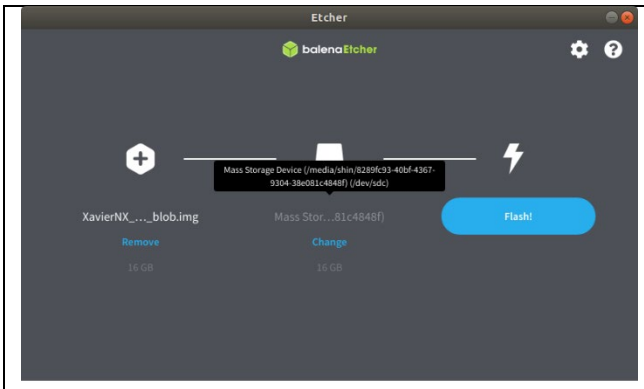
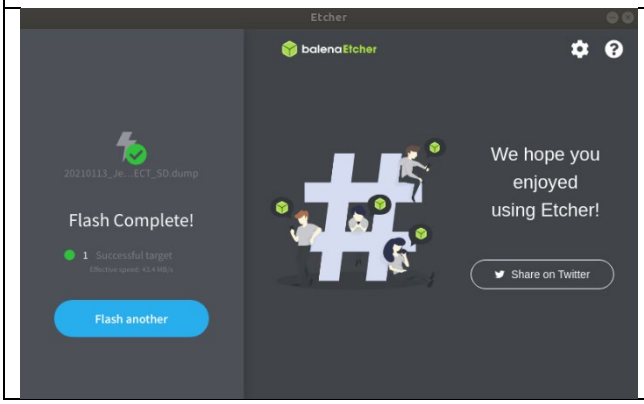
The file (XavierNX_R32.x.x_Vxxx_sd_blob.img) extracted using the command above will be used as the SD image being written.

2. Writing the SD Image

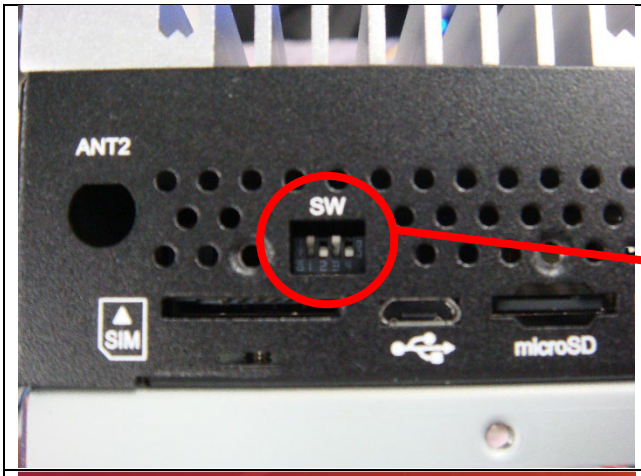
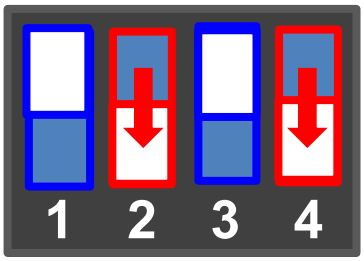
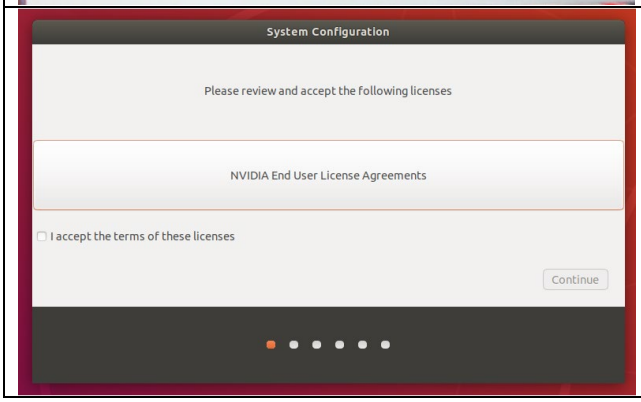
Use the SD card reader in the host PC environment (Ubuntu 18.04 64bit) to write the firmware file.

	1. Insert the USB SD card reader into the Ubuntu PC and verify the SD card is recognized.
	2. Start the [balenaEtcher] app on the host PC (Ubuntu).

	3. Select [Flash from file].
	4. Select the SD image file saved to Ubuntu.
	5. Select the target write drive under [Select target].
	6. Select the inserted microSD card. (* 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

<table>
<tr>
<td> 
</td>
<td>1. Insert the microSD card created in the previous section into the side of the chassis and switch DIPSW PIN2 to ON to boot from the SD card. To turn off the watchdog timer, also switch DIPSW PIN4 to ON.

</td>
</tr>
<tr>
<td> 
</td>
<td>2. Turn on the power supply and 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.</td>
</tr>
</table>

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 18.04.5 LTS

```
root@contec-desktop:~# cat /proc/version
Linux version 4.9.140-tegra (shin@shin-miniPC) (gcc version 7.3.1 20180425 [linaro-7.3-2018.05
revision
 d29120a424ecfbc167ef90065c0eeb7f91977701] (Linaro GCC 7.3-2018.05) ) #96 SMP PREEMPT Thu Apr 15
10:50:56 JST 2021

root@contec-desktop:~# uname -a
Linux contec-desktop 4.9.140-tegra #96 SMP PREEMPT Thu Apr 15 10:50:56 JST 2021 aarch64 aarch64
aarch64 GNU/Linux
```

◆ Configuration

No.	Equipment name	Maker	Model	Remarks
1	Industrial Edge AI Computer	CONTEC	DX-U1200P1	The product model with a Low Profile PCI Express(x1) slot
2	USB Keyboard/USB Mouse	-	-	
3	Display	ViewSonic	VS16861	HDMI/DisplayPort/ HDMI Audio (Speaker)
4	Device used to confirm network communication status	-	Generic PC	Wired LAN

* - : Not specified

2.List of Operational Checks

1. Operational Checks and Results

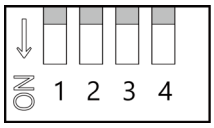
Only basic operations such as the installation and startup are verified as part of the operational checks. The operational checks were not conducted assuming all possible applications.
This manual covers operational checks that were conducted for the items below.

