13. OPTIONS
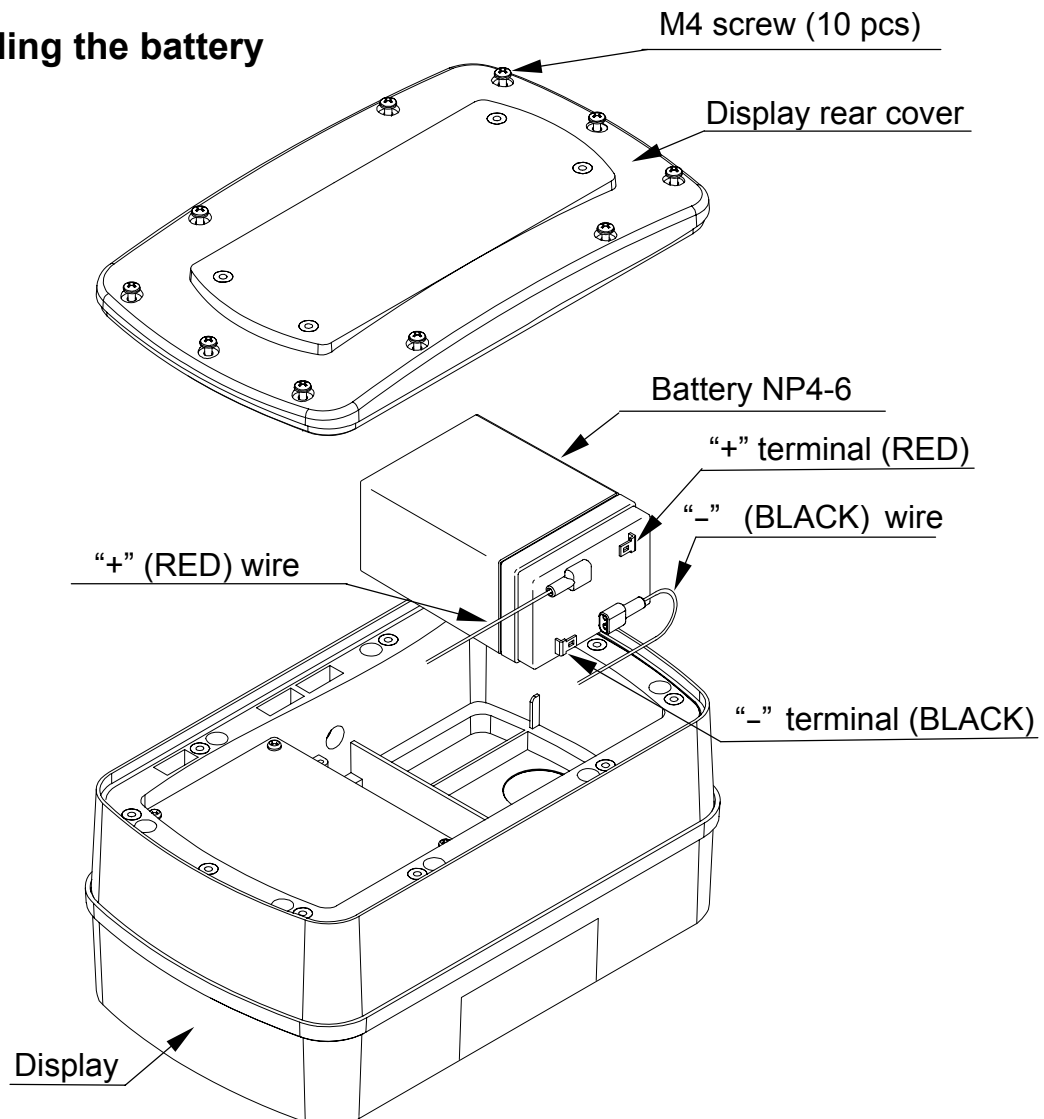
13.1. Using the OP-02 SLA battery

❑ The scale can be operated with a sealed lead acid (SLA) battery, available as an option.

❑ The scale (with no other options) can be operated continuously for about 90 hours with a fully charged battery.

❑ The battery will take about 15 hours to be fully charged.

❑ The battery life will vary depending on how the scale is used, the ambient temperature and so on.

❑ A battery, NP4-6 (6V, 4Ah), manufactured by YUASA, is commercially available.

Caution
- **There will be risk of leakage, fire or explosion if the battery is connected improperly or replaced with the incorrect type.**
- **Dispose of a used battery according to the local laws and regulations.**
- **Do not handle the battery with wet hands. Take much care not to get the battery wet.**
- **Do not install the battery under high temperatures and high humidity.**

13.1.1. Installing the battery

M4 screw (10 pcs)

Display rear cover

Battery NP4-6

"+" terminal (RED)

"−" (BLACK) wire

"+" (RED) wire

"−" terminal (BLACK)

Display

1. Disconnect the AC power cable from the electrical outlet.

2. Loosen the M4 screws and remove the rear cover of the display.

   Note: Take care not to drop the display.

3. Connect the wires inside the display to the battery with much care so that nothing touches the switches.

   Note: Be sure to connect the RED wire to the positive (+ / RED) terminal and the BLACK wire to the negative (- / BLACK) terminal. Or there is a risk of explosion.

