

*Extended-UART*

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**COSEL**

PCA Series  
Extended-UART Manual

## PCA series ---Extended-UART---

	Page
<b>1. Overview</b>	<b>1</b>
<b>2. Extended-UART Wiring and Connection</b>	<b>1</b>
2.1 Extended-UART pin function of PCA series	1
2.2 Connection method	2
2.3 Pull-up recommended value	2
2.4 Address setting	3
<b>3. Communication Specification</b>	<b>4</b>
3.1 Communication specification	4
<b>4. Communication Protocol</b>	<b>5</b>
4.1 Overview	5
4.2 Communication frames and packets	5
4.3 Structure of data bit	6
4.4 Check sum	6
4.5 Data format of command packet	7
4.6 Data format of reply packet	8
4.7 Reply packet in case of communication error	8
<b>5. Hardware Specification of Extended UART</b>	<b>9</b>
5.1 Absolute maximum ratings for communication terminals	9
5.2 Electrical characteristics of communication terminals	9
5.3 Wiring length	9
5.4 Electrical characteristics of communication signal	10
<b>6. Command specification of Extended-UART</b>	<b>11</b>
6.1 Command list supported by Extended-UART	11
6.2 Monitor command	13
6.3 Set command	15
6.4 Control command	17
6.5 System command	18
6.6 Read command	19
<b>A. Revision history</b>	<b>A-1</b>

Note: The contents described in this document are those available at the time of publication and are subject to change without prior notice due to product improvement and corresponding changes in the specifications. Please check the homepage of COSEL for the latest version.

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## 1. Overview

Extended-UART is a communication protocol that enables single-wire and bi-directional communications among multiple machines using a software instead of the general-purpose communication standard UART.

With this product, monitoring of the operational status of the power supply and changing of various set values are possible using the Extended-UART.

In addition, the non-volatilization memory in PCA can maintain various set values and information even if input voltage is shut off.

The communication system consists of a master and slaves.

At most, four slaves (this product) can be connected to one master (a UART module prepared by the customer, etc.).

Communication partner is specified by the "address" set for each slave.

## 2. Extended-UART Wiring and Connection

### 2.1 Extended-UART pin function of PCA series

Tables 2.1 and 2.2 show the pin names and functions of this product, related to the Extended-UART.

Table 2.1 CN1, CN2 Extended-UART related pin function

Pin number	Pin name	Function
7	INFO	Extended UART signal
10	SGND	Signal ground

\* Each terminal of CN1 and CN2 are connected inside PCA series.

Table 2.2 CN4 Extended-UART related pin function

Pin number	Pin name	Function
5	ADDR0	Address bit 0
6	ADDR1	Address bit 1
7	ADDR2	Address bit 2
8	SGND	Signal ground

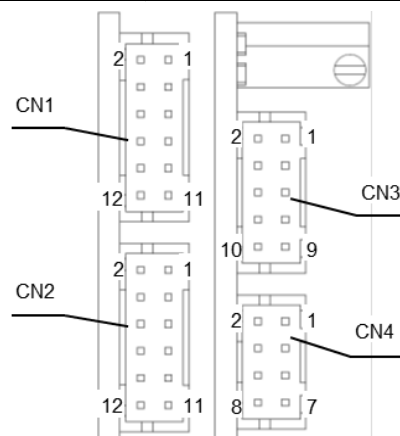
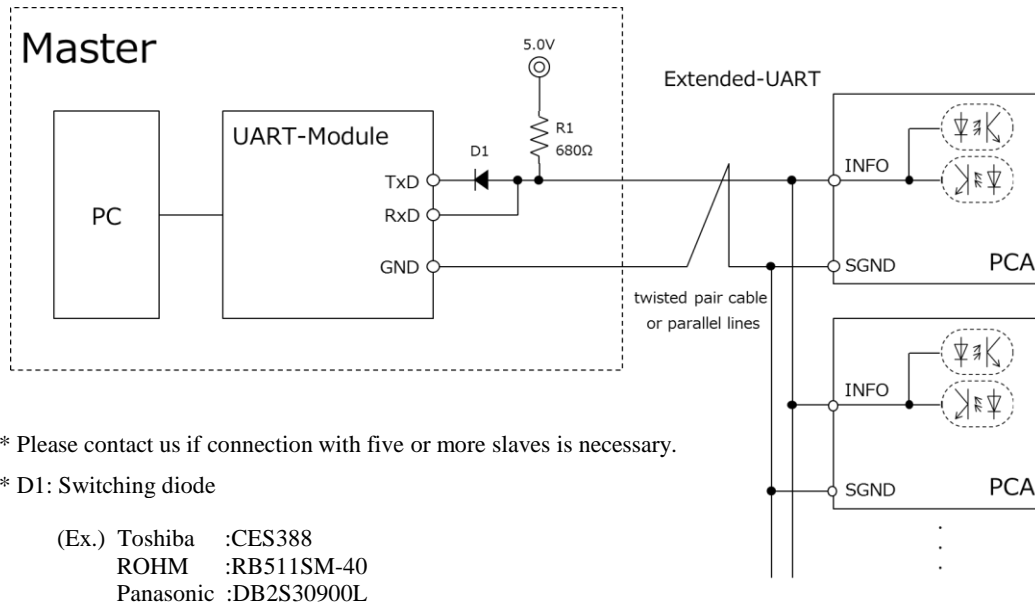


Figure 2.1 PCA600F connector

## 2.2 Connection method

Figure 2.2 shows an example of connection using the Extended-UART.