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
	DisplayPort	Recommended display resolution is displayed	○	See Page 36
	Dual display	Dual display is supported	○	See Page 37
Audio	HDMI Port Output	Confirmed that sound can be output from the display's speakers when connected to the HDMI Port	○	See Page 38
DIPSW		eMMC or SD Boot can be selected with DIPSW	○	See Page 33
Storage	eMMC	eMMC Boot is possible	○	See Page 39
	SD	SD Boot is possible		See Page 40
LAN		Package installation is possible using “apt” commands	○	
		Login is possible using SSH	○	See Page 44
USB	USB 2.0 Port	USB memory can be recognized	○	See Page 45
	USB 3.2 Gen1 (USB3.0) Port	USB memory can be recognized	○	See Page 46
RAS	General-purpose I/O	Input/output operations are possible (DIO)	○	See Page 47
	LED	Alarm LED turns on/off	○	See Page 48
	WDT	Reset is possible after configuring timeout	○	See Page 49
	HW monitor	System temperature can be obtained		See Page 49
	HW monitor	Power voltage can be obtained		See Page 49
RTC		Time can be configured	○	See Page 50
CAMERA-IF		Input images can be HDMI output.	○	See Page 51
40-PIN HEADER	GPIO	Input/output operations are possible (GPIO)	○	See Page 54
	UART	Communication through loopback is possible	○	See Page 55
	SPI	Reading and writing for Serial Flash is possible	○	See Page 56
	I2C	I2C-EEPROM can be recognized	○	See Page 57

3.Operational Check Details

1. BootMode Setting

Setting can be done with the DIPSW 2PIN.

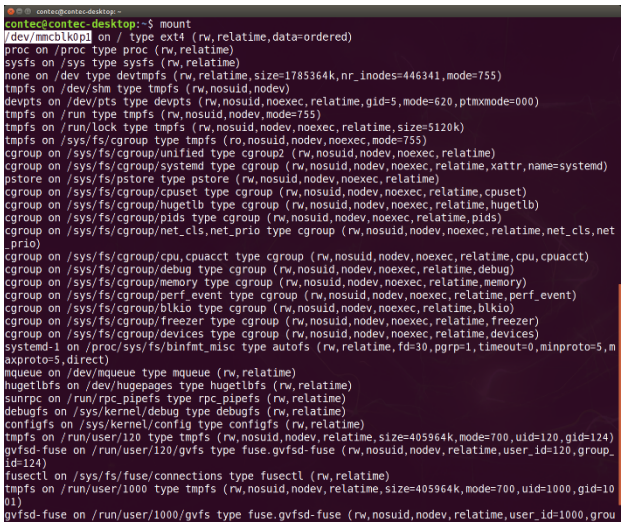


Bit No.	ON/OFF	Description
1	ON	Turn this on for OS writing.
	OFF	Turn this off for a normal booting.
2	**ON**	**Setting this ON boots from the SD card. *1**
	OFF	**Setting this OFF boots from the embedded Multi Media Card (eMMC).**
3	System Reservation : Always OFF	
4	ON	Turn this on for OS Setup.
	OFF	Turn this off for a normal booting.

*1 Reading starts from the eMMC up to U-Boot, then from the SD card thereafter.

◆ eMMC Boot

Confirm that the operating system will boot from the Multi Media Card (eMMC) embedded in the CPU module by setting the DIPSW 2PIN on the side of the chassis to OFF.

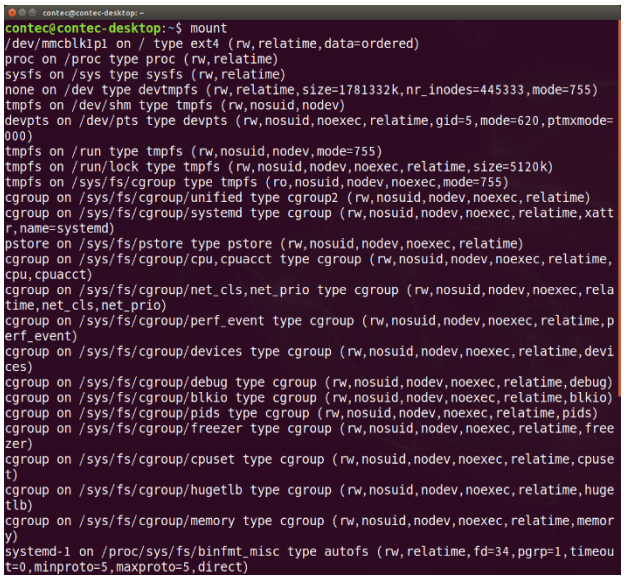


On the console App of the DX-U1200, execute the mount command and confirm that /dev/mmcblk0p1(eMMC) is mounted as /(root).

◆ SD Boot

Confirm that the operating system installed on a microSD card will boot by setting the DIPSW 2PIN on the side of the chassis to ON.

* For details on how to create an OS image to install on the microSD card, refer to **"Boot SD Write Procedure (Page 24)."**

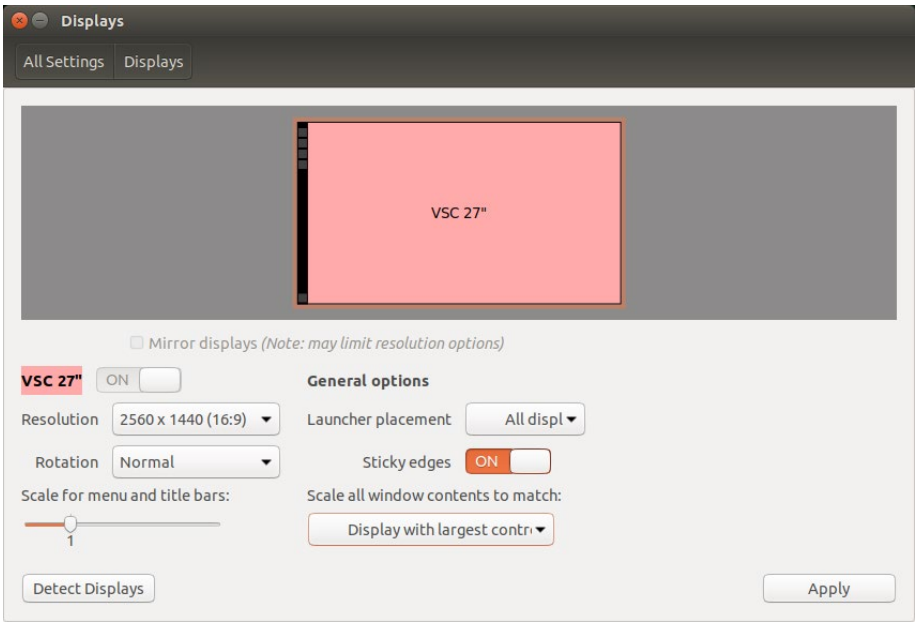


On the console App of the DX-U1200, execute the mount command and confirm that /dev/mmcblk1p1(SD) is mounted as /(root).

