CONTEC

CONPROSYS

User's Manual

(Self-Build Edition)

CONPROSYS Linux SDK Ver. 2.2.0

### CONTENTS

CONTEC CO., LTD.

Table of Contents

Table of Contents

Introduction

1.Outline

CONPROSYS Linux SDK (Software Development Kit) is for creating software development environment to generate modules that operate on the CONPROSYS.

Ubuntu will be run on CONPROSYS in the self-build edition, and the software can be developed in its CONPROSYS.

2.CONPROSYS products

M2M Controller Series Integrated type

CPS-MC341-ADSCx series	Multi Input and Output Model
CPS-MC341G-ADSC1 series	Multi Input and Output + 3G WAN (Japan domestic/Global) Model
CPS-MC341Q-ADSC1	Multi Input and Output + 920HMz LAN (Japan only) Model

M2M Gateway Series Integrated type

CPS-MG341-ADSC1 series	Multi Input and Output Model
CPS-MG341G-ADSC1 series	Multi Input and Output + 3G WAN (Japan only) Model
CPS-MG341G5-ADSC1	Multi Input and Output + LTE Model

M2M Controller Series Configurable type

CPS-MCS341-DS1 series	Controller
CPS-MCS341G-DS1	Controller+ 3G WAN (Japan only) Model
CPS-MCS341G5-DS1	Controller+ LTE Model
CPS-MCS341Q-DS1	Controller+ 920HMz LAN (Japan only) Model

M2M Gateway Series Configurable type

CPS-MGS341-DS1	Controller
CPS-MGS341G5-DS1	Controller+ LTE Model

* The functions such as HMI, VTC, OPC-UA, and Modbus that are installed in the M2M controller series are not provided in the CONPROSYS Linux SDK. The additional software is necessary for these functions.

* The functions such as HM, VTC, OPC-UA, Modbus, PLC, and CNC that are installed in the M2M Gateway series are not provided in the CONPROSYS Linux SDK. The additional software is necessary for these functions.

* The PAC system series and the nano series do not support the CONPROSYS Linux SDK.

3.SDK specification

- Kernel version: 4.19.79
- Distribution: arm edition Ubuntu 20.04
- GCC version: gcc 9.3

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Safety Precautions

1. 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.

2. 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.

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.

SDK preparation

1. Required items for development

- CONPROSYS
- SDHC card (2Gbyte or larger, non-SDXC-compliant)
- Cable for serial monitor (Recommended cable: TTL-232R-3V3-AJ by FTDI)
- LAN Cable
- PC

2.Creating a booting SD card for CONPROSYS

1. Preparation for the SD card image file

Download the SD image file from the CONTEC website. The image file is common to all models.

When starting up, the system software recognizes the model type and configures the settings according to its hardware. The SD image file can also be created by using "CONPROSYS Linux SDK Cross building edition" on Ubuntu of the host PC for development. Please refer to the "Cross building" User's Manual.

2. Tool chain installation necessary for SDK

Write the image file that was either by downloaded or created with "CONPROSYS Linux SDK Cross building edition" into the SD card.

The downloaded image file is a zip file. Decompress it into img file before start writing it in the SD card. Please use the SD card larger than the img file size.

[For Windows]

The following example demonstrates writing procedure with Win32 Disk Imager.

Before you start, download the installer of the Win32 Disk Imager from the website (see below) and install it in the Windows PC.

https://sourceforge.net/projects/win32diskimager/

1 Insert the SD card into Windows PC.

2 Start Win32 Disk Imager.

Win32 Disk Imager
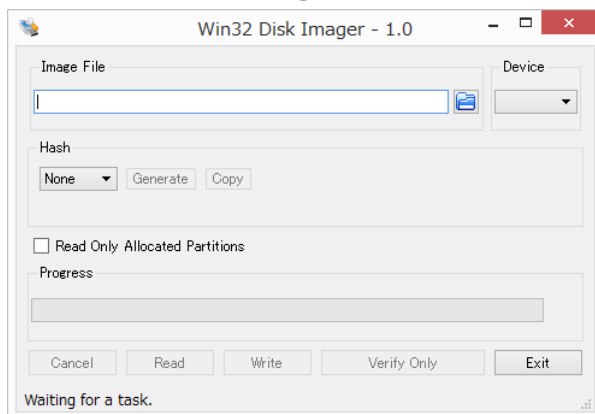
3 Select an image file to write
Check whether the SD card is selected for writing destination in the Device field.
Click "Write" button.

4 Pop-up message appears to notify of the writing completion.
Click "Write" button and remove the SD card.

[With Linux]

1 Unmount the SD card if it is mounted.
sudo umount /dev/sdb

2 Write the image file into the SD card by dd command.
sudo dd if=sd.img of=/dev/sdb bs=1M

3 Synchronize the file by sync command.
sync

4 Remove the SD card when the synchronizing is completed.

Starting CONPROSYS

1. Preparation

Check DIP SW of each CONPROSYS product and make sure SD boot mode is enabled.

◆ Integrated type (e.g., CPS-Mx341-xxx)

No.6 of DIP SW1 is ON. (SD boot mode enabled)

Integrated type BOOT SW setting
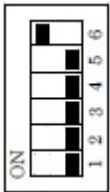
◆ Configurable type (e.g., CPS-MxS341-xxx)

No.2 PIN of BOOT SW (inside of the case) next to the debagging serial port

(3.5Φ MINI-JACK) is ON. (SD boot enabled)

Configurable type BOOT SW setting
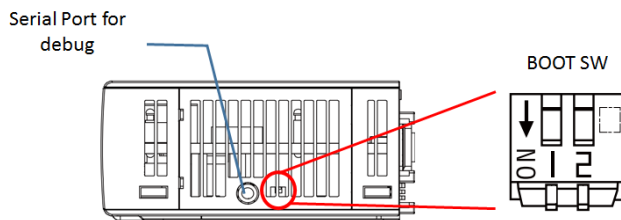
By connecting a serial cable from the host PC to CONPROSYS through the serial port (3.5Φ MINI-JACK), you can login from the console to the product.　See the setting details below.

Baud rate :	115200 bps
Data bit :	8 bit
Parity :	none
Stop bit :	1 bit
Hardware flow :	none

We recommend the following serial cable for connecting the host PC to CONPROSYS.

Download appropriate driver software to match OS of PC for serial monitoring.

- TTL-232R-3V3-AJ by FTDI
  URL for driver:　http://www.ftdichip.com/Drivers/VCP.htm

Connect LAN B to a Rooter connected to Internet so that the Ubuntu software package can be upgraded.

A connecting example of CONPROSYS and PC (Serial monitor)
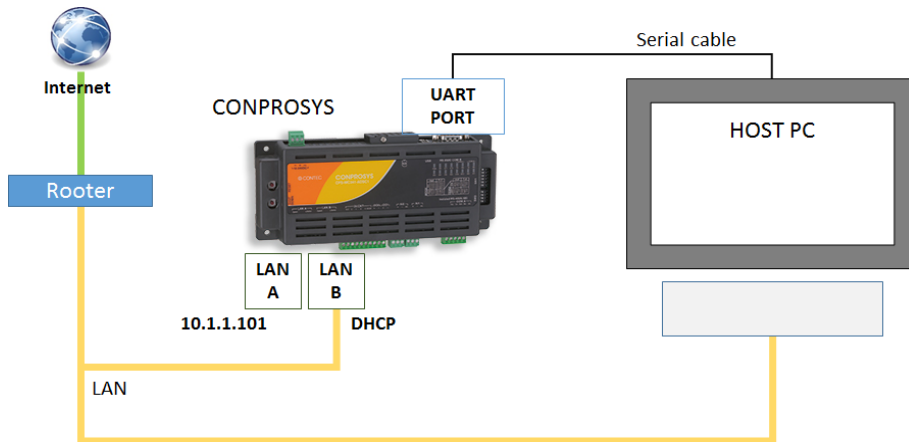
In the default setting, 10.1.1.101 is set in LAN A port (I/F on Linux is eth0), and DHCP network is set in LAN B port (I/F on Linux is eth1).   Also, you can connect LAN cable to CONPROSYS directly from the host PC to access 10.1.1.101- IP address via network.

A connecting example of CONPROSYS and PC (Ether connection)
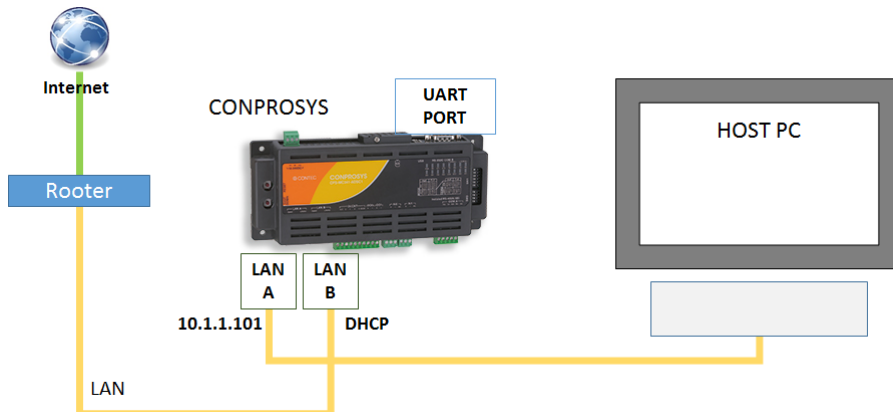
2.Start up

Insert the created SD card and turn on the power of the product.

The Ubuntu starts on the CONPROSYS. The LED of the PWR is lit when booting is completed.

After Ubuntu booting, the product becomes the log-in prompt status in a serial console.

Log in with the following account.

Login: conprosys
Password: contec

You can also log in by ssh when connected through network.

The license agreement appears upon the initial log-in and ask you to assent to all terms.

Enter "Yes" or "No".

With entering "Yes", the contents of agreement no longer appears when you log in from the next time and allow you to write into the SD card.

With entering "No", you are not permitted to write in the SD card and asked to display the contents and assent to them.

3.About File System

To prevent the system from crashing, the root file system (SD card) of CONPROSYS Linux SDK starts up in Read Only mode. By assenting with the software license agreement to log in, you are permitted to write into root file system. Once logging out, the system returns to Read Only mode. (Directory on ramdisk such as /tmp is writable without logging in).

See the followings to write a file into SD card when you are not logged in.

Change two files where Read Only is set.

● Edit /etc/fstab file of rootfs partition.

Before change:

rootfs / rootfs ro,noatime 0 0

After change:

rootfs / rootfs rw,noatime 0 0

Other than rootfs ext4 partition, create a new partition by fdisk and mount it to write a file.

