

AD-4406

OP-03/04/05/07/11

INSTRUCTION MANUAL

Weighing Indicator

AND
A&D Mercury Pty. Ltd.



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This mark informs you about the operation of the product.

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1. Compliance

1.1.1. Compliance with FCC Rules

Please note that this equipment generates, uses and can radiate radio frequency energy. This equipment has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against interference when this equipment is operated in a commercial environment. If this unit is operated in a residential area it may cause some interference and under these circumstances the user would be required to take, at his own expense, whatever measures are necessary to eliminate the interference.

(FCC = Federal Communications Commission in the U.S.A.)

1.1.2. Compliance with European Directive

CE This appliance complies with the statutory EMC (Electromagnetic Compatibility) directive 89/336/EEC and the Low Voltage Directive 73/23/EEC for safety of electrical equipment designed for certain voltages.

Note: The displayed value may be adversely affected under extreme electromagnetic influences.



2. Introduction

- The AD-4406 is a compact weighing indicator that amplifies the signal from a load cell, converts it to digital data and displays it as a mass value.
- This indicator has the following performance:
 - Input sensitivity:.....0.2 μ V/division.
 - Maximum display:.....20000 divisions.
 - Refresh rate of the display:10 times/second approximately.
 - Input voltage range:-1 mV ~ +15 mV.
- There are the following standard functions:
 - The HiHi/Hi/OK/Lo/LoLo limit comparison to check a mass value.
 - The setpoint comparison for batching applications.
 - The accumulation function to totalize these mass values and to count the number of accumulations.
- There are the following interfaces:
 - The RS-232C serial interface to communicate with a computer.
 - This interface can request weighing data, enter parameters and control the state of the indicator.
 - RS-422/485
 - RS-232C, Relay Output and Control Input
 - Analog Output (4-20mA)
- The calibration function includes the following functions:
 - Setting of the minimum division (weighing interval) and the maximum capacity.
 - Zero and span calibration.
 - The weighing range function of the multi-interval weighing instrument (scale).
 - Digital linearization function.
 - Gravity compensation function.



3. Installation and Precautions

3.1.1. Installation and Precautions

- The AD-4406 weighing indicator is a precision electronic instrument. Handle the indicator carefully.
- The operating temperature is -10°C to +40°C (14°F to 104°F).
- Do not install the scale in direct sunlight.
- Misoperation or other problems may be caused by an unstable power source including momentary power failure or instantaneous noise. Use a stable power source.
- ⚠ □ When an AC Adaptor is used please confirm that the local voltage and receptacle type are correct for your scale.
- Use shielded cable for all connections. Connect the cable shields to the shield terminal or indicator case.
- Earth the indicator. Do not join the earth line with other electric power equipment.
- Do not install the scale in a place where it may be charged with static electricity, or where the relative humidity is lower than 45%RH. Plastic and isolators are likely to be charged with static electricity.

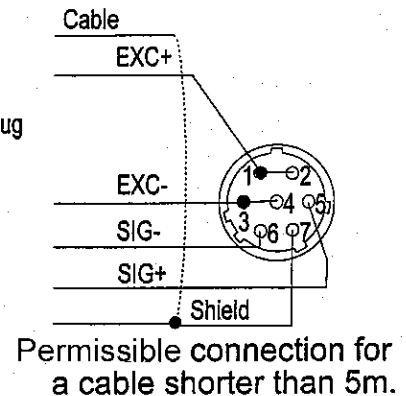
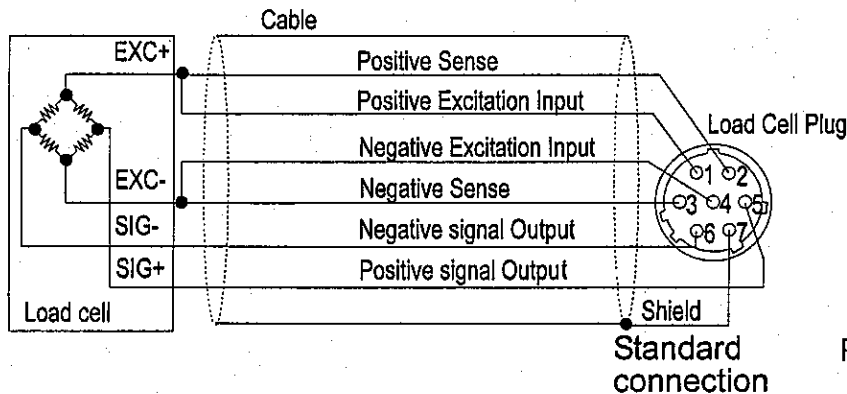
3.1.2. Power Supply

- When the AC Adaptor is used
A stable power source must be used, since an unstable power source which includes an instantaneous noise components may result in misoperation.
- When dry batteries are used
Use fresh batteries, preferably alkaline type. Insert batteries into the battery box (use caution in inserting to match the polarity of the batteries), and insert the battery box with the contacts to the inside of the indicator. Push it in and towards the bottom. The battery box will hook onto the edge of the case. Install the cover over the battery box so that it will not fall out.
To remove the battery box, press in and up on the end of the battery box. Slowly release pressure on the battery box while holding it against the top of the battery compartment and the battery box will slide out.
- The AD-1681 rechargeable battery pack can be used in place of the standard battery box.

3.1.3. The Load Cell Connections

- Connect the load cell wires to the connector (receptacle), at the rear panel, using the accessory load cell plug.
- It is permissible to use a 4 wire cable that has pin1 to pin2 and pin3 to pin4 connected, if the distance between the indicator and a load cell is shorter than 5m.
- The output voltage of a load cell is a very sensitive signal. Space the load cell cable away from any noise source.
- It is possible to connect four x 350 ohm load cells.

The load cell drive is 5VDC \pm 5% between EXC+ and EXC-, the maximum current 60mA.

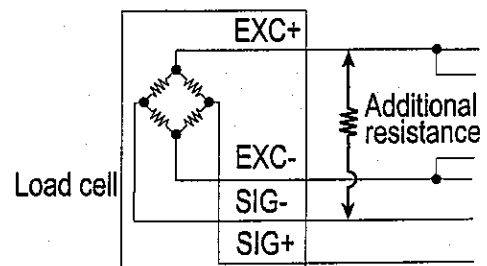


Adjustment of the Load Cell Output

Caution □ Use a metal film resistor in the range of 50kohm to 500kohm with a good temperature coefficient, when adding a resistor to adjust a load cell output. Use as a large a resistance value as possible in the range in which zero adjustment is possible. Solder this resistor at a point near the load cell or the indicator.

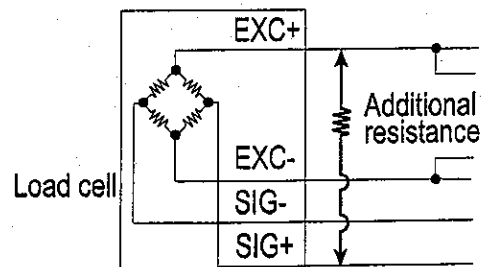
To Reduce the Output Voltage

When the zero output is too large, add a resistor between EXC+ and SIG-.



To Increase the Output Voltage

When the zero output is too small, add a resistor between EXC+ and SIG+.



3.1.4. Verifying Load Cell Output and Input Sensitivity

The input sensitivity of the indicator is 0.2uV/division minimum. Ensure you satisfy equation, when you design a weighing instrument using the indicator and load cell(s).

- Caution** □ **A change in input voltage sensitivity is equivalent to a one division change of the display. Select as large an input sensitivity voltage as possible so that the weighing display becomes stable.**
- **Consider the leverage if a lever is used.**

Weighing instrument using one load cell.	$0.2 \leq \frac{E * B * D}{A}$	A: Rated capacity of load cell [kg] B: Rated output [mV/V] D: Weighing interval [kg] E: Excitation voltage [mV] N: Number of load cells
Weighing instrument using multi-load cell	$0.2 \leq \frac{E * B * D}{A * N}$	

Verification Example

Design:		
Load cell	N=1	
Rated capacity	A=750 [kg]	$\frac{5000 * 3 * 0.05}{750} = 1 \geq 0.2$. Therefore, regard the instrument as a good design.
Rated output	B=3 [mV/V]	
Excitation voltage	E=5000 [mV]	
Weighing interval	D=0.05 [kg]	
Weighing capacity	300 [kg]	

3.1.5. Installing the Option Board

- Caution** □ **Do not remove screws without following these steps.**

This is a procedure for the data output board (OP-03, OP-04, OP-05 and Op-07).

- Step 1 Remove the power cord and other cables from the rear of the indicator.
- Step 2 Remove the two screws from the rear blank panel.
- Step 3 Remove the rear blank panel.
- Step 4 Insert the option board into both board guides and insert the board. Push firmly to make the connection between the option and the main board. If the option board panel will not close completely, retry step 4 to insert the option board correctly.
- Step 5 Secure the option board panel using two screws.

3.1.6. Attaching the Stand Option

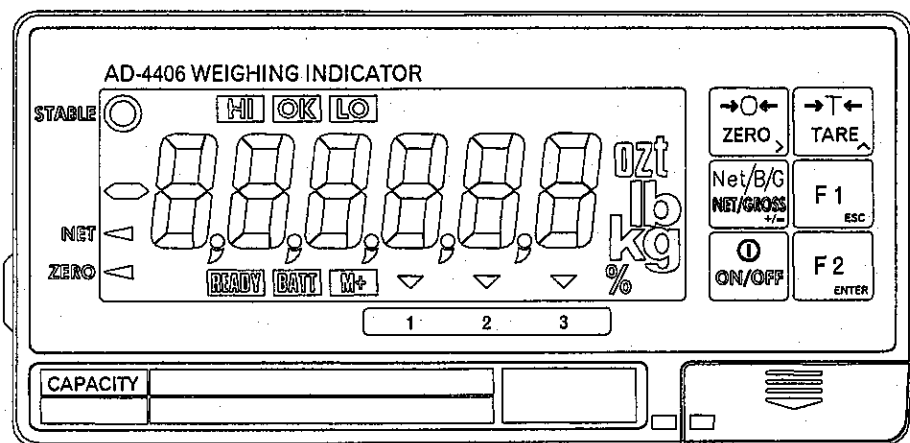
- Caution** □ **Do not remove screws without following these steps.**

This is the procedure for the stand (OP-11).

- Step 1 Remove the power cord and other cables from the rear of the indicator.
- Step 2 Fix the stand to both slide-rails with the bolts included with OP-11.