2. Check the display

◆ HDMI Port

Select [System 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.

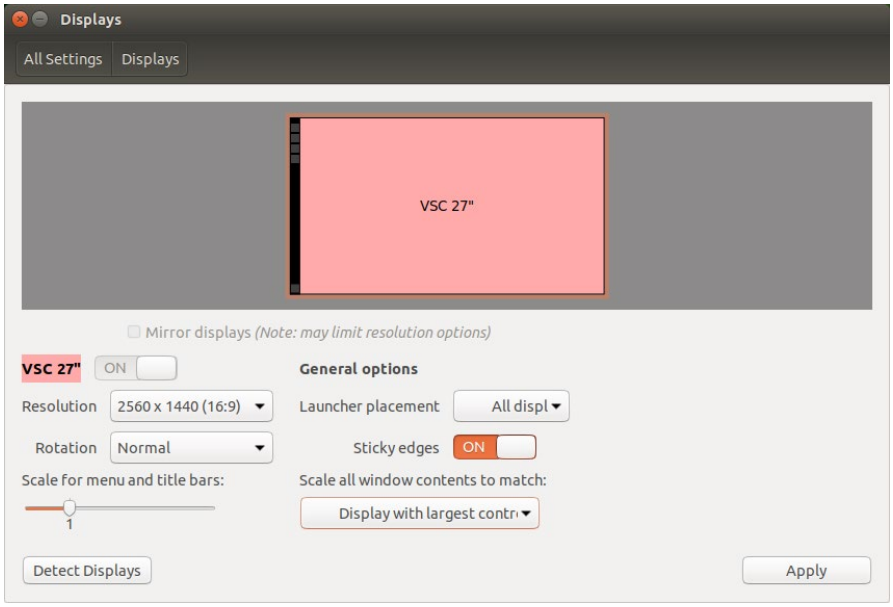


Special note:

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.

◆ DisplayPort

Select [System 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.

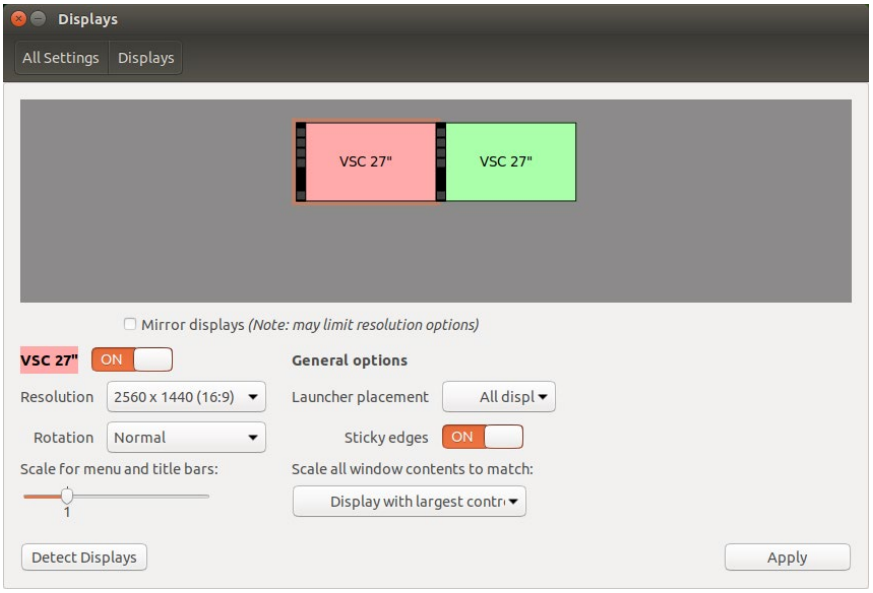


Special note:

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

◆ HDMI + DisplayPort

Select [System 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:

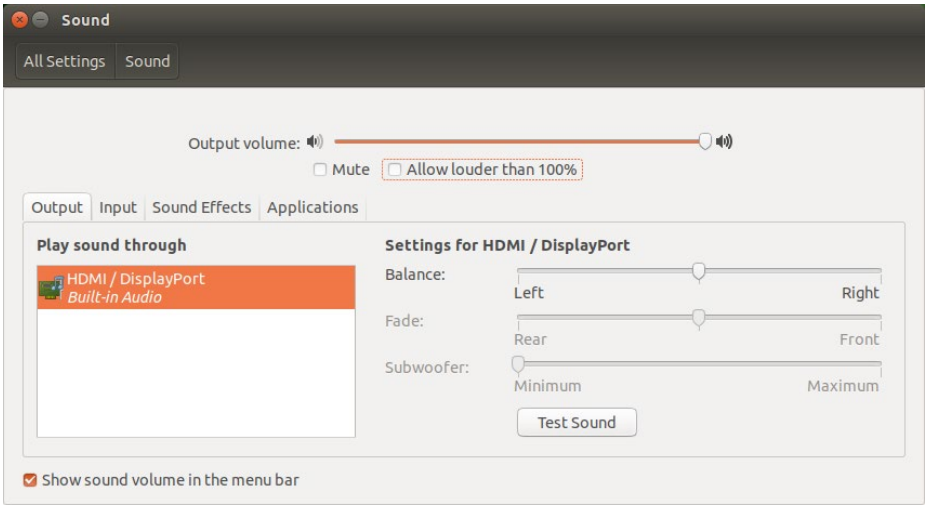
The recommended resolution or the currently selected resolution may not be displayed if the HDMI cable and the DisplayPort cable are connected while the OS is running. In that case, use the display configuration tool again to choose the appropriate resolution.

