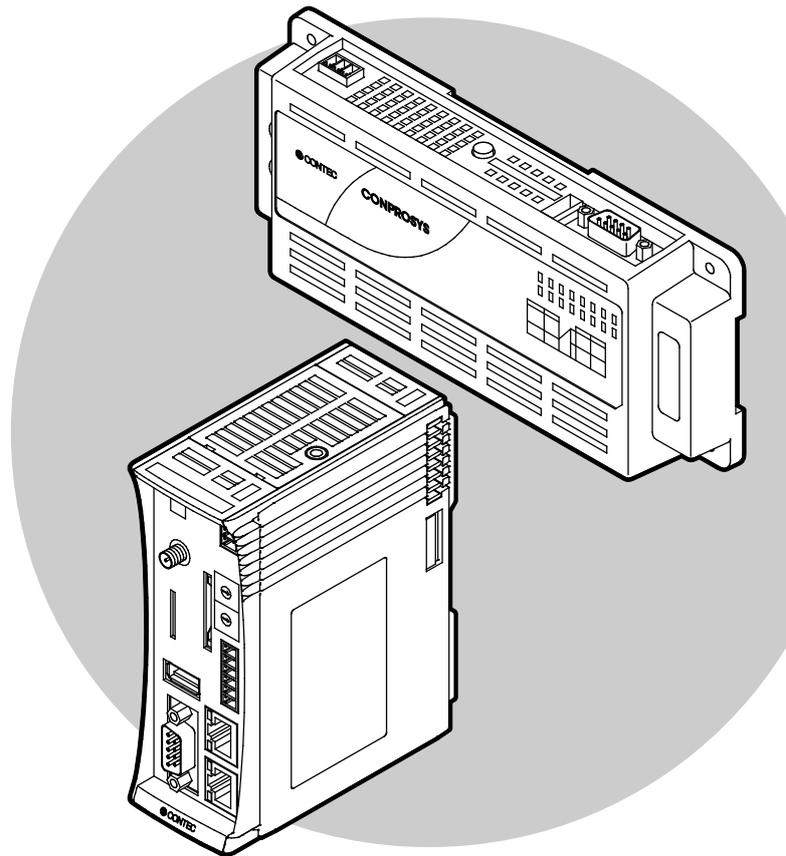


# Reference Manual

## CONPROSYS Expansion SDK

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# Introduction

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This section provides necessary information of the product such as the outline and manuals before actual use.

# 1.About the Product

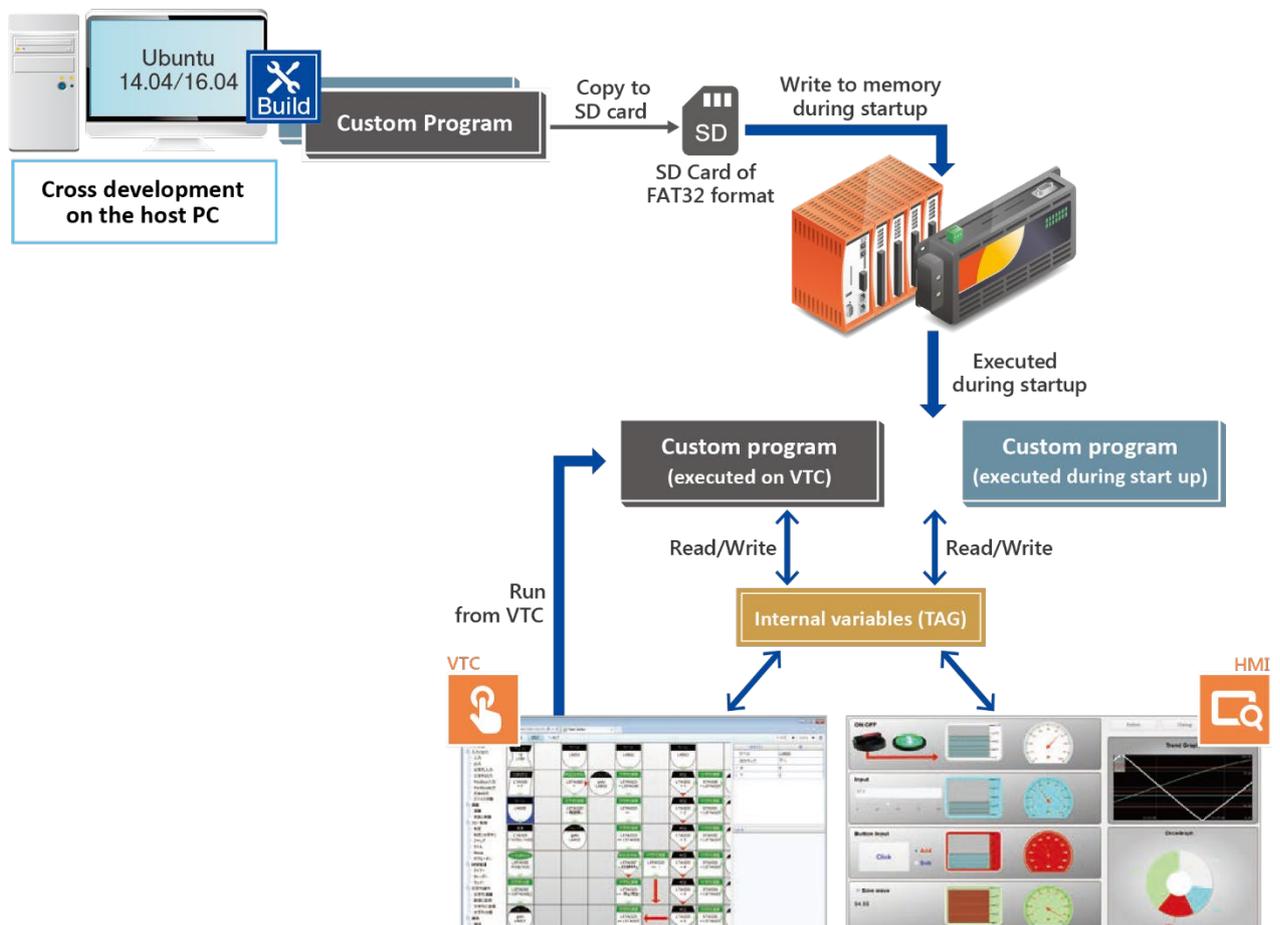
The CONPROSYS expansion SDK is a supporting tool which copies a program created by a user into SD card and performs add-in to the CONPROSYS standard software.

