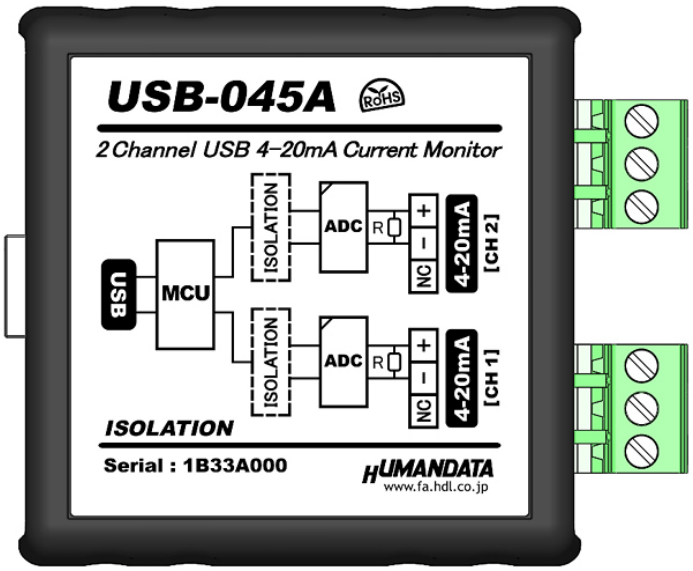
2 Channel USB 4-20mA Current Monitor

USB-045A

User's Manual
Ver. 1.0



HuMANDATA LTD.

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Precautions

Do Not	1	This product uses ordinary off-the-shelf electronic components, and is therefore inappropriate for use in applications that require special quality or reliability and are expected to protect human lives or prevent accidents, such as safety mechanisms in fields including space, aeronautics, medicine, and nuclear power.
	2	Do not be used underwater or in high-humidity environments.
	3	Do not be used in the presence of corrosive gases, combustible gases, or other flammable gases.
	4	Do not turn on power when circuit board surface is in contact with other metal.
	5	Do not apply voltage higher than rated voltage.

Attention	6	This manual may be revised in the future without notice owing to improvements.
	7	All efforts have been made to produce the best manual possible, but if users notice an error or other problem, we ask that they notify us.
	8	Item 7 notwithstanding, HuMANDATA cannot be held liable for the consequences arising from use of this product.
	9	HuMANDATA cannot be held liable for consequences arising from using this product in a way different from the uses described herein, or from uses not shown herein.
	10	This manual, circuit diagrams, sample circuits, and other content may not be copied, reproduced, or distributed without permission.
	11	If the product emits smoke, catches fire, or becomes unusually hot, cut the power immediately.
	12	Do not install the control cables or communication cables together with the main circuit lines or power cables. In such an environment, it may result in malfunction due to noise.
	13	Be careful of static electricity.

Revision History

Date	Revision	Description
May 19, 2026	v1.0	Initial release

Product packaging

Thank you very much for purchasing the USB-045A. In this package, you will find the following items included. If there are any shortages or issues, please contact us.

