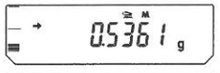
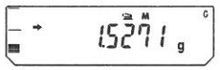




---Formulation Mode---

CMP001 =
0,5361g
CMP002 =
0,5422g
CMP003 =
0,4488g
TOTAL =
1,5271g

The items above are outputted for the measurement examples shown here. Decimal points can be either comma or period in the output. (Refer to 14.4.)

(Operating Formulation Mode)
When the Formulation Mode is set on, the add-on symbol and the Memory symbol are illuminated in the mass display.

1 In the Formulation Mode, place the container (if used) on the pan and press **[O/T]** key to tare. (Taring is accepted only before weighing the first sample.)

2 Place the sample (first component) in the container and press **[PRINT]** key.
Upon stability, the mass value is outputted to the external Device with the numbering "CMP001". After output, the display is automatically tared.

3 Repeat the above step **2** until all the component samples have been weighed.

4 Press the **[POWER]** key.
The measurements up to this point are summed up and displayed on the balance and outputted to the external device.

5 Clear the pan.
The balance is ready for the next set of measurements.

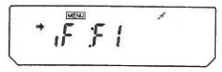
Note

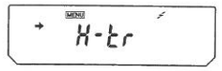
When Formulation mode is in use, fully-automatic span calibration by PSC (10.3.2) or Clock-CAL (10.3.3) is not performed. Instead, Weight symbol (▟) keeps blinking when span calibration is necessary. Span calibration can be performed between sets of measurements.

14. Communication with Peripheral Devices

14.1 Electronic Printer EP-80

The AUW-D/AUW/AUX/AUY series allows connection to Electronic Printer EP-80.
When using EP-80, follow these procedures for connecting to the balance.





1 Set the communication status of the balance to F1 (standard settings 1). (See 14.3.2)

2 When using a computer as well, set to timer handshake (see 14.3.3.1) in the user settings.

3 Turn off the power when the balance is either "oFF" or "STAND-BY". Then connect the printer cable to the DATA I/O on the back of the balance. Connect the printer cable to the printer, too.

4 Turn on the balance power.

5 Turn on the printer power.

Notes

- Refer to the instruction manual of EP-80.
- Continuous output cannot be made to an electronic printer.
- Electronic Printer EP-60A can also be used.

14.2 Personal Computer - RS-232C

Programming with the command codes makes it possible to control the balance from a computer. When the balance does not have to be controlled by the computer, WindowsDirect (see 6.) offers very handy data transmission.

14.2.1 Connecting the Cable

Notes

- The cable must have the correct connections as shown in the diagram below.
- Cables with the connections shown below and the special accessory RS-232 cable are not guaranteed to operate properly for all types of computers and devices.
- Refer to 6.2.2 when using WindowsDirect function.

For DOS/V computers (D-sub9 pin) (Null-modem)

Computer side			Balance side	
RXD	2	----------	2	TXD
TXD	3	----------	3	RXD
DTR	4	----------	6	DSR
SG	5	----------	7	SG
DSR	6	----------	20	DTR
RTS	7	----------	5	CTS
CTS	8	----------	4	RTS
	9	----------	22	.....This connection is not necessarily required.

14.2.2 Data Format

Data format 1 ("F-dF1" in menu item selection) is the Shimadzu's standard data format. (See 14.3.3.5) The following is the details of this data format.

(1) Basic format

An example of data format for a negative weight value (-21.6865g) with delimiter of C/R is shown.

Data length of this example: 13 bytes													
Position	1	2	3	4	5	6	7	8	9	10	11	12	13
ASCII code	2DH	20H	20H	32H	31H	2EH	36H	38H	36H	35H	67H	20H	0DH
Data	**-**			**2**	**1**	**.**	**6**	**8**	**6**	**5**	**g**		**C/R**

The data length varies depending on attached information, unit expression and the delimiter selection as explained in (2).

Remarks

Position 1: For a positive value, " " (space) (20H), and for a negative value, "-" (2DH) is in this position.

Positions 2 to 10: The absolute value. When the numerical value does not use all the 9 positions, the code for space (20H) is entered to each excessive position as shown in this example.
With AUW-D, space may appear after the value; at the position No.10.