See "**Create a new partition in the blank area of the memory. (page 37)**" in "**Expand the size of the SD card memory. (page 37)**".

Run environment setting

1. Web Setup function

CONPROSYS Linux contains the web server function. As standard functions of Self-Build edition SDK, settings of network, date & time, as well as displays of system information, network are supplied.

To display the setup page, access directly the IP address of CONPROSYS from Web browser on PC.

An example: Connect the PC to the LAN A port at the time of initial setting, and see whether the page can be brought in.

http://10.1.1.101/

Login: admin
Password: password

Web setup page

Web Setup features following functions.

1. Setting

Each setting below can be set.

Setting menu

Setting type	Content	Default value	Note
System	Host name	(Blank)	Use the following host name when there is no item in the setting The model name + the lower 3 bytes of MAC address
Network	Wired LAN A	10.1.1.101(fixed IP)	
	Wired LAN B	DHCP	
	3G/LTE network		3G/LTE model exclusively
	Wireless LAN	DHCP	Only when connecting with supported USB wireless adopter
Data & Time	NTP server	(Blank)	
	Manual setting		
Service	SSH server	Upon system booting: enabled	
	FTP server	Upon system booting: disabled	
	SAMBA server	Upon system booting: disabled	
Rooter function	Rooter function	Upon system booting: disabled	
	WAN interface		
	DHCP server	Upon system booting: disabled	
	Static routing	Upon system booting: disabled	The maximum number of settings:32
	Port forwarding	Upon system booting: disabled	The maximum number of settings:32
IP filter	IP filter setting	Upon system booting: disabled	The maximum number of settings:64

2. Status

Each status below can be checked.

Status menu

Item	Description
System	This displays the host name, serial number, distribution/kernel information, a disk/memory usage, and so on.
Network	This displays such as IP address, MAC address, and RX/TX bytes.
Router Function	This displays is routing information.
IP Filter	This displays is IP filtering information.
Log	This displays such as log information.

3. Maintenance

Each maintenance menu is described below.

Maintenance menu

Item	Description
Password	Password to access WEB setting page of the device can be changed.
Configuration File	The configuration file can be backed up and restored.
Default Setting	This restores the factory default setting.
Ping	Ping can be executed on the device to check network conduction.

4. Termination

Each termination menus is described below.

Termination menu

Item	Description
Save and Reboot	This saves the settings and reboots the device.
Save and Shutdown	This saves the settings and shuts down the system.
Save	This saves the settings.
Reboot	This reboots the device. If the settings are not saved before rebooting, settings return to the previous ones prior to the setting.
Shutdown	This shuts down the system. If the settings are not saved before shutting down, settings return to the previous ones prior to the setting.

For further details of each web setup function, refer to "Help" in Web menu.

Setting items are managed in the files below.

Configuration File:

   /etc/conprosys/config.ini

Factory default setting file:

   /etc/conprosys/config_def.ini

Web file is managed in the directory below.

Web content directory:

   /var/www/html/

2. Network setting

Default network setting is set as follows:

[Default setting]

LAN A (eth0): 10.1.1.101

LAN B (eth1): DHCP

* When executing a kernel generated with 1lan (SINGLE EtherMAC), the setting of LAN B is invalid (operated by HUB mode).

The network can be set by connecting to CONPROSYS through LAN from Web browser on PC.

For details, refer to "**Web Setup function (page 25)**".

If you would like to change the network setting by command prompt, edit the file below on the target with root privileges. The settings can be enabled by rebooting this file.

/etc/conprosys/config.ini

LAN Configuration

Item name	Description
eth0_dhcp	Set DHCP enabled or disabled of LAN A (eth0). 　　enabled 　　disabled
eth0_ipaddr	Set IP address of LAN A (eth0).
eth0_netmask	Set a netmask of LAN A (eth0).
eth0_gateway	Set a gateway address of LAN A (eth0).
eth0_dns1	Set DNS server address of LAN A (eth0).
eth1_dhcp	Set DHCP enabled or disabled of LAN B (eth1). 　　enabled 　　disabled
eth1_ipaddr	Set IP address of LAN B (eth1).
eth1_netmask	Set a netmask of LAN B (eth1).
eth1_gateway	Set a gateway address of LAN B (eth1).
eth1_dns1	Set DNS server address of LAN B (eth1).
ntp_addr	Set NTP server.
host_name	Set a host name. The following name is used as the default host name since there is no item in the setting. 　　The model name + the lower 3 bytes of MAC address

3G/LTE network configuration

Item name	Description
m3g_connect	Set 3G/LTE connection enabled or disabled. 　　enabled 　　disabled
m3g_apn	Set APN supplied by network service provider.
m3g_user	Set User ID supplied by network service provider.
m3g_passwd	Set password supplied by network service provider.
m3g_auth	Set the following encryption supplied by network service provider. 　　None 　　PAP 　　CHAP

Wireless LAN configuration

Item name	Description
wlan_dhcp	Set DHCP enabled or disabled of wireless LAN (wlan0). enabled 　　disabled
wlan_ipaddr	Set IP address of wireless LAN (wlan0).
wlan_netmask	Set a netmask of wireless LAN (wlan0).
wlan_gateway	Set a gateway address of wireless LAN (wlan0).
wlan_dns1	Set DNS server address of wireless LAN (wlan0).
wlan_essid	Set SSID of wireless LAN (wlan0).
wlan_encrypt	Set a cipher for wireless LAN (wlan0) by choosing one listed below 　　[Setting items] 　　No cipher:: 　　　　　　　　none 　　WEP: 　　　　　　　　　　wep 　　WPA-PSK AES: 　　　　　　wpapsk-aes 　　WPA-PSK TKIP: 　　　　　　wpapsk-tkip 　　WPA2-PSK AES: 　　　　　　wpa2psk-aes 　　WPA2-PSK TKIP: 　　　　　　wpa2psk-tkip 　　WPA/WPA2-PSK automatic: 　wpawpa2psk-auto
wlan_key	Set a cipher key for wireless LAN (wlan0).

Service startup setting

Item name	Description

srv_ssh	Set SSH server startup.
	    enabled
	    disabled

srv_ftp	Set FTP server startup.
	    enabled
	    disabled

srv_samba	Set Samba server startup.
	    enabled
	    disabled

Rooter function setting

Item name	Description

router	Set rooter function
	    enabled
	    disabled

wan_if	Set WAN interface
	    3G: eth2
	    LTE: ppp0
	    Wireless LAN: wlan0
	    LAN A: eth0
	    LAN B: eth1

DHCP server function setting

Item name	Description

dhcp_server	Set DHCP server startup.
	    enabled
	    disabled

dhcp_server_lan_if	Set LAN interface of DHCP server.
	    Wireless LAN: wlan0
	    LAN A: eth0
	    LAN B: eth1

dhcp_server_top_addr	Set DHCP initial address.
dhcp_server_alloc_num	Set the number of DHCP address allocations.

PPPoE function setting

Item name	Description

pppoek *1	Set PPPoE function.
	    enabled
	    disabled

pppoe_connect	Set PPPoE enabled or disabled.
	    enabled
	    disabled

pppoe_if	Set PPPoE interface.
	    LAN A: eth0
	    LAN B: eth1

pppoe_user	Set the user name of PPPoE.
pppoe_password	Set the password of PPPoE.
pppoe_dns	Set the DNS server of PPPoE.

pppoe_firewall	Set firewall of PPPoE
	    NONE: 0
	    STANDALONE: 1
	    MASQUERADE: 2

*1   PPPoE function setting (pppoe) cannot be set in the Web Setup.

The web setup of PPPoE can be done when only pppoe setting is enabled.

Static routing function setting

Item name	Description

static_route	Set static routing function.
	    enabled
	    disabled

st_route_addr_1	Set the destination IP address of static routing.
st_route_gw_1	Set the gateway address of static routing.
st_route_mask_1	Set the net mask of static routing.
st_route_if_1	Set the interface of static routing.
	: : :
st_route_addr_32	Set the destination IP address of static routing.
st_route_gw_32	Set the gateway address of static routing.
st_route_mask_32	Set the net mask of static routing.
st_route_if_32	Set the interface of static routing.

*   The number in the item names indicates setting number (up to 32).

Port forwarding function setting

Item name	Description

port_forward	Set port forwarding function.
	    enabled
	    disabled

port_fw_sif_1	Set port forwarding input interface.
port_fw_sport_1	Set port forwarding input port.
port_fw_daddr_1	Set port forwarding destination IP address.
port_fw_dport_1	Set port forwarding destination port.
	⋮
port_fw_sif_32	Set port forwarding input interface.
port_fw_sport_32	Set port forwarding input port.
port_fw_daddr_32	Set port forwarding destination IP address.
port_fw_dport_32	Set port forwarding destination port.

*   The number in the item names indicates setting number (up to 32).

IP filter function setting

Item name	Description

ipfilter	Set IP filter function.
	    enabled
	    disabled

ipfilter_kind_1	Set filter type.
	    ACCEPT
	    DROP

ipfilter_proto_1	Set protocol. tcp, udp, icmp, all
ipfilter_saddr_1	Set the source IP address.
ipfilter_sport_1	Set the source port.
ipfilter_daddr_1	Set the destination IP address.
ipfilter_dport_1	Set the destination port.
	⋮

ipfilter_kind_64	Set filter type.
	    ACCEPT
	    DROP

ipfilter_proto_64	Set protocol. tcp, udp, icmp, all
ipfilter_saddr_64	Set the source IP address.
ipfilter_sport_64	Set the source port.
ipfilter_daddr_64	Set the destination IP address.
ipfilter_dport_64	Set the destination port.

*   The number in the item names indicates setting number (up to 64).

Reboot the system after editing the configuration file.

`sudo reboot`

Example 1) set "eth0" to "DHCP"

    eth0_dhcp= enabled

    eth0_ipaddr=

    eth0_netmask=

    eth0_gateway=

    eth0_dns1=

Example 2) set "eth0" to other fixed IP (192.168.30.11)

    eth0_dhcp=disabled

    eth0_ipaddr=192.168.30.11

    eth0_netmask=255.255.255.0

    eth0_gateway=192.168.30.1 (arbitrary)

    eth0_dns1=192.168.30.255 (arbitrary)

Execute the command below to check the network setting.

`Ifconfig`

3. Samba Setting

CONPROSYS Linux contains the web server function. As standard functions of Self-Build edition SDK, settings of network, date & time, as well as displays of system information, network are supplied.