\* D1 is irrelevant if TxD uses an open collector UART module .  
 Please connect TxD and RxD directly.

\* Depending on the type of UART module, the internal impedance may be high and the Low level may not satisfy the specification directly.

Operation confirmed UART module

UB232R(FTDI Chip)

AE-UM232R (AKIZUKI DENSHI TSUSHO)

Figure 2.2 Example of Extended-UART connection

## 2.3 Pull-up recommended value

A pull-up resistor must be connected to the communication line.

Table 2.3 shows recommended values of pull-up voltage and pull-up resistor.

Table 2.3 Pull-up recommended value

No.	Item	Unit	Value	Remark
1	Pull-up voltage	V	5	4.6~5.4
2	Pull-up resistance	Ω	680	±10%

## 2.4 Address setting

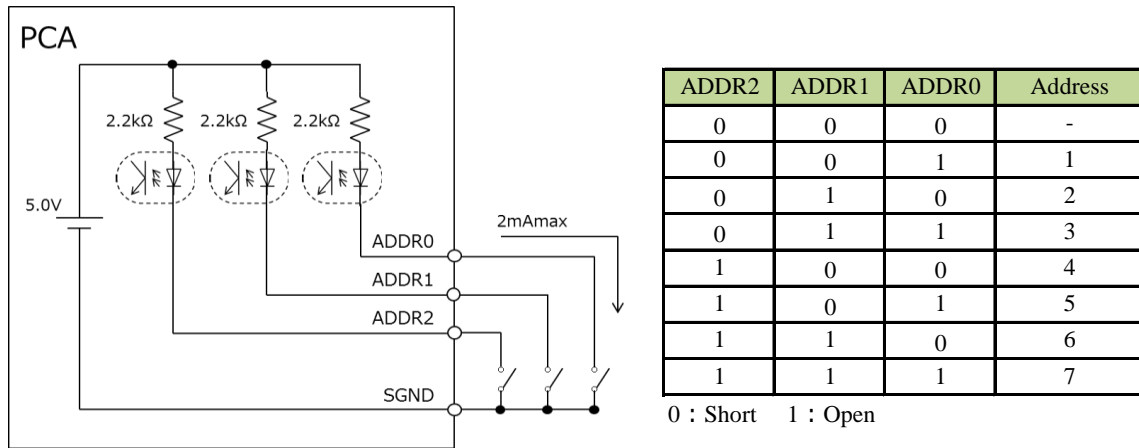


Figure 2.3 Method of address setting

The address can be set to be one of the seven types from "1" to "7" ("0" can not be used).

The address can be set by selecting the connection between the address setting pins (ADDR0, ADDR1, ADDR2) and the signal ground (SGND).

### 3. Communication Specification

#### 3.1 Communication specification

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Table 3.1 shows the communication specifications of this product.  
 The master (UART module) prepared by customer should be set up according to Table 3.1.

Table 3.1 Communication specifications

No.	Item	Specification	
1	Communication method	Single-wire half-duplex	
2	Synchronization scheme	Start-stop synchronization	
3	Connection configuration	1 : N (Master : Slave)	
4	Maximum number of connections	4	
5	Communication speed	2400 bps	
6	Flow control	None	
7	Data format	Data length	8 bits
8		Stop bit	1 bit
9		Parity	1 bit, Even parity
10		Transfer direction	LSB first

## 4. Communication Protocol

### 4.1 Overview

The communication operation in the Extended-UART starts when the master transmits an command packet to a slave, and ends when the corresponding slave (this product) transmits a reply packet to the master.

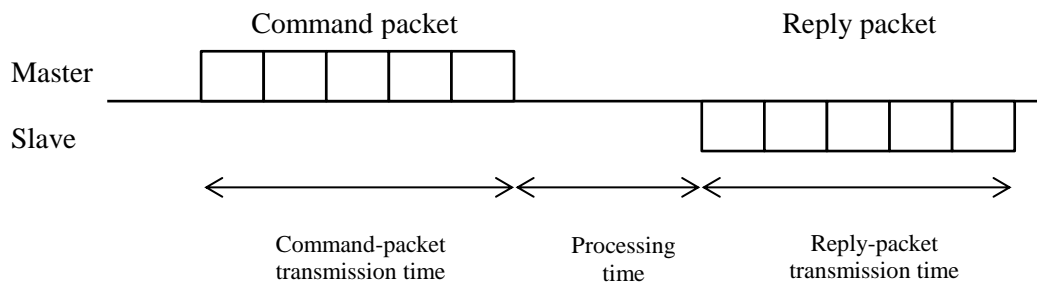


Figure 4.1 Overview of communication operation

Command-packet transmission time	: The transmission time should be within 250 msec. If the transmission time exceeds 250 msec, the slave fails with a timeout error and enters into the receipt wait-state.
Processing time	: Maximum 150 msec
Reply-packet transmission time	: Maximum 25 msec

If the address contained in the received command packet matches its own address, the slave sends a reply-packet, but if it does not match, it will not send anything.