- 2 Channel USB 4-20mA Current Monitor USB-045A 1
- USB cable (1.8m) 1

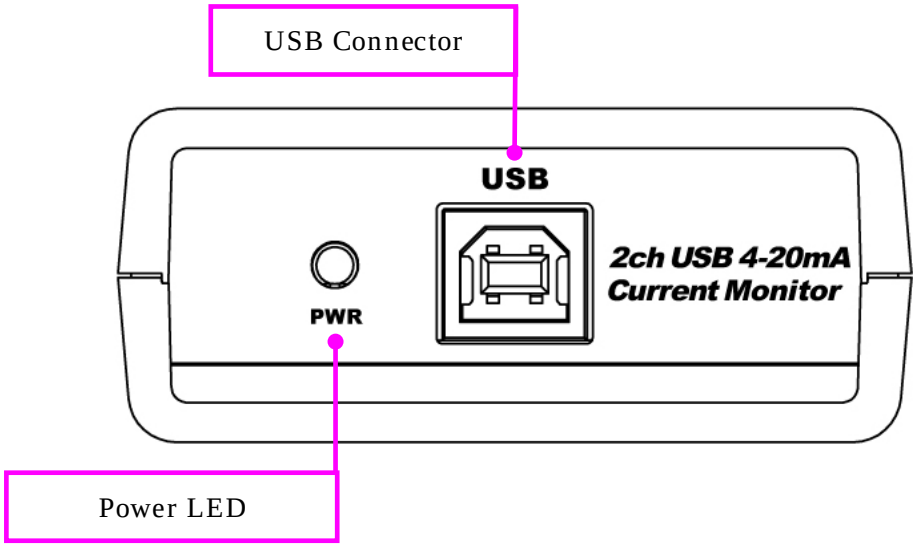
I Introduction

USB-045A is a converter capable of measuring two channels 4-20 mA current. It connects to a computer via USB, allowing measurement results to be displayed and logged. The USB interface and each channel are independently isolated.
In addition, an A/D converter is provided for every two channels, enabling simultaneous measurement of two channels.

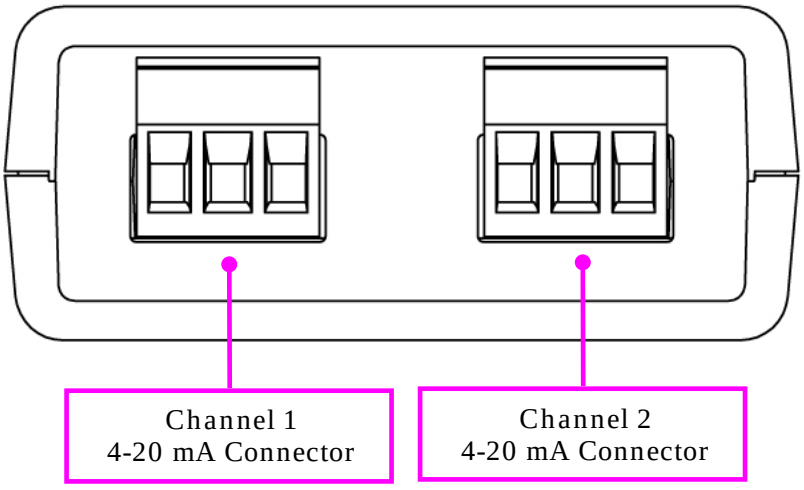
Dedicated control commands are also provided, enabling 4-20 mA measurement from user applications.

1. Overview

USB Host side



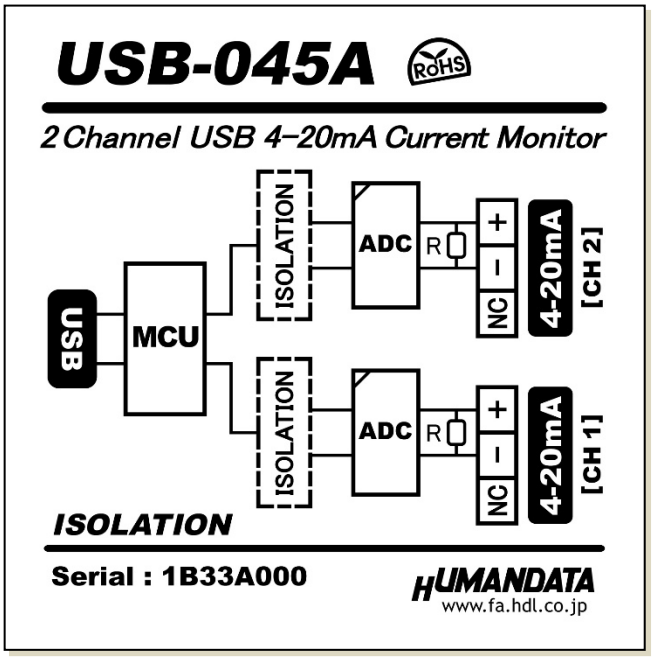
4-20 mA side



1.1. Main Power

USB-045A is powered through a computer's USB port (Bus-powered). When using a USB hub for branching, ensure that a stable power supply is provided to prevent voltage drops. If the voltage is insufficient, stable measurement may not be possible.