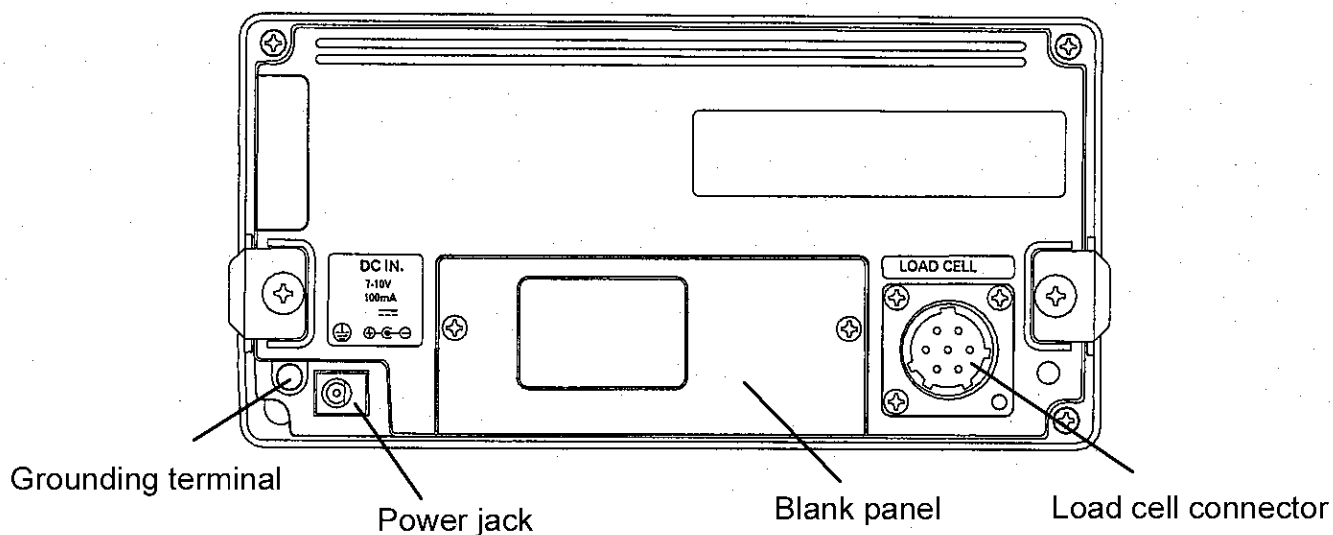


4.1.1. Front Panel Description



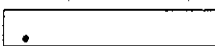
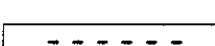
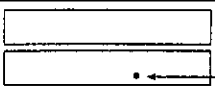
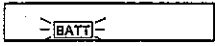
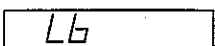
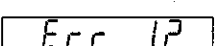
Name	Description
STABLE	Lights when display is stable
NET	Lights when the display shows Net weight
ZERO	Lights when display weight is in the Zero range
Hi/OK/LO	Shows the results of comparison or state of batching
READY	Shows the state of comparison or batching
BATT	Shows when battery is low and the unit is not suitable for use
M+ (Accumulation)	Shows when there is a stored accumulation result.
▼ (Triangle mark)	Depending on function settings, shows various states.
UNIT part	Weighing unit.
Zero key	Zeros the current display.
> key	Selects a digit when in the setting mode.
TARE key	Tares the displayed weight.
^ key	Selects a value in the setting mode.
NET/GROSS key	Selects net or gross weight display
+/- key	Selects a plus or minus value.
F1 key	Programmable function key
ESC key	Proceed to the next step without memorising the data.
F2 key	Programmable function key
ENTER key	Accept settings and memorise the data.
ON/OFF key	Turns the unit On and OFF
CAL key	Selects the Calibration routine.

4.1.2. Rear Panel Description



Name	Description
Power jack	Apply DC 7V to 10V.
Grounding terminal	
Blank panel	Option space (for OP-03, OP-04, OP-05 and OP-07).
Load cell connector	Mating plug supplied as an accessory

4.1.3. Other Displays and Symbols

	Standby display.
	Zero error when turning display on. If the ESC key is pressed, a current weighing value may be displayed.
 Blank or Decimal point	Over load display. Remove any load from the load cell immediately. It may cause damage to the indicator.
	Battery is weak, immediately change batteries.
	Low Battery, immediately change batteries.
	Example of an error display.

4.1.4. Accessories

Accessories	Instruction manual	1	
	Load cell plug	1	JM-GCR06A16-7S
	Capacity label	1	



5. Calibration

This weighing indicator, converts an input voltage from a load cell to the "mass" value, and displays it. Calibration is the adjustment function so that the scale (indicator) can weigh correctly.

5.1.1. Calibration Mode Items

There are four items in the calibration function where setting should be done.

How to calibrate: In weighing mode, press CAL key which is located behind the CAL cover at the lower righthand corner of the front panel. After **CAL in** is displayed for 2 seconds **CAL 0** will appear. The required items should be selected and displayed with **ZERO** key, then executed by pressing **ENTER** key.

*The CAL cover is removed by sliding downward.

Required Items

CALSET

Setting capacity, resolution, alignment of decimal point or display format, unit and weighing range. This item should be set first in order for the unit to function as a weighing device. Set values don't need to be changed again unless weighing unit itself is replaced. To set this item, refer to "Setting as a weighing device."

CAL 0

Calibrates zero and span. To get accurate data it is necessary and must be done when installing. To set this item, refer to "Calibration of Zero and Span"

Optional Items (Sub-functions)

Lnr 0

Performs digital linearisation. Refer to "Digital Linearisation".






G Set

Compensates for gravitational differences.
Refer to "Gravity Compensation Function"

Gravity compensation function

The function to correct weighing errors between the calibration location and another weighing location, caused by gravity differences.

In calibration mode the keys have the following functions:

-  When setting values, moves the flashing cursor. In other modes, changes the setting.
-  When setting values, increments the value. In other modes, changes the setting.
-  Changes settings
-  Proceeds to the next step without changing set value.
-  Memorises the set value and proceeds to the next step.

CAL Writes all the set data into non-volatile memory and displays CALoFF after which the calibration mode is exited by pressing the **ON/OFF** key. Note that ON/OFF does not function alone. Press **ESC** while holding **ON/OFF** to end the calibration mode when value is incorrectly set. After CAnSEL is displayed pressing ON/OFF stops the calibration mode and turns the unit off.

- Caution**
- ❑ **The maximum display is less than or equal to 20000 divisions. This number is calculated from the maximum capacity divided by the minimum division.**
 - ❑ **Check the accuracy of weighing instrument periodically.**
 - ❑ **Recommended mass, use a mass heavier than 2/3 maximum capacity.**
 - ❑ **Calibrate the scale if it is moved to another location or the environment has changed.**
 - ❑ **It is not necessary to set the gravity acceleration correction when calibrating the scale with a calibration mass at the place where the scale is used.**
 - ❑ **Enter the weighing data while the stable mark is turned on. If unstable data is used, it may cause a weighing error. Use the F00 function filter to achieve a stable reading.**
 - ❑ **The span calibration needs the zero calibration data. We recommend that you perform the span calibration immediately after the zero calibration.**
 - ❑ **If you use the dual range function of the multi-interval scale, perform the "Range Function", "Zero Calibration" and "Span Calibration".**



5.2. Calibration Procedure

5.2.1. Calibration Sequence

This section describes how to set capacity, resolution, decimal point position and display format, unit and weighing range.

When **CALSEt** appears on the display, enter the setting mode by pressing the **ENTER** key.



Setting of range function and unit

Single Range

Set resolution and position of the decimal point



Set weighing capacity

Double Range



<First range> Set resolution, place and format of decimal point.



<First range> Set weighing range



<Second range> Set resolution



<Second Range> Set capacity

For range function, refer to Range function section.

5.2.2. Range and unit

Step1 The range is displayed in the main display and the unit in the unit display area.

Range display : SinGL : single range

dUAL : dual range

Change the range function with  key

Unit display The calibration unit is lit.




To select the calibration unit use  key


 Memorises the settings and proceeds to the next step.


 Proceeds to the next step without changing set value.

5.2.3. Resolution, decimal point and display format

Step 2 Resolution will be displayed as d 0.1, with the decimal point and Triangle 1 lit.

The decimal point position can be selected with the  key, setting of display format (point or comma) with  key, resolution with  key. The decimal point format set at this time will apply to the display only. The decimal point format for the serial data output will be set in the F-Functions.

Press  to memorise the settings and proceed to the next step. Use the

 key to proceed to the next step without changing any of the stored data.

5.2.4. First Range Capacity

Step 3 Setting of capacity - when single range is set the capacity will appear after **CAP** is displayed for two seconds. Where dual range is set the first range will appear after displaying **CAP1** for 2 seconds. Triangle 1 will be lit. Set the value with **>**, **▲** and press **ENTER** to memorise the value displayed and proceed to the next step. Use the **ESC** key to proceed to the next step without changing the stored data. The next step in single range is zero calibration and in dual range, setting the resolution of the second range.

5.2.5. Second Range Resolution

Step 4 After displaying **rAnGE2** for 2 seconds a resolution with decimal point, for example 0.02, will be displayed. Also triangle 2 will light to show the second range. The setting procedure for the second range resolution is similar to setting the first range except the decimal point cannot be moved and the resolution will be larger. Use the **ENTER** key to memorise the data and proceed to the next step. Use the **ESC** key to proceed to the next step without changing the stored data.

5.2.6. Second Range Capacity

Step 5 Capacity with unit and decimal point will automatically appear on the display after displaying **CAP2** for 2 seconds. The setting procedure for the second range capacity is similar to setting the first range. Note that the second range capacity must be larger than the first range or an error will occur. Press **ENTER** to memorise the data and proceed to the next step.

5.2.7. To achieve a stable weight

- Step 6 Keep the following conditions to calibrate the scale (indicator) correctly.
- ❑ Maintain a constant temperature, stable power and stable input voltage from the load cell.
 - ❑ Avoid direct sunshine and the locality of an air conditioner.
 - ❑ Do not install the scale (indicator) where there is a strong magnetic field.

Step 7 Allow the scale to warm up for at least 10 minutes.

5.2.8. Zero Calibration

Step 8 Check that **Cal 0** is displayed.

Select a zero calibration method to adjust the zero point

Weighed Mass	The adjustment method with nothing on the weighing unit.	To step 9
Digital input	The numerical input to enter a load cell output voltage.	To step 10

Weighing Input

Step 9 Ensure an empty scale. Press the **ENTER** key after the STABLE mark has turned on. Proceed to step 11.

ESC key The key not to change the zero point data and proceed to the next step.

Caution Do not press the **ENTER** key while the STABLE mark is off (detecting motion). If necessary change the F-00 filter setting.

Digital Input

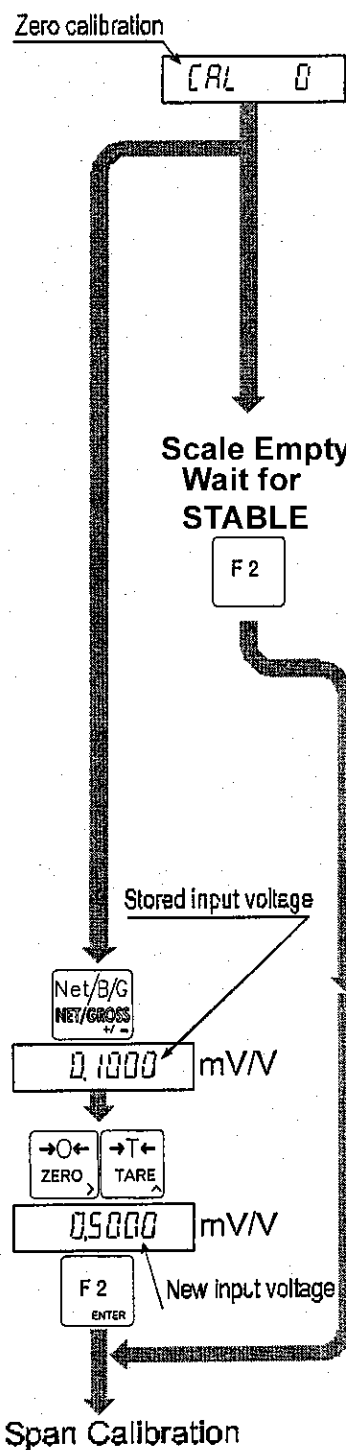
Step 10 Pressing the **+/-** key, a stored input voltage parameter of the zero point is displayed in the unit of mV/V. Adjust the input voltage using the following keys.