### 4.2 Communication frames and packets

Both the command packet and the reply packet are composed of five frames. Each communication frame has a total of 11 bits, consisting of a start bit, data bits (8 bits), a parity bit, and a stop bit (see Figure 4.2).

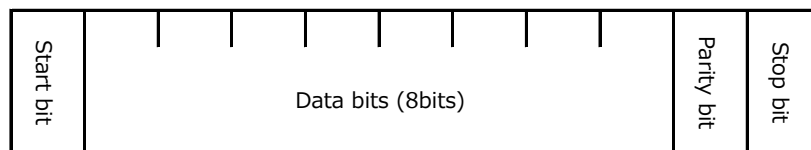


Figure 4.2 Structure of communication frame

### 4.3 Structure of data bit

For all communication frames, the upper three bits contain the address and the lower five bits contain data.

The robustness of the communication data is maintained by the specification that all communication frames have the address information.

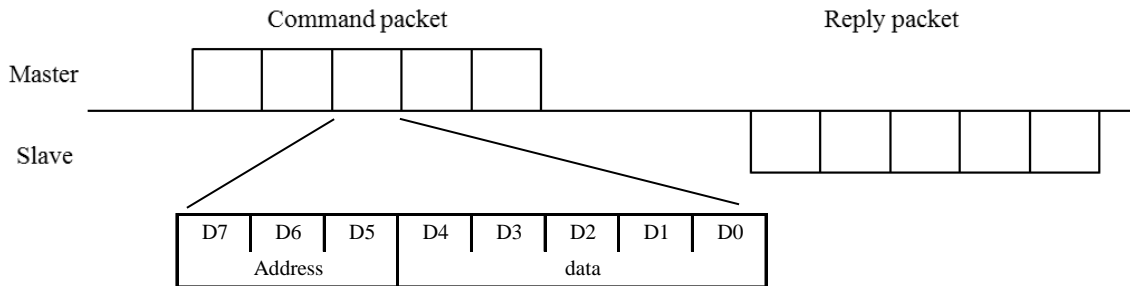


Figure 4.3 Structure of data bit

**【Example of address setting】**

When communicating with the slave at address "6"



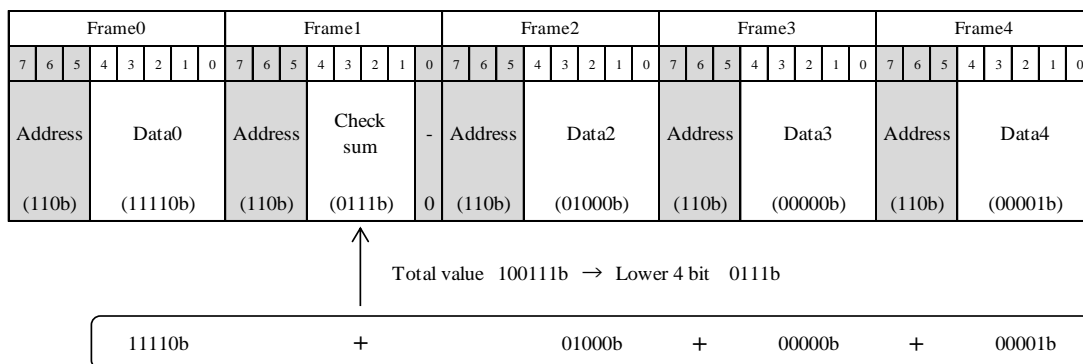
Figure 4.4 Example of address setting

### 4.4 Check sum

Both a command packet and a reply packet have a checksum for detecting communication errors.

The data parts of the communication frames 0, 2, 3, 4 excluding the addresses are summed up and the lower 4 bits of the result is stored in the 1-4 bits of the communication frame 1.

The checksum configuration is shown in Figure 4.5.



\* An example is shown in ( ).

Figure 4.5 Structure of checksum



#### 4.5 Data format of command packet

The command in the Extended-UART command packet has a variable length format shown in Table 4.1.

Table 4.1 Command types

No.	Type	Argument length	Remark
1	5-bit command	16 bits	The command can send numerical value from 0 to 65535 to a slave.
2	10-bit command	10 bits	The command can send numerical value from 0 to 1023 to a slave.
3	20-bit command	None	The command can't send numerical value.

##### (1) Format of 5-bit command

Assign a 5-bit command to the data part of communication frame 0.

The 16-bit argument is assigned as follows: The first bit is assigned to 0 bit of communication frame 1 and the remaining 15 bits are divided into three with 5 bits and each assigned to the data part of communication frame 2,3,4.

Figure 4.6 shows the format for a 5-bit command.