3. HDMI Audio Operational Check

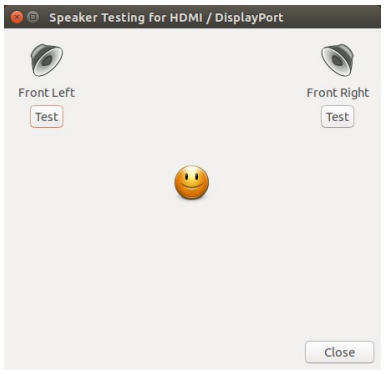
HDMI Output

Select [System 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 [Test] button.



HDMI Port output test screen



Special note:

As for DisplayPort cable, audio output cannot be supported since the specification of the product port is eDP (embedded DisplayPort).

4. Storage Operational Check

◆ eMMC

eMMC is recognized as /dev/mmcblk0.

Confirm that eMMC is mounted as Rootfs when booting from eMMC Boot.

```
root@contec-desktop:~# mount
/dev/mmcblk0p1 on / type ext4 (rw,relatime,data=ordered)
proc on /proc type proc (rw,relatime)
sysfs on /sys type sysfs (rw,relatime)
none on /dev type devtmpfs (rw,relatime,size=1781268k,nr_inodes=445317,mode=755)
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,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)
cgroup on /sys/fs/cgroup/unified type cgroup2 (rw,nosuid,nodev,noexec,relatime)
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)
cgroup on /sys/fs/cgroup/cpuset type cgroup (rw,nosuid,nodev,noexec,relatime,cpuset)
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/memory type cgroup (rw,nosuid,nodev,noexec,relatime,memory)
cgroup on /sys/fs/cgroup/pids type cgroup (rw,nosuid,nodev,noexec,relatime,pids)
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/debug type cgroup (rw,nosuid,nodev,noexec,relatime,debug)
cgroup on /sys/fs/cgroup/hugetlb type cgroup (rw,nosuid,nodev,noexec,relatime,hugetlb)
cgroup on /sys/fs/cgroup/blkio type cgroup (rw,nosuid,nodev,noexec,relatime,blkio)
cgroup on /sys/fs/cgroup/cpu,cpuacct type cgroup
(rw,nosuid,nodev,noexec,relatime,cpu,cpuacct)
cgroup on /sys/fs/cgroup/perf_event type cgroup
(rw,nosuid,nodev,noexec,relatime,perf_event)
mqueue on /dev/mqueue type mqueue (rw,relatime)
hugetlbfs on /dev/hugepages type hugetlbfs (rw,relatime)
sunrpc on /run/rpc_pipefs type rpc_pipefs (rw,relatime)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs
(rw,relatime,fd=36,pgrp=1,timeout=0,minproto=5,maxproto=5,direct)
debugfs on /sys/kernel/debug type debugfs (rw,relatime)
configfs on /sys/kernel/config type configfs (rw,relatime)
tmpfs on /run/user/120 type tmpfs
(rw,nosuid,nodev,relatime,size=405144k,mode=700,uid=120,gid=124)
gvfsd-fuse on /run/user/120/gvfs type fuse.gvfsd-fuse
(rw,nosuid,nodev,relatime,user_id=120,group_id=124)
fusectl on /sys/fs/fuse/connections type fusectl (rw,relatime)
tmpfs on /run/user/1000 type tmpfs
(rw,nosuid,nodev,relatime,size=405144k,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)
```

◆ SD Card

SD card is recognized as /dev/mmcblk1.