> key The key to select a figure.

^ key The key to select a number.

ENTER key The key to store the zero point parameter and proceed to the next step.

ESC key The key not to change parameter and proceed to the next step.



5.2.9. Span Calibration

Step 11 Check the capacity display after **CAL F** display for 2 seconds.


Select a span calibration method to adjust the capacity.

Weighing a mass less than maximum capacity	To step 12
Weighing maximum capacity mass	To step 14
Digital input	To step 16

Calibrating with a mass less than maximum capacity

Step12 Set a mass value using the following keys.


 key Key to select a figure.


 key Key to select a number.


Step13 Place a mass equivalent to displayed value on the weighing unit. Proceed to step 15.

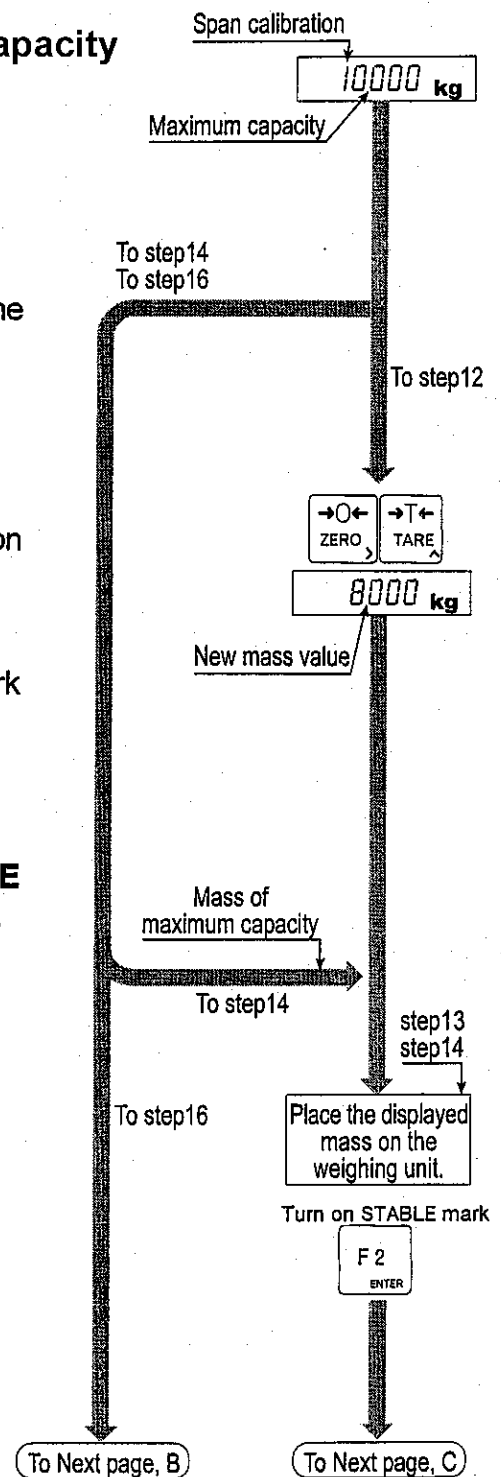
Calibrating with maximum capacity

Step14 Place a mass equivalent to the maximum capacity on weighing unit.

Step15 Press the  key after the STABLE mark turns on. Proceed to the next step.

 key The key not to change span data and proceed to the next step.

Caution Do not press the  key while the STABLE mark is off (detecting motion). Reset the F-00 filter if necessary.

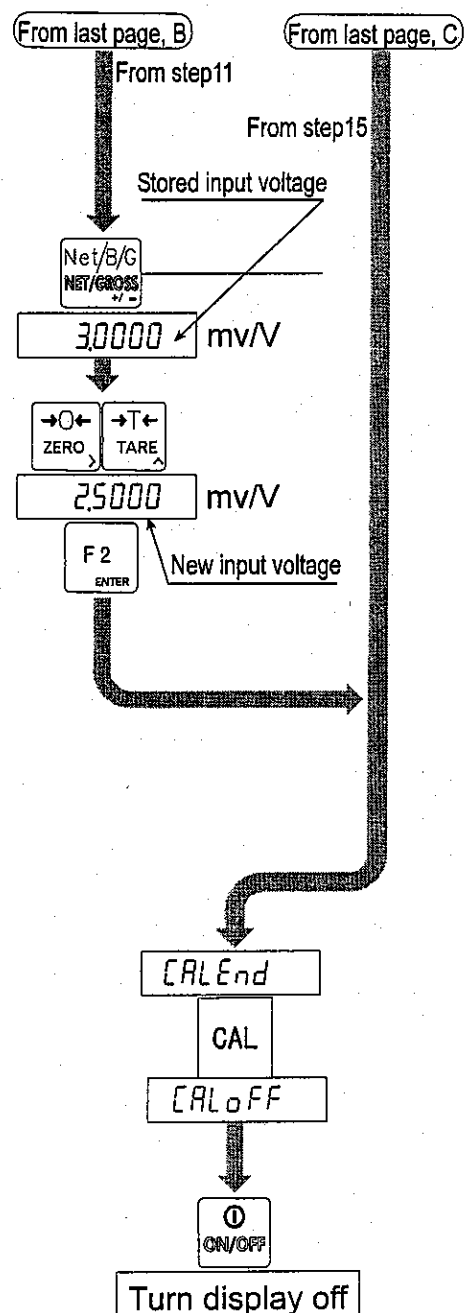


Digital Input

- Step16** Pressing the **[+/-]** key, a stored span input voltage is displayed in mV/V. Adjust the input voltage using the following keys.
- [>]** key The key to select a figure.
 - [^]** key The key to select a number.
 - [ENTER]** key The key to store the span data and proceed to step 17.
- [ESC]** key The key not to change data and proceed to step 17.

5.2.10. Exiting the Calibration Mode

- Step17** Ensure **[CALEnd]** is displayed. Use the following keys.
- [CAL]** key Parameters are stored in the indicator and **[CALoFF]** is displayed. Proceed to the next step.
 - [ESC]** key The key to memorise parameters temporarily. Proceed to "CAL 0" display.
- Press and hold the **[ON/OFF]** key and press the **[ESC]** key. No parameters are changed, **[CAnCEL]** is displayed and the calibration mode is finished.
- Step10** Press the **[ON/OFF]** key to turn the display off.





5.3. Weighing Range Function

The weighing range function can select "single range" and "dual range". Specify each weighing interval (division) for the multi-interval instrument. Each weighing interval is displayed according to a net value or gross value.

Caution □ **Using a single range, it is not necessary to perform this function.**

Example 1 The gross display.

Specified parameters:

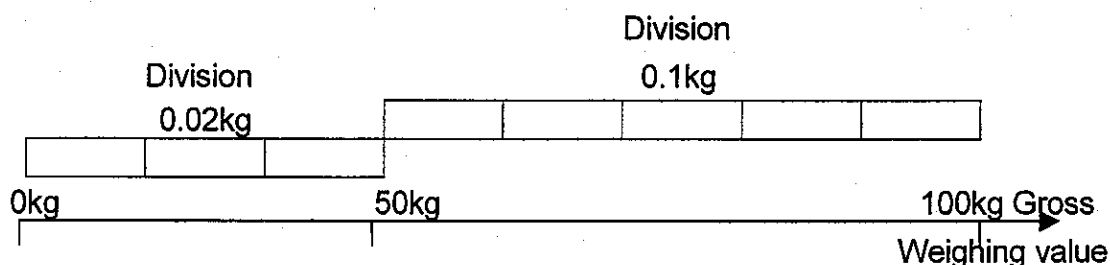
First range Range = 50.00kg, division 0.02kg

Second range Range = 100.00kg (maximum capacity), division 0.1kg

Display

0kg to 50kg : The first range, division 0.02kg.

50kg to 100kg : The second range, division 0.1kg.



Example 2 The net display using a 40kg tare value.

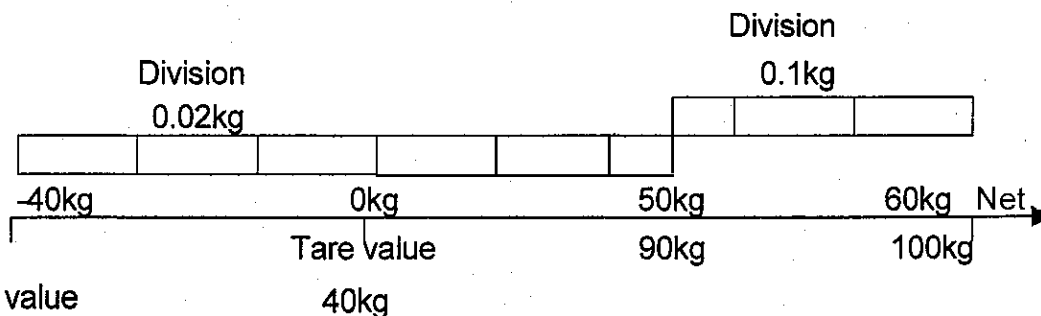
Specified parameters:

The same parameters as example 1.

Display

-40kg to 50kg : The first range, division 0.02kg.

50kg to 60kg : The second range, division 0.1kg.



5.3.1. Division and Range

Consider the following rules when choosing the weighing ranges.

- Rule 1 Select each weighing range so that the first range < the second range.
Select the division of the first weighing range.
The division of the second weighing range is automatically set to the next permissible division, but this may be increased in the calibration setup.
- Rule 2 When setting the dual range, the upper limit value of the second range becomes the maximum capacity of the scale.
- Rule 3 Select a resolution smaller than 10000. The resolution is obtained by dividing the maximum capacity by the minimum division of the first range.



5.4. Digital Linearisation Function

Even if the zero and span calibration have been completed, there may still remain some linearity deviation shown in the performance of the scale. The digital linearisation function can rectify and reduce the linearity deviation using weighing points between zero and full scale setting. Up to three weighing points can be specified.

- Caution**
- ❑ This function does not improve repeatability and hysteresis.
 - ❑ Ensure that $Lnr\ 1 < Lnr\ 2 < Lnr\ 3$.
 - ❑ Do not press the **ENTER** key while the **STABLE** mark is off.