4. Install the battery into the display.

5. Attach the rear cover to the display and secure it with the screws loosened at step 2.

6. Connect the AC power cable to the electrical outlet.

7. Press the ON/OFF switch and check that the scale turns ON.

8. Disconnect the AC power cable and check that the scale works normally.

13.1.2. Charging the battery

❑ When the weight display shows "Lb" (Low battery), the battery voltage is low and should be recharged. Turn the scale OFF and connect the AC power cable to an electrical outlet. The charging process will start.

❑ Charging will be performed when the AC power cable is connected to an electrical outlet and the scale is turned OFF. If the scale is turned ON, trickle charging will be performed.

❑ The scale can be used while the battery is charging. After fully charged, the scale will change the charging process to trickle charge automatically.
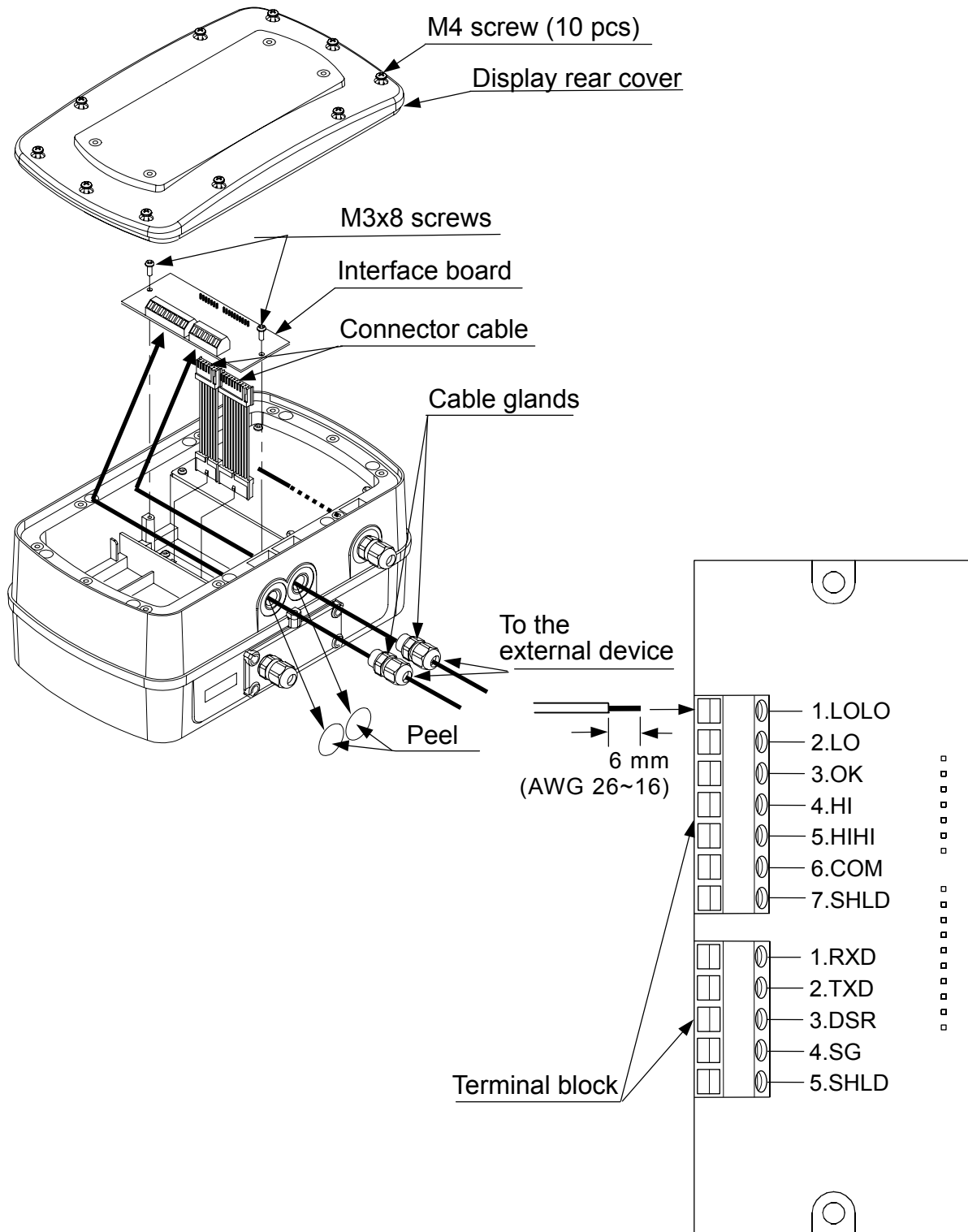
Notes
- **Charge the battery at a temperature between 0°C (32°F) and 40°C (104°F), preferably, at a range of 5°C (41°F) to 35°C (95°F) .**

- **Charge the battery when using for the first time.**

- **The battery must be recharged regularly, every 3 to 6 months, if the scale is not used for a long period of time. More frequent recharging is required in a warmer area.**

13.2. OP-03 RS-232C / RELAY OUTPUT

This interface allows the SW scale to be connected to an AD-8121 printer or a personal computer, and the relay outputs for comparator results are also available.

❏ When OP-03 is installed, the dust-tight and water-tight performance of the scale will be degraded.