To display the setup page, access directly the IP address of CONPROSYS from Web browser on PC.
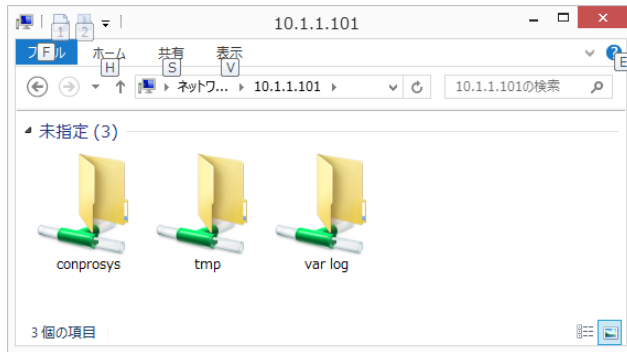
[Access folder]

Windows side	Linux side directory	Note
conprosys	/home/conprosys	Read/Write available upon login once getting the approval of the license agreement.
tmp	tmp	Read/Write available
var log	/var/log	Reading solely (Writing is not available)

Accessing CONPROSYS by Explorer of Windows PC enables you to directly open the files such as program source code with Windows application.

[Samba startup procedure]

The network can be set by connecting to CONPROSYS through LAN from Web browser on PC.

For details, refer to "**Web Setup function (page 25)**".

If you would like to start up by command prompt, execute the command listed below.

```
sudo systemctl start smbd
```
```
sudo systemctl start nmbd
```

Edit the following file to set the Samba access folder and/or the authorization.

/etc/samba/smb.conf

After the file edit, the settings are enabled by rebooting Samba service. If you would like to know more details, please refer to Samba website. (www.samba.org)

[Samba reboot procedure by command prompt]

```
sudo systemctl restart smbd
```
```
sudo systemctl restart nmbd
```

4. Install the software package for Ubuntu

Connecting CONPROSYS to the internet enables you to install the software package of Ubuntu by apt command.

◆ Preparation

Before installing the software, update apt repository information by the command listed below.

> sudo apt update

◆ Upgrade the software package.

To upgrade the version of software that is already installed, execute the command listed below. The software can be upgraded if its version is the latest.

> sudo apt upgrade

◆ Install the software package

Execute the command listed below to install the software package you wish

> sudo apt install <The name of the software>

An example : Installation of MySQL Client

> sudo apt install mysql-client

If you are uncertain of the name of the software, you can try a keyword search with the command listed below.

> sudo apt-cache search <keyword>

An example : Searching the package of mosquitto client

> sudo apt-cache search mosquitto

5. Expand the size of the SD card memory.

When a SD card image file is written into the SD card, and even the memory size of the SD card is larger than the image file, the whole memory size cannot be used.

To use the memory size fully, use one of the methods described below.

◆ Create a new partition in the blank area of the memory.

Create a new partition in the blank area of the memory

SD / MMC

boot section vfat (about 70MByte)		boot section vfat (about 70MByte)
rootfs section ext4	create →	rootfs section ext4
Blank Area		ext4
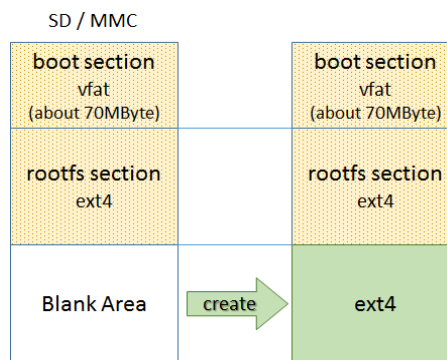
◆ Expand the rootfs partition (ext4) of Linux to the maximum memory size in the SD card.

Expand rootfs partition

SD / MMC

boot section vfat (about 70MByte)		boot section vfat (about 70MByte)
rootfs section ext4	expand →	rootfs section ext4
Blank Area		
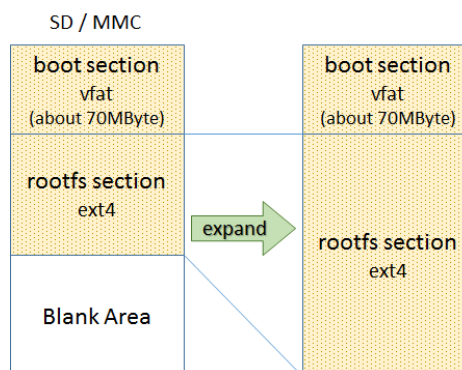
[Create a new partition in the blank area of the memory.]

1 Start the CONPROSYS.

2 Open the SD card device by fdisk to add a new Linux partition.

sudo fdisk /dev/mmcblk0

    i) Add a new Linux partition by n command. Parameter is set as follows:

      <Parameter>

      Command (m for help): <n>

      Partition type: <p>

      Partition number : <3>

      Last sector: <default value>

    ii) Write the partition information by w command.

      Command (m for help): w

3 Reboot CONPROSYS with the command below.

sudo reboot

4 Confirm the device of /dev/mmcblkk0p3 is available.　Format the new created partition.

sudo mkfs -t ext4 /dev/mmcblk0p3

5 Create the destination for the new partition and mount it.
An example: mounting directory /mnt/ext_mmc

sudo mkdir /mnt/ext_mmc

sudo mount /dev/mmcblk0p3 /mnt/ext_mmc

6 Add the setting in /etc/fstab to mount automatically upon booting for the next time succeeding.

    An example: mounting directory /mnt/ext_mmc

    /dev/mmcblk0p3 /mnt/ext_mmc ext4 defaults 0 0

[Expand the rootfs partition of Linux to the maximum memory size in the SD card]

1 Start the CONPROSYS.

2 Open the SD card device by fdisk to change a Linux partition.

sudo fdisk /dev/mmcblk0

    i) Display the present partition information by p command.

      Take a note of the information displayed.

      *Especially the Start / End address of /dev/mmcblk0p2.

      [A display example: a SD card with 4GByte is run by Ubuntu20.04]

      Command (m for help): p

      Disk /dev/mmcblk0: 7746 MB, 7746879488 bytes

      255 heads, 63 sectors/track, 941 cylinders, total 15130624 sectors

      Units = sectors of 1 * 512 = 512 bytes

      Sector size (logical/physical): 512 bytes / 512 bytes

      I/O size (minimum/optimal): 512 bytes / 512 bytes

      Disk identifier: 0x00000000

Device	Boot	Start	End	Blocks	Id	System
/dev/mmcblk0p1	*	63	144584	72261	c	W95 FAT32(LBA)
/dev/mmcblk0p2		144585	7855784	3847567+	83	Linux

    ii) Delete Linux partition (Partition number: 2) by d command.

      Command (m for help): d

      Partition number (1-4): 2

    iii) Add the Linux partition by n command.

      For this, set the parameter as described below.

      <Parameter>

      Command (m for help): n

      Partition type: p

      Partition number : 2

      First sector: <default value>   (the Start address of /dev/mmcblk0p2 which you took a note by p command)

      Last sector: <default value >   (the End address of /dev/mmcblk0p2 which you took a note by p command)

iv) Display the changed partition information by p command.

Check whether the End address and Blocks of /dev/mmcblk0p2 are changed.

A display example: a SD card with 4GByte is run by Ubuntu20.04]

Command (m for help): p

Disk /dev/mmcblk0: 7746 MB, 7746879488 bytes

255 heads, 63 sectors/track, 941 cylinders, total 15130624 sectors

Units = sectors of 1 * 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk identifier: 0x00000000

Device	Boot	Start	End	Blocks	Id	System
/dev/mmcblk0p1	*	63	144584	72261	c	W95 FAT32 (LBA)
/dev/mmcblk0p2		144585	15130623	7484987	83	Linux

v) Write the partition information by w command.

Command (m for help): w

3 Reboot CONPROSYS with the command below.

sudo reboot

4 Resize the partition that was changed by resize2fs command.

sudo resize2fs /dev/mmcblk0p2

*It may take quite a long time to complete the resizing.

(several to several dozen minutes depending on the memory size)

After resize2fs command is completed, confirm whether the memory size is expanded by df command.

df

6. Swap memory setting

CONPROSYS memory may not be enough for building large source code. You can expand the memory by creating a swap file on the disk.

◆ An example: Creating 512Mbyte of SWAP memory

1 Create a SWAP file.

```
sudo dd if=/dev/zero of=/home/swapfile bs=1024 count=512000
sudo mkswap /home/swapfile
```

2 Set the SWAP file.

```
sudo swapon /home/swapfile
```

Once you create the SWAP file, you only need to set the file after next time.

7. Initialization setting with DIP SW

With the DIP SW, restoring the factory settings of LAN A or only initializing LAN A in IP address can be implemented when the power is turned on.
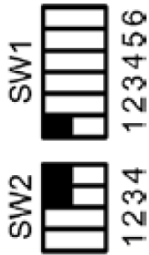
Integrated type   ## Configurable type
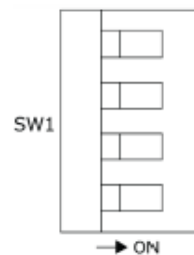
DIP SW Setting Contents

SW settings	Description
Turn on SW1-2 only	Starts up IP address with the factory settings when the power is on. As for User/Password and Group settings, the system starts up with the previous settings. The present settings of IP address and User/Password can be viewed on Web setup page.
Turn on SW1-2 and SW1-3	Restores the factory settings of individual settings when the power is on. When the restoring has finished, PWR and ST1 of LED start flashing. After confirming the flashing, turn off SW2 and SW3, then restart the system.

8. Sample programs

CONPROSYS Linux SDK contains the sample programs of C language available per model.

("Available Sample programs")

These sample programs can be self-built by gcc on CONPROSYS.

Available Sample programs

Sample program	Directory application/sample/	CPS-MC341-ADSC series CPS-MG341-ADSC series	CPS-MxS341-DSx series
TCP/IP server/client	socket	○	○
Timer	timer	○	○
RS-485 communication (Integrated type)	RS485	○	
DI/DO, AI control (Multi-function model)	mc341_io	○	
DI/DO control (Integrated type)	spitest	○	
RTC tools	rtc	○	
DI/DO control (Configurable Type)	mcs341_dio		○
SSI control (Configurable Type)	mcs341_ssi		○
COM control (Configurable Type)	mcs341_com		○
CNT control (Configurable Type)	mcs341_cnt		○
System control (Configurable Type)	mcs341_system		○
iolib control (Configurable Type)	mcs341_iolib		○

○: Available,∆: Available with specific models, Blank: not available

To self-build a sample program, execute a make command in the directory of the sample program. This generates the executable files.