Middle point	Flash indication	▼ mark
First Point	Lnr 1	1
Second Point	Lnr 2	2
Third Point	Lnr 3	3

- Step 1 Press the **>** key to display **Lnr 0**
- Step 2 The value of the linearisation point is displayed after indicating **Lnr x**. x is 1, 2 or 3.
- Step 3 Input zero point. Refer to "5.2.8. Zero calibration".
- Step 4 Select a method, either
- ❑ Press the **ESC** key to finish this function. Proceed to step 7 and other points are cleared (cancelled) or
 - ❑ Select a linearisation point value using the following keys. Proceed to step 5.
> key The key to select a figure.
^ key The key to select a number.
- Step 5 Place a mass equivalent to the displayed value on the weighing unit. Press the **ENTER** key after the **STABLE** mark has turned on. Proceed to step 6.

Step 6 If you add new middle point, repeat steps 3, 4, 5.

If you finish this function, proceed to step 7.

Step 7 Perform step 11 of "5.2.9. Span Calibration" on page 14 immediately.



5.5. Gravity Compensation Function

- If the scale is used at the calibration location, it is not necessary to perform this function.
- It may cause a weighing error, if there is a difference of gravity acceleration between the installed location and calibration location. This function specifies these gravity accelerations and corrects span error.

Caution □ The decimal point is not displayed in the function. Ex. 9798 = 9.798 m/s²

Step 1 At CAL 0 display press the > key until G Set is displayed and press ENTER key to enter the gravity compensation function.

If you want to cancel the current procedure, press and hold the ON/OFF key and press the ESC key, then no parameters are changed and the calibration mode is finished. Press the ON/OFF key to turn the display off after displaying CAnCEL.

Step 2 The parameter is displayed with triangle 1. Enter the gravity acceleration of the calibration location. The parameter xxxx is the gravity acceleration.

> key The key to select a figure.

^ key The key to select a number.

ENTER key... The key to store the new gravity acceleration and proceed to step 3.

ESC key The key not to change the value and go back to G Set.

Step 3 The parameter is displayed with triangle 2. Enter the gravity acceleration of the installed location. The parameter xxxx is the gravity acceleration.

> key The key to select a figure.

^ key The key to select a number.

ENTER key.. The key to store the new gravity acceleration and proceed to step 4.

ESC key The key not to change the value and go back to step 2.

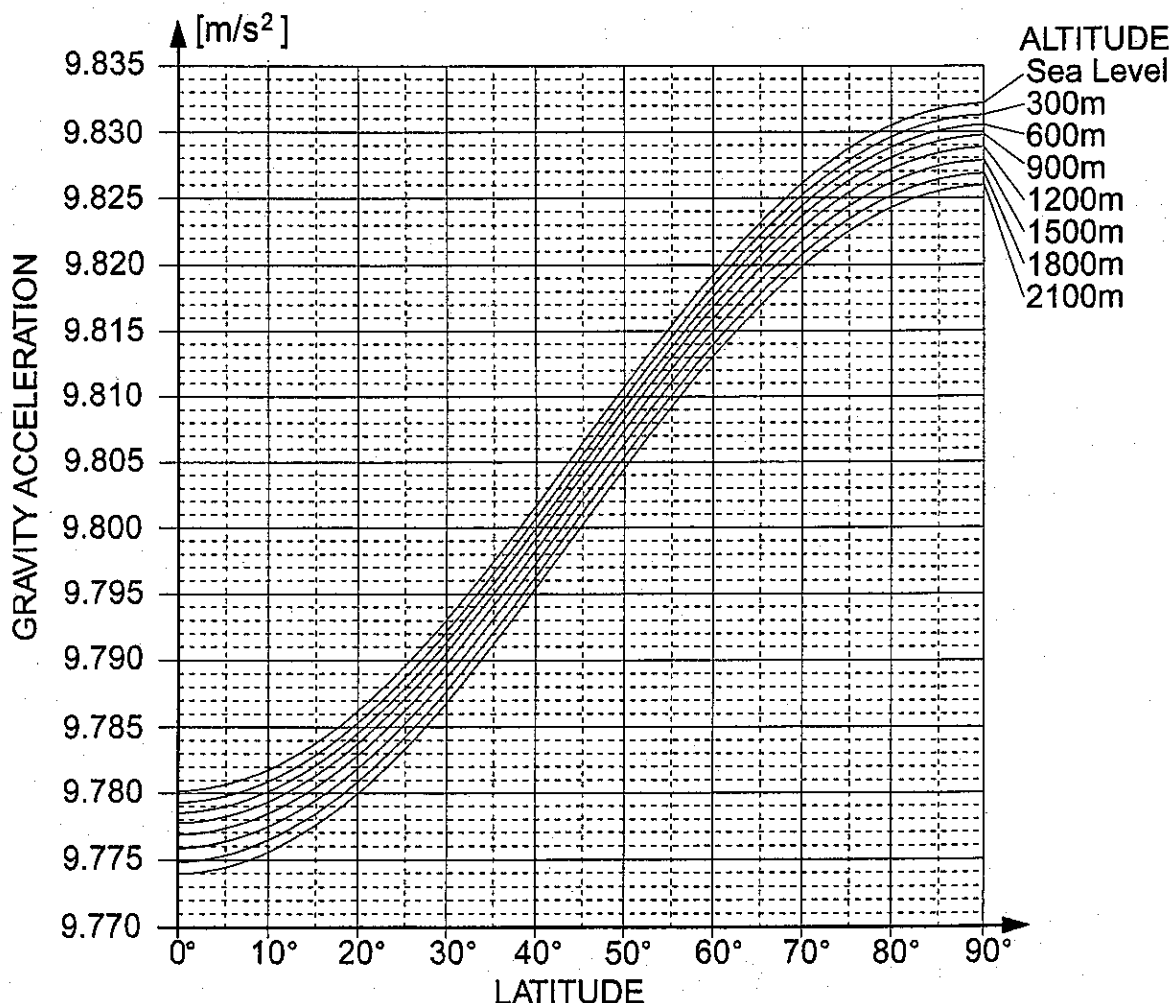
Step 4 Now G xxxx is displayed. Press the CAL key to store the parameters.

CALoFF is displayed. Proceed to step5.

Step 5 Press the ON/OFF key to turn display off.

5.5.1. The Gravity Acceleration Table

Amsterdam	9.813 m/s ²	Manila	9.784 m/s ²
Athens	9.800 m/s ²	Melbourne	9.800 m/s ²
Auckland NZ	9.799 m/s ²	Mexico City	9.779 m/s ²
Bangkok	9.783 m/s ²	Milan	9.806 m/s ²
Birmingham	9.813 m/s ²	New York	9.802 m/s ²
Brussels	9.811 m/s ²	Oslo	9.819 m/s ²
Buenos Aires	9.797 m/s ²	Ottawa	9.806 m/s ²
Calcutta	9.788 m/s ²	Paris	9.809 m/s ²
Chicago	9.803 m/s ²	Rio de Janeiro	9.788 m/s ²
Copenhagen	9.815 m/s ²	Rome	9.803 m/s ²
Cyprus	9.797 m/s ²	San Francisco	9.800 m/s ²
Djakarta	9.781 m/s ²	Singapore	9.781 m/s ²
Frankfurt	9.810 m/s ²	Stockholm	9.818 m/s ²
Glasgow	9.816 m/s ²	Sydney	9.797 m/s ²
Havana	9.788 m/s ²	Tainan	9.788 m/s ²
Helsinki	9.819 m/s ²	Taipei	9.790 m/s ²
Kuwait	9.793 m/s ²	Tokyo	9.798 m/s ²
Lisbon	9.801 m/s ²	Vancouver, BC	9.809 m/s ²
London (Greenwich)	9.812 m/s ²	Washington DC	9.801 m/s ²
Los Angeles	9.796 m/s ²	Wellington NZ	9.803 m/s ²
Madrid	9.800 m/s ²	Zurich	9.807 m/s ²





5.6. Calibration Error Code List

Exiting from calibration errors

ESC key The key to return to the point where the error occurred and re-try the operation.

Press and hold the **+/−** key and press the **CAL** key, or **ESC** while pressing **ON/OFF** key.

All parameters are not changed, the **CanCel** is displayed and the calibration mode is finished.

Error Code List

If an error has occurred during calibration the following codes are displayed.

Error code	Description
Err 0	In multi-interval scale. The first division is set to maximum (d-50). Therefore the next division can not be entered.
Err 1	Resolution exceeds 10000. (Resolution = maximum capacity/ minimum division) Reduce maximum capacity or increase minimum division.
Err 2 Err 3	Load cell output is too large or too small at zero calibration. Check the weighing unit and load cell. Refer to "3.1.4.Verifying Load Cell Output and Input Sensitivity".
Err 4	Measuring calibration mass (or entering digital input), the value exceeded maximum capacity. Reduce calibration mass (or digital input).
Err 5	Selected calibration mass is smaller than minimum division.
Err 6	New input sensitivity is less than 0.2 $\mu\text{V}/\text{division}$. Increase input sensitivity. Refer to "3.1.4.Verifying Load Cell Output and Input Sensitivity".
Err 7	Placing mass on the weighing unit, the load cell output becomes a negative value. Check the load cell cable connections and the direction of load cell mounting.
Err 8	Load cell output exceeds the input range before maximum capacity. Adjust zero balance referring to "3.1.4.Verifying Load Cell Output and Input Sensitivity". Replace with a load cell designed with a smaller output. Reduce maximum capacity.
Err 9	The weighed value is out of the input range at zero calibration or span calibration. Check the weighing unit and cables.
Err 12	The first weighing range is larger than next weighing range
Err 13	Incorrect mass is selected at the digital linearisation function. Select mass of the following relation. $\text{Inr } 1 < \text{Inr } 2 < \text{Inr } 3$.
G Err	An unacceptable value was selected in the gravity acceleration function. Exit this error using the Operate/Standby key.



6. Functions

There are two parameter lists for the F-functions and CF-functions. These functions control the indicator. The parameters of each function are stored in the EEPROM, and are not lost even if power is lost.

F-functions: These parameters can always be changed and are used for internal settings.

CF-functions: To use the CF-functions access is required to the CAL switch. If the indicator CAL switch cover has been sealed, for trade use, then the CF-functions cannot be accessed.



6.1. Changing the Function Settings

Enter function settings. To enter, do one of the following. When you are in the function setting F00 will be displayed.

1. When the unit is off, press **ON/OFF** key while pressing and holding the **+/-** key until F00 is displayed, or
2. When the unit is in weighing mode, press both F1 and F2 at the same time.

Operating Item

Step 3 Select an item using the following keys.

- >** key The key to select a figure.
- ^** key The key to select a number.
- ENTER** key The key to display a parameter of the selected item. Proceed to step 4.

ESC key Ends function setting and enters weighing display.

CAL key The key to switch from F-functions to CF-functions.

