



**OPERATION MANUAL** 

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UNIPULSE

### Introduction

Thank you very much for purchasing our Digital Indicator F350.

The F350 is an indicator for various strain gauge sensors that measure pressure, load, torque, etc. Equipped with ultrahigh-speed peek hold and HI/LO limit comparison functions, the F350 is for general purpose use, such as an automatic assembly machine and testing machine.

To take full advantage of high performance of F350, thoroughly read this operating manual first before use and understand the explanations contained herein for correct operating procedures. Also, carefully store this instruction manual so that it can be referred to at any time.

#### Applications



Tension measurement



Crane load measurement









### Safety Precautions

#### **BE SURE TO READ FOR SAFETY**

Installation, maintenance and inspection of the F350 should be performed by personnel having technical knowledge of electricity.

In order to have an F350 Weighing Controller used safely, notes I would like you to surely follow divide into " A WARNING " and " A CAUTION ", and are indicated by the following documents.

Notes indicated here are the serious contents related to safely.

Please use F350 after understanding the contents well.

## 

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

## ▲ CAUTION

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

## 

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

#### Warning on design

- For the entire system to function safely when the F350 becomes faulty or malfunctions, provide a safety circuit outside the F350.
- Since the F350 has no power switch, install a breaker.
- Before using the F350 as described below, make sure to consult with our sales personnel.
   Use in environments not described in the operation manual.
  - Use greatly impacting human lives and assets, such as medical devices, transport devices entertainment devices, and safety devices.

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

#### Warning on installation

- Do not disassemble, repair, or modify the F350. Doing so may cause a fire or an electric shock.
- Do not install in the following environments.
  - Places containing corrosive gas or flammable gas.
  - Where the product may be splashed with water, oil or chemicals.

#### Warning on wiring

- Do not connect a commercial power source directly to the signal input/output terminals.
- Be sure to ground the protective ground terminal.
- The attached AC cable is designed for domestic use in Japan, and its rating is 125V AC, 10A. For use at voltages exceeding the rating and for overseas use, have a separate AC cable prepared.
- Before performing the following, make sure that no power is applied.
  - Removal and installation of optional connectors and so forth;
  - Wiring and connection of cables to a power input terminal;
  - Wiring and connection of cables to a signal I/O terminal;
  - Connection to protective grounding terminals.
- For connection to the signal input/output terminals, check the signal names and pin assignment numbers, and then carry out wiring properly.
- After wiring, be sure to mount the attached terminal block cover. Otherwise, it may cause an electric shock.
- To take measures against lightning surge, install a lightning surge protector (optionally available).
- Do not connect anything to unused terminal(s).
- Before applying power, carefully check the wiring, etc.

#### Warning during startup and maintenance

- Use a power supply voltage and load within the specified and rated ranges.
- Do not damage the power cord. Doing so may cause fire or electric shocks.
- Do not touch any signal input/output terminal while applying power. Doing so may cause electric shocks or malfunctions.
- If the cover of the main body is opened, it may cause an electric shock internally. Even if the power is off, the internal capacitor is charged. Contact us for internal inspection or repair.
- In the case of smoke, an abnormal smell or strange sound, immediately turn off the power, and disconnect the power cable.

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

#### Caution on installation

- Use the F350 as it is incorporated in a control panel, etc.
- Do not install in the following environments.
  - Locations where temperature or humidity exceeds specifications;
  - Locations subjected to drastic temperature fluctuations or icing and condensing;
  - Outdoors or locations above 2,000m;
  - Locations exposed to direct sunlight;
  - Locations subject to dust accumulation;
  - Locations with poor ventilation;
  - Locations with a lot of salt and metal powder;
  - Locations where the main unit is subject to direct vibration and shock.
- Take adequate shielding measures when using at the following locations.
  - Near a power line.
  - Where a strong electric field or magnetic field is formed.
  - Where static electricity, relay noise or the like is generated.
- Install the F350 as far away from devices generating high frequency, high voltage, large current, surge, etc., as possible. Also, carry out wiring separately from their power lines. Do not carry out parallel wiring and common wiring.
- Do not use it, broken down.

#### Caution on wiring

- Tighten the screws for the power input terminal at the specified torque.
   If they are loose, shorts, fire or malfunctions may occur.
   Tightening torque: 0.5N•m
- For sensors, external inputs/outputs and options, use shielded cables.
- The temporary overvoltage applied to the power should not exceed 1500V.