An example: a sample program of timer.

```
cd ~/sample/timer
make
```

Appendix

1. File system structure

◆ SD / MMC card image structure

SD / MMC card image structure
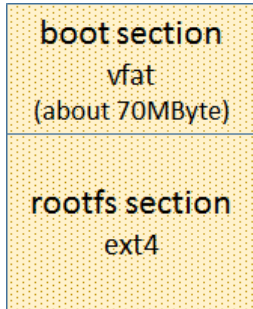
boot section: u-boot, kernel etc.

rootfs section: Ubuntu

[SD card disk storage usage]

boot section: approx. 3.6Mbyte used

rootfs section: approx. 1.4Gbyte used

[Ubuntu boot 20.04 file system]

Filesystem	Mounted on	type
/dev/root	/	ext4
devtmpfs	/dev	devtmpfs
tmpfs	/dev/shm	tmpfs
tmpfs	/run	tmpfs
tmpfs	/run/lock	tmpfs
tmpfs	/sys/fs/cgroup	tmpfs
tmpfs	/run/samba	tmpfs
tmpfs	/tmp	tmpfs
tmpfs	/var/cache/apt	tmpfs
tmpfs	/var/cache/samba	tmpfs
tmpfs	/var/lib/dhcp	tmpfs
tmpfs	/var/lib/dhcp3	tmpfs
tmpfs	/var/lib/logrotate	tmpfs
tmpfs	/var/lib/ntpdate	tmpfs
tmpfs	/var/lib/Plymouth	tmpfs
tmpfs	/var/lib/samba	tmpfs
tmpfs	/var/lib/upstart	tmpfs
tmpfs	/var/lib/urandom	tmpfs
tmpfs	/var/local	tmpfs
tmpfs	/var/log	tmpfs
tmpfs	/var/mail	tmpfs
tmpfs	/var/opt	tmpfs
tmpfs	/var/spool	tmpfs
tmpfs	/var/tmp	tmpfs
tmpfs	/var/lib/samba/private	tmpfs
tmpfs	/var/log/apache2	tmpfs
tmpfs	/var/log/news	tmpfs
tmpfs	/var/log/Plymouth	tmpfs
tmpfs	/var/log/samba	tmpfs
tmpfs	/var/log/upstart	tmpfs