❏ OP-03 includes an interface board, two connector cables (7 and 10 pins), two cable glands and two screws (M3x8).

13.2.1. Installing OP-03

M4 screw (10 pcs)

Display rear cover

M3x8 screws

Interface board

Connector cable

Cable glands

To the external device

Peel

6 mm
(AWG 26~16)

Terminal block

1.LOLO
2.LO
3.OK
4.HI
5.HIHI
6.COM
7.SHLD
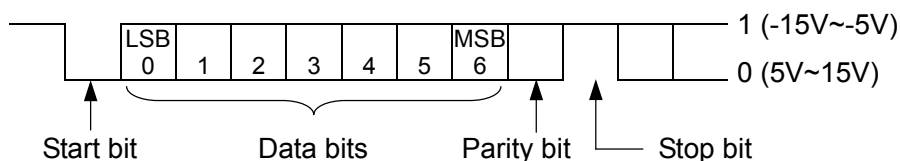
1.RXD
2.TXD
3.DSR
4.SG
5.SHLD

1. Disconnect the AC power cable from the electrical outlet. When the battery is installed, make sure that the scale is turned OFF.

2. Loosen the M4 screws and remove the rear cover of the display.

   Note: Take care not to drop the display.

3. Connect the cables to the external device through the cable gland to the terminal blocks on the interface board.

4. Attach the connector cables (7 and 10 pins), provided with OP-03, to the connectors on the interface board and the connectors on the main board inside the display.

5. Secure the interface board using the two M3 x 8 screws provided with OP-03.

6. Tighten the cable glands and attach the rear cover to the display and secure it with the screws loosened at step 2.

7. Connect the AC power cable to the electrical outlet.

8. Set the function settings "bPS", "$bEPr$", "PrE". "SiF" and "ACE" as necessary.

❑ To use the OP-03 RS-232C, the function setting of "SiF" must be set to "0".

13.2.2. OP-03 Specifications

RS-232C interface

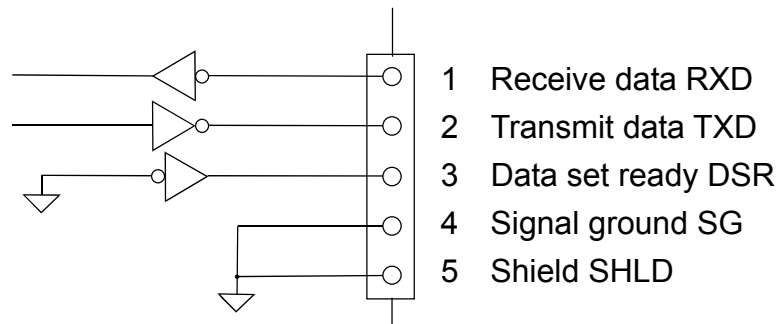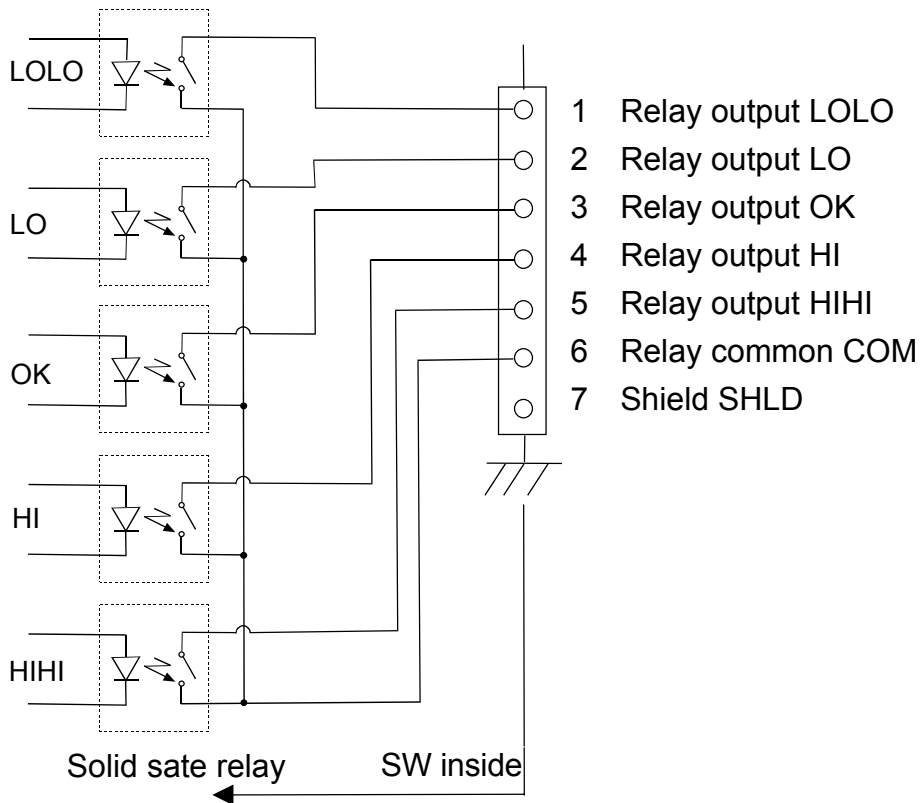|	
Transmission form	Asynchronous, bi-directional, half-duplex
Data format	Baud rate: 2400, 4800, 9600 bps
	Data bits: 7 bits + parity 1bit (EVEN / ODD)
	or 8 bits (non parity)
	Start bit: 1 bit
	Stop bit: 1 bit
	Code: ASCII
	Terminator: $C_R L_F$ (C_R:0Dh, L_F:0Ah)

Relay output

The maximum rating of the replay output is as follows.