Positions 11,12: One or two letters indicating the weighing unit. As shown in this example, the code for space is entered at position No.12 if only one letter is used for the unit.

Position 13: Code for delimiter.

(2) Information of additional bytes

(i) Output with stability information

When outputting data with stability information (Refer to 14.2.3 D7), the code for "S" or "U" is added before Position No.1 in the above example. Consequently, the data becomes 1 byte longer.
When stable: S
When unstable: U

(ii) Verified balance as a legal measuring instrument

The brackets "[ ]" bordering auxiliary indicating device of legal measuring instrument are also outputted. In this case, "[" and "]" are inserted to border the part of auxiliary indicating device in the format. Consequently, the data becomes 2 bytes longer.

(iii) When the delimiter "C/R+L/F" is selected (Refer to 14.3.3.2)

The delimiter information requires one more character. Therefore one more byte is added after Position No.13 in the above example. Consequently, the data becomes 1 byte longer.

(3) Data format in case of "oL" or "-oL" (Overload)

The below is the data format for "oL".

Data length of this example: 13 bytes													
Position	1	2	3	4	5	6	7	8	9	10	11	12	13
ASCII code	20H	20H	20H	20H	20H	4FH	4CH	20H	20H	20H	20H	20H	0DH
Data						**O**	**L**						**C/R**

For "-oL" (negative overload), Position 1 is replaced with "-" (minus, ASCII code: 2DH).

The following parts appearing in "(2) Information of additional bytes" also apply to (3).

(i) Output with stability information

(iv) When the delimiter "C/R+L/F" is selected

14.2.3 Command Codes

Caution

Inputting characters and command codes not shown here into the balance may not only alter the previous settings but may also impair proper measurement.

If by mistake characters or commands not shown here are entered into the balance, immediately unplug the power supply cable and wait about ten seconds before plugging it in again.

Command Code	Function	Description
D01	Continuous output	The balance continuously outputs every 110ms .
D05	1 time output	Corresponds to **[PRINT]** key
D06	Auto Print	See 13.4
D07	1 time output with stability information	The status of the stability mark is appended to the head of the data with output. S: when the stability mark is showing U: when the mark is not showing
D08	1 time output at stability	After command input, the data is output at the first appearance of the stability mark.
D09	Halt output	Auto Print and continuous output halted
Q	ON/OFF switching	Switches between standby status and measurement status.
T	Taring	Corresponds to the **[O/T]** key
TS	Taring after stability wait	After command input, taring is done at the first appearance of the stability mark.
C18	Span calibration	
M	Formulation mode measurement	See 13.7
+	Add-on mode measurement	See 13.6
R	Total reset	All application measurements terminated and reset
mg	mg unit registry*	See 12.
PERCENT	% unit registry	
PCS	Piece counting registry	
CT	ct unit registry	
MOM	Monme unit registry*	
SDENCE	Solid specific gravity registry	
LDENCE	Liquid specific gravity registry	
%	100% setting	

Command Code	Function	Description
G	g, % switching	
- g	g unit removal	
- mg	mg unit removal*	
- PERCENT	% unit removal	
- PCS	Piece counting removal	
- CT	ct unit removal	
- MOM	Monme unit removal*	
- SDENCE	Solid specific gravity removal	
- LDENCE	Liquid specific gravity removal	
C02	High-stability mode setting	
C13	Anti-convection mode setting	
C14	Standard mode setting	
C05	Stability detection band, 1 count setting	
C06	Stability detection band, 5 count setting	
C15	Stability detection band, 10 count setting	
C07	Zero tracking	
C08	Unset zero tracking	
C10	Automatic span calibration	
C11	Unset automatic span calibration	
C17	Display setting status	Measurement conditions set by menu selection in abbreviated form is output.

* Not applicable to a verified balance as a legal measuring instrument in the EU.

14.3 Communication Settings

14.3.1 What are communication settings?

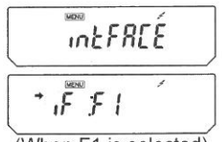
These settings are menu item selections for determining communication specifications when connecting to devices such as an electronic printer or a computer.
The settings here are effective for both RS-232C and DATA I/O communication specifications. When a printer or another device is connected to the DATA I/O connector, set the balance communication settings to “Standard Setting 1”.
Five standard settings are stored in the balance, that are composed for frequently used types of communication. Selecting a standard setting allows all of these items to be set at once: communication speed (baud rate), delimiters, parity (and bit length), stop bit, data format, and handshake. Setting combinations that are not included in the standard settings may be selected by individual items in the User Settings.