2. Block diagram

CPS-Mx341-ADSCx series block diagram *(Italic font means optional choices)*
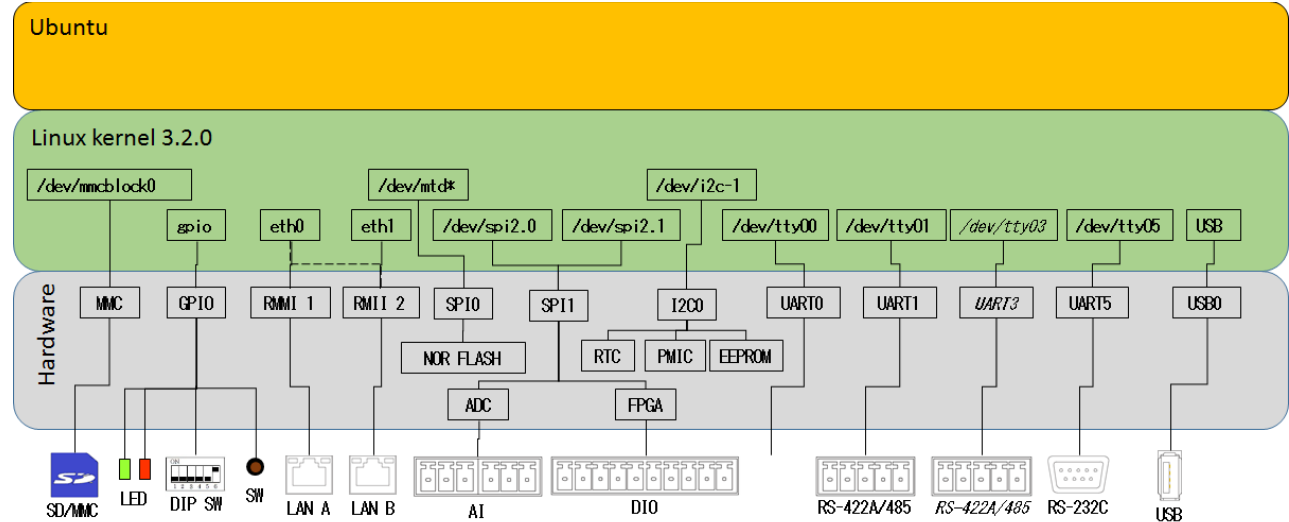
CPS-Mx341G-ADSC1 (Japan Domestic model) block diagram
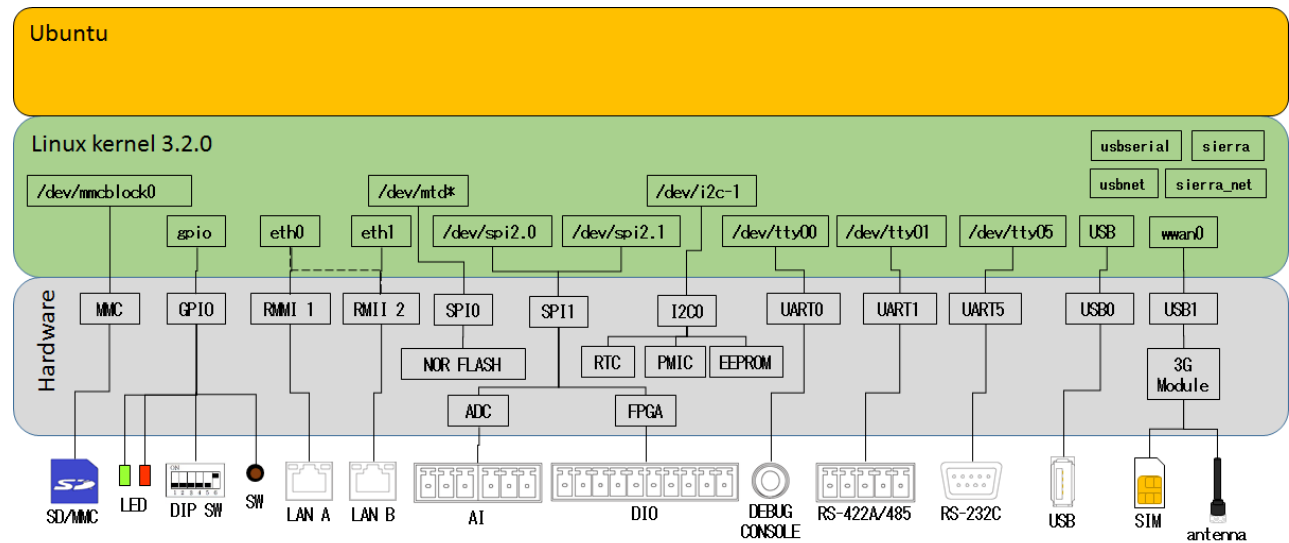
CPS-Mx341G-ADSC1 (Global model) block diagram
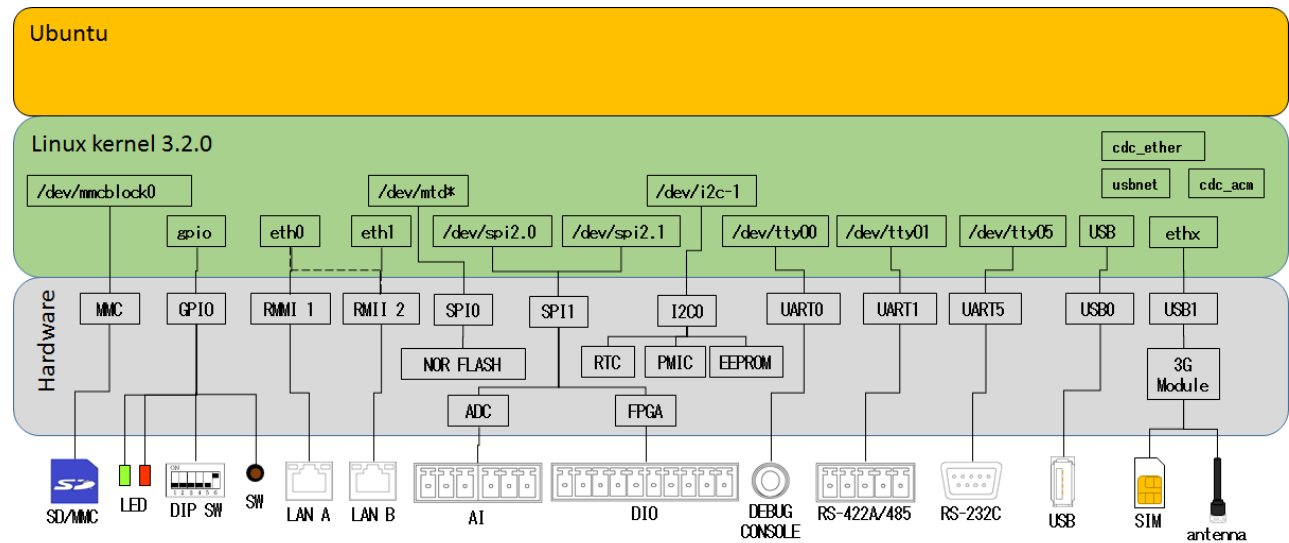
CPS-MC341Q-ADSC1 block diagram
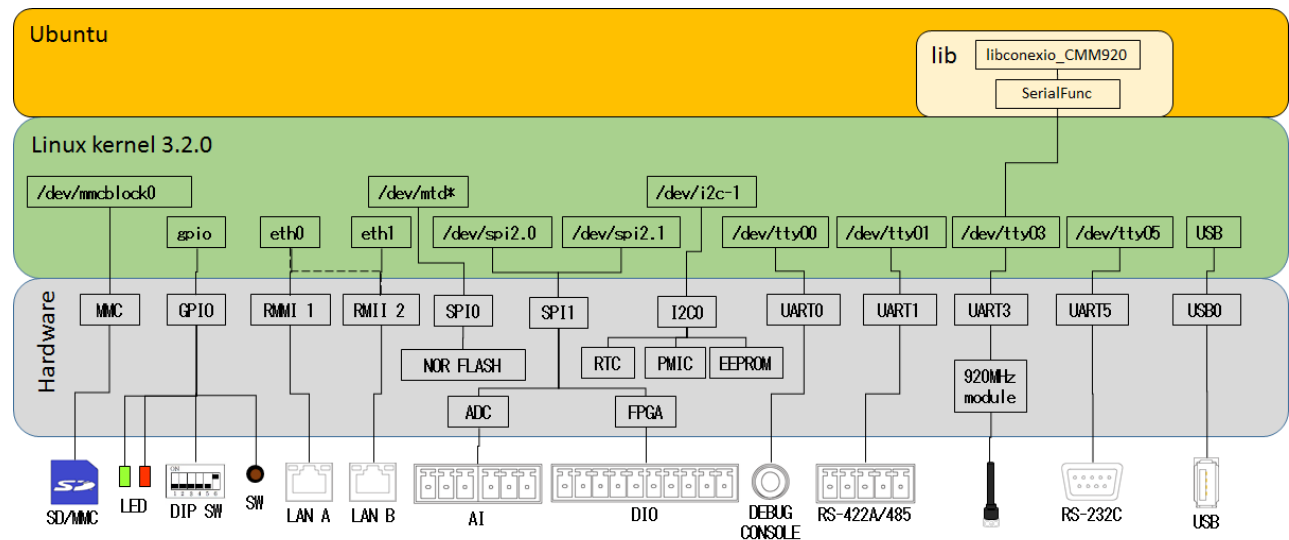
CPS-MG341G5-ADSC1 block diagram
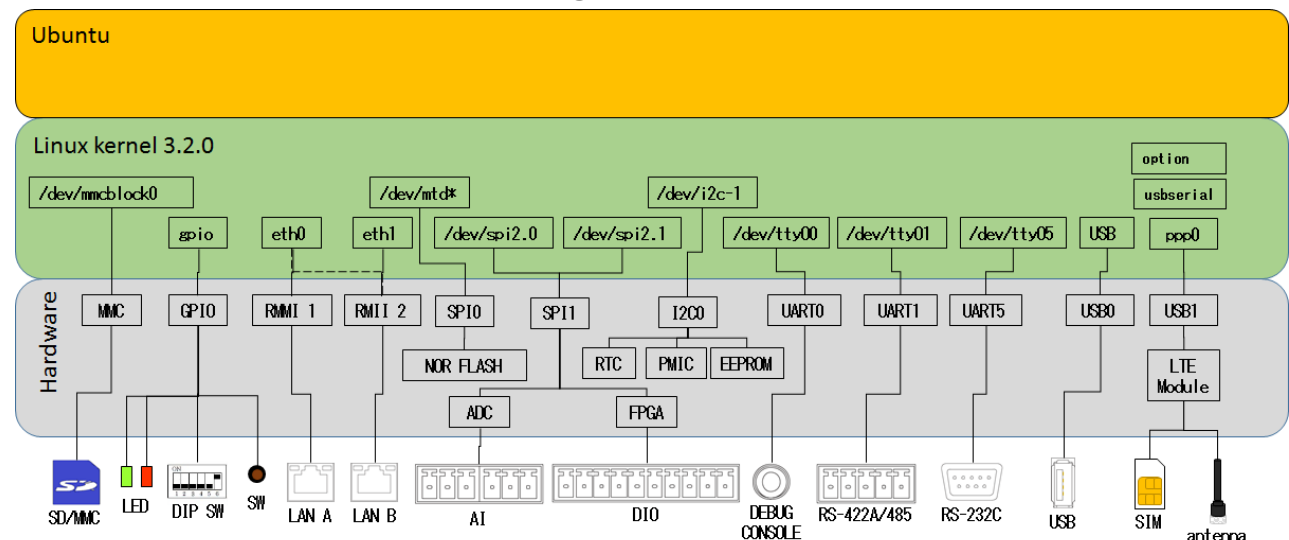
CPS-MxS341-DSx series block diagram *(Italic font means optional choices)*
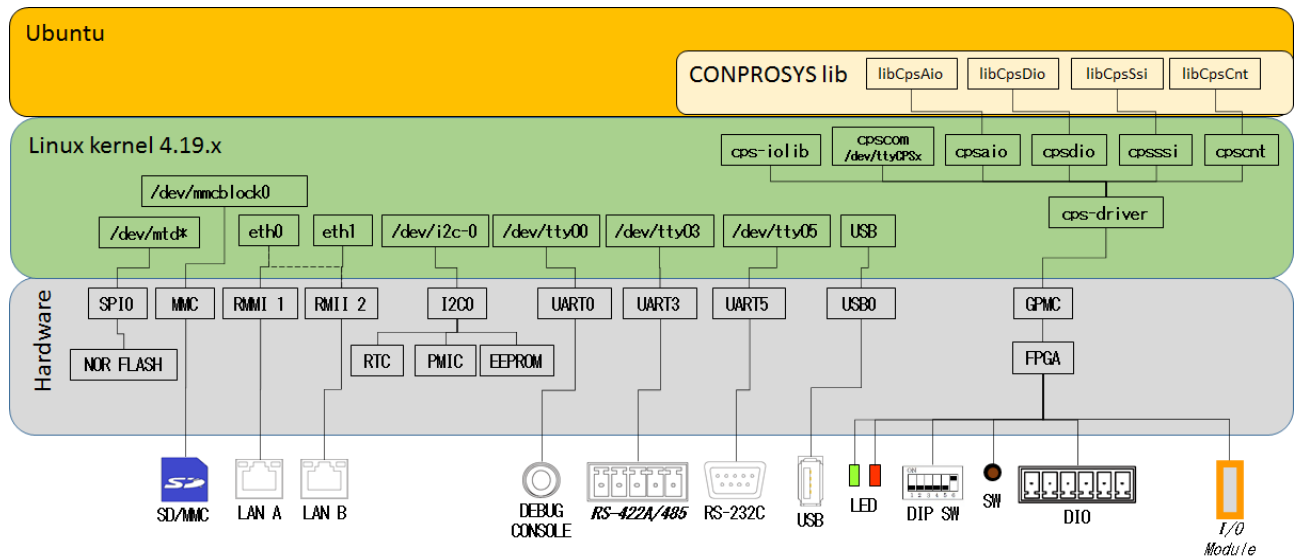
CPS-MCS341G-DS1 block diagram *(Italic font means optional choices)*
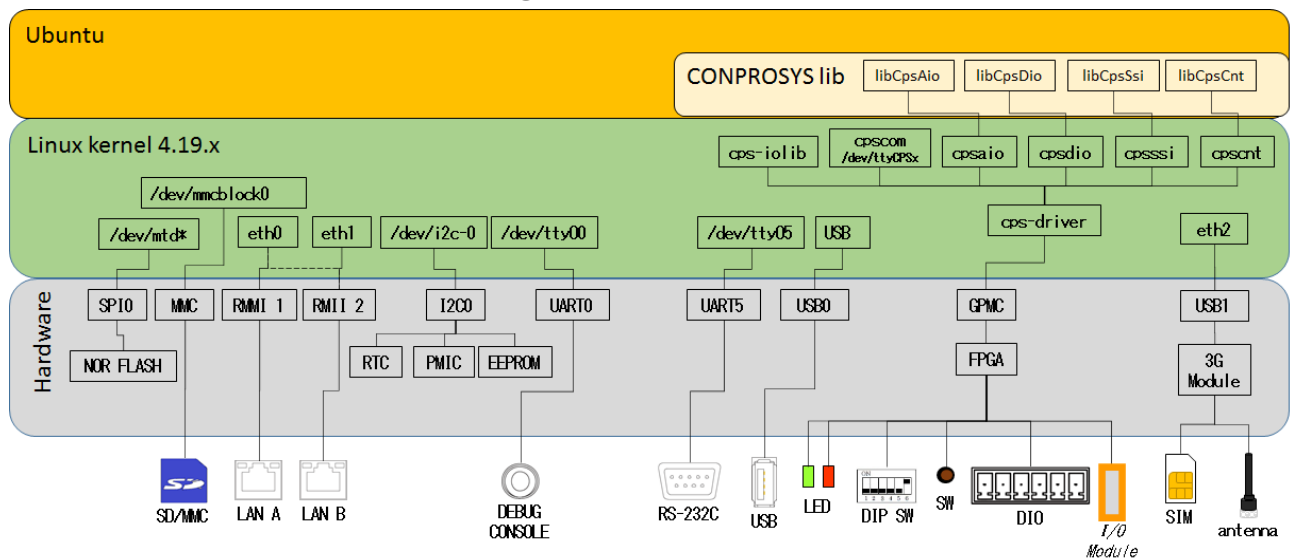
CPS-MCS341Q-DS1 block diagram *(Italic font means optional choices)*
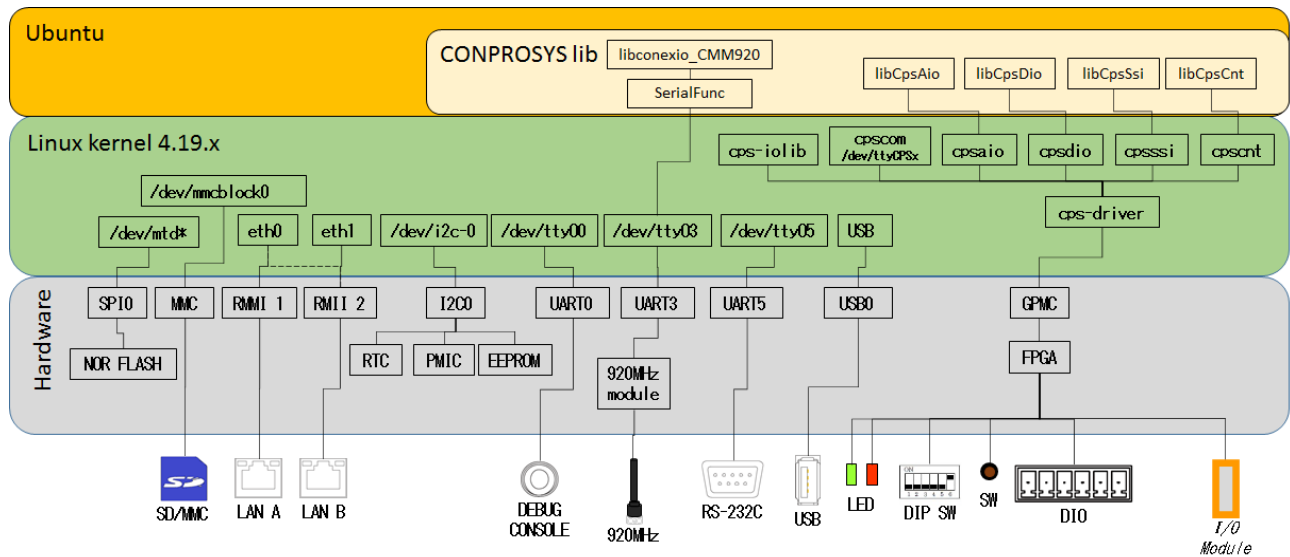
CPS-MxS341G5-DS1 block diagram *(Italic font means optional choices)*
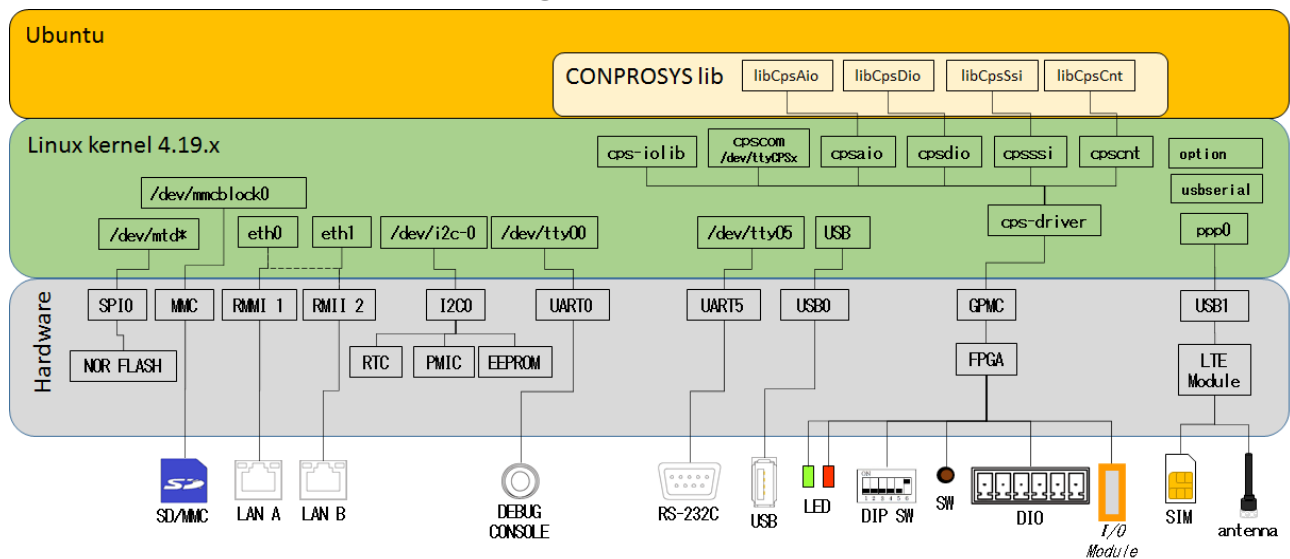
3. Device I/F