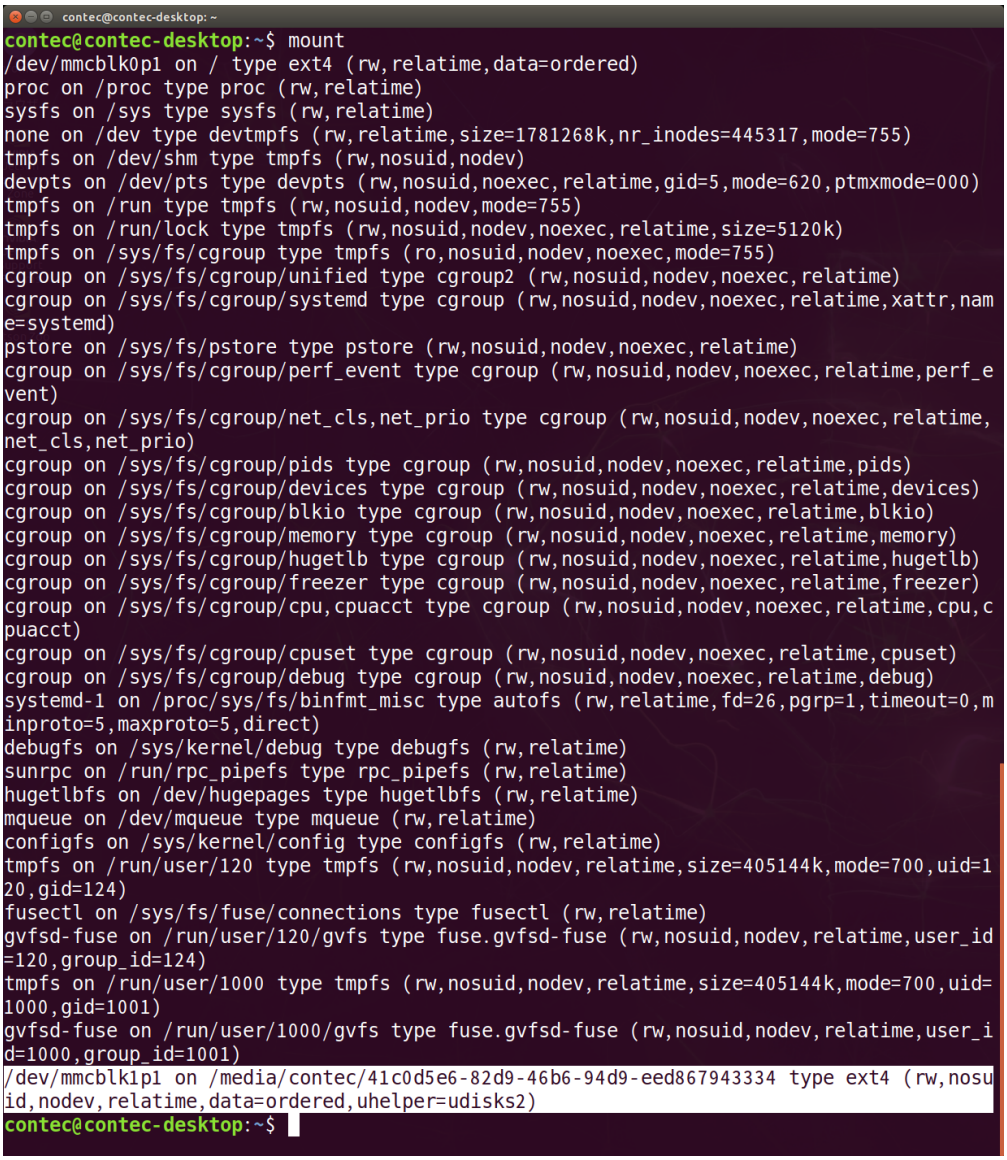
Confirm that SD is mounted as Rootfs when booting from SD card.

```
root@contec-desktop:~# mount
/dev/mmcblk1p1 on / type ext4 (rw,relatime,data=ordered)
proc on /proc type proc (rw,relatime)
sysfs on /sys type sysfs (rw,relatime)
none on /dev type devtmpfs (rw,relatime,size=1781332k,nr_inodes=445333,mode=755)
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,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)
cgroup on /sys/fs/cgroup/unified type cgroup2 (rw,nosuid,nodev,noexec,relatime)
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)
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/blkio type cgroup (rw,nosuid,nodev,noexec,relatime,blkio)
cgroup on /sys/fs/cgroup/freezer type cgroup (rw,nosuid,nodev,noexec,relatime,freezer)
cgroup on /sys/fs/cgroup/cpuset type cgroup (rw,nosuid,nodev,noexec,relatime,cpuset)
cgroup on /sys/fs/cgroup/devices type cgroup (rw,nosuid,nodev,noexec,relatime,devices)
cgroup on /sys/fs/cgroup/pids type cgroup (rw,nosuid,nodev,noexec,relatime,pids)
cgroup on /sys/fs/cgroup/memory type cgroup (rw,nosuid,nodev,noexec,relatime,memory)
cgroup on /sys/fs/cgroup/cpu,cpuacct type cgroup
(rw,nosuid,nodev,noexec,relatime,cpu,cpuacct)
cgroup on /sys/fs/cgroup/perf_event type cgroup
(rw,nosuid,nodev,noexec,relatime,perf_event)
cgroup on /sys/fs/cgroup/hugetlb type cgroup (rw,nosuid,nodev,noexec,relatime,hugetlb)
cgroup on /sys/fs/cgroup/debug type cgroup (rw,nosuid,nodev,noexec,relatime,debug)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs
(rw,relatime,fd=27,pgrp=1,timeout=0,minproto=5,maxproto=5,direct)
mqueue on /dev/mqueue type mqueue (rw,relatime)
debugfs on /sys/kernel/debug type debugfs (rw,relatime)
hugetlbfs on /dev/hugepages type hugetlbfs (rw,relatime)
sunrpc on /run/rpc_pipefs type rpc_pipefs (rw,relatime)
configfs on /sys/kernel/config type configfs (rw,relatime)
tmpfs on /run/user/120 type tmpfs
(rw,nosuid,nodev,relatime,size=405160k,mode=700,uid=120,gid=124)
tmpfs on /run/user/1000 type tmpfs
(rw,nosuid,nodev,relatime,size=405160k,mode=700,uid=1000,gid=1001)
fusectl on /sys/fs/fuse/connections type fusectl (rw,relatime)
gvfsd-fuse on /run/user/120/gvfs type fuse.gvfsd-fuse
(rw,nosuid,nodev,relatime,user_id=120,group_id=124)
```

◆ Using a SD Card as External Storage When Booting From eMMC

SD card is recognized as /dev/mmcblk1.

After the card is inserted, it will be mounted under the /media/[user name]/directory.



By adding an entry to /etc/fstab, the card can always be mounted to a specific directory after booting.

5. LAN Operational Check

◆ Network Settings

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

LAN-A : eth1

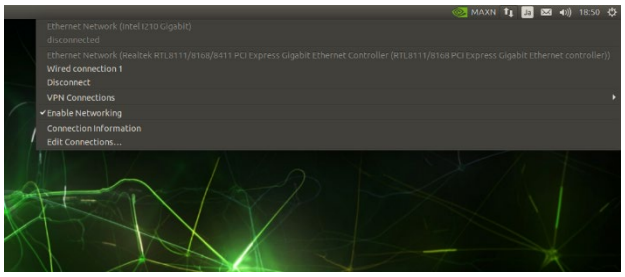
```
eth1: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 00:04:4b:ea:58:53  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device interrupt 156  base 0xe000
```