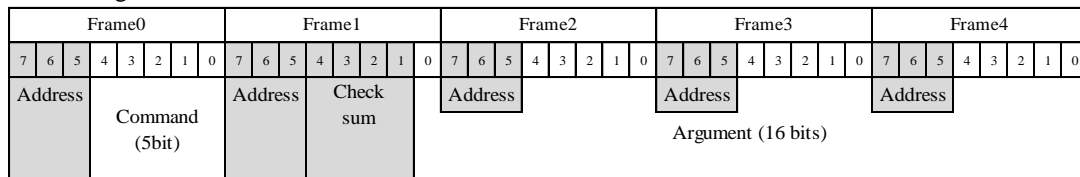


Figure 4.6 Data format of 5-bit command

##### (2) Format of 10-bit command

A 10-bit command is divided into two with 5 bits and they are assigned to the data part of communication frames 0 and 2.

A 10-bit argument is divided into two with 5 bits and they are assigned to the data part of communication frames 3 and 4.

Figure 4.7 shows the format for a 10-bit command.

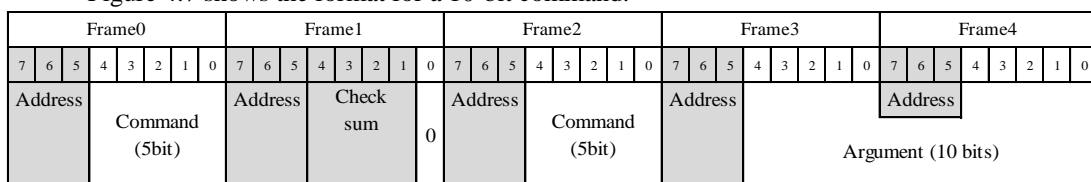


Figure 4.7 Data format of 10-bit command

Specify "0" for bit 0 of communication frame 1.

##### (3) 20-bit command

A 20-bit command is divided into four with 5 bits and they are assigned to the data parts of communication frames 0, 2, 3, and 4. There is no argument.

Figure 4.8 shows the format for a 20-bit command.

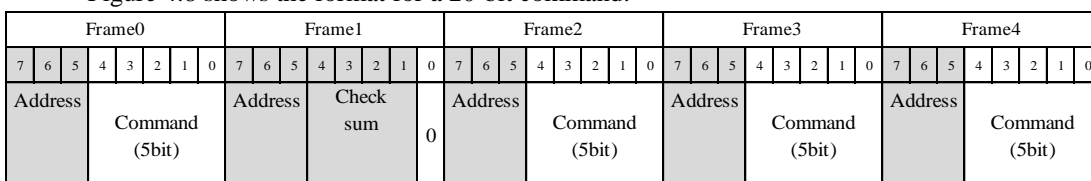


Figure 4.8 Data format of 20-bit command

Specify "0" for bit 0 of communication frame 1.

#### 4.6 Data format of reply packet

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An Extended-UART reply packet consists of the address information, identifier information, checksum, and return value.

The format of the reply packet is shown in Figure 4.9.

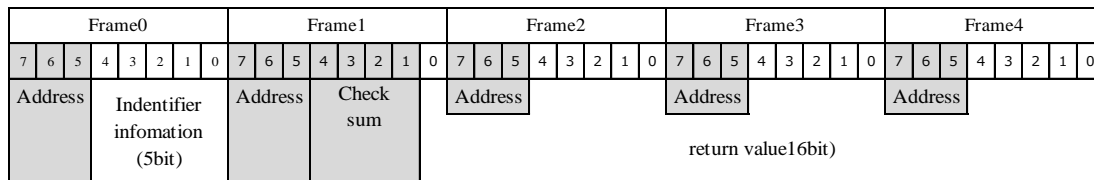


Figure 4.9 Data format of reply packet

Identifier information: If normal communication is performed, the command value contained in the communication frame 0 of the corresponding command packet is returned.

#### 4.7 Reply packet in case of communication error

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(1) Hardware error

If the following hardware error occurs, a reply packet is not sent.

because the slave cannot recognize command packet.

- 1) Parity error
- 2) Frame error
- 3) Timeout (see Section 4.1)

(2) Software error

If there is an error in the command packet sent from the master, a reply packet indicating an error is sent.

Identifier information: 11111(5bit)

Return value : Error code shown in Table 4.2

Table 4.2 Error codes

No.	Error code	Error description	Remark
1	0	No corresponding command	
2	1	Argument outside setting range	
3	256	Checksum mismatch	

## 5. Hardware Specification of Extended UART

### 5.1 Absolute maximum ratings for communication terminals

Table 5.1 shows the absolute maximum ratings of the Extended-UART terminals.

Table 5.1 Absolute maximum ratings

Terminal	Item	Min	Max	Unit	Remark
INFO - SGND	Applied voltage	-0.3	5.5	V	

### 5.2 Electrical characteristics of communication terminals

Table 5.2 shows the electrical characteristics of the Extended-UART terminals.

Table 5.2 Electrical characteristics

Terminal	Item	Measurement condition	Min	Max	Unit	Remark	
INFO - SGND	Signal output	High level output-voltage	open (No output)				
		High level output-current	open (No output)				
		Low level output-voltage	Pull-up voltage 5.0V	-	1.0	V	
		Low level output-current	Pull-up resistance 470Ω	-	-12.0	mA	
	Signal input	High level input-voltage	Pull-up voltage 5.0V	3.0	-	V	
		High level input-current	Pull-up resistance 470Ω	1.5	-	mA	
		Low level input-voltage	Pull-up voltage 5.0V	-	0.8	V	
		Low level input-current	Pull-up resistance 470Ω	-	0.5	mA	

The communication function terminals (INFO/SGND) are isolated from the various function terminals (except MS/ADDR), and input, output, FG, and AUX terminals.

