

Built-in Weight Measuring Sensor

DFB Series Operation Manual

Version 1 December 17, 2008

SHIKO DENSHI CO., LTD.

Outline

Thank you for purchasing our weighing system. Using the electromagnetic balance system, the zero method is adopted as the measurement principle of this system. Therefore, the displacement of the sensor itself that is often seen in a strain gage of load cells can be kept in an extremely subtle range because of the measurement principle. This system is a precision weighing system, and its slim and separable body is suited for installing to your hardware. Also, RS232C Interface, the standard equipment of this system and BCD data output function one of the separate option, allow connecting the controller inside of your hardware easily.

To Use This System Safely

Make sure to hand this instruction manual to the person who will actually use this system.

Read this manual carefully to the end, and well understand the contents before using this system.

Handle this system properly so that the system can perform efficiently, and then work safely.

Make sure to keep this manual in a certain place where everyone who uses this system can reach to at anytime.

Do not use this system for any other purpose than the appropriate application.

Check the following matters immediately, when you have received our product.

- Is this the same specification as the one you ordered?
- Is there any damage from shipping?
- Is there any missing accessory?

If you have found any problem with our product, please claim to the store you purchased our product.

(Information in this manual is subject to change without notice for improvement.)

Caution Classifications

The indications of caution used in this manual or on this system are classified into three levels.



Indicates seriously dangerous conditions that the person who touches or approaches to the system, or the third person may die or get serious injuries when the system is handled in a wrong way, or when any evasion is not made for the dangerous situation.



Indicates possible dangerous conditions that the person who touches or approaches to the system, or the third person may die or get serious injuries when the system is handled in a wrong way, or when any evasion is not made for the dangerous situation.



Indicates possible dangerous conditions that the system may be damaged, or that the person who touches or approaches to the system, or the third person may get minor or more serious injuries when the system is handled in a wrong way, or when any evasion is not made for the dangerous situation.

Symbols



Deadly
Poison



Gas
Hazard



Explosion



Fire



Fire
Free



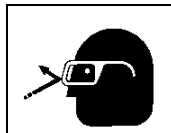
Electric
Shock
Hazard



Burning



Rotating



Need
Protectors



Do Not
Decompose



Other
Caution



Read
Manuals

Safety Notes

Here are some common matters that we would like users to be careful about.

The precautions for particular operations are stated in each chapter followed.

Danger

Do Not
Decompose



Do not decompose, remodel, or repair this system.

It causes breakage and heat generation.

Explosion or fire may occur because of the generation of heat.

Please order our company to repair the system.

Fire



Do not use power other than specified voltage.

It causes breakage and heat generation.

Explosion or fire may occur because of heat generation.

Explosion

Do not use this system in much of mine dust.

It causes explosion or fire.

It causes the system breakage

Do not place this system in the area that inflammable gases such as gasoline or thinner may leak .

This system does not have any explosion proof configuration. If any inflammable gas accumulates around this system, it causes explosion or fire.

Warning

Fire



Do not operate in the rain or with wet hands.

Electric shock may occur, if the power plug or the power switch is handled with wet hands or in the rain.

It causes circuit short or corrosion.

Do not use this system in high temperature or humidity.

It causes electric shock or circuit short.

The operating temperature of this system is 0 ~ 40 °C, and the humidity is below 80%RH.

Caution

Other

Place any driver or facility with moving parts at least 20mm away from the sensor.

Caution



Reading errors may occur, when magnetic materials (such as an iron compact) are moving near the sensor.

30 minute warming up time is required for accurate measurement.

The reading right after power activation may not be accurate. Please take time for the system to be warmed up.



Do not use this system at a voltage that exceeds the rated voltage range (DC24V±10%).

- It causes breakage and heat generation
- Doing so may cause this system to malfunction.

Prohibition



The DC24V power supply line is for use with this system exclusively. It must not be connected to other equipment operating on DC24V.

- If this line is connected to another piece of equipment operating on DC24V, excessive noise from the other piece of equipment may cause this system to malfunction.
- The inrush current generated by the other piece of equipment operating on DC24V may cause this system to malfunction.
- The circuit configuration of this system may cause other equipment operating on DC24V to malfunction.

Compulsory



The capacity of the switching power supply used with the DC24V power supply line for this system must be about 0.7 A per system. (If the capacity is less than 0.7 A, this system may not start.)

- If the capacity of the switching power supply is insufficient, this system may not start normally.

Compulsory



Ground the FG terminal of the switching power supply used with the DC24V power supply line for this system.

- Grounding the FG terminal will increase the noise resistance of this system.
- Grounding the FG terminal will ensure the safety of the overall system operations.

Compulsory



Make sure that you install a noise filter on the section that precedes the switching power supply used with the DC24V power supply line for this system and ground the FG terminal of this noise filter.

- Installing and grounding a noise filter will increase the noise resistance of this system.

Compulsory



Ground the FG terminal of the display part of this system, as well as the sensor.

- Grounding the FG terminal and sensor will increase the noise resistance of this system.

Compulsory

Chapter 1 - Installation method

The DFB Series weight measuring sensor is a built-in high-precision weighing system designed to be built into automated machinery and other types of machinery or equipment. Providing a level of precision that is more than ten times higher than that of a load cell sensor, this system will maintain its original performance level if operated under the appropriate operating conditions.

To ensure the proper use of this DFB Series weight measuring sensor over a long period of time, read this chapter thoroughly before operating it, making sure that you fully understand the negative effects of improper use of the built-in high-precision weighing system and the factors that may result in errors.

1-1. After mounting this system, adjust the level of the hardware to make the surface on which this system is mounted as level as possible.

1-2. Keep motors, solenoid valves, and other types of drive units at least 50 mm away from the sensor.

1-3. When securing packaging or jigs to the weighing pan, do not apply a turning force or pressing load that is greater than the specified allowable value.

Refer to the figure in 5-1-3 Installing and Fastening the Weighing pan.

1-4. After installing this system, make sure you calibrate the span of this system.

(1) A warm-up time of more than two hours is required.

(2) Calibrate the span of this system.

Refer to the figure in 7-1 Span Calibration.

(3) After the first span calibration, span calibration must be performed periodically.

(4) If the hardware on which this system is mounted is relocated, make sure you perform a span calibration.

1-5. This system must be operated in a stable operating environment; specifically, at a temperature of $20\text{C} \pm 5\text{C}$ and humidity of 45 to 60%.

1-6. Do not install this system near to the air outlet of an air-conditioner.

1-7. Do not install this system in a place where it will be exposed to direct sunlight.

1-8. Do not install this system in a place where it will be exposed to dust, splashes from a liquid, mist, and the like.

1-9. Eliminate wind and static electricity.

(1) If packaging or a container made of resin or another insulating material is used, a build up of electrostatic charge may result in the measured values containing errors. Use a windshield made of glass, a windshield made of resin mixed with an electrically-conductive filler, or a metal container.

(2) To dispel any electrostatic charge, ground the sensor to the housing of the hardware.

(3) Enclose packaging or a container with a windshield to eliminate wind. If the size of the packaging or container is large, the effect of any wind will be extremely large.

(4) If a windshield made of acrylic resin is set in close proximity to packaging or a container, the windshield will become electrostatically charged, resulting in errors in the measured values. Such a windshield must be replaced with one made of resin mixed with an electrically-conductive filler or it must be set at a sufficient distance from the packaging or container.

(5) If a convective air flow occurs inside the hardware and if packaging or a container is exposed to this air flow, the measured values may contain errors. Pay attention to not only the effects of wind entering from outside the hardware, but also the effects of a convective air flow occurring inside the hardware.

1-10. Eliminate noise.

(1) Do not connect an inverter or other piece of equipment that operates on DC24V to the DC24V power supply line for this system.

(2) In routing the PU cable to connect the display to the sensor, use a dedicated signal wire conduit; do not route the PU cable through the same conduit as that used to route the power cable.

1-11. Do not use this system in an atmosphere containing explosive gases.

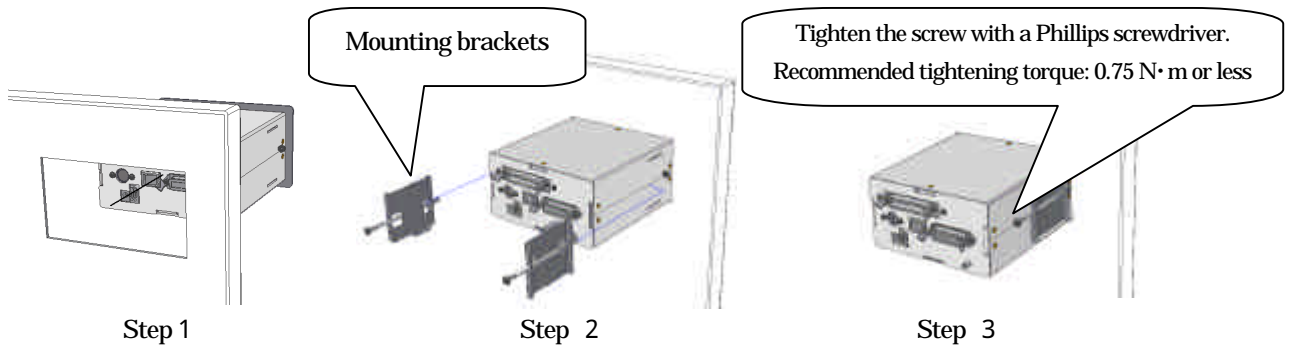
This system is not built to withstand explosions.

1-12. Before installing this system on automated machinery, carry out and complete a debugging of the machinery.

First complete the debugging of the handling and various types of positioning operations performed by the automated machinery. Once this has been done, install this product (sensor) and operate the automated machinery (hardware). If the debugging process is carried out for the automated machinery with this product (sensor) already installed on it, there is a risk that this product (sensor) may be damaged.

1-13. Mounting the display

Secure the display using the attached panel mounting brackets, as shown below. The panel on which the display is to be mounted should have a thickness of less than 4 mm.



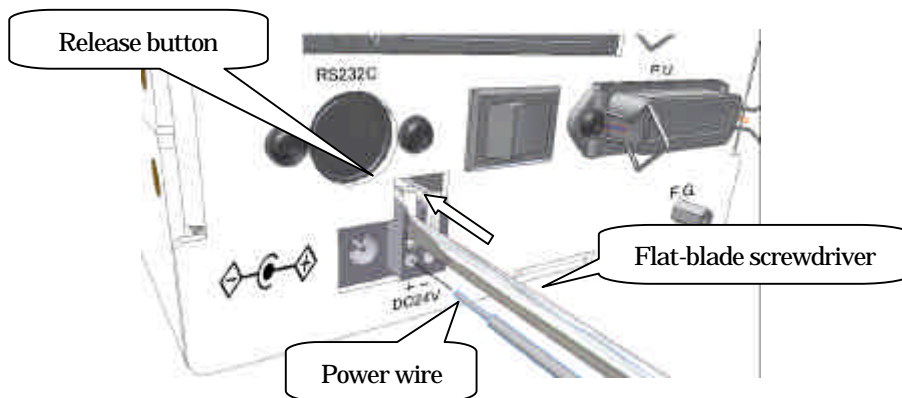
1-14. Wiring for the power supply

1-14-1. Attaching the power wire

After pressing the release button into the terminal block with a flat-blade screwdriver, insert the power wire. Strip away 10 mm of the covering from the end of the covered power wire.