LAN-B : eth0

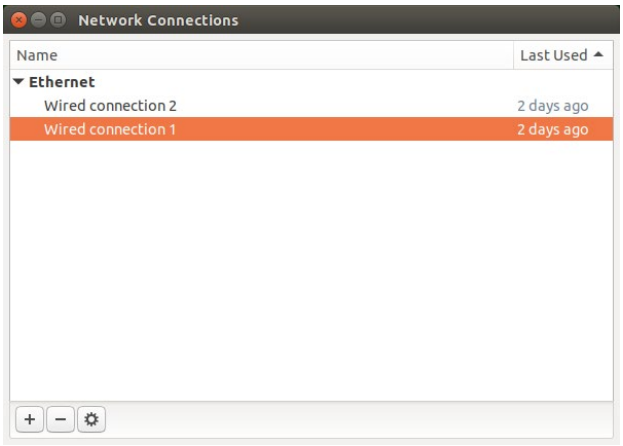
```
eth0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 00:80:4c:6b:9d:11  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

GUI or nmcli command can be used for settings.

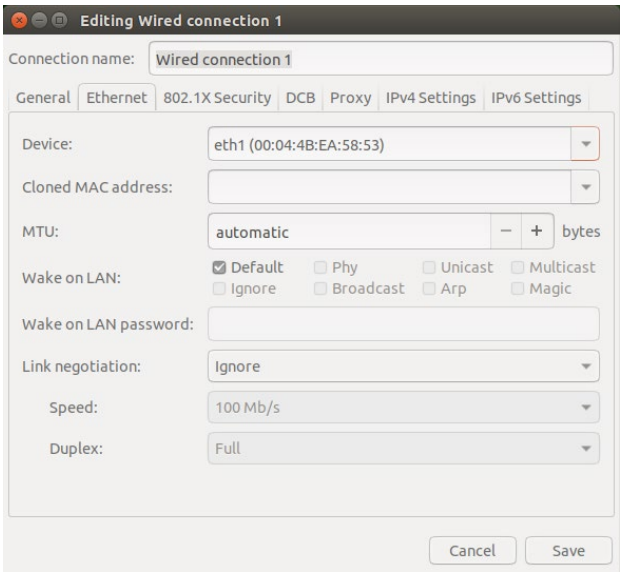
Setting with GUI



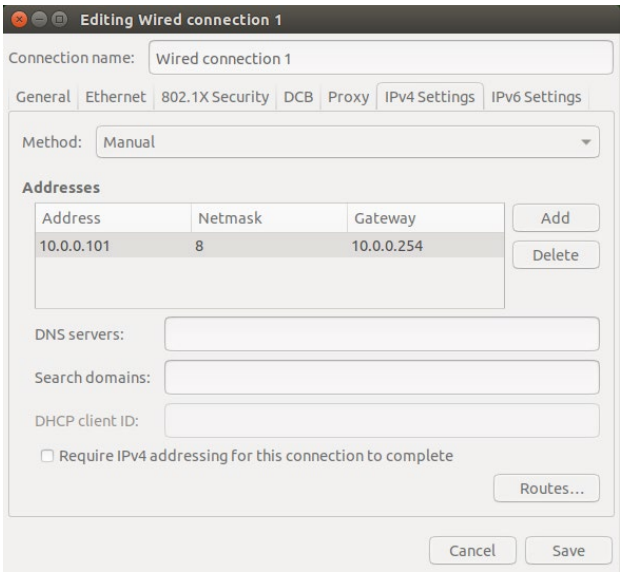
Select the network icon at the upper-right corner on the desktop, then select [Edit Connections...].



Select Wired connection 1 or 2, then select the setting icon at the lower-left corner.



On Ethernet tab, select eth0 (macaddr) or eth1(macaddr).



On IPv4 Settings tab, set Method, IP address, Netmask, and Gateway, then, click "Save" to save the settings.

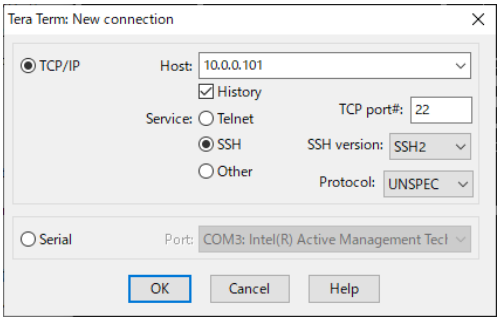
◆ SSH Operations

Access the SSH server of the DX-U1200 Ubuntu and confirm that remote login can be performed.

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

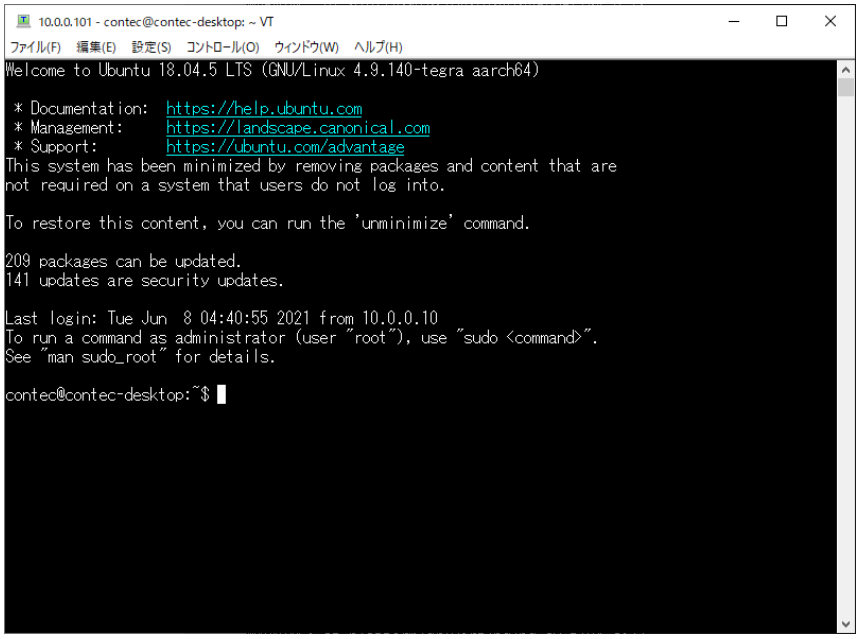
```
$ ssh user_name@ip_address
```

Use Tera Term on the Windows PC, enter the IP of the DX-U1200 to see whether connecting via SSH succeeds.



Enter the username and password used in the Linux configuration.

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



6. USB2.0 Port Operation 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, 5000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/5p, 480M
    |__ Port 3: Dev 2, If 0, Class=Hub, Driver=hub/3p, 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 003: ID 054c:0243 Sony Corp. MicroVault Flash Drive
Bus 001 Device 002: ID 0424:2514 Standard Microsystems Corp. 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, 5000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/5p, 480M
    |__ Port 3: Dev 2, If 0, Class=Hub, Driver=hub/3p, 480M
        |__ Port 1: Dev 3, If 0, Class=Mass Storage, Driver=usb-storage, 480M

root@contec-desktop:~# mount
/dev/mmcblk0p1 on / type ext4 (rw,relatime,data=ordered)
proc on /proc type proc (rw,relatime)
sysfs on /sys type sysfs (rw,relatime)
…
/dev/sda1 on /media/ea2de978-4dd0-42fe-b4a7-850476b72b47 type ext4
(rw,relatime,data=ordered)
```

7. 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, 5000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/5p, 480M
    |__ Port 3: Dev 2, If 0, Class=Hub, Driver=hub/3p, 480M
```

After USB memory device is inserted