### 5.3 Wiring length

Table 5.3 shows the allowable wiring length for connecting the Extended-UART terminal and the master device.

Table 5.3 Allowable wire length

Terminal	Item	Min	Max	Unit	Remark
INFO/ SGND	Connection wiring length	-	20	m	

Use low inductance wiring such as twisted pair wire or parallel wire.

Because the communication signal may be delayed due to the parasitic capacitance and parasitic inductance depending on the wiring type, confirm that the delay is less than the rise and fall times shown in Section 5.4.

## 5.4 Electrical characteristics of communication signal

Table 5.4 shows the communication speed (baud rate) characteristics in the Extended-UART.

The allowable rise and fall times in the input signal (signal from master to slave) is shown in Table 5.5, and the rise and fall times in the output signal (signal from slave to master) is shown in Table 5.6.

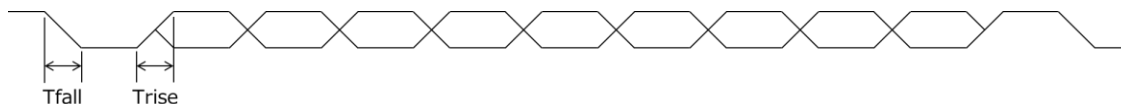


Figure 5.1 Communication waveform

Table 5.4 Specification of communication speed (baud rate)

Item	typ	Tolerance	Unit	Remark
Communication speed (baud rate)	2400	±2%	bps	

Table 5.5 Specification of input signal

Terminal	Item	Min	Max	Unit	Remark
INFO - SGND	Trise	-	150	us	Time corresponding to change from 5% to 95%
	Tfall	-	150	us	Time corresponding to change from 95% to 5%

In the case of signal input exceeding the allowable time, communication error may occur.

Table 5.6 Specification of output signal

Terminal	Item	Min	Max	Unit	Remark
INFO - SGND	Trise	-	150	us	Time corresponding to change from 5% to 95%
	Tfall	-	150	us	Time corresponding to change from 95% to 5%

## 6. Command specification of Extended-UART

### 6.1 Command list supported by Extended-UART

A list of commands supported by Extended-UART is shown below.

#### 6.1.1 Monitor command

The command to monitor PCA operation status.

Table 6.1 Monitor command

No.	Extended-UART command	Code [Hexadecimal]					Command type
1	MON_VIN	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA00000 [00]	AAA00001 [01]	20-bit
2	MON_VOUT	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA00001 [01]	AAA00000 [00]	20-bit
3	MON_IOUT	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA00101 [05]	AAA00000 [00]	20-bit
4	MON_FAN_SPEED	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA01100 [0C]	AAA00000 [00]	20-bit
5	TOTAL_INPUT_TIME_1	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA10000 [10]	AAA00000 [00]	20-bit
6	TOTAL_INPUT_TIME_2	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA10000 [10]	AAA00001 [01]	20-bit
7	TOTAL_OUTPUT_TIME_1	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA10001 [11]	AAA00000 [00]	20-bit
8	TOTAL_OUTPUT_TIME_2	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA10001 [11]	AAA00001 [01]	20-bit

\* A: Address bit C: Checksum bit D: Data bit

#### 6.1.2 Set command

The command to change PCA operation setting value.

Table 6.2 Set command

No.	Extended-UART command	Code [Hexadecimal]					Command type
1	SET_VOUT	AAA01010 [0A]	AAACCCCD	AAADDDDD [0A]	AAADDDDD [0A]	AAADDDDD [0A]	5-bit
2	SET_VOUT_FACTORY_SETTING	AAA11110 [1E]	AAACCCCO	AAA01001 [09]	AAA01011 [0B]	AAA11111 [1F]	20-bit
3	SET_CC	AAA01100 [0C]	AAACCCCD	AAADDDDD [0C]	AAADDDDD [0C]	AAADDDDD [0C]	5-bit
4	SET_CC_FACTORY_SETTING	AAA11110 [1E]	AAACCCCO	AAA01001 [09]	AAA01010 [0A]	AAA11111 [1F]	20-bit
5	SET_CC_MODE_ITRM	AAA11110 [1E]	AAACCCCO	AAA01001 [09]	AAA01010 [0A]	AAA00000 [00]	20-bit
6	SET_CC_MODE_INFO	AAA11110 [1E]	AAACCCCO	AAA01001 [09]	AAA01010 [0A]	AAA00001 [01]	20-bit

\* A: Address bit C: Checksum bit D: Data bit

### 6.1.3 Control command

The command to change the state of PCA.