14.3.2 Standard Setting

The combinations shown in the table below are available as standard setting 1 to standard setting 6. In the communication settings menu, the standard settings 5 and 6 cannot be selected. The standard settings 5 and 6 (WindowsDirect) can be set easily without entering the menu (see 6.2.1).

	Display at menu item selection	Compatible manufacturer	Baud rate	Delimiter	Parity (and bit length)	Stop bit	Data format	Hand-shake
Standard setting 1	iF:F1	Shimadzu (standard)	1200	C/R	None (8)	1	dF1	Hardware
Standard setting 2	iF:F2	Shimadzu (extended)	1200	C/R	None (8)	1	dF2	Hardware
Standard setting 3	iF:F3	Mettler	2400	C/R+L/F	Even (7)	1	dF3	Hardware
Standard setting 4	iF:F4	Sartorius	1200	C/R+L/F	Odd (7)	1	dF4	Hardware
Standard setting 5*	SEtwin |	Shimadzu WindowsDirect	300	Win |	None (8)	1	dF1	Software
Standard setting 6*	SEtwin -	Shimadzu WindowsDirect	300	Win -	None (8)	1	dF1	Software
User settings (see 14.3.3)	iF:USEr		User set	User set	User set	User set	User set	User set

* Refer to 6.2.1 for selection of these standard settings.



(When F1 is selected)

(Selecting one of standard Settings)

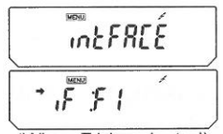
1 From the mass display, press the **[CAL]** key repeatedly until the [intFACE] display appears. Press the **[O/T]** key. The display shows "iF;F1"

2 If necessary, press the **[CAL]** key repeatedly until the desired standard setting display appears. Then, press the **[O/T]** key.

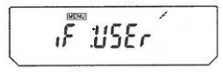
3 Press the **[POWER]** key repeatedly to return to the mass display.

14.3.3 User Setting

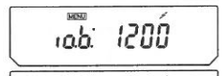
The user setting allows individual setting for each item in communication settings.

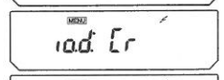


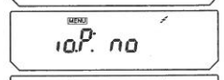
(When F1 is selected)

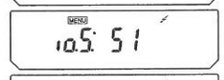


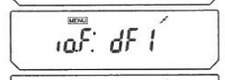
Displays of all the items

(Example) 

(Example) 

(Example) 

(Example) 

(Example) 

(Example)

Making user settings

1 In mass display, press the **[CAL]** key repeatedly until "intFACE" appears and press the **[O/T]** key. "iF:F1" appears.

2 Press the **[CAL]** key repeatedly until "iF: USEr" appears and press the **[O/T]** key. "io.b:****" appears (communication speed settings). (**** shows the current setting; 2 to 4 characters, the same applies hereafter.) After this, pressing the **[CAL]** key alternates the display in this order: "io.d:****" (delimiter setting), "io.P;*:**" (parity setting), "io.S:****" (stop bit setting), "io.F:****" (data format setting), and "io.H:****" (handshake setting).

3 When the item to be set appears, press the **[O/T]** key. (Refer to the following selections thereafter.)

14.3.3.1 Communication speed settings

(1) The display changes from "io.b:****" to "b-300". Pressing the **[CAL]** key cycles through the available settings. The stability mark (➡) appears, when the current setting is displayed.

Display during setting	b-300	b-600	b-1200	b-2400	b-4800
Setting specifics	300bps baud rate	600bps baud rate	1200bps baud rate	2400bps baud rate	4800bps baud rate

Display during setting	b-9600	b-19.2K	b-38.4K
Setting specifics	9600bps baud rate	19.2Kbps baud rate	38.4Kbps baud rate

(2) When the desired setting appears, press the **[O/T]** key.

(3) Press the **[POWER]** key to return to "io.b:****".

14.3.3.2 Delimiter settings

(1) The display changes from "io.d:****" to "d-Cr". Pressing the **[CAL]** key cycles through the available settings. The stability mark (➡) appears, when the current setting is displayed.