The custom program can be generated on the host PC with a cross-build edition of CONPROSYS Linux SDK. Moreover, an uncomplicated Linux shell script can be handled as a custom program.

There are two types of custom programs; one executes during start-up and another that is invoked on VTC.

Data can be linked with HMI and VTC using internal variables (TAG) from the custom program.

## Image of adding custom programs



### ⚠ CAUTION

Custom programs are allowed to be executed with the user privileges.

Note that programs requiring root privileges are not allowed to be executed.

## 2. Specifications

Item	Specification
The CONPROSYS series compatible models	<p>[M2M controller series]</p> <p style="padding-left: 40px;">CPS-MC341 series                      Ver. 3.3.0 or later</p> <p style="padding-left: 40px;">CPS-MCS341series                      Ver. 3.4.0 or later</p> <p>[M2M Gateway series]</p> <p style="padding-left: 40px;">CPS-MG341 series                      Ver. 3.3.0 or later</p>
The Linux SDK environment for CONPROSYS Cross-Build	<p>CONPROSYS Linux SDK ver. 1.2.0 or later</p> <p>Build environment setting (setting items with./configure.sh)</p> <p style="padding-left: 40px;">CONPROSYS Product                      (Arbitrary)</p> <p style="padding-left: 40px;">LAN type                                      1) 1lan</p> <p style="padding-left: 40px;">rootfs type                                    1) light (busybox)</p> <p style="padding-left: 40px;">Cross-compiler type                      1) gnueabi</p>

## 3. 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	When to read	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)
Setup Manual	Read this when setting up the product.	This describes the required items for setup and configuration procedure.	 Download from the Contec website (PDF)
Reference Manual (Hardware)	Read this when operating the product.	This describes the hardware aspects such as functions and settings.	 Download from the Contec website (PDF)
Reference Manual (Software)	Read this when setting up the "CONPROSYS WEB Setting".	This describes how to set each function of "CONPROSYS WEB Setting".	 Download from the Contec website (PDF)
CONPROSYS Expansion SDK, Reference Manual	Read this when adding the various functions of CONPROSYS directly into a program using the SD card.	This describes how to add a custom program that is built with cross development on the host PC using CONPROSYS Linux SDK.	 Download from the Contec website (PDF)

### ◆ Download manuals

Download the manuals from the following URL.

**Download**

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

## 4. CONTEC Software License

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- (3) Modify, adapt, decompile, disassemble or reverse-engineer the Software; or
- (4) Delete or alter the representation or trademark of the rights of the Software.

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2. TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT SHALL CONTEC BE LIABLE FOR PERSONAL INJURY, OR ANY INCIDENTAL, SPECIAL, INDIRECT OR ANY OTHER COMMERCIAL DAMAGES OR LOSSES, ARISING OUT OF OR RELATED TO YOUR USE OR INABILITY TO USE THE SOFTWARE AND THE LIKE.