Table 6.3 Control command

No.	Extended-UART command	Code [Hexadecimal]					Command type
1	CTL_REMOTE_ON	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA11100 [1C]	AAA00000 [00]	20-bit
2	CTL_REMOTE_OFF	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA11100 [1C]	AAA00001 [01]	20-bit
3	CTL_RESET_LATCH	AAA11110 [1E]	AAACCCCO	AAA01000 [08]	AAA11110 [1E]	AAA11111 [1F]	20-bit

\* A: Address bit C: Checksum bit D: Data bit

### 6.1.4 System command

The command to write the set value changed by the Set command into the nonvolatile memory of PCA or to initialize the record.

The setting recorded in the nonvolatile memory is retained even if the input voltage is shut off.

Table 6.4 System command

No.	Extended-UART command	Code [Hexadecimal]					Command type
1	SYS_RESTORE_FACTORY_SETTING	AAA11110 [1E]	AAACCCCO	AAA01001 [09]	AAA00001 [01]	AAA11111 [1F]	20-bit
2	SYS_STORE_USER_SETTING	AAA11110 [1E]	AAACCCCO	AAA01001 [09]	AAA00000 [00]	AAA10000 [10]	20-bit

\* A: Address bit C: Checksum bit D: Data bit

### 6.1.5 Read command

The command to readout a set value of PCA operation.

Table 6.5 Read command

No.	Extended-UART command	Code [Hexadecimal]					Command type
1	READ_VOUT_REFERENCE	AAA11110 [1E]	AAACCCCO	AAA01001 [09]	AAA11011 [1B]	AAA00000 [00]	20-bit
2	READ_CC_REFERENCE	AAA11110 [1E]	AAACCCCO	AAA01001 [09]	AAA11010 [1A]	AAA00000 [00]	20-bit

\* A: Address bit C: Checksum bit D: Data bit

The function and setting method for each command are explained below.

## 6.2 Monitor command

### 6.2.1 MON\_VIN [1E] [08] [00] [01]

Returns the effective value of the current input voltage (AC).

The return value divided by 100 is the input voltage [V].

Readout range	0 ~ 264V
Readout accuracy	±3%FS (Rated AC200V)
Examples of return value	Return value: 24010 => AC240.10 V Return value: 10100 => AC101.00 V

### 6.2.2 MON\_VOUT [1E] [08] [01] [00]

Returns the current output voltage.

The return value divided by 1000 is the output voltage [V].

Model	5V	12V	15V	24V
Readout range	0 ~ 6.0	0 ~ 14.4	0 ~ 18.0	0 ~ 28.8
Readout accuracy	±2%FS			
Examples of return value	Return value: 5010 => 5.010 V Return value: 24200 => 24.200 V			

### 6.2.3 MON\_IOUT [1E] [08] [05] [00]

Return the current output current.

The return value divided by 100 is the output current [A].

Model	5V	12V	15V	24V
Readout range	0 ~ 120A	0 ~ 53A	0 ~ 42A	0 ~ 27A
Readout accuracy	±5%FS			
Examples of return value	Return value: 11550 => 115.50 A Return value: 1350 => 13.50 A			

### 6.2.4 MON\_FAN\_SPEED [1E] [08] [0C] [00]

Read the current the rotation speed of the fan.

The return value is the rotation speed of the fan [rpm].

Readout range	0 ~ 20000 rpm
Readout accuracy	±500 rpm
Examples of return value	Return value: 12100 => 12100 RPM Return value: 5900 => 5900 RPM

## 6.2.5 TOTAL\_INPUT\_TIME

Returns the cumulative length of the time during which input voltage is applied up to the present, recorded in the nonvolatile memory of PCA.

The return value of TOTAL\_INPUT\_TIME\_1 represents "minutes" and that of TOTAL\_INPUT\_TIME\_2 represents "hours".

After 60 minutes, TOTAL\_INPUT\_TIME\_1 becomes 0 and TOTAL\_INPUT\_TIME\_2 increases by 1.

### TOTAL\_INPUT\_TIME\_1 [1E] [08] [10] [00]

Readout range	0 ~ 59 minutes
Accuracy	±2% Total_Time
Example of return value	Return value: 57 => 57 minutes

### TOTAL\_INPUT\_TIME\_2 [1E] [08] [10] [01]

Readout range	0 ~ 65535 hours
Accuracy	±2% Total_Time
Example of return value	Return value: 550 => 550 hours

\* The accuracy corresponds to the cumulative time for applied input-voltage represented by TOTAL\_INPUT\_TIME\_1 and TOTAL\_INPUT\_TIME\_2.

\* Information sent less than 1 minute before input cutoff may not be recorded.

## 6.2.6 TOTAL\_OUTPUT\_TIME

Returns the cumulative output time up to the present, recorded in the nonvolatile memory of PCA.

The return value of TOTAL\_OUTPUT\_TIME\_1 represents "minutes", and that of TOTAL\_OUTPUT\_TIME\_2 represents "hours".

After 60 minutes, TOTAL\_OUTPUT\_TIME\_1 becomes 0 and TOTAL\_OUTPUT\_TIME\_2 increases by 1.

### TOTAL\_OUTPUT\_TIME\_1 [1E] [08] [11] [00]

Readout range	0 ~ 59 minutes
Accuracy	±2% Total_Time
Example of return value	Return value: 57 => 57 minutes

### TOTAL\_OUTPUT\_TIME\_2 [1E] [08] [11] [01]

Readout range	0 ~ 65535 hours
Accuracy	±2% Total_Time
Example of return value	Return value: 550 => 550 hours

\* The accuracy corresponds to the cumulative time for applied output-voltage represented by TOTAL\_OUTPUT\_TIME\_1 and TOTAL\_OUTPUT\_TIME\_2.