❑ Maximum voltage: 50V DC

❑ Maximum current: 100 mA DC
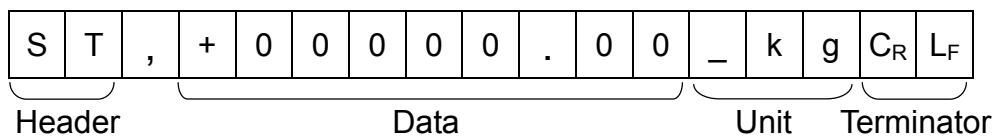
❑ Maximum ON resistance: 8 Ω

Circuit diagram

	1	Receive data RXD
	2	Transmit data TXD
	3	Data set ready DSR
	4	Signal ground SG
	5	Shield SHLD

❑ SW is designed as DCE (Data Communication Equipment).

	1	Relay output LOLO
	2	Relay output LO
	3	Relay output OK
	4	Relay output HI
	5	Relay output HIHI
	6	Relay common COM
	7	Shield SHLD

Solid sate relay   SW inside

Data format

| S | T | , | + | 0 | 0 | 0 | 0 | 0 | . | 0 | 0 | _ | k | g | C_R | L_F |

Header   Data   Unit   Terminator

❑ There are 4 headers for the weighing data.

 ST: Stable weighing data
 QT: Stable counting data
 US: Unstable weighing data
 OL: Out of weighing range

❑ The data consists of 9 characters including the polarity and decimal point.

❑ There are 5 units.

 _ k g: Weighing mode "kg"
 _ _ g: Weighing mode "g"
 _ l b: Weighing mode "lb"
 _ o z: Weighing mode "oz"
 _ PC: Counting mode "pcs"

❑ As a terminator, $C_R L_F$ is always output.

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❑ Data example

Weighing data "kg" (+)	S	T	,	+	0	0	1	2	.	3	4	5	_	k	g	C$_R$	L$_F$
Weighing data "g" (-)	S	T	,	-	0	0	0	0	1	2	3	4	_	_	g	C$_R$	L$_F$
Counting data "pcs" (+)	Q	T	,	+	0	0	0	1	2	3	4	5	_	P	C	C$_R$	L$_F$
Out of weighing range (+)	O	L	,	+	9	9	9	9	.	9	9	9	_	k	g	C$_R$	L$_F$

Data output mode (𝘗𝘳𝘵)

❑ Command mode

The scale is controlled by commands that come from an external device such as a personal computer. For details, refer to "13.2.3. Command mode".

❑ Stream mode (𝘗𝘳𝘵 𝟢)

Data is sent continuously. The data update rate is approximately 10 times per second, the same as the display refresh rate.
There will be no output during the setting procedures.

❑ Print switch mode (𝘗𝘳𝘵 𝟤)

When the weight display is stable, data is sent by pressing the PRINT switch.
At this time, the display flashes once to indicate that the data is sent.

❑ Auto-print mode +/- data (𝘗𝘳𝘵 𝟥)

When the weight display is stable at ±5d (d = minimum display in kg) and above +5d or below -5d, the data is sent. The next transmission can not occur until after the weight display falls between –4d and +4d.

❑ Auto-print mode + data (𝘗𝘳𝘵 𝟦)

When the weight display is stable at +5d (d = minimum display in kg) and above, the data is sent. The next transmission can not occur until after the weight display falls +4d or below.

Baud Rate (𝘣𝘗𝘚)

Select the baud rate according to the device to be connected.

❑ 2400 bps (𝘣𝘗𝘚 𝟢)   Select 2400 bps to connect to an AD-8121 printer.

❑ 4800 bps (𝘣𝘗𝘚 𝟣)

❑ 9600 bps (𝘣𝘗𝘚 𝟤)

13.2.3. Command mode

In the command mode, the scale is controlled by commands that come from an external device such as a personal computer.

Command List

Command	Description	Remarks
Q	Send data immediately.	
Z	Zero the scale when the weight is stable.	Same as the ZERO switch.
T	Tare the scale when the data is stable.	Same as the TARE switch.
U	Switch the weighing unit.	Same as the UNITS switch.
?H2	When the five-level comparator mode is used: Send the current HIHI limit value. When the three-level comparator mode is used: Send the current HI limit value.	Send a setting value. Function settings Five-level (CP-L 0) Three-level (CP-L 1)
?H1	When the five-level comparator mode is used: Send the current HI limit value. When the three-level comparator mode is used: Not used	
?L1	When the five-level comparator mode is used: Send the current LO limit value. When the three-level comparator mode is used: Not used	
?L2	When the five-level comparator mode is used: Send the current LOLO limit value. When the three-level comparator mode is used: Send the current LO limit value.	
H2	When the five-level comparator mode is used: Set the HIHI limit value. When the three-level comparator mode is used: Set the HI limit value.	Set the six-digit value excluding the polarity and decimal point
H1	When the five-level comparator mode is used: Set the HI limit value. When the three-level comparator mode is used: Not used.	
L1	When the five-level comparator mode is used: Set the LO limit value. When the three-level comparator mode is used: Not used.	
L2	When the five-level comparator mode is used: Set the LOLO limit value. When the three-level comparator mode is used: Set the LO limit value.	