```
root@contec-desktop:~# lsusb
Bus 002 Device 002: ID 0930:6545 Toshiba Corp. Kingston DataTraveler 102/2.0 / HEMA
Flash Drive 2 GB / PNY Attache 4GB Stick
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 002: ID 0424:2514 Standard Microsystems Corp. 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, 5000M
    |__ Port 1: Dev 2, If 0, Class=Mass Storage, Driver=usb-storage, 5000M
/:  Bus 01.Port 1: Dev 1, Class=root_hub, Driver=tegra-xusb/5p, 480M
    |__ Port 3: Dev 2, If 0, Class=Hub, Driver=hub/3p, 480M


root@contec-desktop:~# mount
/dev/mmcblk0p1 on / type ext4 (rw,relatime,data=ordered)
proc on /proc type proc (rw,relatime)
sysfs on /sys type sysfs (rw,relatime)
…
/dev/sda1 on /media/202FC8E73FF115F8 type fuseblk
(rw,relatime,user_id=0,group_id=0,allow_other,blksize=4096)
```

8. RAS Operational Check

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

◆ 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=Jan 15 2021:09:02:41
./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
```

Special notes:

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
```

Special notes:

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 help document for details about the API.

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

Special notes:

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 help document for details about the API.

```
# retrieve system temperature
root@contec-desktop:~# ras_misc -t
enter stop ftemp mode
ftemp = 61.210762

# retrieve power-supply voltage
root@contec-desktop:~# ras_misc -l
enter fvol mode Setting
fvol  = 23.626904
```

9. 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 "2021-02-28 10:30:00"    #Set the time
manually
root@contec-desktop:~# timedatectl status   #Check the status
                  Local time: Sun 2021-02-28 10:30:11 JST
              Universal time: Sun 2021-02-28 01:30:11 UTC
                    RTC time: Sun 2021-02-28 01:30:11
                   Time zone: Asia/Tokyo (JST, +0900)
     System clock synchronized: no
systemd-timesyncd.service active: no
              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: Sun 2021-02-28 10:35:51 JST
              Universal time: Sun 2021-02-28 01:35:51 UTC
                    RTC time: Sun 2021-02-28 01:35:51
                   Time zone: Asia/Tokyo (JST, +0900)
     System clock synchronized: no
systemd-timesyncd.service active: no
              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: Thu 2021-01-28 09:11:18 JST
                  Universal time: Thu 2021-01-28 00:11:18 UTC
                        RTC time: Thu 2021-01-28 00:11:19
                       Time zone: Asia/Tokyo (JST, +0900)
      System clock synchronized: yes
systemd-timesyncd.service active: yes
                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: Thu 2021-01-28 09:14:05 JST
                  Universal time: Thu 2021-01-28 00:14:05 UTC
                        RTC time: Thu 2021-01-28 00:14:06
                       Time zone: Asia/Tokyo (JST, +0900)
      System clock synchronized: yes
systemd-timesyncd.service active: yes
                RTC in local TZ: no
```

10. CAMERA-IF Operational Check

Connect the camera to the MIPI CSI-2 camera connector and confirm that the camera is recognized on the console screen.

```
root@contec-desktop:~# dmesg    #Verify that the probe has been completed on the driver.
---
[       1.517479] vi 54080000.vi: vi_probe: ++
[       1.520292] vi 54080000.vi: initialized
[       1.522328] vi 54080000.vi: subdev nvcsi--2 bound
[       1.522342] vi 54080000.vi: subdev imx219 7-0010 bound

root@contec-desktop:~# ls -la /dev/video0 #Confirm recognition as video0.
crw-rw----+ 1 root video 81, 0    January 28 09:27 /dev/video0
```

Execute the Gstreamer. Confirm that camera input images can be HDMI output and displayed.

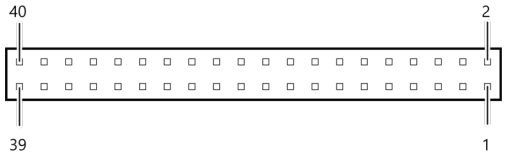
```
root@contec-desktop:~# gst-launch-1.0 nvarguscamerasrc ! nvoverlaysink
Setting pipeline to PAUSED ...
Pipeline is live and does not need PREROLL ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
GST_ARGUS: Creating output stream
CONSUMER: Waiting until producer is connected...
GST_ARGUS: Available Sensor modes :
GST_ARGUS: 3264 x 2464 FR = 21.000000 fps Duration = 47619048 ; Analog Gain range min 1.000000, max 10.625000; Exposure Range min 13000, max 683709000;
GST_ARGUS: 3264 x 1848 FR = 28.000001 fps Duration = 35714284 ; Analog Gain range min 1.000000, max 10.625000; Exposure Range min 13000, max 683709000;
GST_ARGUS: 1920 x 1080 FR = 29.999999 fps Duration = 33333334 ; Analog Gain range min 1.000000, max 10.625000; Exposure Range min 13000, max 683709000;
GST_ARGUS: 1280 x 720 FR = 59.999999 fps Duration = 16666667 ; Analog Gain range min 1.000000, max 10.625000; Exposure Range min 13000, max 683709000;
GST_ARGUS: 1280 x 720 FR = 120.000005 fps Duration = 8333333 ; Analog Gain range min 1.000000, max 10.625000; Exposure Range min 13000, max 683709000;
GST_ARGUS: Running with following settings:
   Camera index = 0
   Camera mode  = 2
   Output Stream W = 1920 H = 1080
   seconds to Run    = 0
   Frame Rate = 29.999999
GST_ARGUS: Setup Complete, Starting captures for 0 seconds
GST_ARGUS: Starting repeat capture requests.
CONSUMER: Producer has connected; continuing.
^Chandling interrupt.
Interrupt: Stopping pipeline ...
Execution ended after 0:00:09.749482496
Setting pipeline to PAUSED ...
Setting pipeline to READY ...
GST_ARGUS: Cleaning up
```

```
CONSUMER: Done Success
GST_ARGUS: Done Success
Setting pipeline to NULL ...
Freeing pipeline ...
root@contec-desktop:~#
```

11. 40-PIN HEADER Operational Check

The 40-pin GPIO pin header is located on the back of the product model with an expansion slot.
(* Not compatible with JetsonNano EVK 40-pin GPIO pin header.)