\* Information sent less than 1 minute before input cutoff may not be recorded.



## 6.3 Set command

### 6.3.1 SET\_VOUT [0A]

Sets the output voltage.

The output voltage is set to be the argument divided by 1000 [V].

When the output-voltage setting function by VTRM-pin voltage is enabled, the setting by this command is neglected.

Model	5V	12V	15V	24V
Specified range	0 ~ 6.0	0 ~ 14.4	0 ~ 18.0	0 ~ 28.8
Specified accuracy	±1%FS			
Examples of argument	Argument: 5010 => 5.010 V			
	Argument: 24200 => 24.200 V			

Regardless of whether the output voltage has been adjusted by a volume before command execution or not, it is replaced by the voltage set by this command.

The output voltage can be adjusted with volume even after this command is executed.

When the input voltage is cut off, the setting by this command will be reset and only the volume adjustment will be reflected.

Table 6.6 "SET\_VOUT" Operation example (PCA600F-12)

Operation	PCA Output	
1 Input voltage on	12.0V	
2 Adjust output voltage to 12.3V by volume	12.3V	(adjustment value by volume +0.3V)
3 Send "SET_VOUT"&"10000"	10.0V	
4 Adjust output voltage to 10.2V by volume	10.2V	(adjustment value by volume +0.2V)
5 Input voltage off	0V	
6 Input voltage on	12.5V	(adjustment value by volume 0.3+0.2=+0.3V)

### 6.3.2 SET\_VOUT\_FACTORY\_SETTING [1E] [09] [0B] [1F]

Return the output voltage to the factory default setting.

Return value	0
--------------	---

This command cannot reset adjustment by the volume.

Table 6.7 "SET\_VOUT\_FACTORY\_SETTING" Operation example (PCA600F-12)

Operation	PCA Output	
1 Input voltage on	12.0V	
2 Adjust output voltage to 12.3V by volume	12.3V	(adjustment value by volume +0.3V)
3 Send "SET_VOUT" "10000"	10.0V	
4 Adjust output voltage to 10.2V by volume	10.2V	(adjustment value by volume +0.2V)
5 Send "SET_VOUT_FACTORY_SETTING"	12.5V	(adjustment value by volume 0.3+0.2=+0.3V)

The set value of the output voltage, recorded in the nonvolatile memory, cannot be reset with the command SYS\_STORE\_USER\_SETTING.

Table 6.8 "SET\_VOUT\_FACTORY\_SETTING" Operation example (PCA600F-12)

Operation	PCA Output
1 Input voltage on	12.0V
2 Send "SET_VOUT"&"10000"	10.0V
3 Send "SYS_STORE_USER_SETTING"	10.0V
4 Send "SET_VOUT_FACTORY_SETTING"	12.0V
5 Input voltage off	0V
6 Input voltage on	10.0V

### 6.3.3 SET\_CC [0C]

Set the output current to start constant current operation.

Constant current operation is performed with the current value [A] given by the argument divided by 100.

Model	5V	12V	15V	24V
Specified range	0 ~ 120A	0 ~ 53A	0 ~ 42A	0 ~ 27A
Specified accuracy	±5%FS			
Examples of argument	Argument: 11550 => 115.50 A Argument: 1350 => 13.50 A			

In the factory default setting, the value is set to be chosen corresponding to the constant current operation in the voltage applied to the ITRM terminal.

By sending command SET\_CC\_MODE\_INFO, the setting value of this command becomes effective.

Therefore, by simply sending this command, the amount of the constant current specified by the argument is neglected.

Table 6.9 "SET\_CC" Operation example (PCA600F-12)

Operation	PCA Output
1 Input voltage on	12.0V
2 Send "SET_CC_MODE_INFO"	12.0V
3 Send "SET_CC"&"4000"	40A_CC max12.0V

\*CC: Constant current mode

Table 6.10 "SET\_CC" Operation example 2 (PCA600F-12)

Operation	PCA Output
1 Input voltage on	12.0V
2 Send "SET_CC"&"4000"	12.0V
3 Send "SET_CC_MODE_INFO"	40A_CC max12.0V

### 6.3.4 SET\_CC\_FACTORY\_SETTING [1E] [09] [0A] [1F]

Restore the constant current operation setting to the factory default status.

Return value	0
--------------	---

Table 6.11 "SET\_CC\_FACTORY\_SETTING" Operation example (PCA600F-12)

Operation	PCA Output
1 Input voltage on	12.0V
2 Send "SET_CC_MODE_INFO"	12.0V
3 Send "SET_CC"&"4000"	40A_CC max12.0V
4 Send "SET_CC_FACTORY_SETTING"	12.0V

The value of constant current operation recorded in the nonvolatile memory with the command SYS\_STORE\_USER\_SETTING is not reset.