#### Caution during startup and maintenance

- For turning on/off the power, be sure to keep intervals of 5 seconds or more.
- After power-on, make sure to warm up the F350 for at least 30 minutes or more before use.
- If the F350 is not used by the specified method, its protective performance may be impaired.
- Maintenance
  - When performing maintenance, disconnect the power.
  - Do not wipe with a wet rag, or with benzine, thinner, alcohol, etc. Doing so may cause discoloration or deformation of the F350. In the case of heavy contamination, wipe off the contamination with a cloth after dipping it into a diluted neutral detergent and wringing it well, and then wipe with a soft, dry cloth.

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

#### Caution during transportation

When the F350 is shipped, spacers made of corrugated cardboard are used as cushioning materials.

Though it is factory-designed so that shocks can sufficiently be absorbed, breakage may result if shocks are applied when the spacers are reused for transportation. If you send the F350 to us for repair, etc., take adequate measures against shocks by using polyurethane materials, etc., separately.

#### Caution during disposal

• If you dispose of the product, handle it as industrial waste.

### **About the Built-in Lithium Battery**

## MARNING

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

• Never disassemble, deform under pressure or throw the battery into fire. The battery may explode, catch fire or leak.

### **Statement of Conformation to EC Directives**

\* The F350 is a CE-compliant product. For use, observe the following.

The F350 Digital Indicator is a CE-marked EC-Directive-conforming product (by the Council of the European Union).

- Low Voltage Directive	EN61010-1:2010 (Overvoltage category II) Pollution degree 2) EN62311:2008 (test distance: 0cm)
- EMC Directive	EN61326-1:2006
	EN55011:2009, A1:2010 Group1, ClassA
	EN61000-3-2:2006, A1:2009, A2:2009
	EN61000-3-3:2008
	EN61000-4-2:2009
	EN61000-4-3:2006, A1:2008, A2:2010
	EN61000-4-4:2004, A1:2010
	EN61000-4-5:2006
	EN61000-4-6:2009
	EN61000-4-8:2010
	EN61000-4-11:2004

When installing, attention should be given to the following.

- 1. Since the F350 is defined as open type (built-in equipment), be sure to use it as installed and fixed to a panel, etc.
- The power cable attached to this product as standard can be used with 100V AC power in Japan.(Nominal rated voltage: 125V AC)
   For using this product in a country outside Japan, use a power cable certified in that

For using this product in a country outside Japan, use a power cable certified in that country.

 For cables other than the power cable (sensor, external input/output, option), use shielded cables.

Also, mount the attached ferrite core to the strain gauge sensor cable.

) Point

The combination of the main unit of the F350 and a lightning surge protector conforms to EN61000-4-5 (lightning surge immunity) in the EMC Directives.

Refer to " Connection of a Lightning Surge Protector (Power Cable)" on page VII for information regarding lightning surge protector connection.

### **Connection of a Lightning Surge Protector** (Power Cable)

Connect a lightning surge protector against lightning surge.

EMC Directive EN61000-4-5 (Lightning Surge Immunity) is met by the F350 body in combination with a lightning surge protector.



●Lightning surge protector [MAINTRAB MNT-1D]



An EU-outlet-shape AC power cable is required.

\* MAINTRAB MNT-1D is a registered trademark of PHOENIX CONTACT.

The lightning surge protector [MAINTRAB MNT-1D] is not included as standard.

In addition, as optional parts, we sell EU-outlet-shape 250V AC withstanding cables (following illustration: European standard) and lightning surge protectors in pairs (TSU02). For details, contact our sales department.





## **RoHS-Compliant Product**

The parts and attachments (including the instruction manual, packaging box, etc.) used for this unit are compliant with the RoHS Directive restricting the use of hazardous substances with regard to adverse effects on the environment and human body.

#### What is RoHS?

It is an abbreviation for Restriction on Hazardous Substances, which is implemented by the European Union (EU). The Directive restricts the use of six specific substances in electric and electronic equipment handled within EU borders. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).