GPIO Pin Header

Connector used on the product		2.54mm Pitch Pin Header	
			
Pin No.	**Signal name**	**Pin No.**	**Signal name**
2	3.3V	1	5.0V
4	I2C_SDA	3	5.0V
6	I2C_SCL	5	GND
8	GPA00	7	UART_TXD
10	GND	9	UART_RXD
12	UART_RTS	11	GPB00
14	GPA01	13	GND
16	GPA02	15	GPB01
18	3.3V	17	GPB02
20	SPI_MOSI	19	GND
22	SPI_MISO	21	GPB03
24	SPI_SCK	23	SPI_CS0
26	GND	25	SPI_CS1
28	I2C_SDA	27	I2C_SCL
30	GPA03	29	GND
32	GPA04	31	GPB04
34	GPA05	33	GND
36	GPA06	35	UART_CTS
38	GPA07	37	GPB05
40	GND	39	GPB06

*1 GPIOs are indicated with the signal names GPA0x and GPB0x.

*2 The two channels of I2C pins are on the same bus.

◆ GPIO

GPA00 - GPB06 are assigned to gpio-488 - gpio502.

```
root@contec-desktop:~# cat /sys/kernel/debug/gpio
…
gpiochip2: GPIOs 232-247, parent: i2c/0-0020, tca9539, can sleep:
gpio-232 (GPA00             )
 gpio-233 (GPA01             )
 gpio-234 (GPA02             )
 gpio-235 (GPA03             )
 gpio-236 (GPA04             )
 gpio-237 (GPA05             )
 gpio-238 (GPA06             )
 gpio-239 (GPA07             )
 gpio-240 (GPB00             )
 gpio-241 (GPB01             )
 gpio-242 (GPB02             )
 gpio-243 (GPB03             )
 gpio-244 (GPB04             )
 gpio-245 (GPB05             )
 gpio-246 (GPB06             )
 gpio-247 (                  )
```

By exporting each GPIO number to /sys/class/gpio, input values can be input and output values can be output.

```
#When setting GPA00 to Output 1
root@contec-desktop:~# echo 232 > /sys/class/gpio/export
root@contec-desktop:~# echo out > /sys/class/gpio/gpio232/direction
root@contec-desktop:~# cat /sys/class/gpio/gpio232/direction
out
root@contec-desktop:~# echo 1 > /sys/class/gpio/gpio232/value

#When setting GPB00 to Input and read
root@contec-desktop:~# echo 240 > /sys/class/gpio/export
root@contec-desktop:~# echo in > /sys/class/gpio/gpio240/direction
root@contec-desktop:~# cat /sys/class/gpio/gpio240/direction
in
root@contec-desktop:~# cat /sys/class/gpio/gpio240/value
0
```

◆ UART

UART_TXD and UART_RXD are assigned to /dev/ttyTHS1.

We looped back UART_TXD/UART_RXD and confirmed with the linux-serial-test that sending/ receiving communication can be performed.

```
root@contec-desktop:~# linux-serial-test -s -e -p /dev/ttyTHS1 -b 115200 -o 5 -i  7
Stopped transmitting.
/dev/ttyTHS1: count for this session: rx=57135, tx=57135, rx err=0
/dev/ttyTHS1: TIOCGICOUNT: ret=0, rx=57135, tx=415, 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=415, frame = 0, overrun = 0, parity = 0,
brk = 0, buf_overrun = 0
```

◆ SPI

SPI-BUS (SPI_MOSI/SPI_MISO/SPI_SCK/SPI_CS0/SPI_CS1) is assigned as

/dev/spidev0.0 (CS PIN: SPI_CS0)

/dev/spidev0.1 (CS PIN: SPI_CS1).

In the environment of the CONTEC, we connected serial EEPROM (25LC128) and confirmed that reading /writing communication can be performed as follows.

```
# Write values of 0-255 bytes incremented by 1 byte
root@contec-desktop:~# 25lc128 -d /dev/spidev0.0 -c

# Display 0-255 bytes
root@contec-desktop:~# 25lc128 -d /dev/spidev0.0 -s
00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f
10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f
20 21 22 23 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f
30 31 32 33 34 35 36 37 38 39 3a 3b 3c 3d 3e 3f
40 41 42 43 44 45 46 47 48 49 4a 4b 4c 4d 4e 4f
50 51 52 53 54 55 56 57 58 59 5a 5b 5c 5d 5e 5f
60 61 62 63 64 65 66 67 68 69 6a 6b 6c 6d 6e 6f
70 71 72 73 74 75 76 77 78 79 7a 7b 7c 7d 7e 7f
80 81 82 83 84 85 86 87 88 89 8a 8b 8c 8d 8e 8f
90 91 92 93 94 95 96 97 98 99 9a 9b 9c 9d 9e 9f
a0 a1 a2 a3 a4 a5 a6 a7 a8 a9 aa ab ac ad ae af
b0 b1 b2 b3 b4 b5 b6 b7 b8 b9 ba bb bc bd be bf
c0 c1 c2 c3 c4 c5 c6 c7 c8 c9 ca cb cc cd ce cf
d0 d1 d2 d3 d4 d5 d6 d7 d8 d9 da db dc dd de df
e0 e1 e2 e3 e4 e5 e6 e7 e8 e9 ea eb ec ed ee ef
f0 f1 f2 f3 f4 f5 f6 f7 f8 f9 fa fb fc fd fe ff

# Erase 0-255byte
root@contec-desktop:~# 25lc128 -d /dev/spidev0.0 -e
```

◆ I2C

I2C-BUS (I2C_SCL, I2C_SDA) is assigned to /dev/i2c-8.

In the environment of the CONTEC, we connected I2C-EEPROM (24LC256) and confirmed that CHIP Addr can be recognized.

```
root@contec-desktop:~# i2cdetect -y -a -r 8
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: 50 51 -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
```

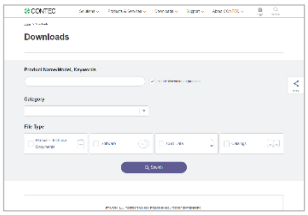
Customer Support and Inquiry

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 driver software, firmware, and differential manuals in several languages. Membership registration (myCONTEC) is required to use the services.

Revision History

MONTH YEAR	Summary of Changes
June 2021	The First Edition
May 2022	Added note about firmware version upgrade

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DX-U1200 Reference Manual Software

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