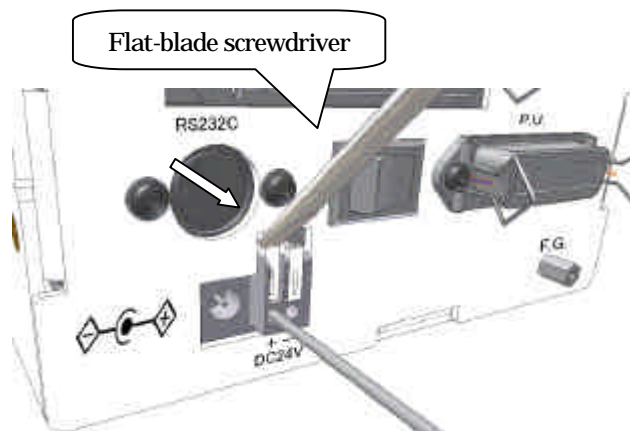
Types of power wires that can be used:

- * Single wire: $\phi 1.0$ (AWG26) to $\phi 1.2$ mm (AWG16)
- * Twisted wire: 0.3 (AWG22) to 0.75 mm² (AWG20)
- * Diameter of element wire: $\phi 0.18$ or larger

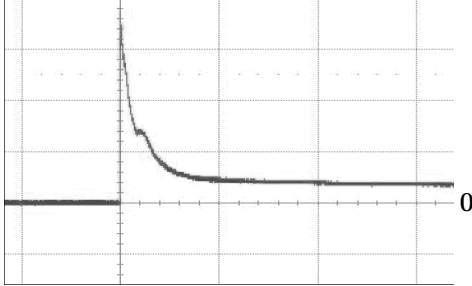


1-14-2. Securing the power wire in place

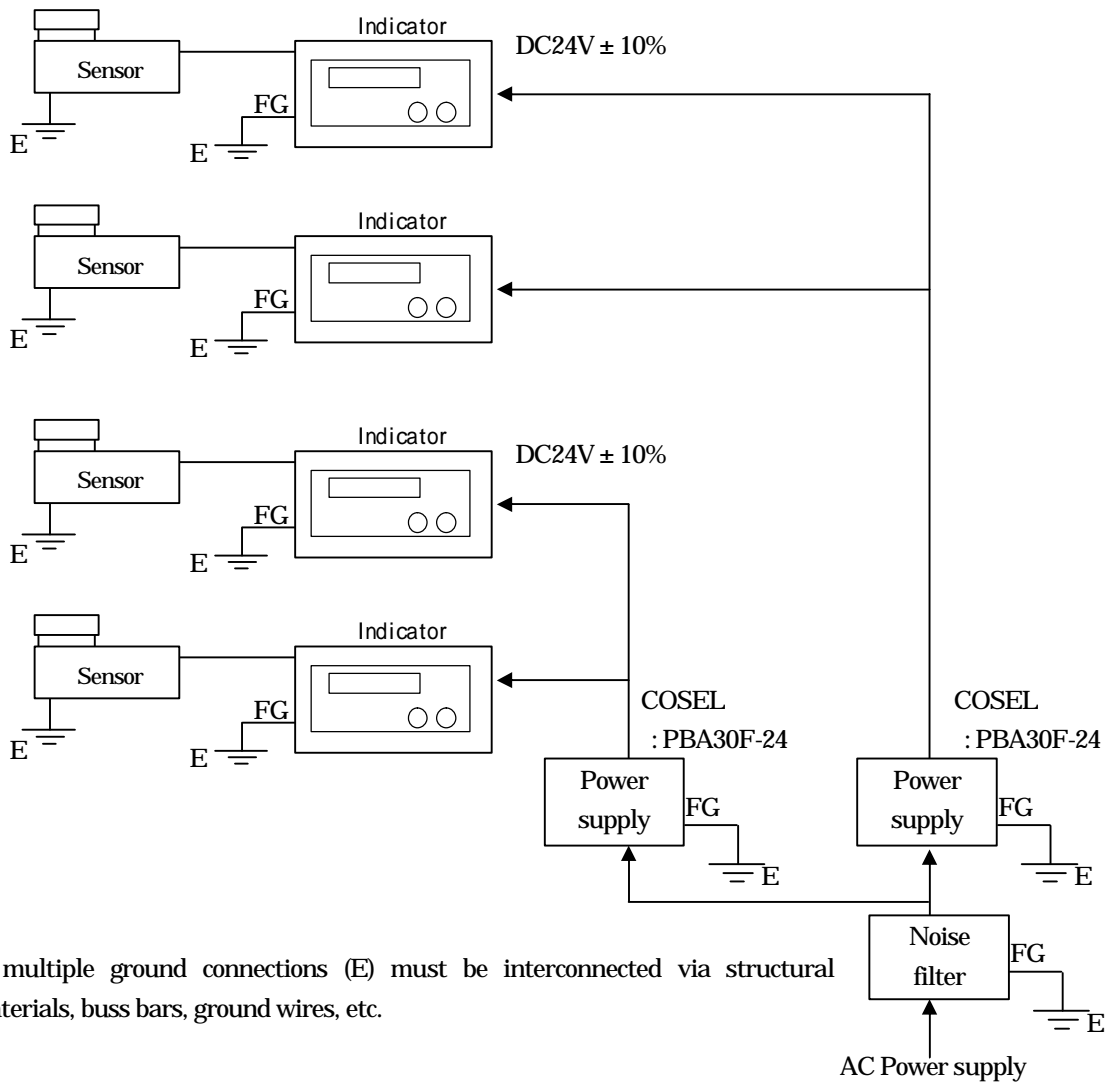
The power wire can be locked in place by using a flat-blade screwdriver or other suitable object to return the release button to its original position. To detach the power wire, press the release button into the inside of the terminal block again with a flat-blade screw or other suitable object.



1-15. Points to note about the power supply

	Descriptions	Notes
Power supply inrush current	 <p>X: 200ms/div, Y: 0.5A/div</p>	Approx 2A
Rated power supply voltage / consumption current	DC +24V ± 10% / 0.3A	
Recommended power supply	COSEL PBA15F - 24 (24V / 0.7A)	To drive one system
	COSEL PBA30F - 24 (24V / 1.3A)	To drive two systems

1-15-1 . Recommended connections if a 24V switching power supply is used



* The multiple ground connections (E) must be interconnected via structural materials, buss bars, ground wires, etc.

Chapter 2 Weighing Method

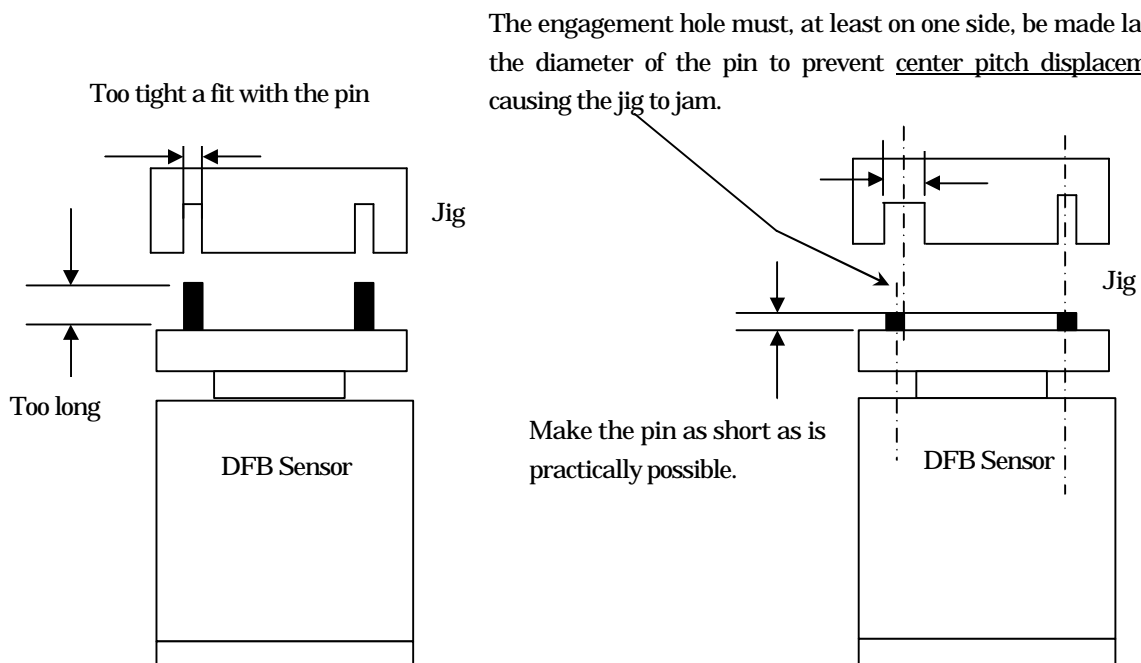
2-1. When transporting a work piece to be weighed, make sure that you lock the sensor in place.

- (1) This system is a built-in high-precision weighing system. Raising, lowering, or otherwise moving the sensor during weighing may alter the set zero point or span.
- (2) If the sensor is raised, lowered, or otherwise moved once it has had packaging or a container loaded onto it, a large inertial force will be exerted on the sensor mechanism, causing a substantial deterioration in the durability of the sensor. If the sensor is moved and then brought to a sudden stop without its movement being gradually decelerated or if the sensor is raised, lowered, or otherwise moved when it has packaging, a work piece, or a container loaded at an unbalanced position, a large inertial force will be exerted on the sensor mechanism, causing the durability of the sensor to deteriorate greatly or the sensor mechanism to be destroyed.

2-2. Load or unload a work piece gently.

- (1) Do not use a weighing method that results in a work piece being dropped onto the weighing pan. Although the sensor's built-in overload stopper provides it with sufficient shock resistance, the zero point may be changed if the sensor is repeatedly subjected to a drop impact. If jigs or work pieces are transported by automated machinery, they must be loaded onto the sensor carefully and gently by hand.
- (2) If a pin is driven into the weighing pan or jig pan for the purpose of positioning and a hole is made on the counterpart jig to enable it to be attached, the length of the protruding pin must be kept to a minimum and the hole made on the counterpart jig to be attached to the weighing pan or jig pan must be large enough for the counterpart jig to be smoothly attached to or detached from the weighing pan or jig pan without it jamming.

If the counterpart jig does jam due to the use of an unnecessarily long pin or the hole being too small, attaching or detaching a jig will exert an excessively large force on the sensor. The attachment or detachment of a jig that jams should be avoided.