The distinctive device I/F of CONPROSYS can be accessed on Linux as shown in the table below.

Ports are vary depending on the models.

UART control device

Model	/dev/ttyO1	/dev/ttyO2	/dev/ttyO3	/dev/ttyO4	/dev/ttyO5
CPS-MC341-ADSC1	RS-422A/485 (COM A)	-	-	-	RS-232C (COM B)
CPS-MC341-ADSC2	RS-422A/485 (COM A)	-	RS-422A/485 (COM C)	-	RS-232C (COM B)
CPS-MC341G-ADSC1 CPS-MG341G5-ADSC1	RS-422A/485 (COM A)	-	-	-	RS-232C (COM B)
CPS-MC341Q-ADSC1	RS-422A/485 (COM A)	-	920MHz module	-	RS-232C (COM B)
CPS-MCS341-DS1 CPS-MGS341-DS1	-	-	-	-	RS-232C
CPS-MCS341G-DS1 CPS-MCS341G5-DS1 CPS-MGS341G5-DS1	-	-	-	-	RS-232C
CPS-MCS341Q-DS1	-	-	920MHz module	-	RS-232C

SPI control device

モデル	/dev/spidev2.0	/dev/spidev2.1	/dev/spidev2.2
CPS-MC341-ADSCx CPS-MC341G-ADSC1 CPS-MG341G5-ADSC1 CPS-MC341Q-ADSC1	AI (ADC / CLK=6MHz)	DIO (FPGA / CLK=24MHz)	-
CPS-MCS341-DS1 CPS-MGS341-DS1 CPS-MCS341G-DS1 CPS-MCS341G5-DS1 CPS-MGS341G5-DS1 CPS-MCS341Q-DS1	-	-	-

Devices and the maximum clock values of SPI controlling are listed in the parentheses.

GPIO control device (LED control)

Model	GPIO 26	GPIO 27	GPIO 67
CPS-MC341-ADSCx CPS-MC341G-ADSC1 CPS-MC341Q-ADSC1	ST1 Green (Out)	ST2 Red (Out)	Power (Out)
CPS-MG341G5-ADSC1	ST1 Green (Out)	ST2 Red (Out)	Power (Out)
CPS-MCS341-DS1 CPS-MGS341-DS1 CPS-MCS341G-DS1 CPS-MCS341Q-DS1	-	-	-
CPS-MCS341G5-DS1 CPS-MGS341G5-DS1	-	-	-

Directions of I/O are listed in the parentheses.

GPIO control device (Switch control)

Model	GPIO 32	GPIO 33	GPIO 34	GPIO 35	GPIO 87
CPS-MC341-ADSCx CPS-MC341G-ADSC1 CPS-MG341G5-ADSC1 CPS-MC341Q-ADSC1	DIP SW1-2 (In)	DIP SW1-3 (In)	DIP SW1-4 (In)	Shutdown SW (In)	-
CPS-MCS341-DS1 CPS-MGS341-DS1 CPS-MCS341G-DS1 CPS-MCS341G5-DS1 CPS-MGS341G5-DS1 CPS-MCS341Q-DS1	-	-	-	-	Shutdown SW (In)

Directions of I/O are listed in the parentheses.

GPIO control device (Board control)

Model	GPIO 22	GPIO 23	GPIO 36	GPIO 37	GPIO 105
CPS-MC341-ADSC1	-	-	-	-	Power RESET (Out)
CPS-MC341-ADSC2	-	-	RS485 Power (Out)	-	Power RESET (Out)
CPS-MC341G-ADSC1	-	LDO_SHUTDOWN (Out)	3G Power (Out)	3G Reset (Out)	Power RESET (Out)
CPS-MG341G5-ADSC1	PWR_ON_N_3V3 (Out)	PWRKEY (Out)	LTE Power (Out)	LTE Reset (Out)	Power RESET (Out)
CPS-MC341Q-ADSC1	-	-	920M Power (Out)	920M Reset (Out)	Power RESET (Out)
CPS-MCS341-DS1 CPS-MGS341-DS1 CPS-MCS341G-DS1 CPS-MCS341G5-DS1 CPS-MGS341G5-DS1 CPS-MCS341Q-DS1	-	-	-	-	Power RESET (Out)

Directions of I/O are listed in the parentheses.

GPIO can be controlled by the shell command listed below.

Read: gpio_in.sh <GPIO number>

Output: gpio_out.sh <GPIO number> value (0 or 1)

USB-Serial control device

Model	/dev/ttyUSB0	/dev/ttyUSB1	/dev/ttyUSB2	/dev/ttyUSB3	/dev/ttyUSB4
CPS-MC341-ADSCx	Optional Device				
CPS-MC341G-ADSC1 (Japan domestic model)	Sierra USB modem	Sierra USB modem	Sierra USB modem	Sierra USB modem	Optional Serial device
CPS-MC341G-ADSC1 (Global model)	Optional Serial device				
CPS-MG341G5-ADSC1	Quectel USB modem	Quectel USB modem	Quectel USB modem	Quectel USB modem	Optional Serial device
CPS-MCS341-DS1 CPS-MGS341-DS1 CPS-MCS341G-DS1 CPS-MCS341Q-DS1	Optional Serial device				
CPS-MCS341G5-DS1 CPS-MGS341G5-DS1	Quectel USB modem	Quectel USB modem	Quectel USB modem	Quectel USB modem	Optional Serial device

Integrated type ADC / DAC / FPGA (DIO) devices

Model	Device	Maker	Device model number	Control port
CPS-MC341-ADSC1 CPS-MC341-ADSC2 CPS-MC341G-ADSC1 CPS-MC341Q-ADSC1 CPS-MG341G5-ADSC1	ADC	Analog Devices	ADC7327	/dev/spidev2.0
	FPGA (DIO)	Lattice Semiconductor	LCMXO2-640HC-4TG100l	/dev/spidev2.1

Regarding device control details of each AIO, please refer to each data sheet listed in the table above.

As for DIO device control (FPGA), please refer to the section "**Integrated type CPS-Mx341-ADSCx Series (page 56)**" in Appendix.

Configurable type FPGA devices

Model	Device	Maker	Device model number	Control port
CPS-MCS341-DS1 CPS-MGS341-DS1 CPS-MCS341G-DS1 CPS-MCS341Q-DS1 CPS-MCS341G5-DS1 CPS-MGS341G5-DS1	FPGA	Lattice Semiconductor	LCMXO2-7000HC-4FTG256I	GPMC

As for device control (FPGA), please refer to the section "**Configurable type　CPS-MxS341-DSx Series (page 63)**" In Appendix.

Configurable type COM device

Model	/dev/ttyCPS0	/dev/ttyCPS1	/dev/ttyCPS2	/dev/ttyCPS3	...	/dev/ttyCPS62	/dev/ttyCPS63
CPS-COM-1PC	RS-232C	-	RS-232C	-	...	RS-232C	-
CPS-COM-2PC	RS-232C	RS-232C	RS-232C	RS-232C	...	RS-232C	RS-232C
CPS-COM-1PD	RS-422A/485	-	RS-422A/485	-	...	RS-422A/485	-
CPS-COM-2PD	RS-422A/485	RS-422A/485	RS-422A/485	RS-422A/485	...	RS-422A/485	RS-422A/485

Configurable type AIO control device

Model	/dev/cpsaio0	/dev/cpsaio1	...	/dev/cpsaio30	/dev/cpsaio31
CPS-AI-1608LI/ CPS-AI-1608ALI	AI	AI	...	AI	AI
CPS-AO-1604LI CPS-AO-1604ALI	AO	AO	...	AO	AO

Configurable type DIO control device

Model	/dev/cpsdio0	/dev/cpsdio1	...	/dev/cpsdio30	/dev/cpsdio31
CPS-DIO-0808L/ CPS-DIO-0808BL	DIO	DIO	...	DIO	DIO
CPS-DI-16L/ CPS-DI-16RL	DI	DI	...	DI	DI
CPS-DO-16L/ CPS-DO-16RL/ CPS-RRY-4PCC	DO	DO	...	DO	DO

Configurable type SSI control device

Model	/dev/cpsssi0	/dev/cpsssi1	...	/dev/cpsssi30	/dev/cpsssi31
CPS-SSI-4P/ CPS-SSI-4C	SSI	SSI		SSI	SSI