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# 1 OUTLINE

## 1-1. Main features of the F350

- The F350 is a digital indicator that is capable of two-channel inputs of strain gauge sensors.
- Calculations, such as addition and subtraction, and comparison judgments are made by using the input values of two channels. The F350 is also suitable for balance measurement.
- The F350 is equipped with comparison judgments on the input value of each channel, and analog voltage output.
- The A/D conversion speed of each channel and the digital processing speed for calculations and judgments are as high as 3,000 times/sec. It can also be switched to 300 times/sec.
- The F350 is equipped with hold functions with respect to calculated values. (sample, peak, bottom, and average holds)
- The F350's compact size of DIN96×96 realizes space-saving.
- By mounting an optional interface according to the purpose, ease of load control can be further improved.

Chapter 1

## 1-2. Contents of the package

The packaging box contains the following. Be sure to check them before use.



F350 body…1



F350 operation manual · · · 1



External input/output connector ••• 1



AC input cord • • • 1 (with solderless terminal)



Connector for BCD parallel data output · · · 1 (with BCD parallel data output option)



Conversion plug for AC input code · · · 1



Ferrite core ••• 2 (with unity band)



Operating tool • • • 1 (with D/A converter (3ch) option)



Mini screwdriver for terminal block connection ••• 1 (with D/A converter option)

## 

The attached AC cable is intended for domestic use in Japan, and it is rated as 125V AC, 10A. If it is used at voltages exceeding the rating or it is used overseas, have a suitable AC cable ready separately.

Chapter



#### 1-4. Appearance description

■Front panel



#### Main status display section

The status with respect to calculated values is indicated.

- HI: Lights when the indicated value is larger than the calculation HI limit. Indicates that the external output "calculation HI" is ON.
- OK: Lights when the indicated value is smaller than the calculation HI limit and larger than the calculation LO limit.
  - Indicates that the external output "calculation OK" is ON.
- LO: Lights when the indicated value is smaller than the calculation LO limit. Indicates that the external output "calculation LO" is ON.
- PEAK: Blinks during hold detection, and lights when a hold is confirmed. However, it is always unlit in all section sample hold.
- HOLD: Lights during hold detection and when a hold is confirmed. However, it blinks when hold waiting in all section sample hold.

#### Main numerical display section

The following display patterns exist.

- Indicated value: Displays calculation results during measurements.
- Error display: Displays an error message when an error occurs.
- Setting value: Displays setting values in setting mode.

#### Sub status display section

The status with respect to ch1/ch2 values is indicated.

- HI: Lights when the indicated value is larger than the ch1/ch2 HI limit. Indicates that the external output "ch1/ch2 HI output" is ON.
- LO: Lights when the indicated value is smaller than the ch1/ch2 LO limit. Indicates that the external output "ch1/ch2 LO output" is ON.

#### Sub numerical display section

The following display patterns exist.

Indicated value: Displays ch1/ch2 values during measurements.

- Error display: Displays an error message when an error occurs.
- Setting value: Displays the mode number and item number at the ch1 display section in setting mode; the currently-selected weight value may be displayed at the ch2 display section according to the setting item



Chapter

#### Setting key pad

These are keys for commanding settings and operations.



• Use this key to go to a setting mode state.



- Use this key to cancel setting/execution.
- Use this key to go back from a setting mode state to an indication display state.



• Use this key to take a shortcut from an indication display state to HI/LO limit setting.



• Use this key to go from an indication display state to ch1 or ch2 Digital Zero ready.





•Use this key to execute/release the calculated value hold in an indication display state.



- Use this key to switch between ch1 setting and ch2 setting, etc., in a Digital Zero ready state or setting item select state.
- Use this key to set whether or not to sign a setting value, when available, in a setting value input state.



- Use this key to select a trailing setting item number in a setting mode state.
- Use this key to select the previous item number in a setting item select state.
- Use this key to increment the numerical value by one in a setting value input state.



- Use this key to select a leading setting item number in a setting mode state.
- Use this key to select the next item number in a setting item select state.
- Use this key to decrement the numerical value by one in a setting value input state.



- Use this key to execute Digital Zero reset in a Digital Zero ready state.
- Use this key to increment the leading setting mode number by one in a setting mode state.
- Use this key to move the setting digit by one in the lower direction in a setting value input state.



- Use this key to execute Digital Zero in a Digital Zero ready state.
- Use this key to move to a setting value input state in a setting item select state.
- Use this key to validate the setting value in a setting value input state.

OUTLINE

#### Rear panel



#### Analog input/output connector

Connect a strain gauge sensor or voltage output.

\* For connection, see "■ Analog input/output connector connection" on page 10.