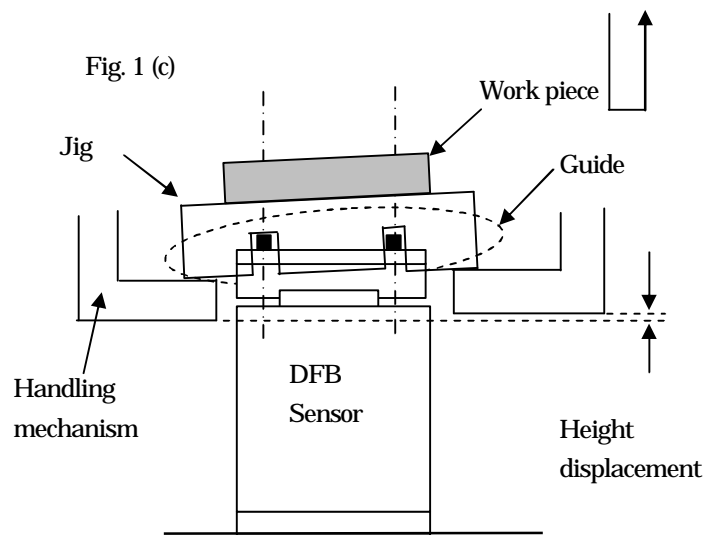
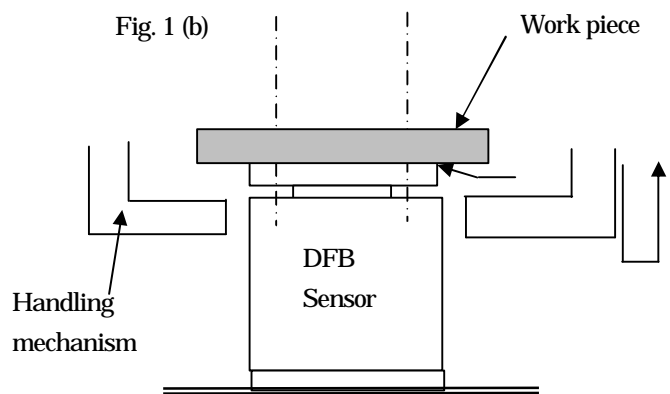
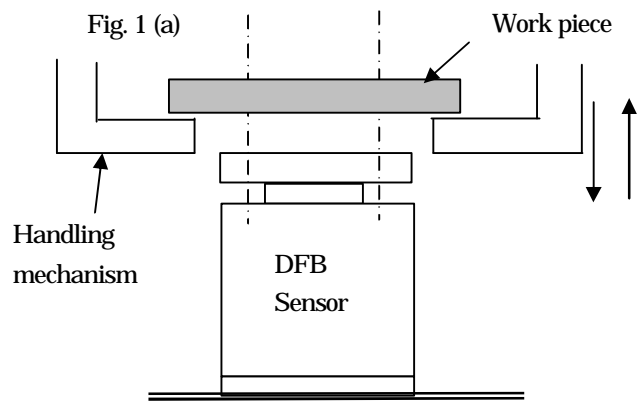
(3) Recommended ways of loading a work piece

To achieve a resolution, accuracy, and performance that far exceeds those of a strain gauge type load cell, the DFB sensor is designed with an entirely different internal mechanism. This design means that, unlike a strain gauge type load cell, its mechanical strength with respect to a load applied from above is not symmetrical with its mechanical strength with respect to a load applied from below. Care must be taken to prevent a pull-up force from being applied to the sensor.

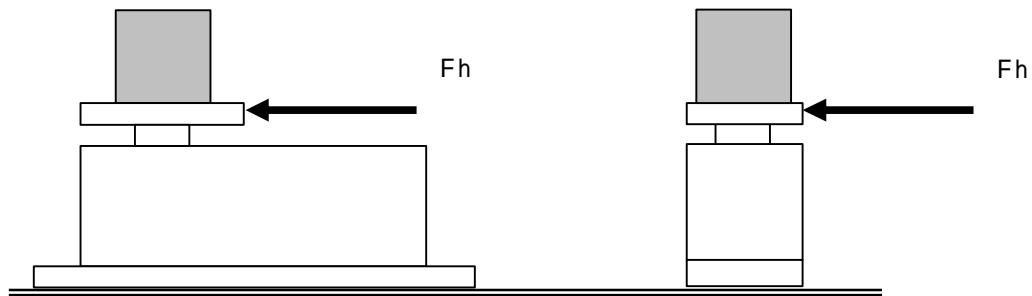
As illustrated in Figure 1 (a) and (b), take care to ensure that the mass of a work piece held by the handling mechanism is gradually transferred to the sensor. Also take care to ensure that no impact is exerted on the sensor when a work piece comes into contact with it.

* A work piece may stick to the weighing pan if it has oil, fat or liquid on its surface, which may result in a pull-up force being applied to the sensor when the work piece is removed. Take care to ensure that the surface of a work piece is kept clean.

If a work piece is guided to the sensor by alignment pins or other such means, it may tilt due to a difference in the degree of parallelism between the handling mechanism and the weighing pan at the sensor. This may cause the work piece to become jammed in the guide, resulting in a pull-up force being applied to the sensor. Consequently, attention needs to be paid to the clearance between the work piece and the guide, the accuracy of the relative positioning between the handling mechanism and the weighing pan, and other such factors.



2-3. Do not apply a lateral force to the sensor.



If an excessive lateral force (F_h) is applied during weighing, the sensor mechanism may be damaged or destroyed.

2-4. Place a work piece near the center of the weighing pan.

If a work piece is placed at a distance from the center of the weighing pan, it will take a longer time for the sensor to enter a stable state or the sensor may not be able to measure the weight accurately.

The DFB-60, DFB-300, and DFB-600 are provided with an overload release mechanism to protect the internal sensor from an unbalanced load or overloading. The weighing operation is performed (i.e. the weighing pan starts to sink) if the approximate loads shown in Table 2-4-1 are applied to the center of the weighing pan. If the overload release mechanism is activated, the normal position of the weighing pan cannot be maintained temporarily, and this interferes with the smooth handling of work pieces. The overload release mechanism can be disabled at the time of shipment from our company if the customer so wishes.

Table 2-4-1 Load at which the weighing pan starts to sink

Model	DFB-60	DFB-300	DFB-600
Overload release amount at the center of the weighing pan	Approx 0.6kg	Approx 1kg	Approx 2kg

2-5. It is recommended that the tare be removed immediately before the start of each weighing operation in order to reduce weighing errors.

This system is provided with an external tare terminal. Externally disconnect this terminal from the signals being sent to it or send the external RS232C tare command signal by external equipment, such as the PLC.

If it is difficult to carry out an external tare, increase the auto zero effect to “ ordinary ” by changing the function setting of this system. This will enable the zero adjustment to be automatically performed when there is no work piece on the sensor.

Chapter 3 - Specifications

3-1. Specification of the sensor

Model	DFB-60-	DFB-600-	DFB-6000-	DFB-300-	DFB-3000-
Capacity	60g	600g	6000g	300g	3000g
Readability	0.001g	0.01g	0.1g	0.001g	0.01g
Repeatability	0.001g	0.01g	0.1g	0.002g()	0.02g()
Non linearity	± 0.001g	± 0.01g	± 0.1g	± 0.003g	± 0.03g
Temperature coefficient	below ± 8ppm /			below ± 5ppm /	
Operating temperature/ Humidity	Temperature : 0 ~ 40 / Humidity : below80%RH(non condensing)				
Housing	SUS304				
Baseboard	SUS303				
Weighing pan	A5052 material, Alumite treatment, 40 × 40	SUS304 material 55 × 55	SUS304 material 74 × 74	A5052 material, Alumite treatment, 55 × 55	SUS304 material 74 × 74
Dust/Water proof	IP43				
PU cable range	5m				
Instrument mass	Approx.1600 g	Approx. 2300 g	Approx.5050 g	Approx. 2150 g	Approx.5050 g

3-2. Specification of the Indicator Panel

Display device	7segment, 6igit, Letter h = 12.5mm Fluorescence display
Overloading	Measuring range : up to +1% / Overloading is displayed as 『 - 』
Operating panel material	PET (tough top)
Housing material	SPCC material, and A5052 material / Enamel painted
Operating temperature/ Humidity	Temperature : 0 ~ 40 / Humidity : below80%RH(non condensing)
Data updating interval	Approx.0.1 sec. ~ Approx.1.6 sec. Correction (Stability / Variety) Possibility
Tare function	Weight up to the measuring capacity can be set to zero point by one touch key.
Zero setting backup function	The amount set to zero point can be saved.
Data output	Two way RS232C Standard Equipment1200, 2400,4800,9600bps BCD Output (Option) Open collector photo coupler, Sink current max.=10mA
Remote input	Two way RS232C Standard Equipment, Input terminal for remote zero setting BCD Output (Option) remote zero setting / External hold input terminal
Power	DC+24V ± 10% / 0.3 A
Instrument mass	Approx. 1200 g (including BCD output)

3-3. Accessories

Product name	Quantity	Product name	Quantity
Weighing pan	1	DIN5P plug set	1
Pan support	1	Instruction Manual	1
Screws to attach Weighing pan	2	Mounting bracket	2
PU cable (5m long)	1		

3-4. Separate Options

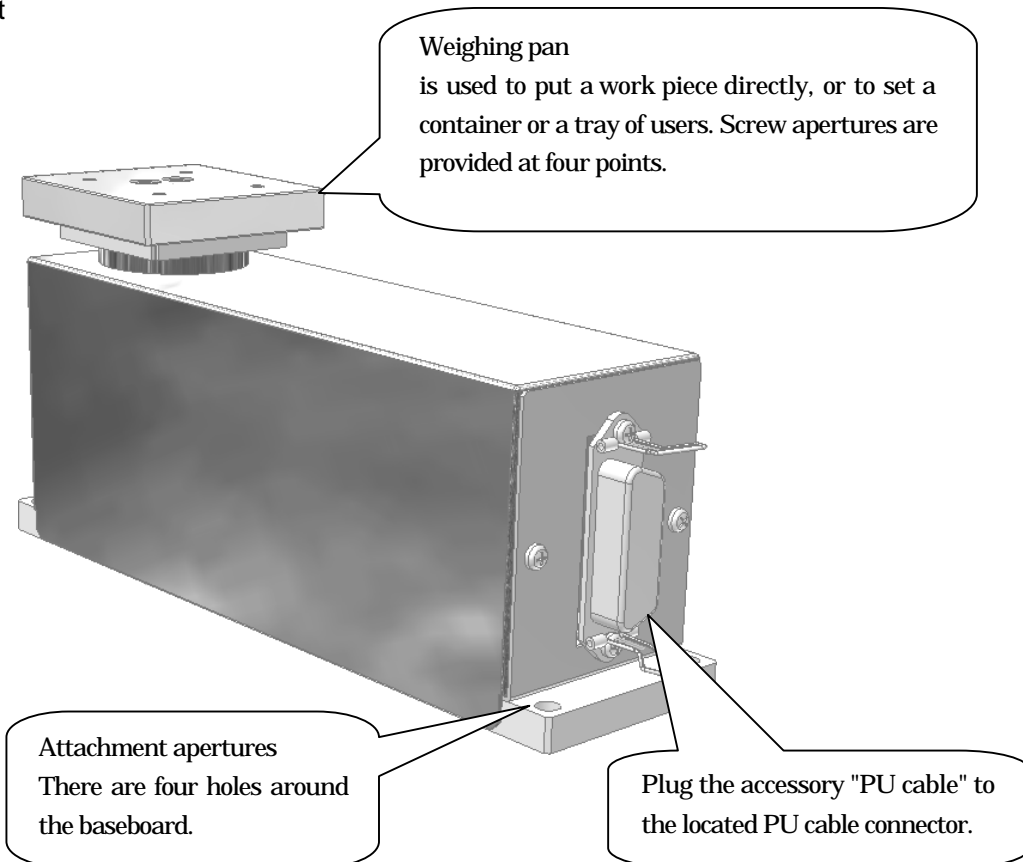
1) BCD output (at the end of the model name = BCD)

2) Overload release mechanism

○ at the end of the model name = blank means "enabled." ○ = L means "disabled."