#### Article 5. Transfer

1. Customers may transfer their rights authorized them with respect to the Software and in accordance herein to a third party only when the customer satisfies all of the following conditions:
  - (1) The customer transfers the Agreement and the Software and the Like to such third party;
  - (2) The customer transfers to such third party all CONTEC hardware products onto which the Software has been downloaded; and
  - (3) The recipient of the transfer agrees to the terms and conditions herein.

#### Article 6. Termination

1. CONTEC may terminate the Agreement with immediate effect without any notice or demand to the customer if the customer fails to comply with any of the provisions herein.

2. Upon the termination of the Agreement, the customer's license shall cease to be effective. The customer shall immediately discontinue using the Software in any way, and shall uninstall and destruct any reproduction of the Software.

#### **Article 7. Limited Warranty on Media**

1. CONTEC warrants the media on which the Software is recorded and delivered by CONTEC to be free from defects in materials and workmanship under normal use for a period of 30 days from the original retail purchase. Customers exclusive remedy shall be replacement of the Software which is returned to CONTEC through the distributor.

#### **Article 8. Information regarding the Software**

1. The information and/or updated program will be delivered through the website of CONTEC.  
2. The information and/or updated program will be licensed to the Customers in accordance with the Agreement. Customers may use the information and/or updated program at their discretions and responsibilities, however, in case the Customers use such information and/or updated program they shall comply with the terms and conditions of the Agreement.

#### **Article 9. Export Control**

1. Customers shall comply with the Foreign Exchange and Foreign Trade Act of Japan, the U.S. Export Administration Regulation and the laws and regulations of any other country when taking the Software and the Like outside Japan.  
2. Customers shall not transfer, export or re-export the Software and the Like to any individual or entity that is likely to use the Software and the Like to design, develop or manufacture nuclear weapons, biochemical weapons, or to design, develop or manufacture missiles.  
3. Customers shall not transfer, export or re-export the Software and the Like to any individuals or entities set forth in the following countries or regions:  
(1) The Republic of Cuba, The Islamic Republic of Iran, the Republic of Iraq, the Great Socialist People's Libyan Arab Jamahiriya or North Korea;  
(2) Any individuals or entities on the "List of Foreign Users" based on the Import Trade Control Order or the U.S. Department of Commerce Denied Person's List or Entity List; or  
(3) Any country, region, individual or entity designated by the government of Japan, the U.S. or any other relevant country.

#### **Article 10. Governing Law**

The provisions herein shall be construed and governed in accordance with the laws of Japan. This Agreement shall not be governed by the United Nations Convention on Contracts for the International Sale of Goods, the application of which is expressly excluded.

#### **Article 11. Dispute Resolution**

Upon the occurrence of any dispute in relation to the Agreement or the Software, if any legal procedures are required, such as the filing of a petition for a lawsuit, the Osaka District Court shall have the exclusive jurisdiction over such dispute.

#### **Article 12. Severability**

If for any reason any portion of the provisions set forth herein is found to be invalid or unenforceable, the remainder of the Agreement shall not be affected in any way and shall be valid and enforceable to the extent permitted by law.

# Safety Precautions

---

Understand the following definitions and precautions to use the product safely. Never fail to read them before using the product.

# 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.

 <b>DANGER</b>	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

## 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.

# Process of Development

---

This section describes the procedure on how to copy a custom program into SD card.

# 1. Required Items for Development

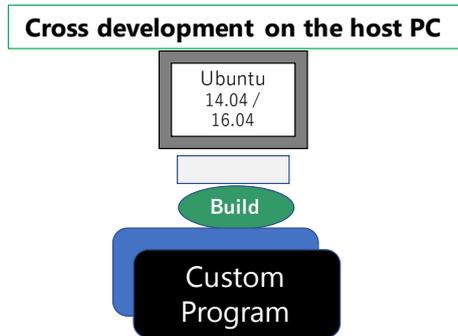
- CONPROSYS product
- SDHC card (SDXC non-compliant) FAT32 format
- LAN cable
- Host PC for development (The Linux PC capable of operating with CONPROSYS Linux SDK Cross-Build edition)
- Host PC (The PC capable of web accessing to the CONPROSYS)

\*By using such as VM, the host pc for development and the host pc can be the same one.