#### Signal input/output connector

Connect external input/output signals or SI/F (serial interface).

\* For connection, see "■ External I/O connection" on page 14.

#### Power input terminal block

Connect an AC input cord.

The input power source is free in the range of 100 to 240V AC (-15%, +10%). The frequency is 50/60Hz.

\* For connection, see "
Power input terminal connection" on page 9.

#### Protective ground

Be sure to ground the protective ground terminal to prevent electric shocks.

#### Frame ground ,,,

Please ground the frame ground terminal to prevent failures due to static electricity.

(The frame and the frame ground terminal are conducted.)

It may be better to remove depending on the environment of the installation location.

#### Options slot

One option board can in stall in the option slot.

<ul> <li>BCD parallel data output</li> </ul>	(BCO)
<ul> <li>RS-232C interface</li> </ul>	(232)
<ul> <li>D/A converter voltage output (3ch)</li> </ul>	(D3V)
<ul> <li>D/A converter voltage output</li> </ul>	(DAV)
<ul> <li>D/A converter current output</li> </ul>	(DAI)

Chapter

# **2** INSTALLATION & CONNECTION

The following are precautions related to connection to the signal input/output terminal block. The precautions described here are important for safety.

Make connections after properly understanding the description.

## 

- Do not connect commercial power directly to the signal input/output terminals.
- Make connection to the signal input/output terminals with no power applied because you may receive an electric shock.
- For connections to the signal input/output terminals, carry out wiring properly after confirming the signal names and pin assignment numbers.
- Use of the F350 is limited to category II specified by EN61010. Overvoltage applied to the signal input/output terminals should not exceed the value defined to category II.
- After wiring, make sure to mount the attached terminal block cover. Otherwise, you may receive an electric shock.
- Turn on the power after carefully checking the wiring, etc.
- Do not touch the signal input/output terminals while the power is on. Otherwise, you may receive an electric shock, or a malfunction may occur.
- The F350 conforms with EMC Directives as a product used in industrial environments (class A). If it is used in living environments, radio disturbance may occur. In that case, take suitable measures.

## 

- Tighten the terminal screws at specified torque. If the terminal screws are loose, short-circuiting, fire, or a malfunction may occur.
- Use shielded cables.

INSTALLATION & CONNECTION

## 2-1. Installation

To install the F350 into a control panel, use the following procedure.

- **1.** Make a hole in the panel according to the panel-cut dimensions.
- **2.** Remove the screws (two), and remove the guide rails from both sides.
  - \* Do not use other screws than those installed to the F350 body.

**3.** Fit in the F350 from the front of the panel.

**4.** Install from the rear the guide rails having been removed from both sides in Step 2, and fix them with the screws (two).



92mm<sup>+1</sup><sub>-0</sub>



92mm<sup>+1</sup><sub>-0</sub>





Chapter

## 2-2. Connection

#### Power input terminal connection

Connect an AC input cord. The input power source is free in the range of 100 to 240V AC (-15%, +10%).

The frequency is 50/60Hz.

Make connections to the terminal block with a solderless terminal within 6mm in diameter as shown in the illustration so as not to let the tip of the cable spread out.

- **1.** Make sure that no power is applied.
- **2.** Remove the screws (two), and remove the terminal block cover.
- **3.** Remove the two screws(M3) at the terminal block.
- **4.** Align the solderless terminals with the screw holes, and then tighten the screws.
  - L : Black N : White



Color description are for the attached AC input cord.

- **5.** Install the terminal block cover, and fix it with the screws (two).
- **6.** Remove the screws(M4) of the protective ground, align the crimp contacts with the screw holes, and then tighten the screws.

(\_\_\_\_\_) : Green/ Yellow

\* The protective ground is internally connected with  $\xrightarrow{}$  frame ground.

Chapter

#### ■Analog input/output connector connection

Connect a strain gauge sensor or voltage output.

Make connections according to the silk-screen printing on the rear panel of the F350.

#### Pin Assignment

-		
12	SHIELD	
11	-MONITOR(ch2)	
10	+MONITOR(ch2)	
9	-MONITOR(ch1)	
8	+MONITOR(ch1)	
7	-SIG(ch2)	
6	+SIG(ch2)	
5	-SIG(ch1)	
4	+SIG(ch1)	
3	-EXC*	
2	+EXC*	
1	SHIELD	*
		4

\* EXC is common to ch1 and ch2.