Chapter 4 - Names of Each Part

4-1. Sensor Part



4-2. PU cable

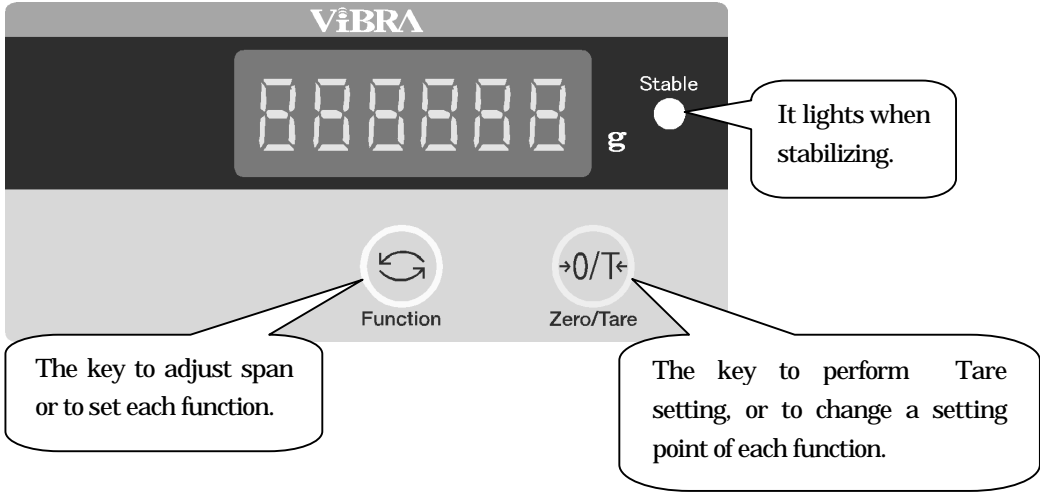


Standard 5m length

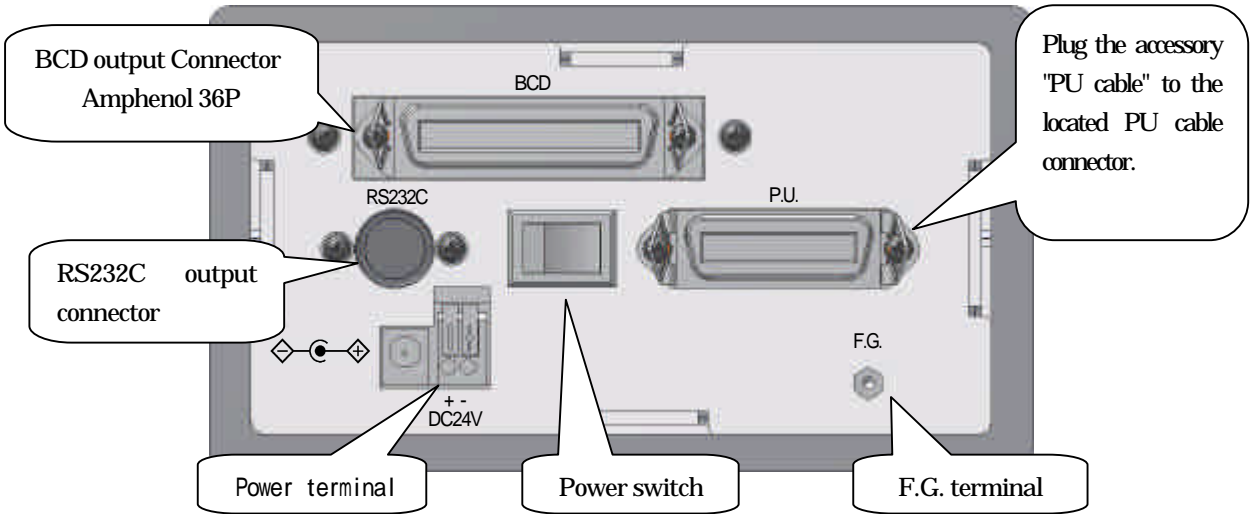
4-3. Indicator Part
4-3-1. Front Panel



4-3-2. Operation Panel



4-3-3. Rear Panel



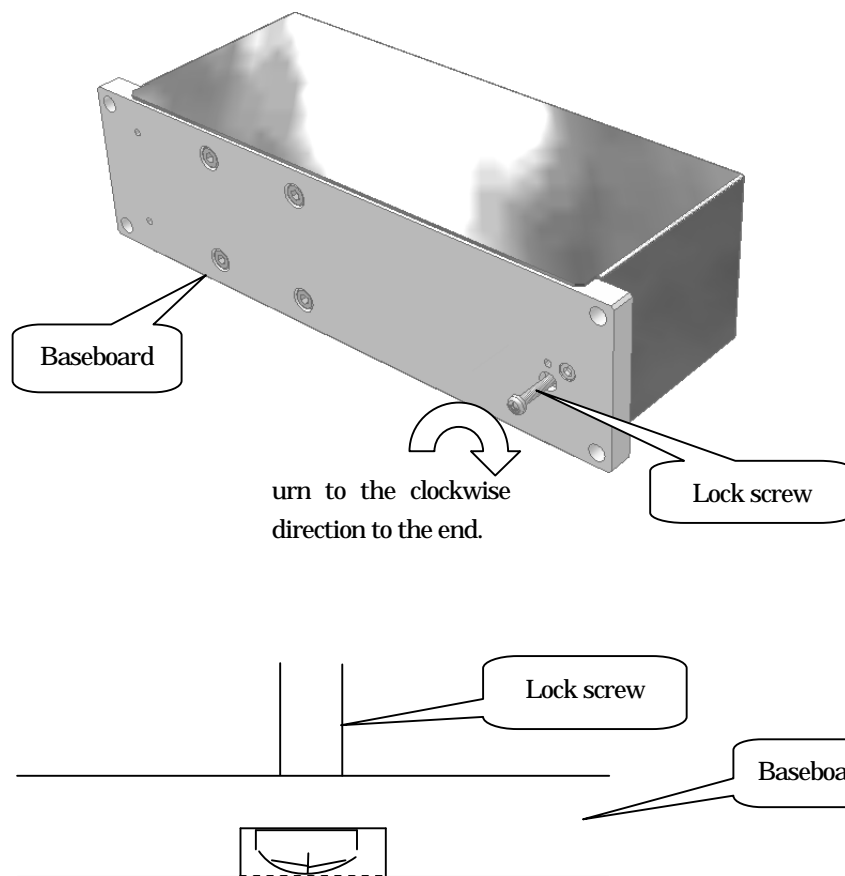
Chapter 5 - Installing to Hardware

5-1. Installing the Sensor Part

5-1-1. To release the security lock of the sensor for transportation

1) Lay down the sensor and use a plus screwdriver to turn the lock screws on the bottom face to the clockwise direction to the end.

Note : Please do this step before installing Weighing pan onto the sensor so that the internal mechanism won't be disturbed by any excessive force when the sensor is laid down.



Turn to the clockwise direction until the head of lock screw reaches to the baseboard (until it gets tight). The lock screw should not be prominent on the baseboard.

Note: If the unlock procedure is incomplete, the indicator may flicker, or the error message (-) may be seen before the system reaches to the maximum measuring capacity. It causes reading errors.

Note: If the sensor needs to be transported for some reasons, uninstall the sensor from the hardware, and turn the lock screw explained above to the counterclockwise direction so that it will be completely locked.

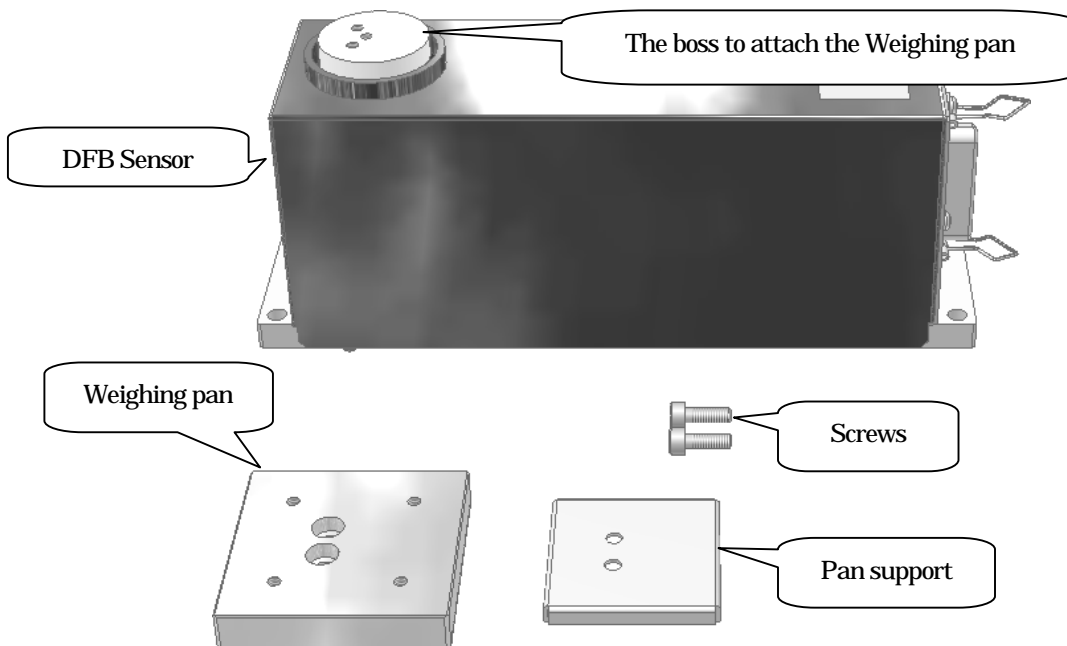
5-1-2. To Place the Sensor and Stability Adjustment

1) To install the sensor to your hardware, fix the sensor horizontally by using a spirit level or other instruments.

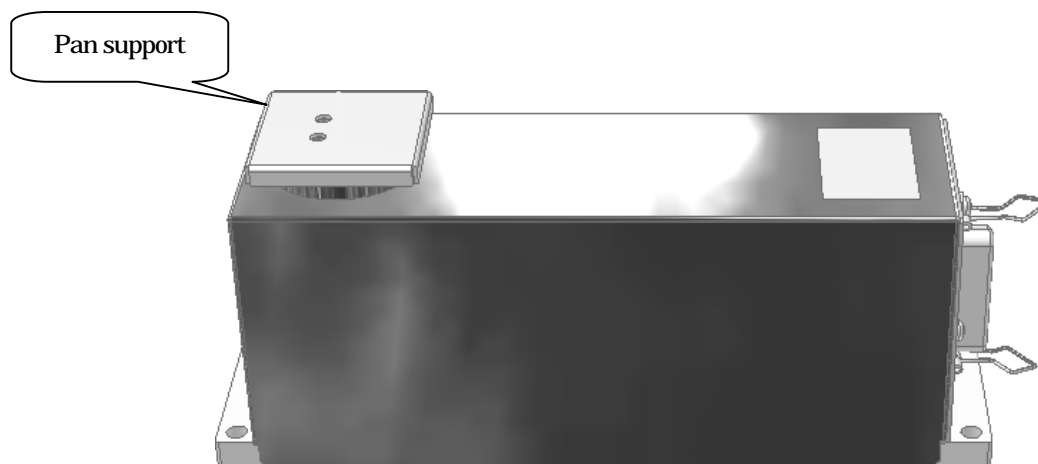
Note: Please pay attention to the sensor's stability when machinery is on stream. Because the indicating resolution of this system is extremely high, the change of levelness significantly affects on its reading result errors. Therefore, please adjust the sensor at level as much as possible. The Influence of the slight stability change to the reading result will be reduced afterwards.