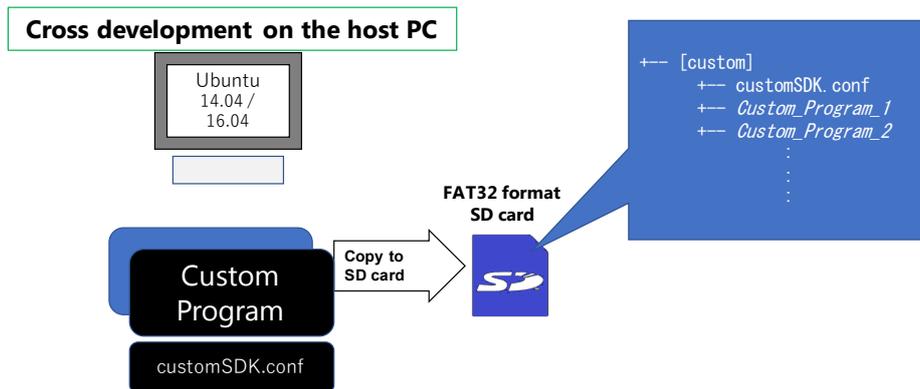
## 2.Procedure

Follow the procedure described below.

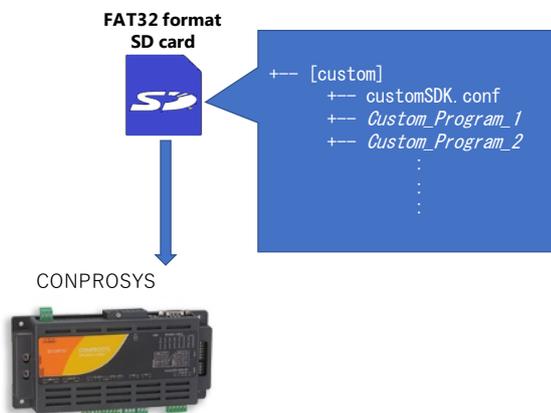
- 1 Create a custom program on the host PC for development.  
Starting the custom program or options are defined in the "customSDK.conf" file.



- 2 Copy the custom program created on the host PC for development and the "customSDK.conf" file to a directory called [custom] onto the SD card.



- 3 Insert the SD card into the CONPROSYS to start up.



## 4 Check whether the custom program runs.

The diagram illustrates the process of checking a custom program. It shows a FAT32 format SD card being inserted into a CONPROSYS device. The device's web interface, titled 'CONPROSYS WEB Setting', displays the 'Program List' section. The 'Program List' table shows the following data:

Type	PID	Program	Option
S	9348	TimeStamp_To_STAG01	
1	-	SEC_To_Return	

Below the table, there are 'Stop' and 'Log' buttons. The interface also shows a ladder logic diagram with red arrows indicating the execution flow between components like 'TAG00 = SEC\_To\_Return' and 'TAG02 = TAG00'.

## 5 Create an encrypt package for release.

The diagram illustrates the process of creating an encrypt package. It shows a FAT32 format SD card being inserted into a CONPROSYS device. The device's web interface, titled 'CONPROSYS WEB Setting', displays the 'Package Creating' section. The 'Encrypt Setting' section includes an 'Encrypt Password' field with a 'Set' and 'Reset' button. The 'Release Package Creating' section includes a 'Package Creating' button.

From the SD card, copy the [custom\_release] directory and the encrypt package file (customSDK.pack) positioned below to another SD card, then insert the card to another CONPROSYS. This allows you to use the encrypt packaged custom program of the CONPROSYS with only matched encrypt password.



# Create a Custom Program

---

This section describes how to create a custom program.

# 1. Build Custom Program

Create a custom program on the host PC (Linux) by using cross-build edition of CONPROSYS Linux SDK.

Follow the steps described in "3. Building" in the CONPROSYS Linux SDK Cross-Build Edition User's Manual for Build initial setting and the environment setting.

## Build initial setting

```
./configure.sh
```

CONPROSYS Product	(Arbitrary)
LAN type	1) 1lan
Rootfs type	1) light (busybox)
Cross-compiler type	1) gnueabi

## The environment setting

```
source sdkenv.txt
```

After setting up the build environment above, cross build the C / C ++ program source code.

```
${CROSS_COMPILE}gcc C/C++Source code file -o Output file
```

## 2. Create a Definition File for the Custom Program

With the following format, create a definition file "customSDK.conf" to make CONPROSYS identify the custom program.

### [Definition format]

Program type    Program file name    Option

Program type:	Specify a program type. S: for start-up,    O: for VTC
Program file name:	Specify a execution program file name.
Option:	Specify when the execution program needs options.

### [Comment line]

The comment is mentioned after "#".

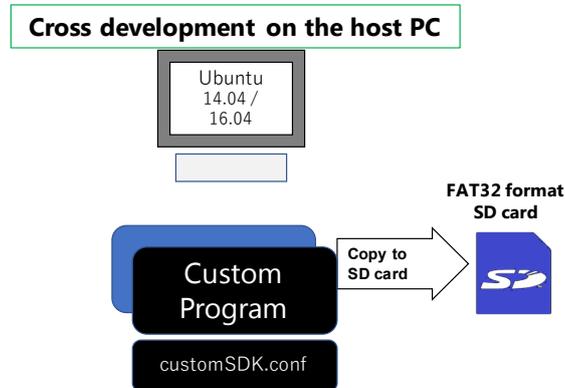
An example:    As an option for custom\_1, start up with -debug  
                  For VTC, define custom\_4. program

```
#Start-up program custom_1  
S custom_1 -debug  
#For VTC program custom_4  
O custom_4
```

- \* As for the line feed code, use only LF that is available in Linux system.
- \* You cannot specify the program file names that are duplicated.