1.2. Nameplate



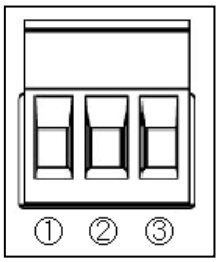
The USB side and each channel are independently isolated.

1.3. 4-20 mA Connector

Do not connect/disconnect while powered.

Pin Assignment	Signal
1	NC
2	Current Terminal (–)
3	Current Terminal (+)

Note: Follow this document over connector manufacturer markings.



Connector: Phoenix Contact 1757022
Supported wire:
AWG24 (0.2 sq) to AWG12 (3.5 sq)

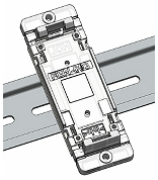
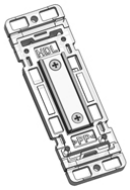
2. Specifications

2.1. Product Specification

Item	Description	Remarks
Model	USB-045A	
Input Power	5 VDC / 350 mA max. Supplied via USB cable	
HOST interface	USB 2.0 compliant (Full-Speed supported) USB-B connector	･USB 1.1 compatible ･ESD protection ±11 KV
4-20 mA Connector	3-pin terminal block × 2	Phoenix Contact Model: 1759020
Measurement Range	0-25 mA	
Number of Channels	2	
Resolution	24-bit A/D Converter (ADC)	
Measurement Accuracy	≤ ±0.25% FS	
Sampling Period	Minimum setting unit: 10 ms	Selectable by command
Shunt Resistor	200 Ω ±0.01%	
Isolation Method	Independent bus isolation	
Isolation Protection	2500 VDC	Designed value
LSI	General-purpose microcontroller 4-20 mA ADC	
LED	Power LED	
Control Method	Communication control via virtual COM port	
Operating Ambient Temp.	-20°C to 60°C (-4°F to 140°F)	No condensation permitted
Operating Ambient Humi.	30% to 85%RH	
Storage Ambient Temp.	-20°C to 60°C (-4°F to 140°F)	
Storage Ambient Humi.	30% to 85%RH	
Noise Immunity	Not specified	
Compliance Standards	Not specified	
Weight	Approx. 90 g	Only main body
Dimensions	67 x 67 x 28 mm (2.638" x 2.638" x 1.102")	Without projections

* There is a case to be changed to the parts of the compatibility.
* Power saving function (suspend, standby, sleep and others) is not supported.

2.2. Optional Accessories

MODEL	Image	Remarks
PEN-003		Attachment with clamping screw JAN：4937920800709
PEN-003-DIN		Attachment for 35mm DIN rail JAN：4937920800716
PEN-003-MG		Attachment with neodymium magnet JAN：4937920801201
TB-USB-3		Detachable 3P Terminal Connector 1757022 (Phoenix Contact) JAN：4937920801263

3. CDC Class Driver Installation Guide

USB-045A uses the CDC (Communication Device Class) driver, which is included in the operating system.

Windows 10 or later:
No driver installation required. Automatically recognized as a "USB Serial Device (COM*)".

* Driver installation is required in the following cases:
- When using Windows 8.1 or earlier
- When using Windows 10 or later, so that the device is recognized by its model name in Device Manager

The device driver and installation manual can be downloaded from the product documentation page. Please refer to Chapter 6, “Additional Documentation and User Support.”

4. Control Command

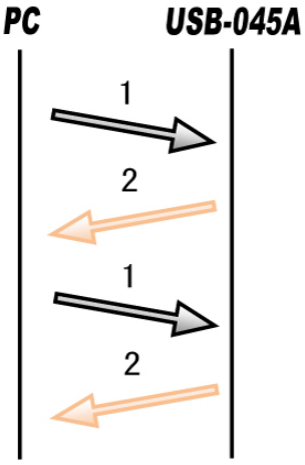
4.1. Overview of Control Commands

By using control commands, you can measure the 4-20 mA current from your own application.
A control command consists of a command character, sequence number, parameter(s), and an end code, separated by commas. Some commands do not require parameters.
The sequence number {SQNO} is an arbitrary string (up to 5 characters).
USB-045A returns the same sequence number in its response, allowing the host to match commands with responses.
ASCII characters are assigned to the control commands, allowing operation to be verified by keyboard input using a terminal application such as Tera Term.
Use uppercase letters for command characters.