5-1-3. Installing and Fastening the Weighing pan

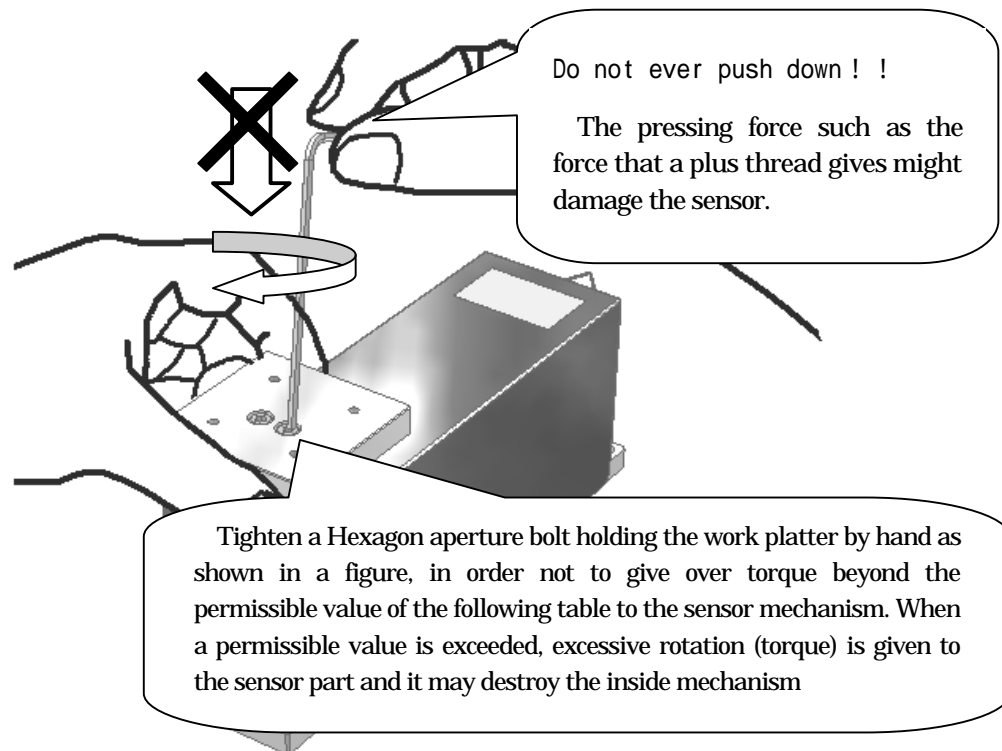
1) Prepare the sensor, the accessory " Weighing pan", "Pan support ", and "screws".



2) Place the Pan support on the boss to attach the Weighing pan.



3) Fasten the Weighing pan with the two screws provided.



permissible value at the time of Container implement fixation


	DFB-60	DFB-300	DFB-600	DFB-3000	DFB-6000
Permission torque [N · m]	0.5	0.5	1.0	3.0	3.0
Permission forcing power [g]	200	600	1200	6000	8000

5-2. Connecting to the Indicator.

Make sure to turn off the power switch, when you connect the sensor to the indicator with the accessory "PU cable".

Chapter 6 - Functions









6-1. Tare Function

The current weight can be tared point by pressing  key.





Tare function is available within the maximum of measuring capacity.

6-2. Other Functions

In order to meet the operating environment after installing to your hard ware, the setting of the data filtering transaction or the data interface conditions can be changed.

- 1) Keep pressing  key, and release the key after the display has shown  .
- 2) Press the  key to change the current function setting.
- 3) Press the  key to proceed to the next function item.
- 4) To return to the weight display, proceed to the final function setting and then press the  key.
 - *  sign indicates the setting point when the system was shipped from the factory.
(General speed response setting)
 - *  sign indicates the setting point for Max speed response.

Functions	Descriptions	Displays	Notes	
Auto zero setting function	<ul style="list-style-type: none"> • Automatically adjusts the point zero according to the slight changes of zero point affected by depositions of dust or moisture. • Operates in a stable condition 		Effect of Auto zero setting /Off	
			Effect of Auto zero setting /Weak	
			Effect of Auto zero setting /Normal	
			Effect of Auto zero setting /Strong	
Stability criterion	<ul style="list-style-type: none"> • Sets criterion of stable condition. 		Stability criterion /Strict	
			Stability criterion / Little strict	
			Stability criterion / Normal	
			Stability criterion/ Little reasonable	
			Stability criterion/ Reasonable	
Data updating interval setting	<ul style="list-style-type: none"> • Sets the interval of data updating to be automatically variable, or stable. 		Data updating interval / Automatically variable	
			Data updating interval/ fixed	
Data updating interval (Integral time)	<ul style="list-style-type: none"> • Sets the integral time for data updating. • In the case of (*1), it becomes Droplet mode, and filtering function (delay) becomes more effective. • In the case of (), the integral time of unstable condition automatically becomes short. 		(Variable)	
			DFB-60, 300, 3000	DFB-600, 6000
		(*1)	Approx.0.1sec ~ Approx. 0.2sec	Approx.0.1sec fixed
			Approx.0.1sec ~ Approx. 0.4sec	Approx.0.1sec ~ Approx. 0.2sec
			Approx.0.1sec ~ Approx.0.8sec	Approx.0.1sec ~ Approx. 0.4sec
			Approx.0.1sec ~ Approx.0.8sec	Approx.0.1sec ~ Approx. 0.4sec
			Approx.0.1sec ~ Approx.0.8sec	Approx.0.1sec ~ Approx.0.8sec
			(Fixed)	
			Approx.0.1sec fixed	
			Approx.0.2sec fixed	
			Approx.0.4se fixed	
			Approx.0.8sec fixed	
			Approx.1.6sec fixed	

Functions	Descriptions	Displays	Notes
Digital filtering effect in a stable condition	• Sets the effect of Digital filtering function in a stable condition		Filter effect /weak
			Filter effect /strong
RS interface function setting	•Sets the format of RS data output.		RS interface function / stop
			6 digits number format
			7 digits number format
RS data output control	• Selects programs to output RS data.		Output stops
			Outputs continuously
			Outputs continuously in a stable condition
			Outputs one time by pressing  key
			Output automatically
			Outputs one time in a stable condition (Output stops in an unstable condition)
			Outputs one time in a stable condition (Outputs continuously in an unstable condition)
			Outputs one time by pressing 
Baud rate setting	• Sets baud rates.		1200 bps
			2400 bps
			4800 bps
			9600 bps
Parity setting	• Sets parities. It is effective only in the () condition.		No parity bit
			Odd number parity
			Even number parity
BCD interface function setting	•Selects BCD data output format.		BCD interface function / halt
			IOH format
			IOB-H format
BUSY pulse width of BCD output.	Selects the pulse width of BCD data. It is invalid in the () condition.		BUSY pulse width 1ms
			BUSY pulse width 20ms
Stable signal for BCD output	• Stable signal of IOH format. It is valid only in the condition of ()		Stable sign of IOH format NO
			Stable sign of IOH format Yes
Numerical logic of BCD output	• To adjust with PLC input logic to connect each other. It is invalid in the () condition.		Numeric value part / positive
			Numeric value part / negative
Decimal point logic of BCD output	• To adjust with PLC input logic to connect each other. It is invalid in the () condition.		Decimal point part / positive
			Decimal point part / negative
BCD output stable signal logic	• To adjust with PLC input logic to connect each other. It is invalid in the () condition.		Stability sign part / positive
			Stability sign part / negative
Backup function of Zero setting point	•The function to use the memorized former zero setting point when the power is turned on.		Backup function OFF
			Backup function ON
Zero setting timing	• Selects Immediate zero setting or Stable condition waiting (then zero setting).		Immediate zero setting / by pressing  key
			Stable condition waiting (then zero setting)/ by pressing  key











Chapter 7 - Span Calibration

7-1. Procedure of Span Calibration

- 1) Remove any tare, if it is set onto Weighing pan of this system. And if it can not be removed, refer to 5) , and provide necessary balance weights.
- 2) Confirm the stability of the hardware that this system is installed into, and adjust it if it is not leveled.
- 3) More than 2 hour warming up time is required for precise calibration of this system.
- 4) Make sure to keep any disturbance, such as mechanical vibration or wind away from this system during its span calibration.
- 5) Provide exact balance weights required for calibrating the span of this system.

	DFB-60	DFB-600	DFB-6000	DFB-300	DFB-3000
Mass of balance weights [g] 1	60g	600g	6000g	300g	3000g
Mass of balance weights [g] 2	10g,20g,30g,40g,50g	100g,200g,300g,400g,500g	1000g,2000g,3000g,4000g,5000g	50g,100g,200g	500g,1000g,2000g

Basically, provide "Mass of balance weights [g] 1" that meets the maximum of the measuring capacity. However, those exact balance weights listed above in " Mass of balance weights [g] 2 " also can be used when any tare is set onto Weighing pan of this system, and a balance weight to meet the maximum of measuring capacity cannot be put on, or when the net measuring capacity is smaller than the maximum of measuring capacity.





- 6) Keep pressing  key, and release it when the display shows  .
Weight display  .       

- 7) Hold  key and press  key. Then release both keys at once.



    flashingThe system is reading the zero point data.

Do not place any work piece.

Wait for the system to complete to read the zero point data.




   The system is requesting Full sensor data.

Place the exact balance weight of " Mass of balance weights [g] 1 " or " Mass of balance weights [g] 2."



  FlashingThe system is reading the full sensor data.

The display returns to show force values after the calibration is normally completed.

7-2. Interrupting Span Calibration

Span calibration will be interrupted, and the display will return to show force values, by pressing  key while  is flashing, or  is flashing.

7-3. Error Display of Span Calibration

-  will be displayed when the mass of actual balance weight[g] is smaller than the minimum weight listed above , in " Mass of balance weights [g] 2 " , and the span calibration will be interrupted.
-  will be displayed when an significant error is found in the mass of balance weights, and the span calibration will be interrupted.

Chapter 8 - Reference of RS232C Interface

RS232C Interface which is a standard deployment of this system, is the most common interface principally used for data communication with external instruments such as PLC, personal computers, and so on.

1) The maximum transfer distance is 15m.

8-1. List of Connecting Terminal Number

Terminal number	Signal name	Input / Output direction	Functions / Descriptions
1	EXT.TARE	Input	Contact point of remote taring (*1)
2	DTR	Output	DTR-ON (when the power of the system is on)
3	RXD	Input	Received data
4	TXD	Output	Sent data
5	SG		Signal GND
E	FG		Case GND

8-2. Connectors

The connector that conforms to RS232C connector of this system

TCP0556-01-0201 Din 5 bin, Straight type, produced by Hosiden Corp. / Accessory Parts)

*1 : Contact point or Remote Tare input

Tare setting can be done at the contact point between EXT.TARE and SG, or from external devices by turning on the transistor switch.

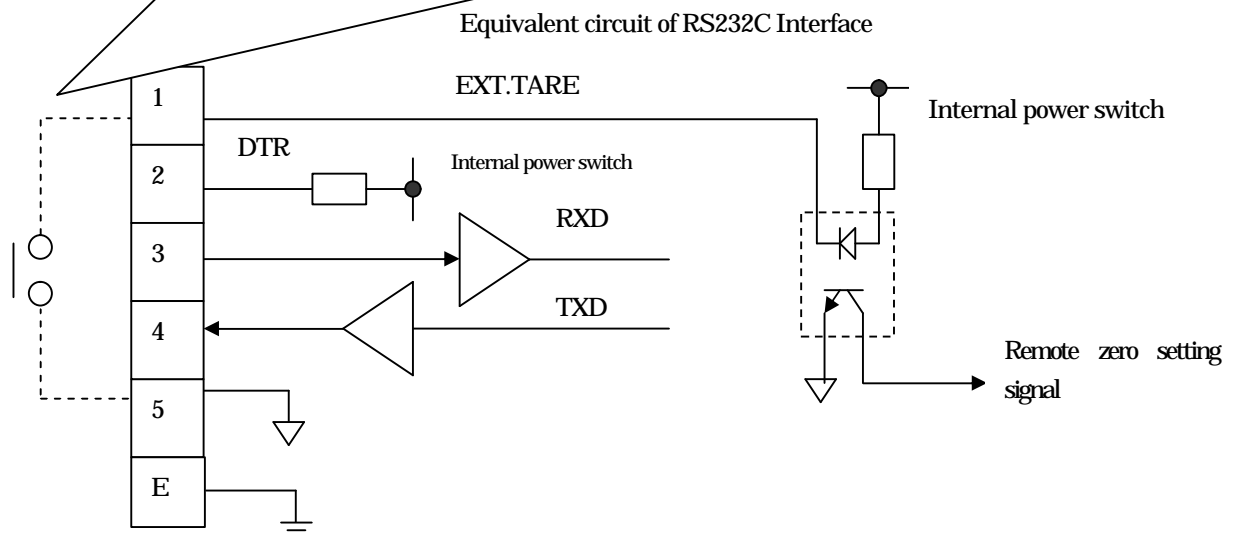
To do so, turn the transistor switch on at least for 0.2 seconds.