## 3. File Layout in SD Card

Write the custom program and the definition file "customSDK.conf" into SD card.



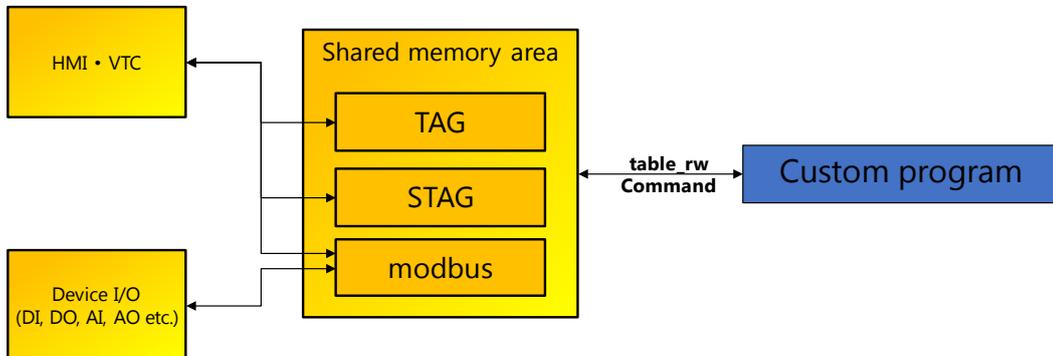
Use the SD card of FAT32 formatted.

Layout the file into the SD card as follows;

```
+-- [custom]
  +-- customSDK.conf
  +-- Custom_1
  +-- Custom_2
  +-- Custom_3
  +-- Custom_4
  :
```

## 4. Access to Internal Variables (TAG)

The custom program can access to Device I/O and to TAG variables that are usable in HMI or VTC through the shared memory area using table\_rw command.



table\_rw command is a command that executes on Linux shell.

The command can be executed from the same position under the directory with custom programs.

With the following interface, writing and reading in the shared memory area can be performed.

- Interface  
/tmp/SDK/table\_rw [options]

- Option

- r (read table)
- w val (write table from val)
- t tagno (tagno)
- s stagno (stagno)
- d 0x2000 -c ModbusMapAddress (Modbus area access)

- Examples

- /tmp/SDK/table\_rw -r -t 1 (read TAG01)
- /tmp/SDK/table\_rw -w 123 -t 2 (write TAG02=123)
- /tmp/SDK/table\_rw -r -s 3 (read STAG03)
- /tmp/SDK/table\_rw -r -d 0x2000 -c 0 (Modbus area access, Modbus map address=0)
- /tmp/SDK/table\_rw -r -d 0x2000 -c 32 (Modbus area access, Modbus map address=0x20)

# Start Up the CONPROSYS

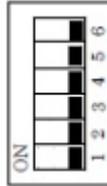
This section describes how to start up the CONPROSYS with the created SD card.

# 1.Preparation

Make sure that SD boot mode of DIP switch on the CONPROSYS is disabled.

## Controller - Integrated model (such as CPS-MC341-xxx/CPS-MG341-xxx)

Number 6 of DIP switch 1 is OFF.



## Controller – Configurable model (such as CPS-MCS341-xxx)

Number 2 pin of BOOT switch (inside the case) next to 3.5Φ mini-jack is OFF.

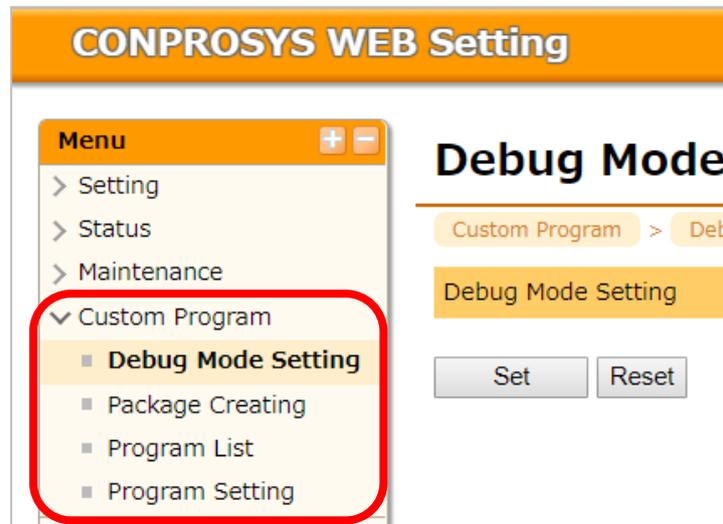


## 2.Start Up

Insert the created SD card into the CONPROSYS and turn on the power of the controller.