Example

	Command {CMD}	Comma { , }	Sequence number {SQNO}	Comma { , }	Parameter {PRAM}	End code <CR>
HEX	43h 52h 44h	2Ch	31h 32h 33h	2Ch	31h 30h 30h	0Dh
ASCII	CRD	,	123	,	100	CR

4.2. Control Sequence



1. The PC sends a command to the USB-045A.
2. USB-045A detects the end code <CR> and returns a response. The PC checks this response to confirm that the command was received correctly. Refer to the command list for response formats.

When sending multiple commands, always wait for the response to the previous command before sending the next one.

If the USB-045A does not respond

The USB-045A may not be powered
- Check the USB cable connection
- Check that the PWR LED is lit

If using a USB hub
- Ensure other USB devices are not consuming too much power
- Try connecting the USB-045A directly to the PC

4.3. Control Command List

No.	Command	Function	Format
1	CST	Connection check	CST,{SQNO}<CR>
2	DR1	Read CH1 current value	DR1,{SQNO}<CR>
3	TM1	Set CH1 sampling period	TM1,{SQNO},{PRAM}<CR>
4	CR1	Continuous read CH1 current value	CR1,{SQNO},{PRAM}<CR>
5	EX1	Stop CH1 continuous read	EX1,{SQNO}<CR>
6	DR2	Read CH2 current value	DR2,{SQNO}<CR>
7	TM2	Set CH2 sampling period	TM2,{SQNO},{PRAM}<CR>
8	CR2	Continuous read CH2 current value	CR2,{SQNO},{PRAM}<CR>
9	EX2	Stop CH2 continuous read	EX2,{SQNO}<CR>
10	DRD	Read CH1 & CH2 current values	DRD,{SQNO}<CR>
11	TMR	Set CH1 & CH2 sampling period	TMR,{SQNO},{PRAM}<CR>
12	CRD	Continuous read CH1 & CH2 current values	CRD,{SQNO},{PRAM}<CR>
13	EXT	Stop CH1 & CH2 continuous read	EXT,{SQNO}<CR>

The commands are explained below.
(The sequence number is fixed at "123".)

1. CST Command (Connection check)

Format		CST,{SQNO}<CR>
Function		This command is used to verify the connection between the PC and the USB-045A. The connection is confirmed by receiving a response.
Example	**Send**	CST,123<CR>
	Response	OK,CST,123<CR>

2. DR1 Command (Read CH1 current value)

Format		DR1,{SQNO}<CR>
Function		Read the CH1 current value and return the A/D value in hexadecimal format. Let the received A/D value converted to decimal be Adec. The current value can be calculated using the following formula. Current [mA] = (Adec × 0.298) / 200,000
Example	**Send**	DR1,123<CR>
	Response	OK,DR1,123,004F12<CR>

3. TM1 Command (Set CH1 sampling period)

Format		TM1,{SQNO},{PRAM}<CR>
Function		Set the sampling period for CH1 continuous current reading. (Sampling period = parameter × 10 ms)
Parameter Range		0-65535 (default: 0) 0: Minimum 1: 10 ms 2: 20 ms … 60000: 10 minutes
Example	**Send**	TM1,123,100<CR> * When set to 1 second
	Response	OK,TM1,123<CR>

4. CR1 Command (Continuous read CH1 current value)

Format		CR1,{SQNO},{PRAM}<CR>
Function		Continuously read the CH1 current value and return the A/D value in hexadecimal format. PRAM: number of measurements If PRAM = 0 → continues until EX1 command is received The measurement count is appended at the end of the response. Let the received A/D value converted to decimal be Adec. The current value can be calculated using the following formula. Current [mA] = (Adec × 0.298) / 200,000
Parameter Range		0-999,999 (default: 0)
Example	**Send**	CR1,123,100<CR> * When 100 count read
	Response	OK,CR1,123<CR> CH1_004F15,1<CR> CH1_004F17,2<CR> CH1_004F18,3<CR> … CH1_004F15,100<CR>