(OFF time of maximum voltage:1.5V / ON time of sink current: 20mA)

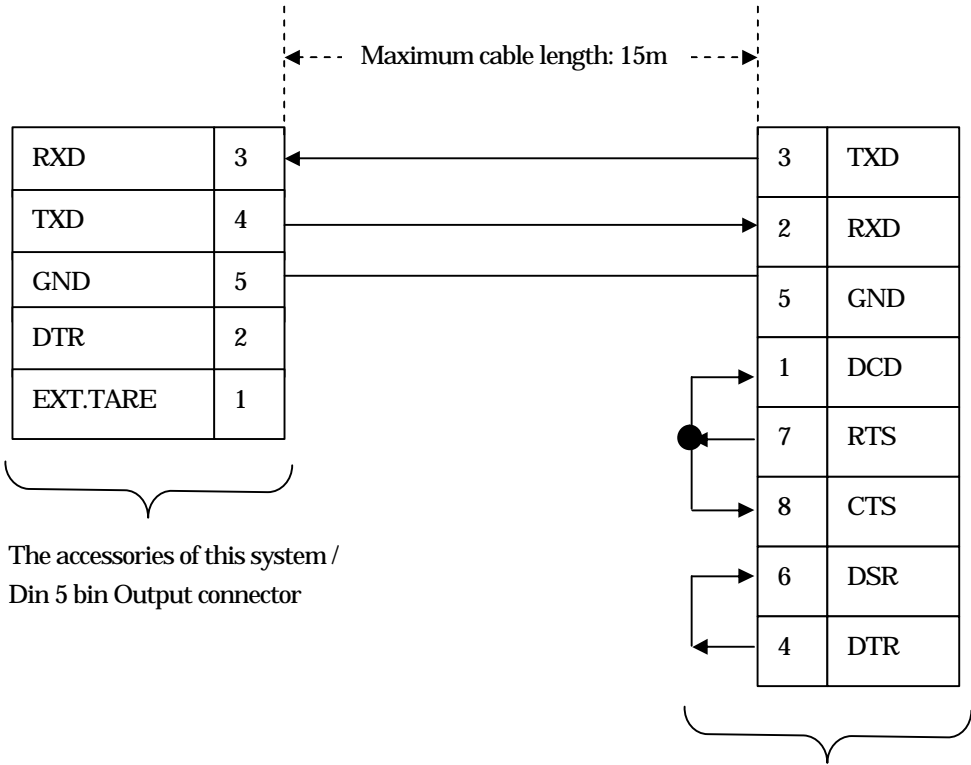
(Caution 1) When connecting with the transistor (open collector) output of PLC (Sequencer), the input circuit may be turned on automatically with the leakage current. In this case, please use a relay point-of-contact output circuit.

(Caution 2) The outflow current for the tare input terminal with the external point-of-contact is about 0.8mA.

If you use the switch element for the power switch which minimum operation current is about 10mA, such as SSR (solid state relay), it may not operate normally.



8-3. RS Connector Cable to Connect to External Instrument. (Reference)



The accessories of this system /
Din 5 bin Output connector

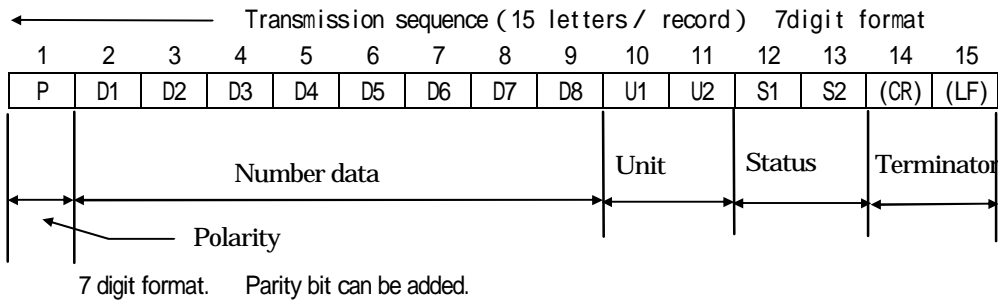
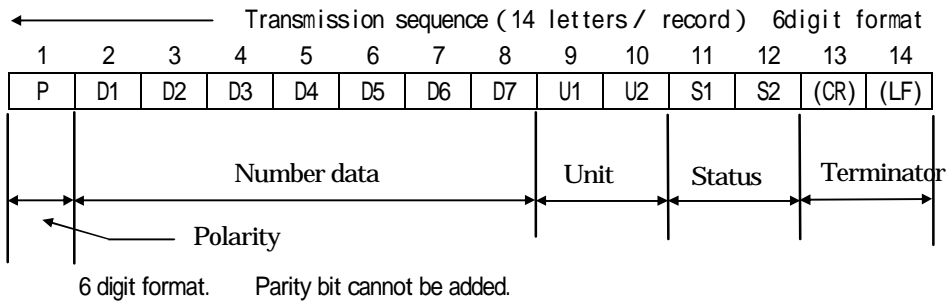
To fit RS232C connector of
External devices (such as personal
computers) .
D sub 9 bin female connector

8-4. Data Output Format

8-4-1. Character Configurations

- 1) Start bit 1 bit
- 2) Data bit 8 bits
- 3) Parity bit None. Even number/ 1 bit, or Odd number/ 1 bit can be selected.(7 digit format)
- 4) Stop bit 2 bits
- 5) Baud rate 1200 bps, 2400 bps, 4800 bps, 9600 bps can be selected.

8-4-2. Record Configurations



8-4-3. Polarity

P	Code	Description
+	2BH	The number data is 0 or positive number.
-	2DH	The number data is negative number.

8-4-4. Number data

D1 ~ D7 : 7letters (7digit format D1 ~ D8 : 8 letters)

D*	Code	Description
0 ~ 9	30H ~ 39H	Number 0 ~ 9
.	2EH	Decimal point (the position will shift) is abbreviated for positive number data, and data is outputted with a blank space (20H) in the space of the lowest figure.
	20H	Blank space Zero display omission of the first top digit.

8-4-5. Unit

U1, U2 : 2 letters

U1	U2	U1code	U2code	Meaning
SP	G	20H	47H	Gram

8-4-6. Status 1

S1 : 1 letter

S1	Code	Description
SP	20H	No definition has been given.



8-4-7. Status2

S2: 1 letter

S2	Code	Descriptions
S	53H	Weight data is stable.
U	55H	Weight data is unstable.
E	45H	Weight data over / under errors All data except S2 will be invalid at this time.
SP	20H	No status is assigned.

8-5. List of the sensor controls by commands

8-5-1. List of Control Commands of this system

	Functions	Command Letter HEX code		Responses after sending command
		C1	C2	
1	Zero setting command	T (54H)	SP(20H)	A00(CR)(LF) : Zero setting is succeeded. E01(CR)(LF) : Zero setting is failed
2	Suspends output (allows inputting commands)	O(4FH)	0 (30H)	A00(CR)(LF)
3	Outputs continuously.	O(4FH)	1 (31H)	A00(CR)(LF)
4	Outputs continuously in a stable condition. (Suspends output in an unstable condition)	O(4FH)	2 (32H)	A00(CR)(LF)
5	Outputs one time by pressing  key.	O(4FH)	3 (33H)	A00(CR)(LF)
6	Automatic output	O(4FH)	4 (34H)	A00(CR)(LF)
7	Outputs one time in a stable condition. (Suspends output in an unstable condition)	O(4FH)	5 (35H)	A00(CR)(LF)
8	Outputs one time in a stable condition. (Outputs continuously in a stable condition.)	O(4FH)	6 (36H)	A00(CR)(LF)
9	Outputs one time in a stable condition by pressing  key.	O(4FH)	7 (37H)	A00(CR)(LF)
10	Outputs one time immediately.	O(4FH)	8 (38H)	A00(CR)(LF)
11	Outputs one time after the condition becomes stable.	O(4FH)	9 (39H)	A00(CR)(LF)

8-5-2. Procedure to transmit commands

- 1) Because Full Duplex System is used for data communication, commands can be transmitted at anytime, and the transmission won't be interrupted by the data sending cycle of the sensor.
- 2) The sensor will send a normal responding message, when commands are received properly.
- 3) The sensor will send an error responding message, when commands are not received properly, or when the received commands are invalid.
- 4) When the sensor displays weight data properly, the sensor will send these responding messages normally within 2 seconds after commands have been transmitted.

However , in a case of the function [] (the function to wait a stable condition for zero setting), the responding message will be sent, after the weight data becomes stable, and after the zero setting is completed.

- 5) If the sensor has received a command in the middle of its operation (such as during the key operation or the operation of function setting, the sensor will run the command and send the responding message as soon as the unfinished operation has been completed.

- 6) To send several commands from an external device, do not send the next command before receiving the responding message for the first command from the sensor.

【Note 1】

The output control of Command " O0 " to "O7 "and the output control of this system's function setting work the same. Command 'O8 "and 'O9 "order this system to output data.

【Note 2】

Once Command 'O8 'and 'O9 "are performed, the system will keep the same condition until the next command is inputted. However, once the power of this system is turned off, the output control position returns to the function setting position when the system is turned on again.

8-5-3. Command Format (The sensor External Devices)

Including the terminator CR = (0DH) and LF = (0AH), Command is composed with four letters.

For C1, C2, refer to the figure in 8-5-1

1	2	3	4
C1	C2	CR (0DH)	LF (0AH)

8-5-4. Command Response Format (The Sensor External Devices)

Including the terminator CR = (0DH) and LF = (0AH), the command is composed with five letters.

Normal response

1	2	3	4	5
A (41H)	0(30H)	0(30H)	CR (0DH)	LF (0AH)

Error response

1	2	3	4	5
E (45H)	0(30H)	1(31H)	CR (0DH)	LF (0AH)

Chapter 9 - Reference of BCD Interface

With BCD interface, which can be installed in the indicator box, measurement data is output in parallel BCD data format. With this interface, direct connection to I/O terminal in PLC can be arranged by which measurement data is stored in PLC easily. Generally, use IOH data format as described in 9-1-1.