Connect the host PC and the CONPROSYS with LAN cable, then access to the top page of CONPROSYS Web Setting through a Web browser.

If the Custom Program menu is displayed on the left side, it indicates the definition file of the program has been read.



- \* If there is no Custom Program folder, the Custom Program menu will not be displayed in CONPROSYS Web Setting.

# CONPROSYS WEB Setting

---

This section describes the function details of CONPROSYS Web Setting.

# 1. Outline

On the CONPROSYS WEB Setting, you can view the custom program list or start-up status, and configure settings.

CONPROSYS WEB Setting menu of the displayed custom program differs depending on the debug mode setting status and the custom program status in the SD card.

## Web setting side menu display status when Debug Mode Setting is enabled

SD Card Folder Status	Web Setting Side Menu			
	Debug Mode Setting	Package Creating	Program List	Program Setting
(No custom folder in SD card)	Hidden	Hidden	Hidden	Hidden
Custom	Displayed	Displayed	Displayed	Displayed
custom_release	Displayed	Hidden	Hidden	Hidden
custom_release (Password - not matched)	Displayed	Hidden	Hidden	Hidden
custom custom_release (Both folders)	Displayed	Displayed	Displayed	Displayed

## Web setting side menu display status when the debug mode setting is disabled

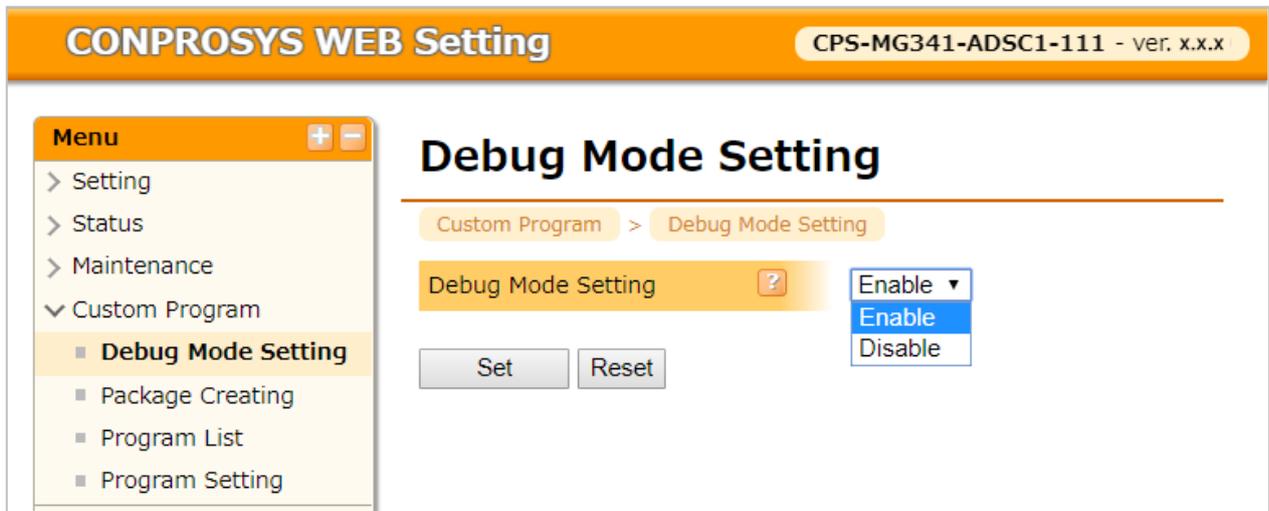
SD Card Folder Status	Web Setting Side Menu			
	Debug Mode Setting	Package Creating	Program List	Program Setting
(No custom folder in SD card)	Hidden	Hidden	Hidden	Hidden
Custom	Displayed	Hidden	Hidden	Hidden
custom_release	Displayed	Displayed	Displayed	Hidden
custom_release (Password - not matched)	Displayed	Displayed	Displayed	Hidden
custom custom_release (Both folders)	Displayed	Displayed	Displayed	Hidden

## 2.Debug Mode Setting

[Custom] appears in the menu when the SD card containing the custom program is inserted in the CONPROSYS, and it allows you to configure the debug mode settings.

When the debug mode is enabled, it starts up the custom program defined by the setting file (customSDK.conf) in the custom folder of the SD card.

When the debug mode is disabled, the encrypt package in the custom\_release folder of the SD card is expanded into CONPROSYS with the encrypt password set in the release package creation, and it starts up the custom program.