Command examples　("_" indicates "Space" (20H).)

The examples below are for the function setting "$RCP\ 1$" (Reply to commands).

❑ Request the weight data.

Command | Q | C_R | L_F |

Reply

S	T	,	+	0	0	1	2	.	3	4	5	_	k	g	C_R	L_F	Stable positive data
U	S	,	+	0	0	0	7	.	8	9	0	_	k	g	C_R	L_F	Unstable positive data
O	L	,	+	9	9	9	9	.	9	9	9	_	k	g	C_R	L_F	'E' display

❑ Zero the scale. (No reply for the function setting "$RCP\ 0$".)

Command | Z | C_R | L_F |

Reply | Z | C_R | L_F |　The scale is in a condition that zero operation is possible.

❑ Tare the scale. (No reply for the function setting "$RCP\ 0$".)

Command | T | C_R | L_F |

Reply | T | C_R | L_F |　The scale is in a condition that tare operation is possible.

❑ Switch the weighing unit. (No reply for the function setting "$RCP\ 0$".)

Command | U | C_R | L_F |

Reply | U | C_R | L_F |　Switch the weighing unit to the next weighing unit.

❑ Five-level comparator mode···Send the current HIHI limit value.
Three-level comparator mode···Send the current HI limit value.

Command | ? | H | 2 | C_R | L_F |

Reply | H | 2 | , | + | 0 | 0 | 0 | 4 | 0 | 0 | C_R | L_F |

❑ Five-level comparator mode···Send the current HI limit value.
Three-level comparator mode···Not used

Command | ? | H | 1 | C_R | L_F |

Reply | H | 1 | , | + | 0 | 0 | 0 | 3 | 0 | 0 | C_R | L_F |

❑ Five-level comparator mode···Send the current LO limit value.
Three-level comparator mode···Not used

Command | ? | L | 1 | C_R | L_F |

Reply | L | 1 | , | + | 0 | 0 | 0 | 2 | 0 | 0 | C_R | L_F |

❑ Five-level comparator mode···Send the current LOLO limit value.
Three-level comparator mode···Send the current LO limit value.

Command | ? | L | 2 | C_R | L_F |

Reply | L | 2 | , | + | 0 | 0 | 0 | 1 | 0 | 0 | C_R | L_F |

❏ Five-level comparator mode···Set the HIHI limit value.
Three-level comparator mode···Set the HI limit value.
(No reply for the function setting "*RՐ比 0* ".)
Set the six-digit value excluding the polarity and decimal point.

Command | H | 2 | , | + | 0 | 0 | 0 | 4 | 0 | 0 | C_R | L_F |

Reply | H | 2 | , | + | 0 | 0 | 0 | 4 | 0 | 0 | C_R | L_F |

❏ Five-level comparator mode···Set the HI limit value.
Three-level comparator mode···Not used.
(No reply for the function setting "*RՐ比 0* ".)
Send the six-digit value excluding the polarity and decimal point.

Command | H | 1 | , | + | 0 | 0 | 0 | 3 | 0 | 0 | C_R | L_F |

Reply | H | 1 | , | + | 0 | 0 | 0 | 3 | 0 | 0 | C_R | L_F |

❏ Five-level comparator mode···Set the LO limit value.
Three-level comparator mode···Not used.
(No reply for the function setting "*RՐ比 0* ".)
Send the six-digit value excluding the polarity and decimal point.

Command | L | 1 | , | + | 0 | 0 | 0 | 2 | 0 | 0 | C_R | L_F |

Reply | L | 1 | , | + | 0 | 0 | 0 | 2 | 0 | 0 | C_R | L_F |

❏ Five-level comparator mode···Set the LOLO limit value.
Three-level comparator mode···Set the LO limit value.
(No reply for the function setting "*RՐ比 0* ".)
Send the six-digit value excluding the polarity and decimal point.

Command | L | 2 | , | + | 0 | 0 | 0 | 1 | 0 | 0 | C_R | L_F |

Reply | L | 2 | , | + | 0 | 0 | 0 | 1 | 0 | 0 | C_R | L_F |

Replies to the commands other than examples above when the function setting "*RՐ比 1* " is selected.

❏ The scale is not in a state where a command could be executed. Then, the scale will reply "I".

Command | Z | C_R | L_F |

Reply | I | C_R | L_F | The scale is not in a condition that zero operation is possible.

❏ Command does not exist for the scale. Then, the scale will reply "?".

Command | B | C_R | L_F |

Reply | ? | C_R | L_F | The scale received an undefined command.

❏ When the function setting "*RՐ比 0* " is selected, undefined commands are ignored and no reply is sent.

13.3. OP-04 RS-422 / 485

This interface allows a personal computer to connect and control up to 16 scales.