Configurable type FPGA control device

Model	/dev/cps-iolib
CPS-MCS341-DSx CPS-MGS341-DS1 CPS-MCS341G-DS1 CPS-MCS341Q-DS1 CPS-MGS341G5-DS1	GPMC

Network device

Network Category	eth0	eth1	eth2	can0	can1	wwan0	ppp0
1 LAN(Hub Mode) Type	LAN A/B	-	-	-	-	-	-
2 LAN Type	LAN A	LAN B	-	-	-	-	-
3G on-board type (Japan domestic model) 1 LAN(Hub Mode) Type	LAN A/B	-	-	-	-	3G	-
3G on-board type (Japan domestic model) 2 LAN Type	LAN A	LAN B	-	-	-	3G	-
3G on-board type (Global model) 1 LAN(Hub Mode) Type	LAN A/B	3G	-	-	-	-	-
3G on-board type (Global model) 2 LAN Type	LAN A	LAN B	3G	-	-	-	-
LTE on-board type 1 LAN Type	LAN A/B	-	-	-	-	-	LTE
LTE on-board type 2 LAN Type	LAN A	LAN B	-	-	-	-	LTE

4. FPGA I/O map

1. Integrated type CPS-Mx341-ADSCx Series

Maker: Lattice Semiconductor

Device model number: LCMXO2-640HC-4TG100I

Interface: SPI

SPI signal timing
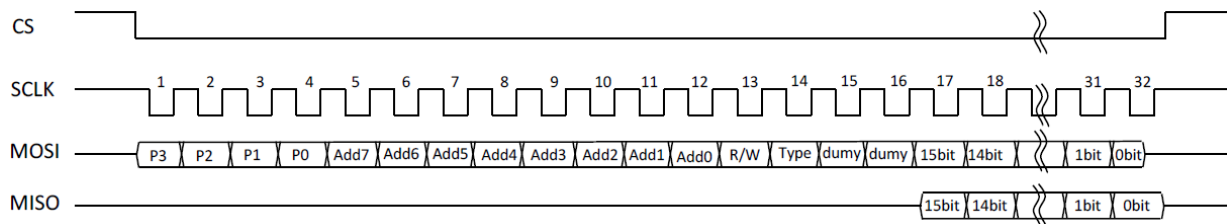
MOSI: Slave latches the signal with a fall of SCLK

MISO: Output slave signals with a rise of SCLK. Master latches the signal with a fall of SCLK.

SPI signal format

Register Page	Address	R/W	Access Type	Dummy	Data
4bit	8bit	1bit	1bit	2bit	16bit

- R/W: 0 = Read, 1 = Write
- Access Type: 0 = Byte Access, 1 = Word Access
- Dummy: Always 0

Upon Byte accessing, data are LSB justified and converted into 16 bit for transmission and reception.

Example: Write 00AAh to Page = 0h, Address=12h.

0x0 12 C 00AA

Products Category

Products Category	Function	Register Page	Product
01h	Digital I/O unit	0h	CPS-MC341-ADSCx
02h	Analog input unit	1h	CPS-MC341-ADSCx
03h	Counter unit	2h	CPS-MC341-ADSCx

Digital I/O unit port map (Page 0h)

Address	Read/Write	Meaning
00h - 01h	R	System reservation area
02h - 03h	R	System reservation area
04h - 0Ch	R	Not used
0Eh - 0Fh	R	System reservation area
10h - 11h	R	Digital input port
12h - 13h	R/W	Digital output port
14h - 17h	R	Not used
18h - 19h	R/W	Digital filter setting time
1Ah - 1Fh	R	Not used
1Ch - 1Dh	R/W	Internal power ON/OFF*
1Eh - 1Fh	R	Not used
20h - 21h	R/W	System reservation area
22h - 23h	R	Not used
24h - 25h	R/W	System reservation area
26h - FFh	R	Not used

*For CPS-MC341-ADSC1-931 exclusively

Analog input unit port map (Page 1h)

Address	Read/Write	Meaning
00h - 01h	R	System reservation area
02h - 03h	R	System reservation area
04h - 27h	R	Not used
28h - 29h	R/W	Analog input unit
2Ah - FFh	R	Not used

Counter I/O unit port map (Page 2h)

Address	Read/Write	Meaning
00h - 01h	R	System reservation area
02h - 03h	R	System reservation area
04h - 0Fh	R	Not used
10h - 11h	R/W	Direct Counter Data lower (R) / Read Channel Select (W)
12h - 13h	R/W	Direct Counter Data higher (R) / Direct Counter Latch Select (W)
14h - 15h	R/W	Counter Select Enable Status
16h - 17h	R	Not used
18h - 19h	R/W	Command Select
1Ah - 1Bh	R	Not used
1Ch - 1Dh	R/W	Counter Input / Output data lower data
1Eh - 1Fh	R/W	Counter Input / Output data higher data
20h - 21h	W	System reservation area
22h - 23h	W	System reservation area
24h - 25h	R/W	System reservation area
26h - 27h	R/W	System reservation area
2Ah - FFh	R	Not used

Digital input port (Page 0h / Address 10h - 11h)　R

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0

This port gets a value of digital input terminal.

When digital filter is set, a value after passing through the filter is taken.

*This function is only available with DI0 - DI3 in CPS-MC341-ADSCx series.

Digital output port (Page 0h / Address 12h -13h)　R/W

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D05	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0

This port sets a value of digital output terminal or gets a setting value.

*This function is only available with DO0 - DO1 in CPS-MC341-ADSCx series.

Digital filter setting time (Page 0h / Address 18h - 19h)　R/W

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	ST4	ST3	ST2	ST1	ST0	0	0	0	0	0	0	0	0

This port sets a digital filter value applicable to digital input terminal or gets a setting value.

The setting value applies to all input terminals.　See "**Digital filter settings(page 59)**" for the setting value.

Digital filter settings

Set	Name	Meaning	Set item	Initial value
ST4 - 0	Digital filter setting time	Set the digital filter time	0: filter function not used	0 [filter function not used]
			1: 0.25μsec	
			2: 0.5μsec	
			3: 1μsec	
			4: 2μsec	
			5: 4μsec	
			6: 8μsec	
			7: 16μsec	
			8: 32μsec	
			9: 64μsec	
			10: 128μsec	
			11: 256μsec	
			12: 512μsec	
			13: 1.024msec	
			14: 2.048msec	
			15: 4.096msec	
			16: 8.192msec	
			17: 16.384msec	
			18: 32.768msec	
			19: 65.536msec	
			20: 131.072msec	
			21 - 31: Reserve	

Internal power ON/OFF setting port (Page 0h / Address 1Ch - 1Dh)   R/W

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	PWEn

This ports sets enabled(ON) or disabled(OFF) of internal power for digital input port.

Read this port to check the setting status. See "**Internal power ON/OFF setting (page 59)**" for setting value.

Internal power ON/OFF setting

Set	Name	Meaning	Set item	Initial value
PWEn	Internal power enabled	Set the internal power enabled (ON).	0: disabled (OFF) 1: enabled (ON)	0 [disabled]

Analog input port (Page 1h / Address 28h - 29h)　R/W

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	03	D2	D1	00
0	0	0	0	0	0	0	0	0	0	0	0	0	0	AT1	AT0

This port obtains a value of analog input channel.　When an isolation between channels is needed, do not turn on both switches simultaneously. It disables an isolation function.

Counter data read port (Page 2h / Address 10h - 13h)　R

Addr	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
10h	D15	D14	D13	D12	D11	D10	D09	D08	D07	D06	D05	D04	D03	D02	D01	D00
12h	0	0	0	0	0	0	0	0	D23	D22	D21	D20	D19	D18	D17	D16

This port reads latched counter data.

Set "**Counter read channel setting port (Page 2h / Address 10h)　W**" to read data.

Counter read channel setting port (Page 2h / Address 10h)　W

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sel0

This port selects a channel to read from Counter data read port.

See the instruction "**Counter data read port (Page 2h / Address 10h - 13h)　R**" to read counter data.

Counter read setting

Set	Name	Meaning	Set item	Initial value
Sel0	Counter read channel	Set the cannel to read from counter data read port	0: Channel 0 1: Channel 1	0 [Channel 0]

Counter data latch setting port (Page 2h / Address 12h)　W

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ch01	Ch00

Write "1" into this port to latch counter data. The latched count values in this section are read from the Counter data read port.

Counter valid channel setting port (Page 2h / Address 14h)　R/W

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ch01	Ch00

This port sets counter valid channels and reads the status of the setting.

Counter command port (Page 2h / Address 18h) W

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	0	Cmd06 - 00						

This port is an operation command port to execute the following command codes.

Command code list:

08h: Ch0 counter mode (Write)

09h: Ch1 counter mode (Write)

18h: Ch0 comparison register 0 (Write)

19h: Ch1 comparison register 0 (Write)

20h: Ch0 comparison register 1 (Write)

21h: Ch1 comparison register 1 (Write)

38h: Count match status check / clear (Read/Write)

3Ah: Carry status check / clear (Read/Write)

3Dh: Zero clear (Write)

When executing the command to write, the data are set into data address port (Page 2h / Address 1Ch - 1Fh).   When executing the command to read, the data are read from data address port (Page 2h / Address 1Ch - 1Fh).

Control data address port after controlling the command port.

Refer to "**Counter I/O unit port map (Page 2h (page 58)**" to "**Internal power ON/OFF setting port (Page 0h / Address 1Ch - 1Dh)   R/W (page 59)**" regarding the format of the data address port for each command code.

Ch0 / Ch1 counter mode (counter command code: 08h / 09h) W

Addr	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1Eh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

This sets operation modes of the counter.   Each mode can be set per input channel.

Ch0 / Ch1 comparison register 0 (counter command code: 18h / 19h) W

Addr	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1Ch	Data00 - 15															
1Eh	0	0	0	0	0	0	0	0	Data16 - 25							

This sets data into Ch0 - Ch1 count value comparison register 0.

Ch0 / Ch1 comparison register 1 (counter command code: 20h / 21h) W

Addr	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1Ch	Data00 - 15															
1Eh	0	0	0	0	0	0	0	0	Data16 - 25							

This sets data into Ch0 - Ch1 count value comparison register 1.

Count match status check / clear (counter command code: 38h) R/W

Addr	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1Ch	0	0	0	0	0	0	Cmp1_Ch1	Cmp1_Ch0	0	0	0	0	0	0	Cmp0_Ch1	Cmp0_Ch0
1Eh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Upon reading, the bit becomes 1 if the condition is satisfied.