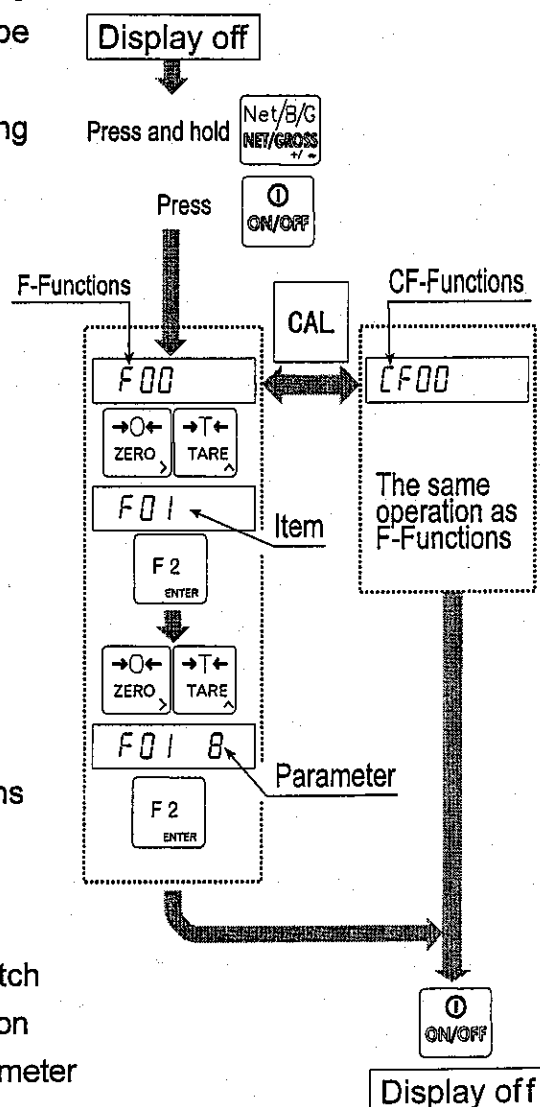
Operating parameter

Step 4 Select a parameter using the following keys.

- >** key The key to select a figure or a switch
- ^** key The key to select a value or condition
- ENTER** key The key to store a parameter and return to step 3.
- ESC** key The key not to change the parameter. Return to step 3.

Display off

ON/OFF key to turn the display off.





6.2. F-Functions

Weighing conditions (Digital Filter, Zero tracking and Stability)

Item	Parameter	Description
F00 Filter Motion / Averaging time	0	2 d/ 1.6s
	1	4 d/ 1.6s
	2	8 d/ 1.6s
	3	16 d/ 1.6s
	4	32 d/ 1.6s
	5	64 d/ 1.6s
	6	128 d/ 1.6s
	7	2 d/ 3.2s
	* 8	4 d/ 3.2s
	9	8 d/ 3.2s
	10	16 d/ 3.2s
	11	32 d/ 3.2s
	12	64 d/ 3.2s
	13	128 d/ 3.2s
F01 Zero tracking	0	OFF
	1	0.5 d/ 1s
	2	1.0 d/ 1s
	3	1.5 d/ 1s
	4	2.0 d/ 1s
	5	2.5 d/ 1s
	6	0.5 d/ 2s
	7	1.0 d/ 2s
	* 8	1.5 d/ 2s
	9	2.0 d/ 2s
	10	2.5 d/ 2s
F02 STABLE mark (Motion detection) condition	0	No motion detection
	1	0.5 d/ 0.5s
	2	1.0 d/ 0.5s
	3	2.0 d/ 0.5s
	4	3.0 d/ 0.5s
	5	4.0 d/ 0.5s
	6	0.5 d/ 1s
	7	1.0 d/ 1s
	* 8	2.0 d/ 1s
	9	3.0 d/ 1s
	10	4.0 d/ 1s
F03 Auto print timing	0	1 (STABLE on)
	1	Twice in succession
	* 2	Three times
	3	Four times

d: division (weighing interval) of first range.

s: second.

*: Initial settings.

Display and other general settings

Item	Parameter	Description
F04 Display update rate	* 0	5 times/s
	1	10 times/s
F05 Buzzer	1 x	Key click (ON/OFF)
	2 x	LoLo /Zero band
	3 x	Lo
	4 x	OK
	5 x	HI
	6 x	HiHi/Batch finish/Full
F06 Device ID (Address)	00 to 99	Command address or Device ID
F07 Auto power off	* 0	Not automatically off
	1	5 minutes

s: second.

*: Initial settings.

Key switchDisplay and other general settings

Item	Parameter	Description																			
F10 F1 key function	x 0	No function	Left: Priority, select with key																		
	x 1	Serial data output 1	Right: Function(listed), select with key																		
	x 2	Serial data output 2	First priority is functioned by releasing the key after pressing.																		
	x 3	Addition (M+)																			
	x 4	"ToTAL" display																			
	x 5	Setting setpoint	Press the key for more than two seconds & low priority functions are displayed sequentially.																		
	x 6	Start Comparison/Batch																			
	x 7	Stop Comparison/Batch																			
	x 8	(no function)	Initial value is 13, others x0																		
	x 9	Unit change																			
F11 F2 key function		same as F10	Initial value is 11, others x0																		
F12 Disabling keys	2 0	A key is selected by the left parameter																			
	<table><tr><td>* 0</td><td>enable</td><td></td></tr><tr><td>1</td><td>disable</td><td></td></tr></table> <table><tr><td>1</td><td>ZERO key</td><td rowspan="6"> key</td></tr><tr><td>2</td><td>TARE key</td></tr><tr><td>3</td><td>NET/GROSS key</td></tr><tr><td>4</td><td>F1 key</td></tr><tr><td>5</td><td>F2 key</td></tr><tr><td>6</td><td>ON/OFF key</td></tr></table>	* 0	enable		1	disable		1	ZERO key	key	2	TARE key	3	NET/GROSS key	4	F1 key	5	F2 key	6	ON/OFF key	A key condition is selected by the right parameter: When specifying 1 at the right parameter, this key does not work. Use this function to avoid misoperation of 6 keys on the front panel without key.
* 0	enable																				
1	disable																				
1	ZERO key	key																			
2	TARE key																				
3	NET/GROSS key																				
4	F1 key																				
5	F2 key																				
6	ON/OFF key																				

*: Initial settings.

External Input

Item	Parameter	Description
F13 EXT1 Function selection of external input	* 0	Not used (No function)
	1	ZERO key
	2	TARE key
	3	NET/GROSS key
	4	OFF key
	5	F2 key
	6	F1 key
	7	Serial data output (Format1)
	8	Serial data output (Format2)
	9	Addition (M+)
	10	Start batching
	11	Stop batching
	12	Over signal. Gross over and display data are output.
	13	Accumulation data display when shorting terminal.
	14	Net weight display when shorting terminal.
	15	Execute comparison when shorting terminal
	16	Display by the second unit when shorting terminal.
	17	All keys are enabled when shorting terminal.
	18	Inhibit reading the memory card when shorting terminal.
F14 EXT2	The same as F13 (0 - 17) 18 Memory card1 (BCD bit1)	
F15 EXT3	The same as F-13 (0 - 17) 18 Memory card1 (BCD bit2)	

*: Initial settings.

Accumulation

Item	Parameter	Description
F20 Accumulation Mode	10/11	acc. no(0)/exec(1)
	20/21	Manual(0)/Auto(1)
	30/31	+ only(0)/+/- (1)
	40/41	OK only/All data(1)
		Initial settings: 10,21,31,41
F21 Inhibit region for accumulation	0	Add data anytime
	* 1	Above ± 5 d
	2	Above ± 10 d
	3	Above ± 20 d
	4	Above ± 50 d
		The selection of the inhibit region for accumulation

d: division (weighing interval) of first range.

s: second.

*: Initial settings.

Comparator

Item	Parameter	Description	
F22 Comparator function	* 0	Not used	
	1	Upper/lower limit comparison(2 Limits setting)	
	2	Upper/lower limit comparison(Target and allowance)	
	3	Upper/lower limit comparison(Target and % allowance)	
	4	HH/Hi/OK/Lo/LL comparison(4 Limits setting)	
	5	HH/Hi/OK/Lo/LL comparison(Target and allowance)	
	6	HH/Hi/OK/Lo/LL comparison(Target and % allowance)	
	7	Check weighing 1	
	8	Check weighing 2	
	9	Check weighing 3	
	10	Simple batch 1	
	11	Simple batch 2	
	12	Simple batch 3(Loss in weight)	
F23 (F22=1-6) Validation of comparison	10/11	Includes zero band(1)	Initial settings are 11,21,31,40
	20/21	Includes minus(1)	
	30/31	Stable(0) /All time(1)	
	40/41	All time(0)/Start, stop(1)	
F23 (F22=10-12) Sub function for batch weighing	10/11	Tare when start(1)	Initial settings are 11,21,31,40
	20/21	Stop after Full by key(0)/Auto(1)	
	30/31	Over/Under judgment: after dribble flow(0)/Batch finish(1)	
	40/41	Start with press and hold TARE(1)	
F24 Relay output selection	* 0	Over	Effective when F22=7,9,10,12
	1	Under	
	2	Finish/Full (F22=9,10,12)	
F25 Batch finish output time	00 to 99	Relay on time by 0.1second step (00:continuous to zero band)	Initial setting is 00
F26 Zero band	-999999 to 999999		Initial setting is 0

*: Initial settings.

Data output

Item	Parameter	Description	
F30 Data output	* 0	No data output	
	1	Analog output	Set F31, 32, 33
	2	Serial output	RS-232C, RS-422, RS-485
	3	(Reserve)	
	4	(Reserve)	

*: Initial settings.

Analog output

Item	Parameter	Description
F31 Output data	* 0	Display data
	1	Gross data
	2	Net data
F32 Weight value at 4mA output	-999999 to 999999	Initial setting is 0
F33 Weight value at 20mA output	-999999 to 999999	Initial setting is 10000

*: Initial settings.

Serial data format

Item	Parameter	Description
F34 Serial data format 1	x 0	Terminator
	x 1	ID number of unit(determined F06)
	x 2	Code number
	x 3	Data number
	x 4	Result of comparison
	x 5	(Reserved)
	x 6	(Reserved)
	x 7	Accumulated value
	x 8	Number of accumulations
	x 9	Stable/Over
	x A	Displayed weight
	x B	Gross weight
	x C	Net weight
	x D	Tare weight
	x E	Weight type(G / N / T , cf. CF06)
	x F	Weight unit(cf. CF07)
F35 Serial data format 2	Same as F34	Initial value 19,2E,3A,4F,50,00

Serial Interface

Item	Parameter	Description
F40 Output mode	* 0	Stream mode
	1	Manual mode
	2	Auto print mode(+)
	3	Auto print mode(+/-)
	4	Automatic output upon accumulation.
	5	Command mode
F41 Accumulated data output at accumulated data display	* 0	Manual, Fixed format
	1	Auto, Fixed format
	2	Manual, Format 1(F34)
	3	Auto, Format 1(F34)
	4	Manual, Format 2(F35)
	5	Auto, Format 2(F35)

Serial Interface (cont.)

Item	Parameter	Description	
F42 Delay for continual data	* 0	No delay	
	1	0.5 second	
	2	1.0 second	
	3	1.5 second	
	4	2.0 second	
F43 Command address	* 0	Not use	
	1	Use (Address determined by F06)	
F44 Time out	* 0	Approx. 1 second	
	1	No limit	
F45 Terminator	* 0	CR, LF	
	1	CR	
F46 Decimal point/Delimiter	* 0	DP:point(,)/Del imitter:comma(,)	Common to sending/receiving
	1	DP:comma(,)/Del imitter:semicolon(,)	
F47 Baud rate	0	600 bps	
	1	1200bps	
	* 2	2400bps	
	3	4800bps	
	4	9600bps	
F48 Data bit, parity	* 0	Data 7bit, Even parity	
	1	Data 7bit, Odd parity	
	2	Data 8bit, Non parity	

bps: bit per second.