Table 6.12 "SET\_CC\_FACTORY\_SETTING" Operation example 2 (PCA600F-12)

Operation	PCA Output
1 Input voltage on	12.0V
2 Send "SET_CC_MODE_INFO"	12.0V
3 Send "SET_CC"&"4000"	40A_CC max12.0V
4 Send "SYS_STORE_USER_SETTING"	40A_CC max12.0V
5 Send "SET_CC_FACTORY_SETTING"	12.0V
6 Input voltage off	0V
7 Input voltage on	40A_CC max12.0V

### 6.3.5 SET\_CC\_MODE\_ITRM [1E] [09] [0A] [00]

Reflect the setting by the ITRM terminal voltage as the control value of the constant current operation.  
 This mode is the factory default setting.

Return value	0
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### 6.3.6 SET\_CC\_MODE\_INFO [1E] [09] [0A] [01]

Make the assignment of the setting by the command SET\_CC effective as the control parameter for the constant current operation.

Return value	1
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## 6.4 Control command

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### 6.4.1 CTL\_REMOTE\_ON [1E] [08] [1C] [00]

Turn ON and OFF of output voltage (remote control function).  
 With this command, the output voltage turns ON.  
 The output voltage is not turned ON when it is set to OFF by the RC terminal.

Return value	1
--------------	---

### 6.4.2 CTL\_REMOTE\_OFF [1E] [08] [1C] [01]

Turn ON and OFF of output voltage (remote control function).  
 With this command, the output voltage turns OFF.  
 The output voltage turns OFF independent of the setting of the RC terminal.

Return value	0
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### 6.4.3 CTL\_RESET\_LATCH [1E] [08] [1E] [1F]

Release the latch stop of output caused by the overvoltage-protection and overheat-protection functions.  
 Should be released only after removal of the abnormal status.

Return value	0
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## 6.5 System command

### 6.5.1 **SYS\_RESTORE\_FACTORY\_SETTING** [1E] [09] [01] [1F]

Restore the values and settings recorded in the nonvolatile memory of PCA to the initial state (factory shipping state) with the command **SYS\_STORE\_USER\_SETTING**.

Return value	0
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Even if this command is sent, items and settings will not return to the initial state while PCA is running. The initial state is recovered by cutting off the input voltage and restarting, after sending this command.

Table 6.13 "SYS\_RESTORE\_FACTORY\_SETTING" Operation example (PCA600F-12)

Operation	PCA Output
1 Input voltage on	12.0V
2 Send "SET_VOUT"&"10000"	10.0V
3 Send "SYS_STORE_USER_SETTING"	10.0V
4 Input voltage off	0V
5 Input voltage on	10.0V
6 Send "SYS_RESTORE_FACTORY_SETTING"	10.0V
7 Input voltage off	0V
8 Input voltage on	12.0V

\* Do not shut off the input for 5 seconds after sending this command. Otherwise, recording in nonvolatile memory may not be executed.

### 6.5.2 **SYS\_STORE\_USER\_SETTING** [1E] [09] [00] [10]

The values and settings set by the communication function are recorded in the nonvolatile memory of PCA. Values and settings remain effective even after the input voltage is cut off and reapplied.

Return value	1
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Multiple items are recorded at the same time.  
 However, the value set after sending this command is not recorded.

Table 6.14 "SYS\_STORE\_USER\_SETTING" Operation example (PCA600F-12)

Operation	PCA Output
1 Input voltage on	12.0V
2 Send "SET_VOUT"&"10000"	10.0V
3 Send "SET_CC_MODE_INFO"	10.0V
4 Send "SET_CC"&"4000"	40A_CC max10.0V
5 Send "SYS_STORE_USER_SETTING"	40A_CC max10.0V
6 Send "SET_CC"&"2000"	20A_CC max10.0V
7 Input voltage off	0V
8 Input voltage on	40A_CC max10.0V

\* Do not shut off the input for 5 seconds after sending this command. Otherwise, recording in nonvolatile memory may not be executed.

## 6.6 Read command

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### 6.6.1 READ\_VOUT\_REFERENCE [1E] [09] [1B] [00]

Returns the setting of the output voltage.

Model	5V	12V	15V	24V
Readout range	0 ~ 6.0	0 ~ 14.4	0 ~ 18.0	0 ~ 28.8
Examples of return value	Return value: 5010 => 5.010 V Return value: 24200 => 24.200 V			

\* A value different from that set with command SET\_VOUT is returned, when there is some change in the state such as caused by a volume adjustment.

### 6.6.2 READ\_CC\_REFERENCE [1E] [09] [1A] [00]

Returns the set value of the constant current operation.

Model	5V	12V	15V	24V
Readout range	0 ~ 138.0A	0 ~ 61.0A	0 ~ 48.3A	0 ~ 31.1A
Examples of return value	Return value: 11550 => 115.50 A Return value: 1350 => 13.50 A			

\* A value different from that set with command SET\_CC is returned, when there is some change in the state such as caused by activation of the protection function.

**A. Revision history**

No.	Date	Ver	Page	note
1	2017.04.12	1.0E	-	First edition issued
2	2017.05.10	1.1E	2	Correction of errors
3	2017.08.09	1.2E	2	Operation confirmed UART module addition
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