Display during setting	d-Cr	d-LF	d-CrLF	d-Cn	d-win1	d-win-
Setting specifics	delimiter C/R	delimiter L/F	delimiter C/R + L/F	delimiter Comma	delimiter Windows-Direct (Enter)	delimiter Windows-Direct (Right)

(2) When the desired setting appears, press the **[O/T]** key.

(3) Press the **[POWER]** key to return to "io.d:****".

14.3.3.3 Parity settings

The display changes from "io.P:****" to "P-no". Pressing the **[CAL]** key cycles through the available settings. The stability mark (➡) appears, when the current setting is displayed.

Display during setting	P-no	P-odd	P-EvEn
Setting specifics	No parity (eight bits)	Odd parity (seven bits)	Even parity (seven bits)

(1) When the desired setting appears, press the **[O/T]** key.

(2) Press the **[POWER]** key to return to "io.P:****".

14.3.3.4 Stop bit settings

(1) The display changes from "io.S:****" to "S-S1". Pressing the **[CAL]** key cycles through the available settings. The stability mark (➡) appears, when the current setting is displayed.

Display during setting	S-S1	S-S2
Setting specifics	Stop bit, 1 bit	Stop bit, 2bit

(2) When the desired setting appears, press the **[O/T]** key.

(3) Press the **[POWER]** key to return to "io.S:****".

14.3.3.5 Input-output data format settings

(1) The display changes from "io.F:****" to "F-dF1". Pressing the **[CAL]** key cycles through the available settings. The stability mark (➡) appears, when the current setting is displayed.

Display during setting	F-dF1	F-dF2	F-dF3	F-dF4
Setting specifics	Data format 1. Standard Shimadzu format.	Data format 2. Extended format from data format 1.	Data format 3. Same format as Mettler balances.	Data format 4. Same format as Sartorius balances.

(2) When the desired setting appears, press the **[O/T]** key.

(3) Press the **[POWER]** key to return to "io.F:****".

> **Caution**
>
> When using EP-80, EP-50, EP-50WIN or EP-60A electronic printer, always use data format 1.

> **Note**
>
> When set to data format 2, the balance will always send a process result in response to commands from the computer.

14.3.3.6 Handshake settings

(1) The display changes from "io.H:****" to "H-oFF". Pressing the **[CAL]** key cycles through the available settings. The stability mark (➡) appears, when the current setting is displayed.

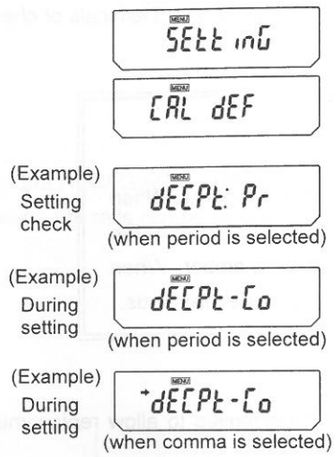
Display during setting	H-oFF	H-Soft	H-HArd	H-tr
Setting specifics	No handshake	Software hand-shake	Hardware hand-shake	Timer handshake

When the desired setting appears, press the **[O/T]** key.

Press the **[POWER]** key to return to "io.H:****".

14.4 Decimal Point Symbol in Output Data

The AUW-D/AUW/AUX/AUY series offers choice of decimal point symbols in the outputted data to a computer or an electronic printer. The decimal point can be expressed with either "." (period) or "," (comma) depending on your preference. Note that the decimal point expression on the balance display is always with "." (period).



1 From the mass display, press the **[CAL]** key repeatedly until "SEttinG" appears, press the **[O/T]** key. "CAL dEF" will appear.

2 Press the **[CAL]** key repeatedly until "dECPt:**" appears (** indicates the current setting. "Pr" for period, "Co" for comma.

3 Press the **[O/T]** key. The display shows "dECPt-Co" and after this, pressing the **[CAL]** key switches the displays between "dECPt-Co" and "dECPt-Pr". When the current setting is displayed, the stability mark (➡) appears. To change the setting, press the **[O/T]** key when the desired setting appears, or

4 Press the **[POWER]** key to return to "dECPt:**" without changing the setting.

5 Pressing the **[POWER]** key again returns to the mass display.