5. EX1 Command (Stop CH1 continuous read)

Format		EX1,{SQNO}<CR>
Function		Stop continuous reading of CH1 current.
Example	**Send**	EX1,123<CR>
	Response	OK,EX1,123<CR>

6. DR2 Command (Read CH2 current value)

(Same as DR1, applied to CH2)

7. TM2 Command (Set CH2 sampling period)

(Same as TM1, applied to CH2)

8. CR2 Command (Continuous read CH2 current value)

(Same as CR1, applied to CH2)

9. EX2 Command (Stop CH2 continuous read)

(Same as EX1, applied to CH2)

10. DRD Command (Read CH1 & CH2 current values)

Format		DRD,{SQNO}<CR>
Function		Read both CH1 and CH2 current value and return the A/D value in hexadecimal format. Let the received A/D value converted to decimal be Adec. The current value can be calculated using the following formula. Current [mA] = (Adec × 0.298) / 200,000
Example	**Send**	DRD,123<CR>
	Response	OK,DRD,123,CH1_004F12,CH2_004F15<CR>

11. TMR Command (Set CH1 & CH2 sampling period)

Format		TMR,{SQNO},{PRAM}<CR>
Function		Set the sampling period for CH1 & CH2 continuous current reading. (Sampling period = parameter × 10 ms)
Parameter Range		0-65535 (default: 0) 0: Minimum 1: 10 ms 2: 20 ms … 60000: 10 minutes
Example	**Send**	TMR,123,100<CR> * When set to 1 second
	Response	OK,TMR,123<CR>

12. CRD Command (Continuous read CH1 & CH2 current values)

Format		CRD,{SQNO},{PRAM}<CR>
Function		Continuously read both CH1 and CH2 current value and return the A/D value in hexadecimal format. PRAM: number of measurements If PRAM = 0 → continues until EXT command is received The measurement count is appended at the end of the response. Let the received A/D value converted to decimal be Adec. The current value can be calculated using the following formula. Current [mA] = (Adec × 0.298) / 200,000
Parameter Range		0-999,999 (default: 0)
Example	**Send**	CRD,123,100<CR> * When 100 count read
	Response	OK,CRD,123<CR> CH1_004F15,CH2_004F18,1<CR> CH1_004F20,CH2_004F19,2<CR> … CH1_004F15,CH2_004F15,100<CR>

13. EXT Command (Stop CH1 & CH2 continuous read)

Format		EXT,{SQNO}<CR>
Function		Stop continuous reading of both CH1 and CH2 current values.
Example	**Send**	EXT,123<CR>
	Response	OK,EXT,123<CR>

4.4. Error Codes

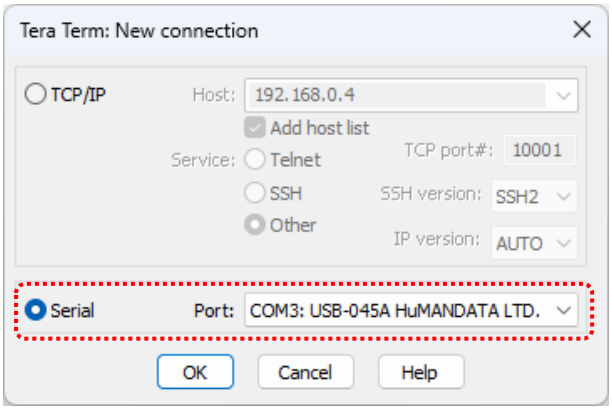
If a control command cannot be processed successfully, an error code is returned.