❑ When OP-04 is installed, the dust-tight and water-tight performance of the scale will be degraded.

❑ OP-04 unit includes an interface board, a connector cable (10 pins), two cable glands and two screws (M3x8).
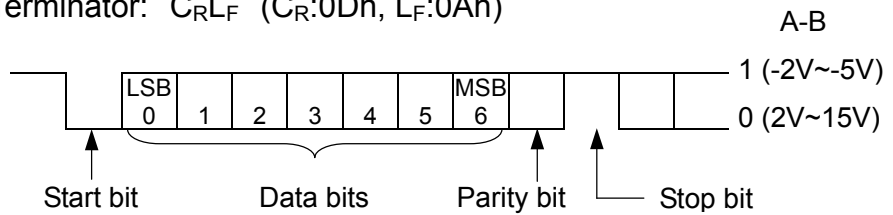
13.3.1. Installing OP-04
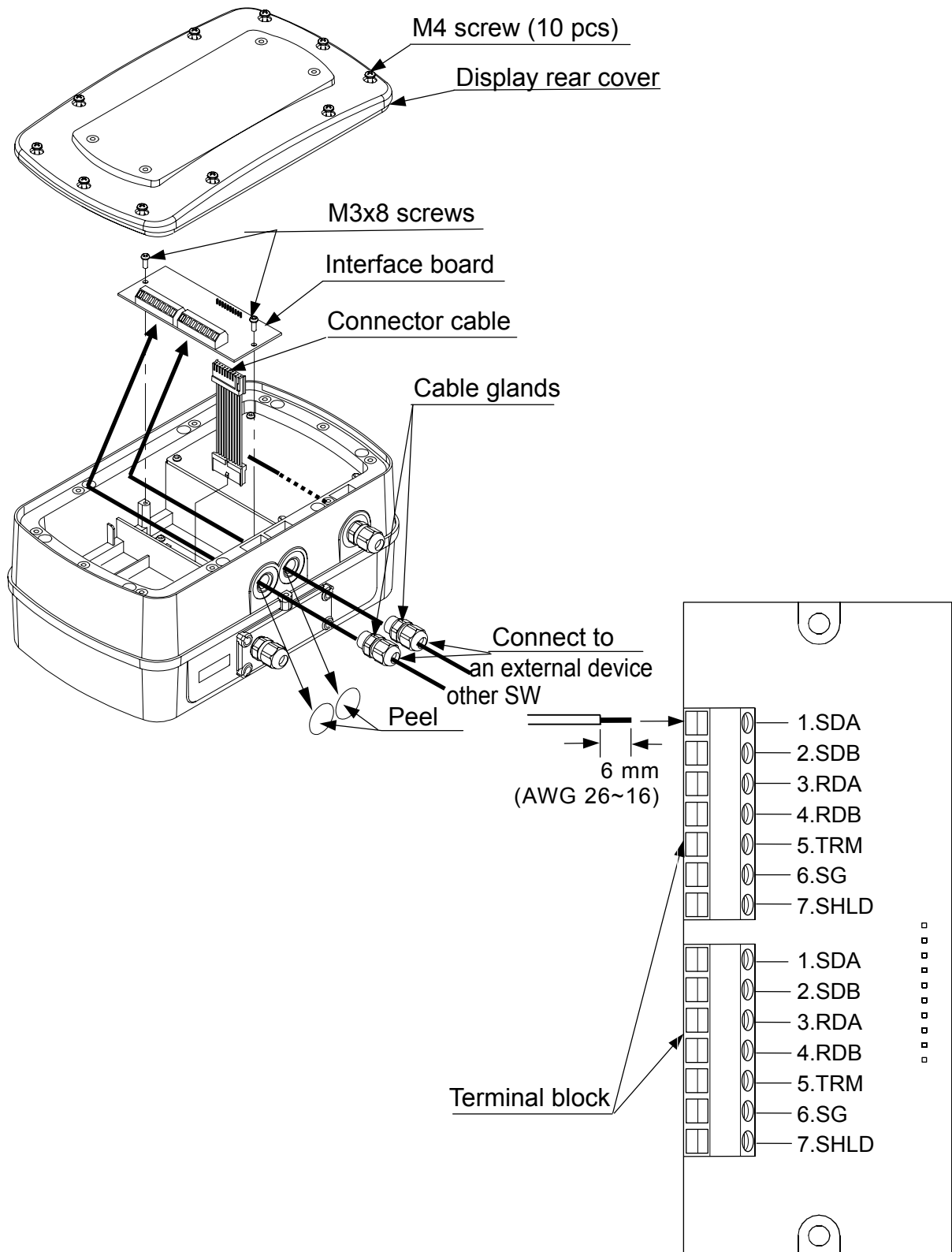
❑ The installation procedure is the same as for OP-03. Refer to "13.2.1. Installing OP-03".

❑ Set the function settings "bPS", "$btPr$", "Prt", "SiF", "Adr" and "ACt" as necessary.