*: Initial settings.

Description of "Stream Mode"

Object F40 0

Operation Data is output in every sampling (when refreshing the display).

Use this mode to output data to an external display (Data may not be output due to timing of the baud rate and internal sampling rate). If data is printed by pressing the PRINT key on the printer, use stream mode.

Description of "Manual Print"

Object F40 1

Operation When pressing the key set to output data, the stable weighing data is output once.

Description of "Auto Print Mode"

Object F40 2 or F40 3

Operation When weighing data varies from the "inhibition region of output" to the "permission region of output", the stable data is output once. If you use this mode, set F02 to any value except 0.

- ☐ When weighing (and removing) each object and printing the data, use this mode.
- ☐ In case of F40 2
"Inhibition region of output" $\leq +5d$.
 $+5d < \text{"permission region of output"}$.
- ☐ In case of F40 3
 $-5d \leq \text{"inhibition region of output"} \leq +5d$.
"Permission region of output" $< -5d$, $+5d < \text{"permission region of output"}$.

d: division (weighing interval) of first range.

Description of "Delay for continual data"

Object F42

Operation This function can be used in the "Auto print mode" and "Manual print mode".
When using a non-buffered printer like the AD-8121, set to F42 3 and F43 1.



6.3. CF-Functions

Item	Parameter	Description																
CF00 Zero track width, motion detection condition	* 0	No limitation																
	1	Use limitation at F01, F02 and F03																
CF01 Push button zero range Turning display on, the range to zero display.	* 0	± 2% of CAP, Tare limit is 100 % CAP																
	1	±10% of CAP, Tare limit is 100 % CAP																
	2	± 3% of CAP, Tare limit is 50 % CAP																
	3	± 4% of CAP, Tare limit is 50 % CAP																
CF02 Power on zero range Turning display on, the zero acquisition range.	* 0	Do not zero when turning display on.																
	1	±10% of CAP																
	2	± 3% of CAP																
	3	± 4% of CAP																
CF03 Zero tracking	0	Gross when displaying gross.																
	1	Gross																
	* 2	Gross or Net when displaying net.																
CF04 TARE, ZERO in motion	* 0	Not accept TARE or ZERO in motion																
	1	ExecuteTARE or ZERO even if in motion.																
CF05 Output on over load and unstable state.	* 0	Not to output data at unstable value or over load. It is effective in key mode.																
	1	To output data always.																
CF06 Header 2	* 0	<table><tr><td></td><td>Gross</td><td>Net</td><td>Tare</td></tr><tr><td>* 0</td><td>GS</td><td>NT</td><td>TR</td></tr><tr><td>1</td><td>GS</td><td>NT</td><td>TR</td></tr><tr><td>2</td><td>G</td><td>N</td><td>T</td></tr></table>		Gross	Net	Tare	* 0	GS	NT	TR	1	GS	NT	TR	2	G	N	T
			Gross	Net	Tare													
	* 0		GS	NT	TR													
	1		GS	NT	TR													
2	G	N	T															
1																		
2																		
CF07 No. of weighing unit digits.	* 0	Two figurers																
	1	Three figures																
CF08 Accumulation function	* 0	Not used (Ineffective)																
	1	Used (Effective)																

CAP : maximum capacity

*: Initial settings.



7. Tare

- The function is used to display a net value with the container weight subtracted from the total weight, if you put an object into a container to weigh it.
- Using the serial interface(RS-232C etc.), you can perform tare from external equipment.

Caution □ When turning the power off, the tare value is cleared.

7.1.1. Weighing Tare

Operation Put the tare on the weighing unit. Press the **TARE** key to store the tare weight after the **STABLE** mark turns on. The display changes to net.

Caution □ When displaying a negative gross value, tare cannot be used.

7.1.2. Clearing Tare

- When pressing the **TARE** key while gross is zero, tare is cleared and gross is displayed.
- When zeroing with the **ZERO** key, tare is cleared.



8. Function key F1 and F2

For easier use, select functions of F1 key and/or F2 key and prioritize them in function settings.

Functions that can be set are as follows:

"Print 1" or "Print2"...for serial data output in either format 1 or 2

"Add" ... for addition

"totAL"...for display of accumulated data

Code number ex."1- ". ...for setting and/or changing the compared data

"StArT" or "StoP"... for start or stop comparison

"StoP" ... for forced termination of batch weighing

"Unit"...for changing unit

Function set at first priority is operated when F1 or F2 key is released and functions of other priority, by pressing either F1 or F2 key for more than 2 seconds. For further details, refer to each item's description.

Also, regardless of the function settings above, by pressing both F1 and F2 or press one key while holding the other key, functions below can be done.

F1 + F2 Entering function settings

F1 + NET/GROSS Displaying the accumulation result

F2 + NET/GROSS Displaying and setting data number

F2 + TARE Starting batch-weighing

F2 + ON/OFF Changing the unit



9. Accumulation

The function accumulates weighing data and stores sum of weight and count of weighing. Data is stored in the EEPROM, and is not lost even if the AC power supply is disconnected.

9.1.1. Preparation and Specification

Set the following parameters to use the accumulation function.

- Select CF08 1 for the CF-function so that the accumulation function becomes effective. Also select F20 of the F-function 11.
- Specify the method of accumulation and data at F20 of the F-function.
- Specify the inhibit range for accumulation at F21 of the F-function.

Selection of Accumulation Mode, F20 of the F-function

- There are two methods of manual accumulation, with the **M+** function operation, where a function is allocated to a key and automatic accumulation.
- The accumulation data can select "positive data only" or "both polarity data".
- The accumulation data can select "result of comparison is OK only" or "all result".

Accumulation Condition, F21 of the F-function

- In case of manual accumulation mode, press the key to accumulate weighing data when the STABLE mark has turned on.
- Data can be accumulated after weighing value becomes to the "inhibition region of output". When connecting power cord and turning display on, the accumulation mode makes the same action.

Inhibition region for accumulation	F21	Description
Add data anytime	F21 0	Stable data can be used anytime
Above ± 5 d	F21 1	Factory setting
Above ± 10 d	F21 2	
Above ± 20 d	F21 3	
Above ± 50 d	F21 4	

- Caution**
- Do not set to F21 0 for the automatic accumulation mode
 - If setting to F21 0, it may add the same data two times or more.

Limitation of Accumulation Count and Total

- The limitation of accumulation count is 999999.
- The limitation of total is ± 999999 ignoring the decimal point.
- If exceeding these limitations, data is not accumulated.
Example: Setting the decimal point to second a figure like "0.0", the limitation is "99999.9".

9.1.2. Display and Operation

Action of Accumulating Data

- When accumulating data, the display blinks once.
- If storing accumulation data, the M+ mark is displayed.

Caution □ **This function can not accumulate data with different units.**
Specify the unit before use.

Display of Accumulation Data

- When setting to CF08 1 (Effective accumulation function) and pressing the key that allows accumulation display, the totAL is displayed and the total data is displayed with the M+ mark blinking. A press of the ESC key displays the number of accumulations, and when the ESC key is pressed again, the weighing data is displayed.
- The total data can be output. Refer to "Output of Accumulation Data"

Undoing the Accumulation Data

- The last weighing data can be deducted from the accumulated data.

Step 1 Press the key allocated to display totAL and accumulation data.

Step 2 Press and hold the +/- key more than 3 seconds. The display blinks once and the last weighing data is deducted and the new total is displayed.

Caution □ **External input cannot be used.**

Clearing the Accumulation Data

Step 1 Press the key allocated to display totAL and accumulation data.

Step 2 Press and hold the ZERO key more than 3 seconds. The display blinks once and the accumulation data is cleared.

Caution □ **External input cannot be used.**

Output of Accumulation Data

- Accumulation data can be output to the serial interface.
- Output can be automatic or manual and the output data format is selectable by F41 of F- functionsetting.

F41	Parameter	Manual/Automatic	Format
Accumulated data to be output when accumulated data is displayed.	* 0	Manual	Fixed format
	1	Automatic	
	2	Manual	Format 1(determined by F34)
	3	Automatic	
	4	Manual	Format 2(determined by F35)
	5	Automatic	

Step 1 Press the key allocated to display **totAL** and accumulation data.

Step 2 If automatic output setting, data is output once.

Step 3 If manual output, pressing the **F2** key while accumulated data is displayed, the data is output.

Fixed data format :

Count

				N	,	+	0	0	0	0	0	0	1		C	R	F
--	--	--	--	---	---	---	---	---	---	---	---	---	---	--	---	---	---

□ Space(20h)

Header Data Terminator

Total

T	O	T	A	L	,	+	0	0	0	0	0	0	1	k	g	C	R	F
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Header Data Unit Terminator



10. Comparison

- This function has "upper / lower comparison", "5-stage(HiHi/Hi/OK/LO/LOLO) comparison", "setpoint comparison" and "simple batch" modes. They compare the weighing data with preset parameters and can output the result of the comparison to the display and beeper and to the relay-outputs of OP-03 and OP-05.
- Set F-function F22 and F23 to use the "upper / lower comparison" or the "5-stage (HiHi/Hi/OK/LO/LOLO) comparison" (Note these two comparisons will be referred to as the "Weight check mode" from now), and set F22 through F26 to use "setpoint comparison" and "simple batch" modes.
- There are four code memories for the setpoints. Data is stored in the EEPROM, and is not lost even if the AC power supply is disconnected or battery is discharged.
- Code memory can be selected by key switch, external control input, or command through the serial interface.



10.1. Weight Check Mode

- This function compares the weighing data with the upper limit value and lower limit value(upper/lower limit comparison) or four limit values(HiHi, Hi, Lo and LoLo), and indicates, beep and/or outputs the result to the three relays of HI, OK and LO. Use this comparison when judging whether a weight is correct.
- Refer to F-function F22 1, 2, 3 to use upper/ lower limit comparison and F22 4, 5, 6 to use 5-stage comparison.
- Select a parameter of F-function F23 for the comparison condition.
- Specify the upper and lower limit / HiHi, Hi, Lo, LoLo limit values.
- When inputting the lower limit value(s), it is not necessary to input F-function F22 and F23 again unless changing the F-function.
- 3 type of setting values for each comparison.

1) Set limit value (upper limit and lower limit / HiHi, Hi, Lo, LoLo limit).

2) Set Target value and acceptable tolerance(upper and lower) in weight.

Limit value is calculated automatically.

3) Set Target value and acceptable tolerance(upper and lower) in percentage of the target weight. Limit value is calculated automatically.

Example. Target = 50kg, Upper limit = 51kg, Lower limit = 48kg

1) Hi(Upper limit) : 51 (kg), Lo(Lower limit) : 48 (kg)

2) TG(Target) : 50 (kg), Hi(Upper acceptable tolerance) : 1 (kg),

Lo(Lower acceptable tolerance) : 2 (kg) not minus value

3) TG(Target) : 50 (kg), Hi(Upper acceptable tolerance) : 2 (% of Target),

Lo(Lower acceptable tolerance) : 4 (% of Target) not minus value

10.1.1. Comparison Formulae

Comparison is performed based on the following formulae.