ER001	**Command error**	Invalid or unsupported command
	Response	ER001<CR>
ER002	**Sequence number error**	SQNO is missing or exceeds 5 characters
	Response	ER002<CR>
ER003	**Parameter setting error**	The parameter is outside the allowed range or the parameter data is missing.
	Response	ER003<CR>
ER004	**Continuous read active**	Stop continuous read before sending a new command
	Response	ER004<CR>

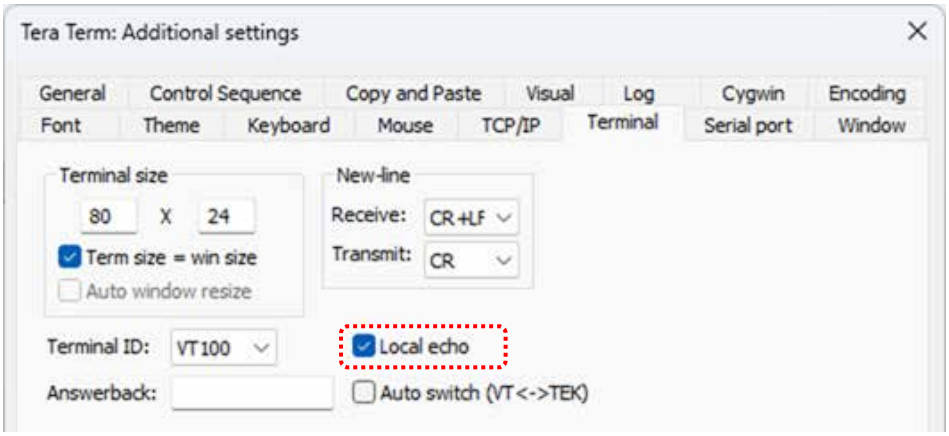
4.5. Example of Command Verification Using Communication Software

The communication software Tera Term is a terminal application for Microsoft Windows that sends characters entered from the keyboard to the connected device and displays the characters returned from the device.

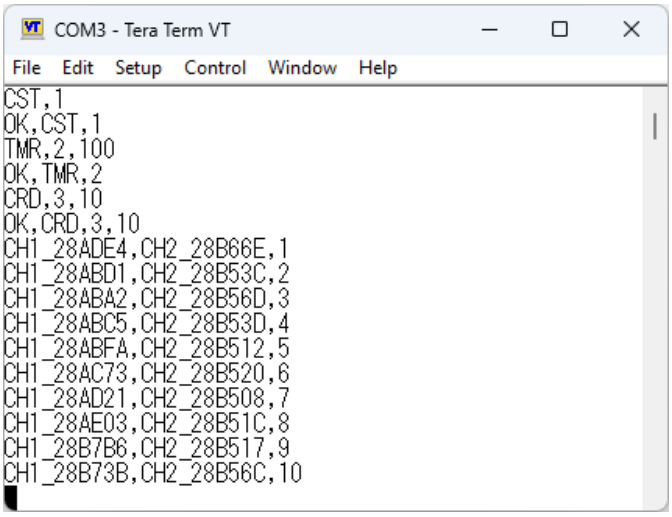
1. Connect the Device
   Connect the USB-045A to the PC. Start Tera Term and select “New connection”
   Select the serial port and click OK.



2. Enable Local Echo
   Open Terminal Setup > Terminal... and check Local echo so that the characters entered from the keyboard are displayed on the screen. Click OK.