❑ Before using OP-04, the function setting "SiF" must be set to specify whether RS-422 or RS-485 is used.
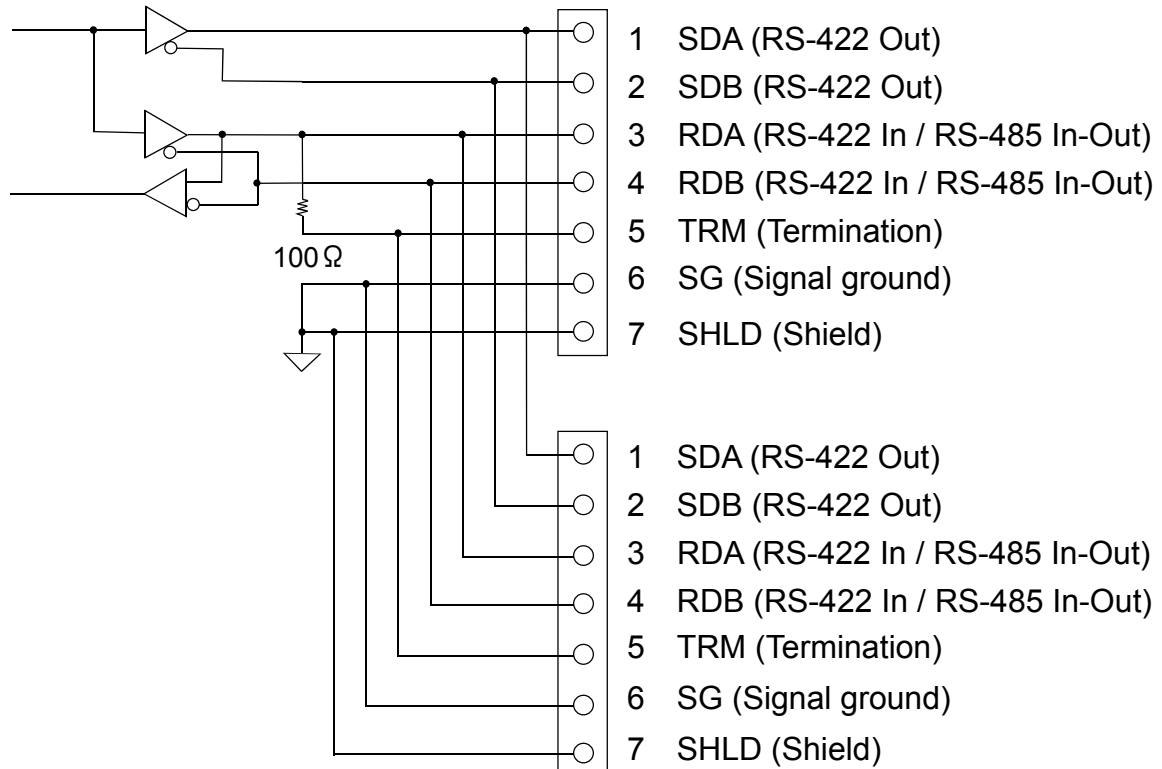To connect more than one scale to a computer, set a different address to each scale using the function setting "Adr".
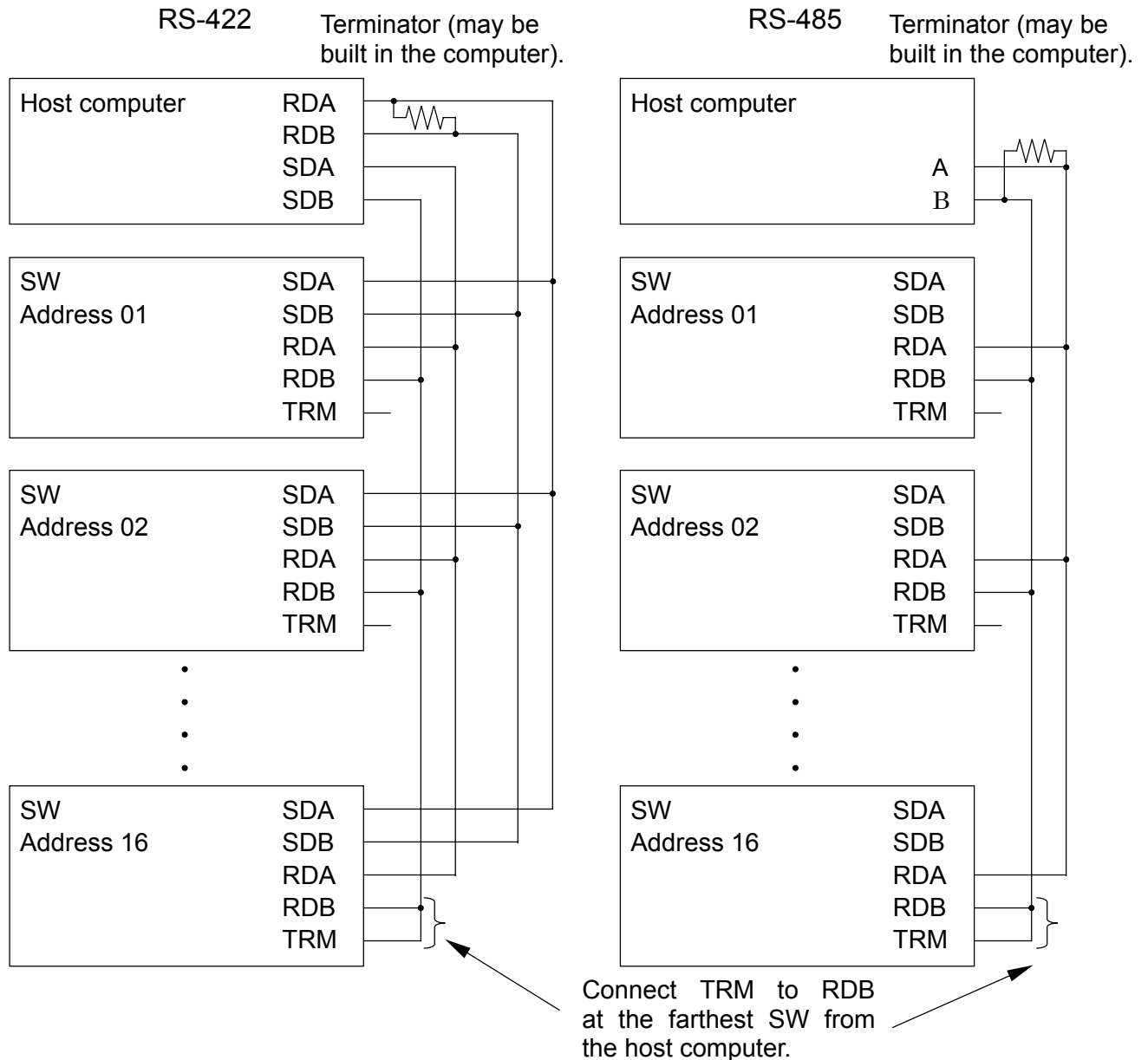
13.3.2. OP-04 Specifications