State Name	Condition Formula
HiHi *	HiHi limit value < Display value
HI	Upper limit (Hi limit) value < Display value
OK	Lower limit value \leq Display value \leq Upper limit value
LO	Display value < Lower limit (Lo limit) value
LoLo *	Display value < LoLo limit value

* HiHi and LoLo is 5-stage comparison only

- The decimal point is not considered. Example: If the upper limit value is 10.0, input 100.
- These parameters are stored in the EEPROM, and are not lost even if the AC power is disconnected or the batteries are discharged.
- When the display value becomes an over load (positive over), HI (over) is output.
When the display value becomes an under load (negative over), LO (under) is output.
- This function compares the upper limit value first.
- This function does not check the relation of upper limit value and lower limit value.

10.1.2. Upper/Lower Limit Values

Step 1 Press the key which has been allocated to the setpoint function, see Functions F10 & F11, "SEt Pt" display will appear. Release the key and the mode will change to the setpoint mode, with the display showing a 'blinking' code memory number.

Step 2 Set memory code number using following keys.

- [>] key To select a comparison class and proceed to step 3.
- [^] key To select a code memory number.
- [ESC] key .. To return to weight display without code memory change.
- [ENTER] key . To set displayed code memory's setpoint and return to weight display.

Step 3 Select the comparison class(upper limit value etc.) using the following keys.

- [>] key To select a comparison class (flashing).
- [ESC] key To go back to step 2.
- [ENTER] key . To proceed to step 4.

Step 4 Set the setpoint value using the following keys.

- [>] key To select a digit.
- [^] key To select a number.
- [ENTER] key To store the parameter and go back to step 3.
- [ESC] key To not change the parameter and go back to step 3.

10.1.3. Weight Check Mode Setting & Display Table.

F22	MODE	Display	1	2	3	4	5
1	Upper Lower 1	Setpoint	Upper I	Lower			
		Class	Hi	Lo			
		Comparator	HI	LO			
2	Upper Lower 2	Setpoint	Target	Upper	Lower		
		Class	tG	Hi	Lo		
		Comparator	OK	HI	LO		
3	Upper Lower 3	Setpoint	Target	Upper	Lower		
		Class	tG	Hi	Lo		
		Comparator	OK	HI	LO		
		Unit		%	%		
4	5-stage 1	Setpoint	HiHi	Hi	Lo	LoLo	
		Class	HH	Hi	Lo	LL	
		Comparator	HI	HI	LO	LO	
		Triangle	2			3	
5	5-stage 2	Setpoint	Target	HiHi	Hi	Lo	LoLo
		Class	tG	HH	Hi	Lo	LL
		Comparator	OK	HI	HI	LO	LO
		Triangle		2			3
6	5-stage 3	Setpoint	Target	HiHi	Hi	Lo	LoLo
		Class	tG	HH	Hi	Lo	LL
		Comparator	OK	HI	HI	LO	LO
		Unit		%	%	%	%
		Triangle		2			3

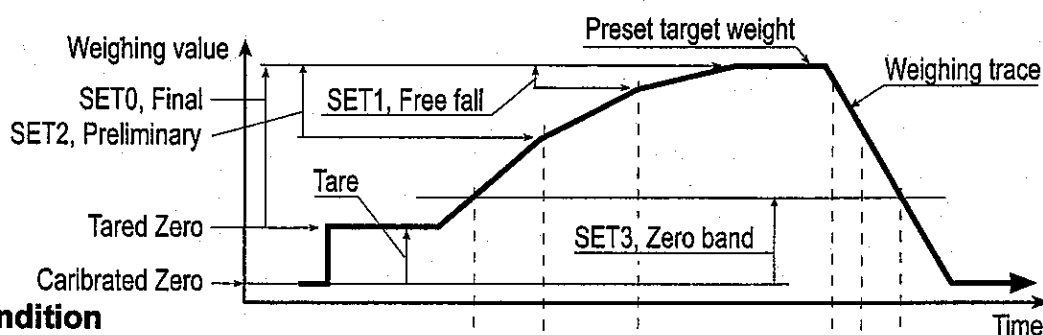


10.2. Setpoint Comparison

- This function includes the weighing sequence and is used to obtain a preset target weight.
- There are four parameters of "Final", "Preliminary", "Free fall" and "Zero band" which are used in the setpoint comparison.
- The result of the sequence is output to three relays.
- When setting these parameters, it is not necessary to input the F-function F22 again unless changing the F-function.

Caution □ This function is normal batching only and can not perform loss-in-weight.

10.2.1. Description of Input parameters and Outputs (F22 = 11)



Output and Condition

Relay HI, $\text{Net} \geq (\text{Final} - \text{Free fall})$	OFF (Break)	ON (Make)	OFF (Break)
Relay OK, $\text{Net} \geq (\text{Final} - \text{Preliminary})$	OFF (Break)	ON (Make)	OFF (Break)
Relay LO, $\text{Gross} < \text{Zero band}$	ON (Make)	OFF (Break)	ON (Make)

Parameters List

SET0	Final	Set a preset target weight.
SET1	Free fall	Set a corrective value related to closing the dribble flow gate.
SET2	Preliminary	Set a starting point to use the dribble flow gate only.
SET3	Zero band	Set a value to regard as nearly zero.

10.2.2. Setting the Parameters of Setpoint Comparison

See "Upper/Lower Limit Values".

Zero band value is set at F26 of F-Function, and the value is not related to a specific code memory but is used throughout.

10.2.3. Setpoint Comparison and Simple Batch Setting & Display Table

F22	MODE	Display	1	2	3	4	5
7	Setpoint Comparison 1	Setpoint	Final	Free fall	Over	Under	
		Class	Fi	FF	Hi	Lo	
		Comparator	OK		HI	LO	
		Triangle		1			
8	Setpoint Comparison 2	Setpoint	Final	Free fall	Preliminary	Over	Under
		Class	Fi	FF	Pr	Hi	Lo
		Comparator	OK			HI	LO
		Triangle		1	2		
9	Setpoint Comparison 3	Setpoint	Final	Free fall	Full	Over	Under
		Class	Fi	FF	Fu	Hi	Lo
		Comparator	OK			HI	LO
		Triangle		1	2		
10	Simple Batch 1	Setpoint	Final	Free fall	Over	Under	
		Class	Fi	FF	Hi	Lo	
		Comparator	OK		HI	LO	
		Triangle		1			
11	Simple Batch 2	Setpoint	Final	Free fall	Preliminary	Over	Under
		Class	Fi	FF	Pr	Hi	Lo
		Comparator	OK			HI	LO
		Triangle		1	2		
12	Simple Batch 3	Setpoint	Final	Free fall	Full	Over	Under
		Class	Fi	FF	Fu	Hi	Lo
		Comparator	OK			HI	LO
		Triangle		1	2		



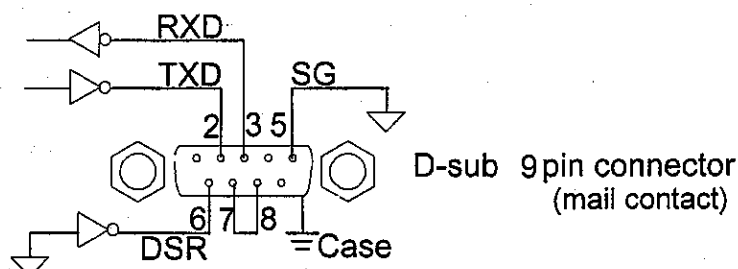
11. RS-232C Interface

11.1.1. Specification

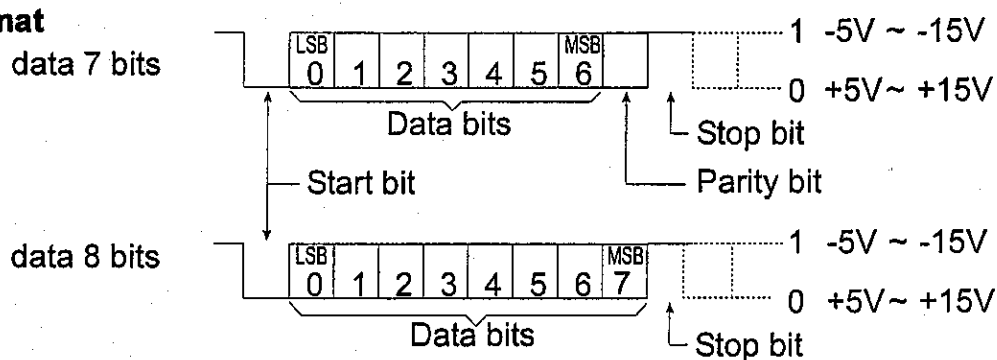
Transmission	Asynchronous, bi-directional, half-duplex
Baud rate	600, 1200, 2400, 4800, 9600 bps
Data bits	7 bits, 8 bits
Parity bits	1 bit, Even or Odd (for 7 data bits) or Non parity (for 8 data bits)
Start bit	1 bit
Stop bit	1 bit
Code	ASCII
Terminator	CR LF, CR (CR: 0Dh, LF: 0Ah)
Connector	D-sub 9 pin connector

Circuit and Pin Connection

Pin No.	Signal name	Direction	Description
2	TXD	Output	Transmit data
3	RXD	Input	Received data
5	SG	-	Signal ground
6	DSR	Output	Data set ready
7	RTS		Pin 7 is connected to pin 8
8	CTS		
Other			Not used
Case			Shield

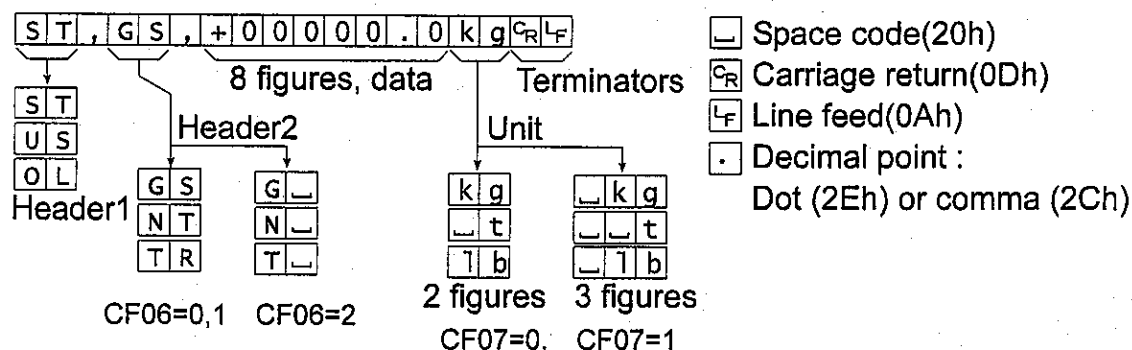


Bit Format



11.1.2. Data Format

- Two types of data format can be set up at F-Function F34 and F35.
- The initial data format of F34 is shown below.



Header 1 F34,35 : 9(Status)

ST Stable weighing data.
 US Unstable weighing data.
 OL Overload (Out of range).