Compatible connector: ETB42-12P(OSADA CO.,Ltd.) or equivalent (Connector optional type: CN81)

## 

Before connecting a strain gauge sensor, make sure to check the setting of excitation voltage.

For the setting of excitation voltage, see "4-2 ②Excitation voltage setting" on page 25.

#### How to remove the terminal block

- 1. Loosen the screws (two) with a screwdriver.
- **2.** Remove the terminal block by giving it a strong pull.



#### Attention

When installing the terminal block to the F350 body, check its orientation. (See the illustration at the right.)



5mm

#### How to connect and install the terminal block

- Strip 5mm of the covering of the wire to be connected. The size of connectable wires is from 0.21 to 3.31mm<sup>2</sup> (AWG12 to 24).
- 2. Twist the tip to such an extent that it will not spread out.
- **3.** Loosen the screw with a screwdriver to open the connection hole.

\*A Phillips screwdriver 3 to 3.5mm #1 in shaft diameter is recommended. (Precision screwdriver, etc.)

- **4.** Insert the wire into the connection hole so as not to let the tip spread out.
- **5.** Tighten the screw with the screwdriver. \*0.5Nm of tightening torque is recommended.
- **6.** Lightly pull the wire to make sure that it is securely clamped.
- Insert the wire-connected plug into the F350 body, and tighten the screws (two).





Pin No.1

#### ■Attachment of a ferrite core

It is necessary to twist a power supply cable and sensor cables, such as a load cell, around an attached ferrite core.

(Turn clockwise.







#### ■ 6-wire sensor



Short-circuit +EXC with +S and -EXC with -S for connecting a 6-wire straingage sensor.

Chapter **2** 

#### Strain gauge sensor cable coloration

Cable colors of sensors may differ from one manufacturer to another (it may even differ from one model to another for some products). Refer to the sensor manual (or data sheet) and check signal names and colors in order to connect the cables correctly.



#### ■Voltage output connection

The voltage output terminals output analog voltage in proportion to each sensor signal input. The voltage output is approximately 2V per sensor input of 1 mV/V.

It is useful for observing or recording waveforms by connecting a recorder, etc.

· Example) Connection of output equivalent circuit and external instrument.



- •Since the output voltage is taken out in a step prior to A/D conversion of the sensor input signal, it is not synchronized with indicated values processed digitally, such as Digital Zero and digital filter. Output in synchronization with indicated values requires an optional D/A converter.
- Since the ±MONITOR terminals are not insulated from the internal circuit, use two-core shielded twisted pair wires for connection with external equipment, and carry out with as short a wiring as possible.

## 

- Do not short-circuit. Doing so will cause a failure.
- Do not apply voltage externally. Doing so will cause breakage.

**NSTALLATION & CONNECTION** 

#### External I/O connection

Details of signal, see "8-1.External I/O" on page 60.

#### How to connect external output (Sink type)

The external output circuit is operated through an open collector. A1(A7) COM1 is the common terminal. The open collector output capacity is 30mA and the withstand voltage is up to 30V.



Output Transistor Status

Output Data	Tr
OFF	OFF
ON	ON

For driving, have an external power source ready. (24V DC is shown in the illustration.)

#### How to connect external input (minus common connection of no-voltage contact input type)

A signal is inputted to the signal input circuit by short-circuiting or opening the input terminal and the COM2 terminal. Short-circuiting is effected by means of a contact (such as a relay or a switch) or a noncontact (such as a transistor or an open-collector TTL)



Chapter

#### How to assemble the connector



- 1. Set the connector and screws (two) into the grooves of the case (one side).
- **2.** Cover with the other case, and fit the cases.
- 3. Tighten the M2×8 pan-head machine screws (two).
  Tighten the M2×10 pan-head machine screws (two).
  Be aware that washers should be set to the M2×10 pan-head machine screws (two).

#### ■SI/F interface connection

Two-wire serial interface (SI/F) for connecting printers and external display from UNIPULSE.

Connect from A11 and A12 of the external input/output connector.

The interface is nonpolarized and up to three external devices can be connected.

Wiring materials should use a two-core parallel cable, cabtyre cable (electric wire with covering thickened for construction), etc. When a two-core parallel cable or a cabtyre cable is used, the transmission distance is approximately 30m. When a two-core shielded twisted pair wire is used, the transmission distance is approximately 300m.