Upon writing, set 1 into the corresponding bit to reset.

Carry status check / clear (counter command code: 3Ah) R/W

Addr	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Carry Ch1	Carry Ch0

Upon reading, the bit becomes 1 if the condition is satisfied.

Upon writing, set 1 into the corresponding bit to reset.

Zero clear (3Dh) W

Addr	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ch1	Ch0

Upon writing, set 1 into the corresponding bit to reset.

2. Configurable type　CPS-MxS341-DSx Series

Maker:　　　　　　　　Lattice Semiconductor

Device model number:　LCMXO2-7000HC-4FTG256I

Interface:　　　　　　　GPMC

Register map

Address	Read/Write	Meaning
08000000h - 08000001h	R	System reservation area
08000002h	R	Rotary switch
08000003h	R	DIP Switch
08000004h	R	The number of device connections
08000005h	R/W	System reservation area
08000006h	R/W	LED control
08000007h	R	Not used
08000008h - 0800005fh	R/W	System reservation area
08000060h - 08000061h	R/W	DIO control register
08000063h - 080000FFh	R/W	Not used
08000100h - 080001FFh	R	Device 0
08000200h - 080002FFh	R	Device 1
⋮		⋮
08000F00h - 08000FFFh	R	Device 14
08001000h - 080010FFh	R	Device 15

Rotary Switch Register (08000002h)　　　R

Get the rotary switch condition.

Table 1 Rotary Switch Register

D7	D6	D5	D4	D3	D2	D1	D0
GROUP ID				UNIT ID			

DIP Switch Register (08000003h)　　　R

Get the DIP switch condition.
Reading a value with the lower 4 bits 0 or 0xF can cause a failure.

Table 2 System Status / DIP Switch Register

D7	D6	D5	D4	D3	D2	D1	D0
DIP Switch				System Status			
SW4	SW3	SW2	SW1				

I/O Module Information Register (08000004h)   R

Get the number of device connections

Table 3 I/O Module Information Register

D7	D6	D5	D4	D3	D2	D1	D0
-			I/O Module Num				

LED Control Register (08000006h)   R/W

Control the LED.

Table 4 LED Control Register

D7	D6	D5	D4	D3	D2	D1	D0
-				ERR LED	ST2 LED	ST1 LED	PWR LED

[PWR LED]
   0: ON
   1: OFF
[ST1 LED]
   0: OFF
   1: ON
[ST2 LED]
   0: OFF
   1: ON
[ERR LED]
   0: OFF
   1: ON

DIO Control Register (08000060h)   R/W

Set the DIO Direction.

Table 5 DIO Control Register

D7	D6	D5	D4	D3	D2	D1	D0
-				DIO Direction			
				DIO4	DIO2	DIO1	DIO0

[DIO Direction]
   0: Input
   1: Output

DIO Value Register (08000061h)   R/W

Get DI / DO condition and set DO output.

Table 6 DIO Value Register

D7	D6	D5	D4	D3	D2	D1	D0
DO Value				DI Value			
DIO3	DIO2	DIO1	DIO0	DIO3	DIO2	DIO1	DIO0

5. Integrated type products LED / DIP Switch / Switch control

LEDs of Integrated types listed below can be controlled by GPIO port.

LED control for integrated type

LED	Control device	Port No	Port attribute	Control method (Linux shell)
Power	GPIO	67	Out	On : /usr/local/bin/gpio_out.sh 67 0 Off : /usr/local/bin/gpio_out.sh 67 1
ST1	GPIO	26	Out	On : /usr/local/bin/gpio_out.sh 26 0 Off : /usr/local/bin/gpio_out.sh 26 1
ST2	GPIO	27	Out	On : /usr/local/bin/gpio_out.sh 27 0 Off : /usr/local/bin/gpio_out.sh 27 1

Switches of integrated types listed below can be read by GPIO port.

Switch control for integrated type

LED	Control device	Port No	Port attribute	Control method (Linux shell)
DIP SW1-2	GPIO	32	In	/usr/local/bin/gpio_in.sh 32 On=0, Off=1
DIP SW1-3	GPIO	33	In	/usr/local/bin/gpio_in.sh 33 On=0, Off=1
DIP SW1-4	GPIO	34	In	/usr/local/bin/gpio_in.sh 34 On=0, Off=1
Shutdown SW	GPIO	35	In	/usr/local/bin/gpio_in.sh 35 Press(On)=0, Release(Off)=1

6. Configurable type products DIO / LED / DIP Switch / Switch control

DIO / LED / DIP Switch / Switch of configurable types can be controlled by file under the directly on CONPROSYS listed below.

/sys/bus/platform/drivers/cps-driver

See the function and usage of each file in "**Configurable type DIO / LED / DIP Switch / Switch control (page 67)**".

Configurable type DIO / LED / DIP Switch / Switch control

File	Control device	Function
	How to use	
dio0_direction	DIO	DI/DO switch setting

	Set DI when b0(DIO0) - b3(DIO3) are 0, set DO when b0(DIO0) - b3(DIO3) are 1. Setting example:
	  Set DIO0 and DIO1 to DI, DIO2 and DIO3 to DO.
	   b3:1, b2:1, b1:0, b0:0 → cH
	  <Command>
	   echo 0xc > /sys/bus/platform/drivers/cps-driver/dio0_direction
	Setting reading example:
	  <Command>
	   cat /sys/bus/platform/drivers/cps-driver/dio0_direction		

dio0_do_value	DO	DO value setting

	Setting example:
	  Set DO0 and DO2 to 1, DO1 and DO3 to 0.
	   b3:0, b2:1, b1:0, b0:1 → 5H
	<Command>
	   echo 0x5 > /sys/bus/platform/drivers/cps-driver/dio0_do_value
	Setting reading example:
	<Command>
	   cat /sys/bus/platform/drivers/cps-driver/dio0_do_value		

dio0_di_value	DI	DI value reading
	<Command> cat /sys/bus/platform/drivers/cps-driver/dio0_di_value		
id	Rotary switch	Rotary switch value reading
	<Command> cat /sys/bus/platform/drivers/cps-driver/id		
led_status1	Status1 LED	Status1 LED On/Off setting

	Setting example:
	  Turn on the light of Status 1LED.
	<Command>
	   echo 1 > /sys/bus/platform/drivers/cps-driver/led_status1
	Setting reading example:
	  <Command>
	   cat /sys/bus/platform/drivers/cps-driver/led_status1		

led_status2	Status2 LED	Status2 LED On/Off setting

	Setting example:
	  Turn off the light of Status 2 LED.
	<Command>
	   echo 0 > /sys/bus/platform/drivers/cps-driver/led_status2
	Setting reading example:
	  <Command>
	   cat /sys/bus/platform/drivers/cps-driver/led_status2		

led_error	Error LED	Error LED On/Off setting

	Setting example:
	  Turn on the light of Error LED.
	<Command>
	   echo 1 > /sys/bus/platform/drivers/cps-driver/led_error
	Setting reading example:
	<Command>
	   cat /sys/bus/platform/drivers/cps-driver/ switch		

switch	DIP Switch	DIP Switch value reading
	<Command> cat /sys/bus/platform/drivers/cps-driver/switch		

7. Option Board control

The models listed below contain an option board of 3G/LTE/920Hz communication.

[Integrated type products M2M Controller Series]

CPS-MC341G-ADSC1 Series   Multi-I/O + 3G WAN (Japan domestic / Global) Model

CPS-MC341Q-ADSC1   Multi-I/O + 920MHz (Japan only) Model

[Integrated type products M2M Gateway Series]

CPS-MG341G-ADSC1 Series   Multi-I/O + 3G WAN (Japan only) Model

CPS-MG341G5-ADSC1   Multi-I/O + LTE Model

[Configurable type products M2M Controller Series]

CPS-MCS341G-DS1   Controller + 3G WAN (Japan only) Model

CPS-MCS341G5-DS1   Controller + LTE Model

CPS-MCS341Q-DS1   Controller + 920MHz (Japan only) Model

[Configurable type products M2M Gateway Series]

CPS-MGS341G5-DS1   Controller + LTE Model

These models can control the power of the option board.

Option board control

Function	How to control (Linux shell)
Option board power On*	/usr/local/cps-board/PowerOnOptionBoard.sh
Option board power Off*	/usr/local/cps-board/PowerOffOptionBoard.sh
Option board detection	/usr/local/cps-board/DetectOptionBoard.sh 　[End Status] 　　0:　Option board activated 　　1:　Option board no detection

*root privileges is requested. Use the sudo command when controlling the power in the console.

The models with 3G/LTE can control such as connection/disconnection, SIM check, and RSSI acquisition.

3G/LTE control

Function	How to control (Linux shell)
Connection *1	/usr/local/cps-board/mobile/start_mobile.sh
Disconnection *1	/usr/local/cps-board/mobile/stop_mobile.sh
3G/LTE module reset *1	/usr/local/cps-board/mobile/reset_mobile.sh
SIM check	/usr/local/cps-board/mobile/checkSIM_mobile.sh 　[End status] 　　0:　When SIM is detected, this displays the "Detect SIM" 　　1:　When SIM is not detected, this displays the "Not Detect"
RSSI acquisition	/usr/local/cps-board/mobile/checkSIM_mobile.sh 　[End status] 　　0: Succeed　　displays RSSI value (dbm) 　　1: Fail
RSRP acquisition (only for the models with LTE)	/usr/local/cps-board/mobile/getRSRP.sh 　[End status] 　　0: Succeed　　displays RSRP value (dbm) 　　1: Fail
Option board LED control *2	/usr/local/cps-board/mobile/ctrl_LED.sh param 　[param] 　　0: All off 　　1: Green On　　Red Off 　　2: Green Off　　Red On 　　3: Green On　　Red On 　[End status] 　　0: Succeed 　　1: Fail

*1. *root privileges is requested. Use the sudo command when controlling the power in the console.

*2. As for the CPS-MC341G-ADSC1-111 and CPS-MG341G-ADSC1-111 models, LED control is not available since 3G module control is used in these products.

Revision History

MONTH YEAR	Summary of Changes
February 2022	1st edition
September 2023	Ver 2.1.0 - Add the support models. CPS-MCS341-DSx series (Configurable type) - Add the support I/O modules for Configurable type CPS-COM series CPS-AI series CPS-AO series CPS-DIO series CPS-DI series CPS-DO series CPS-RRY series CPS-SSI series
November 2024	Ver 2.2.0 - Add the support models. CPS-MGS341-DS1 CPS-MGS341G5-DS1 - Added I/O support for the following modules CPS-SSI-4C

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