## 3.Package Creating

[Custom] appears in the menu when the SD card containing the custom program is inserted in the CONPROSYS, and it allows you to create the encrypt package for release.

Enter an encrypt password and create an encrypt key from the password, then generate an encrypt package in the SD card using the encrypt key.

The encrypt package containing the custom program can start up even when the debug mode is disabled.



## 4. Program List

Program List appears in the menu when the SD card containing the custom program is inserted in the CONPROSYS, and it allows you to control start/stop of the custom program for start-up.

Moreover, outputs using the `printf ()` function in the C / C ++ language and echo-outputs of the shell script are saved as logs, and their contents can be displayed.

The screenshot shows the 'CONPROSYS WEB Setting' interface. The top bar displays 'CPS-MG341-ADSC1-111 - ver. x.x.x'. On the left is a 'Menu' sidebar with options: Setting, Status, Maintenance, Custom Program (expanded), Debug Mode Setting, Package Creating, Program List (highlighted), and Program Setting. The main area is titled 'Program List' and shows a breadcrumb 'Custom Program > Program List'. Below this is a table with columns 'Type', 'PID', 'Program', and 'Option'. The table contains two rows: one with Type 'S', PID '9348', and Program 'TimeStamp\_To\_STAG01', and another with Type '1', PID '-', and Program 'SEC\_To\_Return'. To the right of the second row are 'Stop' and 'Log' buttons. A callout points to the 'Log' button, stating 'Logs are displayed on the different page.' Another callout points to the 'Program List' menu item, stating 'For VTC, controlling start/stop or displaying logs cannot be performed.'

Type	PID	Program	Option
S	9348	TimeStamp_To_STAG01	<input type="button" value="Stop"/> <input type="button" value="Log"/>
1	-	SEC_To_Return	

## 5. Program Setting

Program List appears in the menu when the SD card containing the custom program is inserted in the CONPROSYS and also debug mode is enabled, which allows you to configure the custom program settings.

You can edit and register custom programs individually, display logs, and save the uploaded programs to RAM.

The screenshot shows the 'CONPROSYS WEB Setting' interface. The top header includes the title 'CONPROSYS WEB Setting' and the version 'CPS-MG341-ADSC1-111 - ver. x.x.x'. A left-hand menu is visible with the following items: Setting, Status, Maintenance, Custom Program (expanded), Debug Mode Setting, Package Creating, Program List, Program Setting (selected), and Monitoring Edit. The main content area is titled 'Program Setting' and contains a breadcrumb trail 'Custom Program > Program Setting'. Below this is a table with the following data:

Type	PID	Program	Option
S	17766	TimeStamp_To_STAG01	<input type="button" value="Edit"/> <input type="button" value="Delete"/>
1	-	SEC_To_Return	<input type="button" value="Edit"/> <input type="button" value="Delete"/>

Below the table, there is a 'Register' button. At the bottom of the page, there are two buttons: 'Save to SD card' and 'Reload'.

## 6. Program Editing

In the custom program setting, custom programs can be edited by clicking the "Edit" or "Resister". Uploading the programs can also be performed on this page. Uploading files are expanded on RAM temporarily.

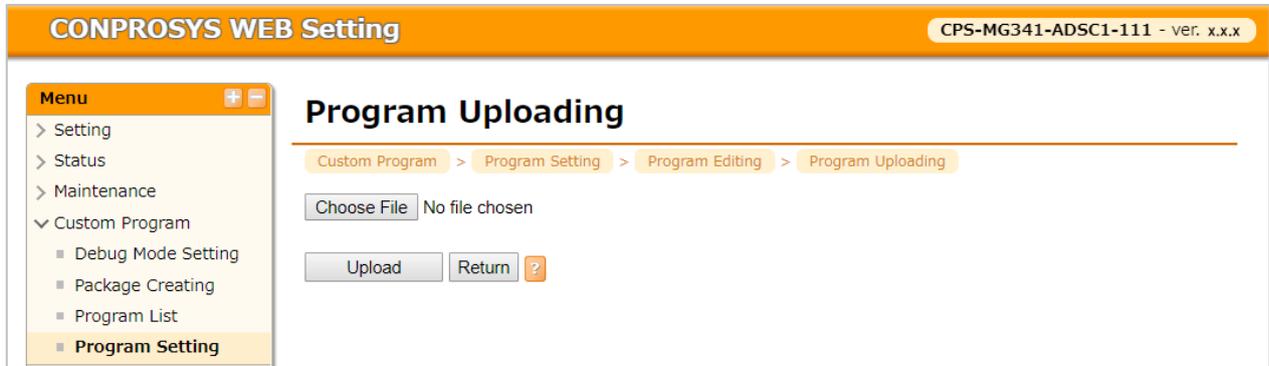
By clicking the "Set", the files are saved into the setting file (customSDK.conf) on RAM.