- 1) Parallel transmission Open collector signal up to 2m
- 2) Featuring EXTERNAL TARE EXTERNAL HOLD
- 3) RS232C is available at the same time.

for transmission, be sure to use shielded cable. Connect shield wire to shell case of the connector of Amphenol 36 pin

9.1 Connector pin assignment table

9-1-1. In IOH format (upon function setting)

Pin Number	Signal Contents	Direction	Pin Number	Signal contents	Direction
1	Numerical Data $10^5 - 1$	Output	19	Numerical Data $10^5 - 2$	Output
2	Numerical Data $10^5 - 4$	Output	20	Numerical Data $10^5 - 8$	Output
3	Numerical Data $10^0 - 1$	Output	21	Numerical Data $10^0 - 2$	Output
4	Numerical Data $10^0 - 4$	Output	22	Numerical Data $10^0 - 8$	Output
5	Numerical Data $10^1 - 1$	Output	23	Numerical Data $10^1 - 2$	Output
6	Numerical Data $10^1 - 4$	Output	24	Numerical Data $10^1 - 8$	Output
7	Numerical Data $10^2 - 1$	Output	25	Numerical Data $10^2 - 2$	Output
8	Numerical Data $10^2 - 4$	Output	26	Numerical Data $10^2 - 8$	Output
9	Numerical Data $10^3 - 1$	Output	27	Numerical Data $10^3 - 2$	Output
10	Numerical Data $10^3 - 4$	Output	28	Numerical Data $10^3 - 8$	Output
11	Numerical Data $10^4 - 1$	Output	29	Numerical Data $10^4 - 2$	Output
12	Numerical Data $10^4 - 4$	Output	30	Numerical Data $10^4 - 8$	Output
13	Decimal point code - 1	Output	31	Decimal point code - 2	Output
14	Decimal point code - 4	Output	32	Stable *1	Output
15	Polarity(minus)	Output	33	Over range	Output
16	External Hold	Input	34		Output
17	External Tare	Input	35	BUSY	Output
18	GND		36	GND	

*1 effective upon function setting
always logic '0' upon

9-1-2. In IOB-H format (upon function setting)

Pin Number	Signal Contents	Direction	Pin Number	Signal contents	Direction
1	Numerical Data $10^5 - 1$	Output	19		Output
2		Output	20	Stable	Output
3	Numerical Data $10^0 - 1$	Output	21	Numerical Data $10^0 - 2$	Output
4	Numerical Data $10^0 - 4$	Output	22	Numerical Data $10^0 - 8$	Output
5	Numerical Data $10^1 - 1$	Output	23	Numerical Data $10^1 - 2$	Output
6	Numerical Data $10^1 - 4$	Output	24	Numerical Data $10^1 - 8$	Output
7	Numerical Data $10^2 - 1$	Output	25	Numerical Data $10^2 - 2$	Output
8	Numerical Data $10^2 - 4$	Output	26	Numerical Data $10^2 - 8$	Output
9	Numerical Data $10^3 - 1$	Output	27	Numerical Data $10^3 - 2$	Output
10	Numerical Data $10^3 - 4$	Output	28	Numerical Data $10^3 - 8$	Output
11	Numerical Data $10^4 - 1$	Output	29	Numerical Data $10^4 - 2$	Output
12	Numerical Data $10^4 - 4$	Output	30	Numerical Data $10^4 - 8$	Output
13	Decimal point position - 1	Output	31	Decimal point position - 2	Output
14	Decimal point position - 4	Output	32		Output
15	Polarity (minus)	Output	33	Over range	Output
16	External Hold	Input	34		Output
17	External Tare	Input	35	BUSY	Output
18	GND		36	GND	

*1 : Data indefinite, *2 logic '1' fixed

9-1-3. Designated Connector

Receptor installed in the indicator: Amphenol 36pin female (DDK 57-40360-D60 or equivalent)

Plug attached to make connecting cable Amphenol 36pin male (DDK 57-30360 or equivalent)

9-1-4. Logic

1) positive logic for output circuit : photo coupler transistor output photo coupler transistor output

logic '1' : photo coupler transistor is OFF

logic '0' : photo coupler transistor is ON

2) Input circuit : external contact (or transistor switch) Input

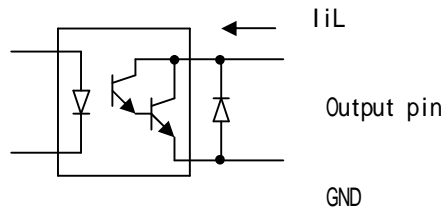
external contact ON = external input is ON

9-1-5. Equivalent circuit for INPUT/OUTPUT

1) Output logic

Logic "1"	Logic "0"
Transistor :OFF Impedance at OFF :200K or higher Voltage prrof:+30V	Transistor :ON Sink current(IiL):MAX. 10mA

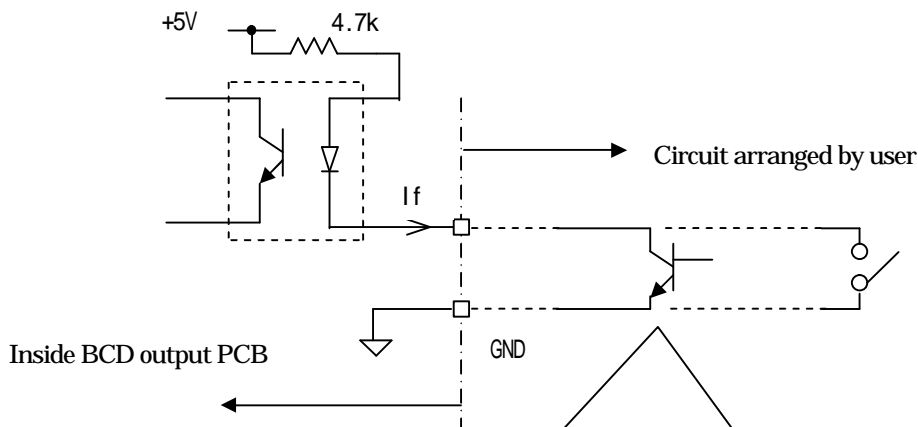
2) Equivalent circuit of output



3) Input logic

Logic "1"	Logic "0"
External contact :OFF Impedance at OFF:100k or more	External contact :ON Residual voltage :MAX. 1.5V

4) Equivalent circuit of input (External Tare, External Hold)



(Caution 1) When connecting with the transistor (open collector) output of PLC (Sequencer), the input circuit may be turned on automatically with the leakage current. In this case, please use a relay point-of-contact output circuit.

(Caution 2) The outflow current for the tare input terminal with the external point-of-contact is about 0.8mA. If you use the switch element for the power switch which minimum operation current is about 10mA, such as SSR (solid state relay), it may not operate normally.

Please use the switch element suitable for the micro-current switch such as a mechanical relay point of contact.

9-1-6. Description of signal

1) Numerical data

indicated by BCD code in each digit

Number	Logic			
	2^3	2^2	2^1	2^0
0	0	0	0	0
1	0	0	0	1
8	1	0	0	0
9	1	0	0	1

2) Decimal point

2)-1 upon IOH mode (upon function)

indicated as 3 bit code

Decimal point	Position code		
	4	2	1
None or at the right end(10^0)	0	0	0
2 nd from the right end(10^1)	0	0	1
3 rd from the right end(10^2)	0	1	0
6 th from the right end (10^5)	1	0	1

MSD					LSD	
10^5	10^4	10^3	10^2	10^1	10^0	
1	2	3	4	5	6 .	
1	2	3	4	5	. 6	
1	2	3	4	5	. 6	
1	2	3	4	5	. 6	

2)-2 upon IOB-H mode (upon function)

indicated as position data

Decimal point	Position code		
	4	2	1
2 nd from the right end(10^1)	0	0	1
3 rd from the right end(10^2)	0	1	0
4 th from the right end(10^3)	1	0	0

MSD					LSD	
10^5	10^4	10^3	10^2	10^1	10^0	
1	2	3	4	5	. 6	
1	2	3	4	5	. 6	
1	2	3	4	5	. 6	

3) polarity output

- + (plus) logic '1' photo coupler OFF
- (minus) logic '0' photo coupler ON

4) over range

- when b-Err or u-Err is displayed logic '1' photo coupler OFF
- for normal data logic '0' photo coupler ON
- note : upon logic '1' all the other data are indefinite

5) stable

- when weight data is stable logic '0' photo coupler ON
- when weight data is stable logic '1' photo coupler OFF

6) BUSY

- during data revision logic '0' photo coupler ON
- during data held logic '1' photo coupler OFF

7) External hold

no data revision upon logic "0" (external contact ON)

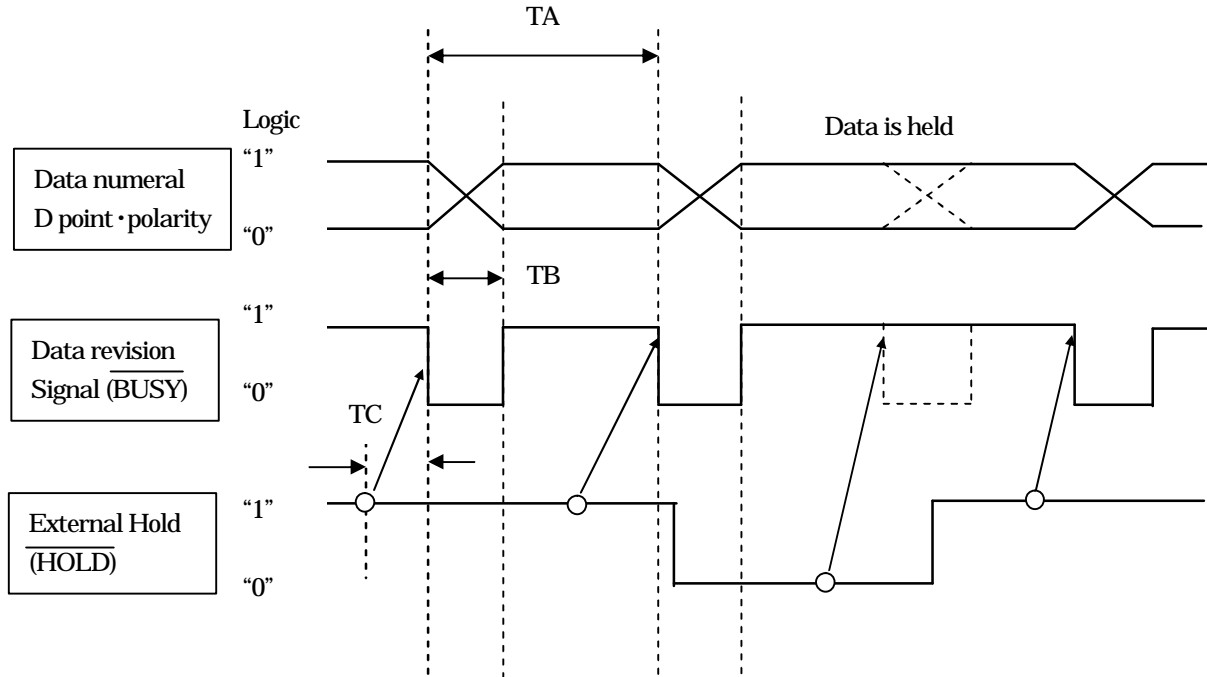
• upon logic "0" during data revision (BUSY logic "0") data is revised and held.