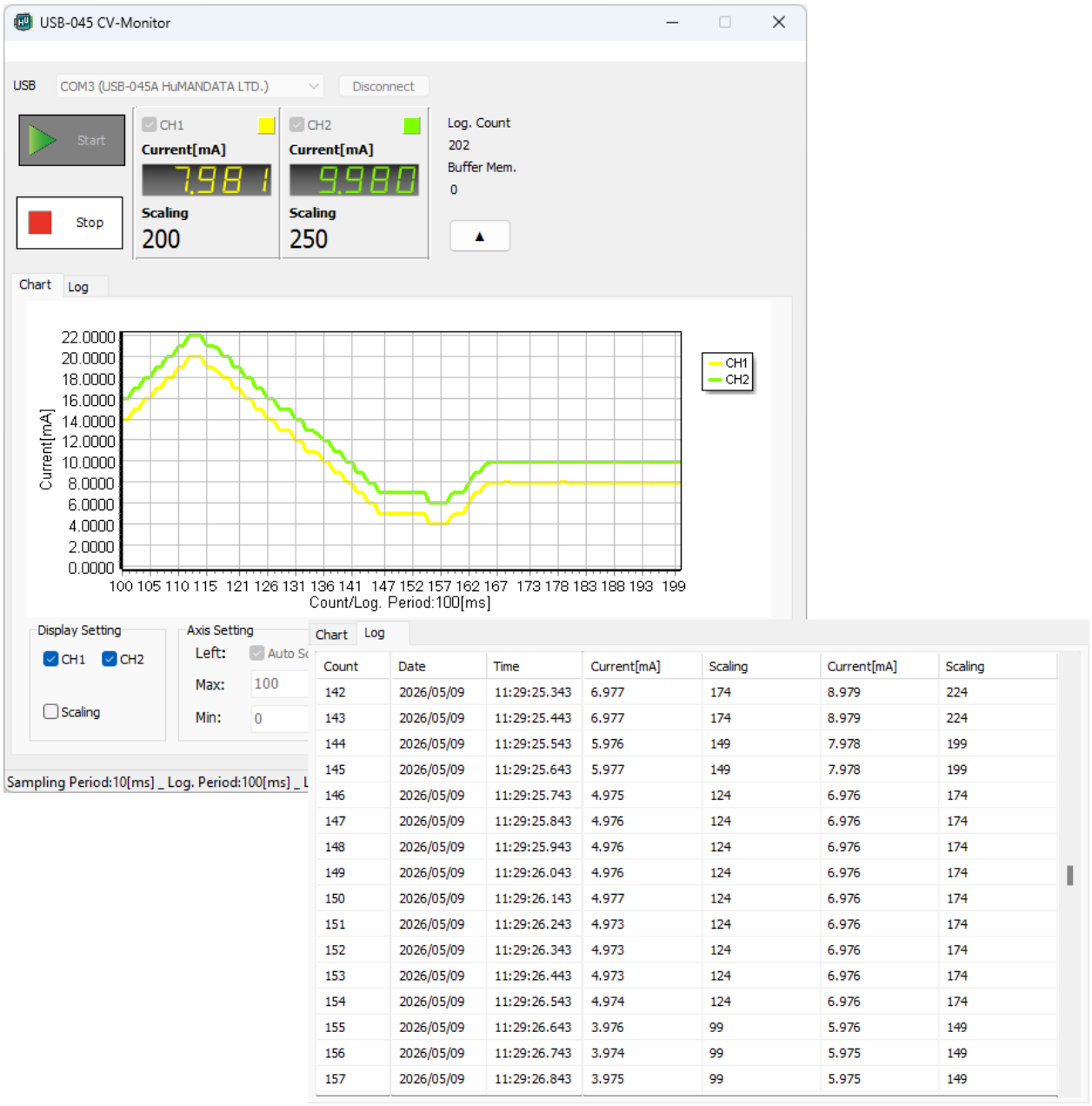


3. Enter Commands
   Enter commands in the terminal and confirm the operation of the USB-045A.



5. Dedicated Application (USB-045 CV-Monitor)

The dedicated application, USB-045 CV-Monitor, can be used with the USB-045A. It can send control commands to the USB-045A, display measurement results, and perform data logging. This application software and the user's manual can be downloaded from the documentation page. Please refer to Chapter 6, "Additional Documentation and User Support."



6. Additional Documentation and User Support

The following documents and other supports are available at

https://www.hdl.co.jp/en/faspc/USB/usb-045a

- Dedicated Application (USB-045 CV-Monitor)
- User's Manual
- Outline Drawing
- Device Driver

… and more.

7. Warranty and Compensation

Please refer to the following URL for the warranty.

https://www.fa.hdl.co.jp/en/fa-warranty.html

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USB-045A

User's Manual

Ver. 1.0 ..... May 19, 2026

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