Since the contents on RAM will be lost when turning off the product, click the "Save to SD card" on the Program Setting page to save the data into SD card.

The screenshot displays the 'CONPROSYS WEB Setting' interface. At the top, there is a header bar with the title 'CONPROSYS WEB Setting' on the left and the version information 'CPS-MG341-ADSC1-111 - ver. x.x.x' on the right. Below the header, a 'Menu' sidebar on the left lists various settings: Setting, Status, Maintenance, Custom Program (with sub-items: Debug Mode Setting, Package Creating, Program List, and Program Setting), and Program Setting (which is currently selected). The main content area is titled 'Program Editing' and features a breadcrumb trail: 'Custom Program > Program Setting > Program Editing'. The form contains three rows of settings: 'Custom Type' with a dropdown menu set to 'For Start-up', 'Program' with a text input field containing 'TimeStamp\_To\_STAG01' and an 'Upload' button, and 'Option' with an empty text input field. At the bottom of the form, there are three buttons: 'Set', 'Reset', and 'Return'.

## 7. Program Uploading

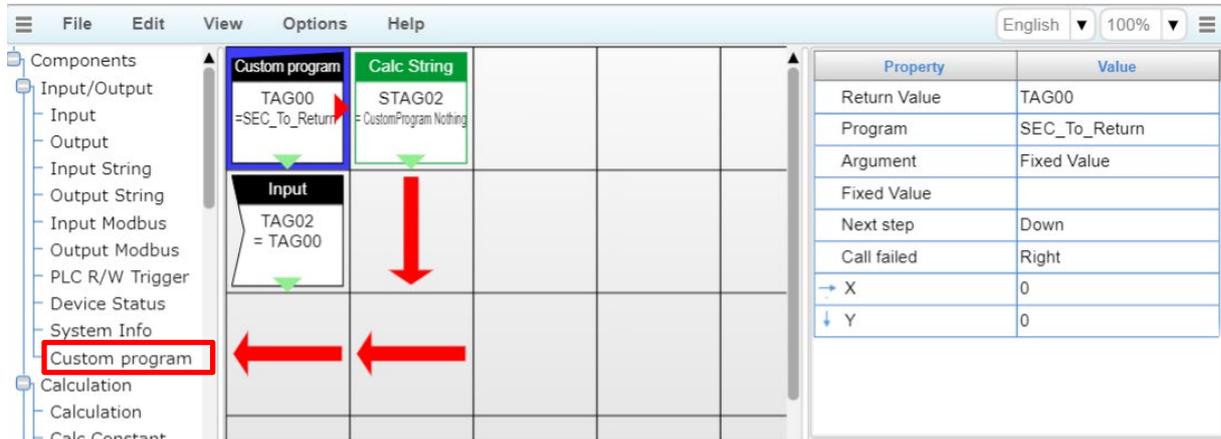
Select a file of the custom program to upload into the CONPROSYS.



## 8.Task Program Editing

Custom programs can be executed by editing task.

Place a custom program item on the page to set its execution.



### [Property]

Available property of the custom program item is listed below.

Property name	Default value	Description
Return Value	TAG00	Select TAG to store the return value of a program. If the program ended with an error, -1 is stored.
Program		Select a program from the list to execute.
Argument	Fixed Value	Select a string for argument of the program. Select from "Fixed Value" or STAG number.
Fixed Value		This is displayed when argument is "Fixed Value". Specify the fixed value to be used for argument.
Next step	Down	Specify the direction of the task to be executed as a next step when the program ends properly. If the process goes outside of the cell, the first command (0, 0) is processed.
Call failed	Right	Specify the direction of the task to be executed as a next step when no program exists and calling fails. If the process goes outside of the cell, the first command (0, 0) is processed.

# Appendix

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This section describes the specification and an additional information of the product.

# 1.CONPROSYS Linux Spec

Item		Version
Kernel		3.2.0
Distribution	CONPROSYS original	-
Software / Library	busybox	1.22.1
	glibc	2.19
	zlib	1.2.8
	libxml2	2.9.2
	openssl	1.0.1i
	apache	2.4
	php	5.6
	curl	7.40

# Customer Support and Inquiry

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

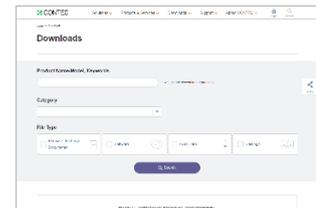
# 1.Services

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 2019	The First Edition

- For product information: Contact your retailer if you have any technical questions about a CONTEC product or need its price, delivery time, or estimate information.
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