8) External tare

• to tare the sensor by setting logic "0" (external contact ON)

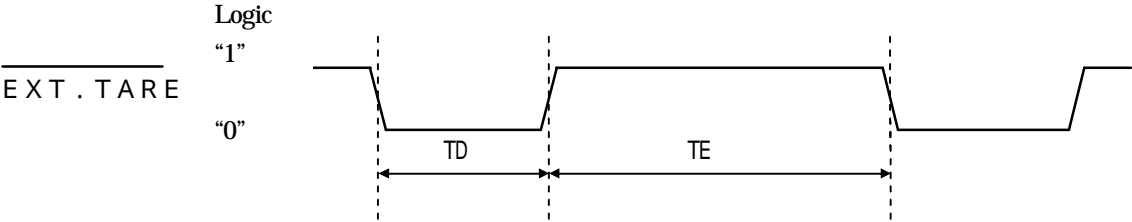
9-1-7. Signal timing

1) BCD output vs. EXTERNAL HOLD input



Title	Symbol	Min.	Max.	Remarks
DATA revision period	TA	80msec depend on integral time	App. 2 sec Depend on integral time	Period for data revision without HOLD input
DATA revision time	TB	20msec (upon function)	23msec (upon function)	Time to revise data.
<u>HOLD</u> Set up time	TC	- - - - -	1 m sec	Time to test <u>HOLD</u> input and turn <u>BUSY</u> to logic "0"

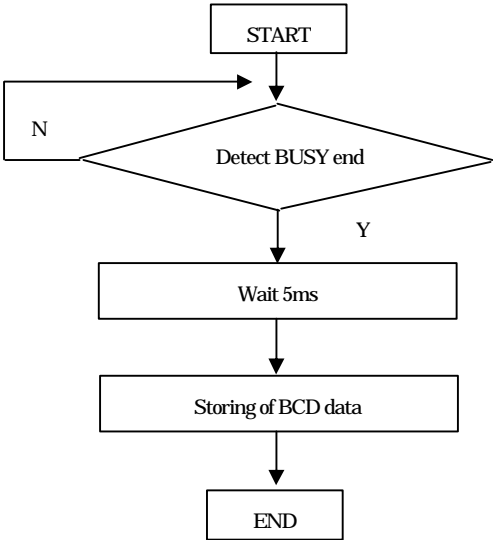
1) External Tare



Title	Symbol	Min.	Max.
Logic "0" time	TD	200ms	- - - -
Logic "1" time	TE	20ms	- - - -




9-1-8. BCD data acquisition procedure

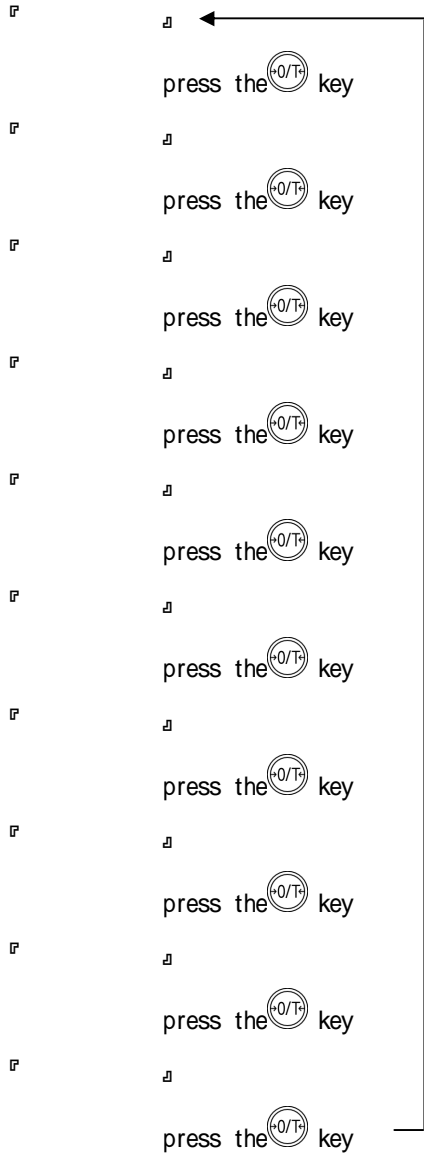
method of detecting end of the BUSY pulse







9-1-9. Operation for **BCD** data test output mode

DFB features BCD test output mode for testing connection to a customer arranged controller

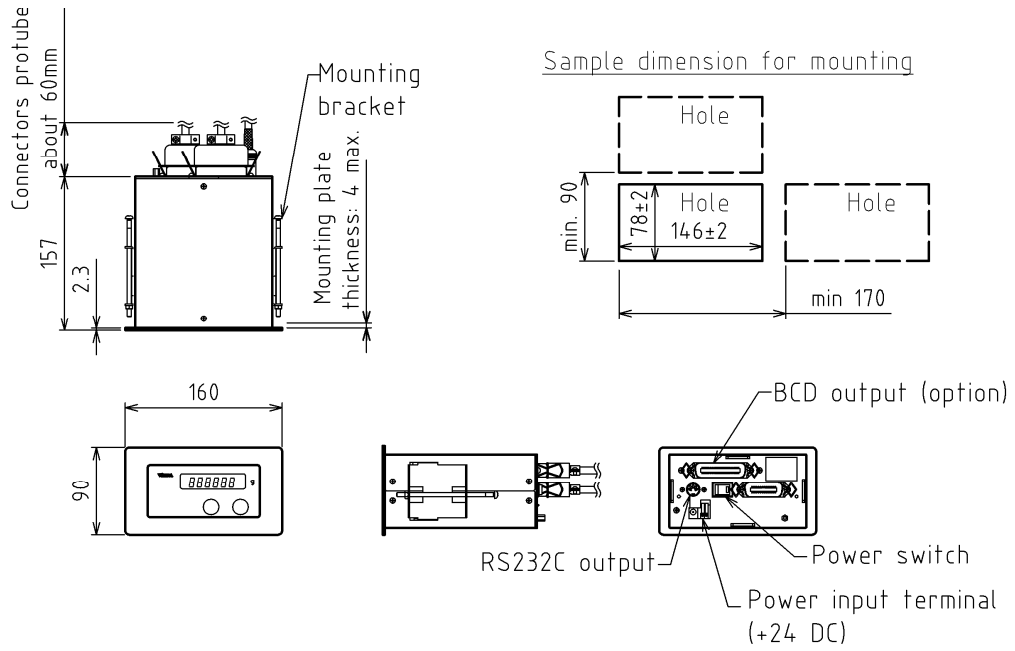
1) Keep pressing  key, release the key when  appears  appears



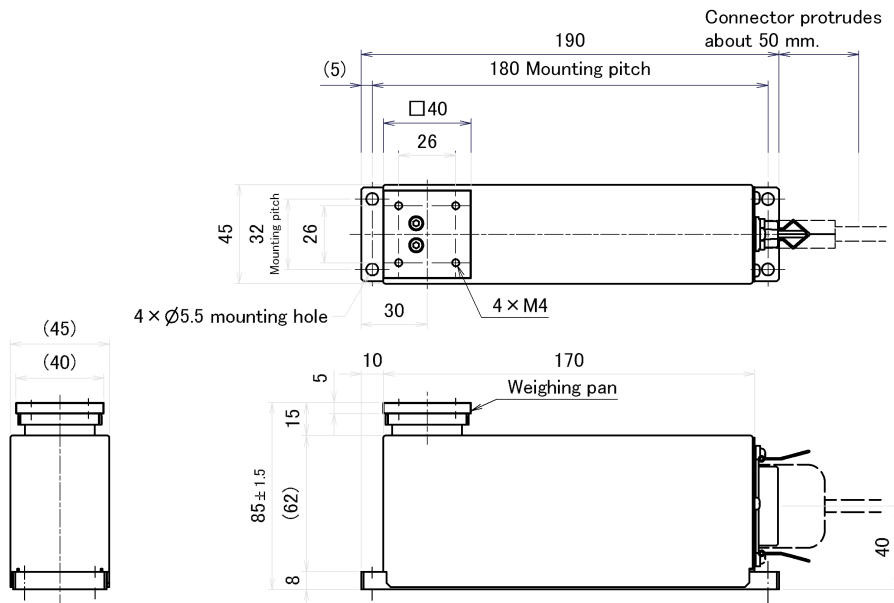
(note)
 Enable BCD output by setting  or
 press the  key to go back to weight display
 same (6 digit) data on the display is output in BCD
 press the  key 20msec BUSY pulse is generated
 during data refresh
 Upon negative logic is set by , formatted
 in negative BCD.

Appendix. External View

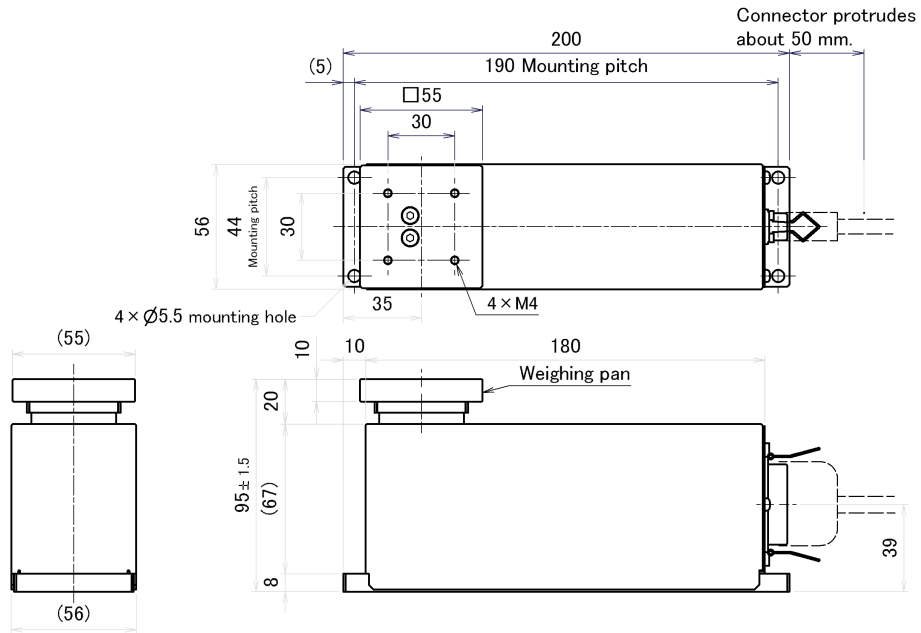
Indicator outline drawing



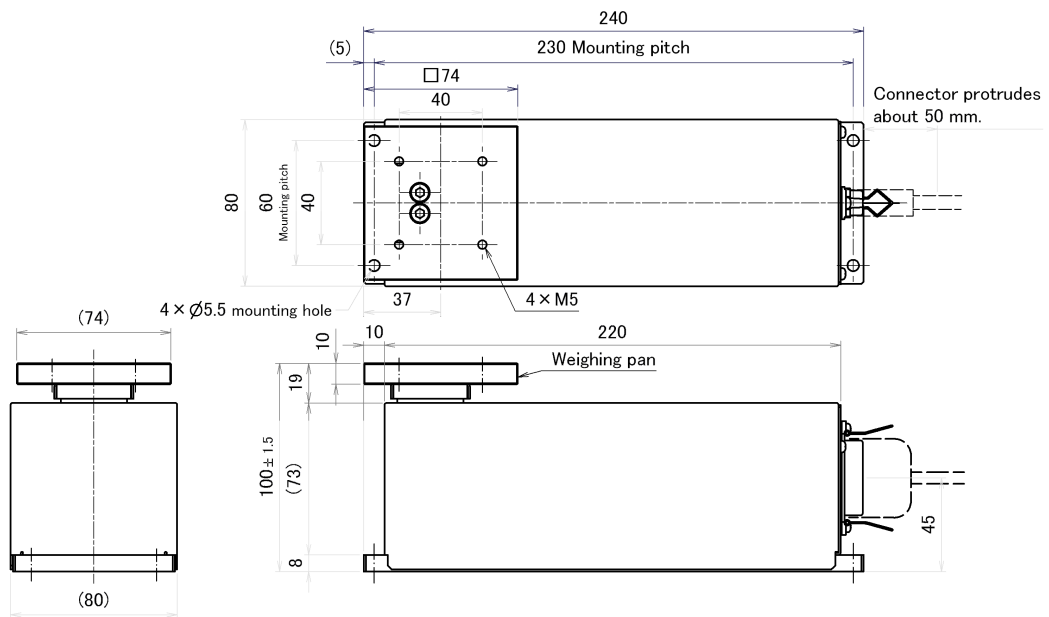
DFB-60 Weighing Unit outline drawing



DFB-300 / DFB-600 Weighing Unit outline drawing



DFB-3000 / DFB-6000 Weighing Unit outline drawing



MEMO.

SHIKO DENSHI CO., LTD.