RS-422/485 Specifications

Transmission system	EIA RS-422 / 485
Transmission form	Asynchronous, bi-directional, half-duplex
Data format	Baud rate: 2400, 4800, 9600 bps
	Data bits: 7 bits + parity 1bit (EVEN / ODD)
	or 8 bits (non parity)
	Start bit: 1 bit
	Stop bit: 1 bit
	Code: ASCII
	Terminator: C_RL_F (C_R:0Dh, L_F:0Ah)

Start bit   Data bits   Parity bit   Stop bit

A-B
1 (-2V~-5V)
0 (2V~15V)

Circuit diagram

100 Ω

1 SDA (RS-422 Out)
2 SDB (RS-422 Out)
3 RDA (RS-422 In / RS-485 In-Out)
4 RDB (RS-422 In / RS-485 In-Out)
5 TRM (Termination)
6 SG (Signal ground)
7 SHLD (Shield)

1 SDA (RS-422 Out)
2 SDB (RS-422 Out)
3 RDA (RS-422 In / RS-485 In-Out)
4 RDB (RS-422 In / RS-485 In-Out)
5 TRM (Termination)
6 SG (Signal ground)
7 SHLD (Shield)

Example of connection

RS-422   Terminator (may be built in the computer).   RS-485   Terminator (may be built in the computer).

Connect TRM to RDB at the farthest SW from the host computer.

❑ The polarity (A, B) of the host computer signal depends on the computer model. Check the technical manual of the computer.

Data format

The data format for the RS-422/485 is the same as the RS-232C except the following:

❑ When used with the function setting "$5 \,\imath F \quad 1$" (RS-422) or "$5 \,\imath F \quad 2$" (RS-485), set a different address to each scale using the function setting "$Adr\,\#\#$". ((##=01 to 99)

❑ Start all commands with "@##" (## is the address of the scale to send a command). All replies from the scale start with "@##". The format after "@##" is the same as the RS-232C, both in commands and replies.

❑ When used with the RS-485 interface (function setting: "$5 \,\imath F \quad 2$"), note the following:
  • When sending commands continuously, leave an interval of 500 ms or more between commands.
  • Do not use stream mode (function setting: "$Prt \quad 0$") when sending commands. Commands will not be received correctly and will be invalid.

Command examples   ("_" indicates "Space" (20H).)

The examples below are for the function setting "*ACP* *1* " (Reply to commands).

The address ## = 23.

❑ Request a weight data.

Command | @ | 2 | 3 | Q | C$_R$ | L$_F$ |

Reply | @ | 2 | 3 | S | T | , | + | 0 | 0 | 1 | 2 | . | 3 | 4 | 5 | _ | k | g | C$_R$ | L$_F$ | Stable data
| @ | 2 | 3 | U | S | , | + | 0 | 0 | 0 | 7 | . | 8 | 9 | 0 | _ | k | g | C$_R$ | L$_F$ | Unstable data
| @ | 2 | 3 | O | L | , | + | 9 | 9 | 9 | 9 | . | 9 | 9 | 9 | _ | k | g | C$_R$ | L$_F$ | "E" display

❑ Zero the scale. (No reply for the function setting "*ACP* *0* ".)

Command | @ | 2 | 3 | Z | C$_R$ | L$_F$ |

Reply | @ | 2 | 3 | Z | C$_R$ | L$_F$ | The scale is in a condition that zero operation is possible.

❑ Send the current LO limit value.

Command | @ | 2 | 3 | ? | L | 1 | C$_R$ | L$_F$ |

Reply | @ | 2 | 3 | L | 1 | , | + | 0 | 0 | 0 | 2 | 0 | 0 | C$_R$ | L$_F$ |