Header 2 F34,35 : E(weight type)

GS or G Gross data.
 NT or N Net data
 TR or T Tare data.

Data F34,35 : A, B, C, D (weight data)

The first of the data bits is the polarity "+" or "-".

When data is zero, the polarity is "+".

8 figures (digits) including polarity and decimal point(dot or comma).

In case of "out of range", the data bits are replaced by spaces except for the decimal point.

Unit F34,35 : F (unit)

In case of CF07 0, the unit length is 2 figures.

In case of CF07 1, the unit length is 3 figures. Depending on circumstances, an A&D printer may not work correctly.

11.1.3. Command Format

Explanation of Command

- When performing a command, the received command or reply data is sent back.
- When the received command cannot be performed such as the "busy" state, the code "I" is sent back. In this case, insert a delay time. Electrical noise may be the cause of this error.
- When receiving an undefined command (unknown command), the code "?" is sent back.

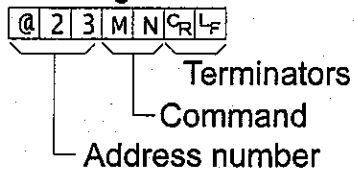
- Optional addresses can be appended to a command. The form of address is "@address" and this address is two figures specified at F-Function F06.

Example: Command is "Display net value". Address is 23.

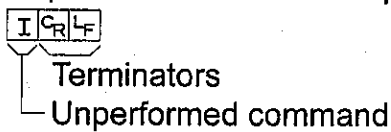
Sending a command



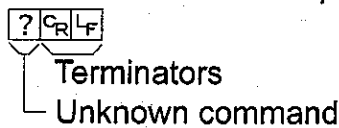
Sending a command with address



Unperformed command reply



Unknown command reply



- Space code(20H)
- Carriage return(0Dh)
- Line feed(0Ah)

11.1.4. Command to Request Data

Request Data (1)

When receiving this command, Display data is sent back immediately.

Template RW

Command

Reply

Request Data (2)

When receiving this command, data is sent back immediately with format 1 or 2.

Template RW,1 or RW,2

Command or

Reply Format1(F34) or Format2(F35)

11.1.5. Commands to Control the Indicator

Zero Display

The current display is set to the zero point.

Template MZ

Command

Reply

Tare

The current display is set to zero - net value.

Template MT

Command

M	T	C _R	L _F
---	---	----------------	----------------

Reply

M	T	C _R	L _F
---	---	----------------	----------------

Clear Tare Value

The tare value is cleared and the gross value is displayed.

Template CT

Command

C	T	C _R	L _F
---	---	----------------	----------------

Reply

C	T	C _R	L _F
---	---	----------------	----------------

Display Gross Value

The gross value is displayed.

Template MG

Command

M	G	C _R	L _F
---	---	----------------	----------------

Reply

M	G	C _R	L _F
---	---	----------------	----------------

Display Net Value

The net value is displayed.

Template MN

Command

M	N	C _R	L _F
---	---	----------------	----------------

Reply

M	N	C _R	L _F
---	---	----------------	----------------

11.1.6. Commands to Set Parameters

Set Limit/Setpoint Value

Set the limit or setpoint value of the comparator. The decimal point is not necessary as it is set by the display.

Template Sm,n, [value]

m: memory code number, 1 - 4

n : setpoint order number, refer "Setting the setpoint"

Command

S	1	,	3	,	+	1	6	0	C _R	L _F
---	---	---	---	---	---	---	---	---	----------------	----------------

Reply

S	1	,	3	,	+	1	6	0	C _R	L _F
---	---	---	---	---	---	---	---	---	----------------	----------------

Set Zero band

Set the zero band value of the setpoint comparator. The decimal point is not necessary as it is set by the display.

Template SZ, [value]

Command

S	Z	,	+	7	4	8	C _R	L _F
---	---	---	---	---	---	---	----------------	----------------

Reply

S	Z	,	+	7	4	8	C _R	L _F
---	---	---	---	---	---	---	----------------	----------------



12. Specifications

Analog Input and A/D Conversion

Input sensitivity	0.2 μ V/division minimum
Input signal range	-1 mV ~ 15 mV
Load cell excitation voltage	5V DC \pm 5%, 60 mA with sense voltage input
Load cell drive capacity	Maximum 4 x 350 Ω load cells
Temperature coefficient	
Zero	$\pm(0.2 \mu\text{V} + 0.0008 \% \text{ of zero adjustment voltage})/^{\circ}\text{C}$ (typ.)
Span	$\pm 0.0008\%/^{\circ}\text{C}$ of reading (typ.)
Non-Linearity	0.01 % of full scale
Maximum input noise	Less than 0.4 μ Vp-p
Input impedance	10 M Ω or more
A/D conversion method	Integrating dual slope type
A/D resolution count	40000 counts
A/D conversion rate and display update rate	Approximately 10 times/s
Maximum display resolution	20000 (permissible 40000)

Digital Section

Measurement display	7 segment, Liquid crystal display
Character height	25 mm
State indicator Symbol	Minus sign, Zero point, Stable, Net, Comparison result Storing accumulation data, Percentage, Low battery Various state indicator(triangle1,2,3)
Unit	kg, t, lb

Interface

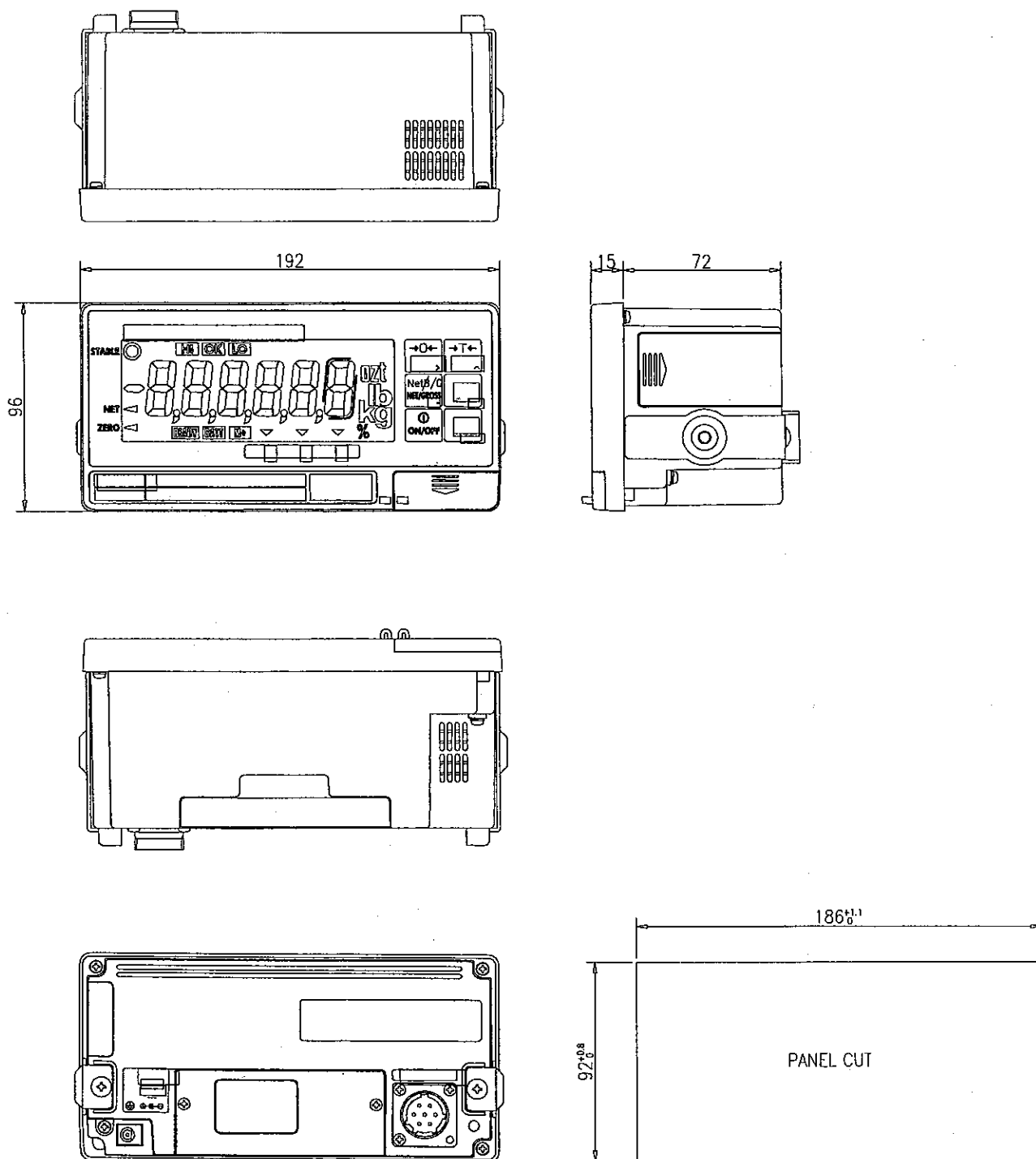
RS-232C interface	Serial interface for communication (D-Sub 9P male contact)
RS-422/485 interface	Serial interface for communication, control (terminal block)
Analog output	4-20mA, free scaling output (terminal block)
External Control Input	3 contact input terminals for selected functions
Relay output	3 point Capacity: 50V AC/DC, maximum current 100mA (resistive load) Comparison mode selection HIHI, HI, OK, LO, LOLO output for limit comparison Zero band, preliminary, free fall, final for setpoint comparison

General

Power supply	DC 7-10V (AC adaptor, dry battery(6 x C size), AD-1681)
Power consumption	Less than 1VA
Operation temperature	-10 $^{\circ}$ C to +40 $^{\circ}$ C (14 $^{\circ}$ F to 104 $^{\circ}$ F)
Operation humidity	85% R.H. (no condensation)
Mass	650g approximately
Dimensions	192(W) x 96(H) x 86(D) mm
Accessories	Refer to "4.1.4.Accessories and Option"



12.1. Dimensions





A&D Company, Limited

3-23-14 Higashi-Ikebukuro, Toshima-ku, Tokyo 170-0013 JAPAN
Telephone: [81] (3) 5391-6132 Fax: [81] (3) 5391-6148

A&D ENGINEERING, INC.

1555, McCandless Drive, Milpitas, CA. 95035 U.S.A.
Telephone: [1] (408) 263-5333 Fax: [1] (408) 263-0119

A&D INSTRUMENTS LTD.

Unit 24/26 Blacklands Way, Abingdon Business Park, Abingdon, Oxon OX14 1DY United Kingdom
Telephone: [44] (1235) 550420 Fax: [44] (1235) 550485

<German Scales Office>

Berner Strabe 64, 60437 Frankfurt/Main 50 GERMANY
Telephone: [49] (69) 507-1017 Fax: [49] (69) 507-2054

A&D MERCURY PTY. LTD.

32 Dew Street, Thebarton, South Australia 5031 AUSTRALIA
Telephone: [61] (8) 8352-3033 Fax: [61] (8) 8352-7409

A&D KOREA Limited

8th Floor, Manhattan Bldg. 36-2 Yoido-dong, Youngdeungpo-ku, Seoul, KOREA
Telephone: [82] (2) 780-4101 Fax: [82] (2) 782-4280