Do not parallel it with AC lines and high-voltage lines. Doing so will cause malfunction.



### **SETTING MODE** 3 **CONFIGURATION**

## **3-1.** Setting mode composition





SETTING MODE CONFIGURATION



## 3-2. Key operation

≪Setting procedure≫



Point

If key operation is not performed for one minute or more between the time of pressing the FNC key and the time of validating with the |  $\downarrow$  key, the setting is stopped to go back to the indicated value display. In that case, the setting value is not saved.

«Setting mode select state»





Chapter

#### ≪Setting item select state≫

[Normal setting item]



[Normal setting item (with separate

#### «Setting ch switching function»

For settings available for ch1 and ch2 in a setting item select state, press +/- to switch between ch1 value setting and ch2 value setting.



Ch1 setting value

Ch2 setting value

Chapter

#### ≪HI/LO limit setting mode function≫

By pressing H/LO on the indicated value display screen, you can enter a HI/LO limit setting item select state.

↓ at the setting value you want to change, and you will go to a setting value input Press state.

After inputting the setting value, you will go back to the HI/LO limit setting item state.





While the lowest decimal place on the sub display (ch2 side) is lit, writing in NOVRAM is in progress. If the power is turned off at this time, normal writing cannot be performed.



# CALIBRATION PROCEDURE

## **4-1.** How to calibration

"Calibration" refers to an operation whereby matching between the F350 and a strain gauge sensor is obtained. The F350 uses the two calibration methods as described below.

#### Equivalent input calibration

Calibration is performed without an actual load by entering the rated output value (mV/V) and the capacity (to be indicated) of the strain-gage sensor by the keys. Calibration is easily performed when no actual load is available.

For example,

for load:	2.001mV/V-100.0kgf
for pressure:	$2.002 mV/V - 10.00 kgf/cm^{2}$
for torque:	2.502mV/V-15.00kgf • m

Gain will be automatically decided by registering the values indicated as follows.

POINT A data sheet will be attached to a strain gauge sensor you buy. On the data seat, the following values are listed.

Capacity Non-Linearity Input Resistance Zero Balance etc. Rated Output Hysterisis **Output Resistance** 

The Capacity and the Rated Output are necessary values for the equivalent input calibration. Input these two values to F350.

#### Actual load calibration

This approach provides calibration by applying an actual load to the strain gauge sensor and inputting the actual load value. This calibration is without little errors and more correct.

\* Perform either actual load calibration or equivalent input calibration.

If an actual load cannot be applied, make sure to perform equivalent input calibration alone.

Chapter
# **4-2.** Procedure of equivalent input calibration and calibration protect

The equivalent input calibration and the calibration protect uses the following procedure :

Equivalent input Actual load calibration calibration 1 Calibration protect 2 Excitation voltage 3 Decimal place **(4)** Min. scale division Zero calibration 6 6 b.Actual load a.Equivalent input calibration calibration 7 Digital offset 8 Digital Zero limit (9) Alarm HI and LO limits

(10)

Calibration protect

Turn off the calibration protect that inhibits calibration.

Set the excitation voltage according to the sensor used.

Set the decimal place.

Set the desired minimum value of digital increments. (This step may be omitted if there is no change.)

Set the zero point of the strain gauge sensor in noload condition (with the sensor unloaded).

#### Equivalent input calibration

Register the rated output value of the strain gauge sensor, and the indicated value of that time.

#### Actual load calibration

Set the span (gain) point of the strain gauge sensor with a load applied to the sensor.

The calibrated value can be offset in advance. (When not using, set "0.")

Set the load limit that allows Digital Zero.

Set the HI/LO limit for monitoring overload.

Turn on the calibration protect to prevent misoperation.

ні LO

Fg

н LO

0: OFF 1: ON

## ①Releasing the calibration protect

Turn off the calibration protect that inhibits calibration.

- ≪Setting value≫
  - 0: OFF Enables rewriting of setting values.
  - 1: ON Disables rewriting of setting values.

## ♦ Calibration protect setting method

- Select setting mode 9. Press FNC five times.
- 2. Set "Calibration protect."



## 2 Excitation voltage setting

Select the bridge voltage (excitation voltage) supplied to the strain gauge sensor. The bridge voltage can be selected from 2.5V and 10V.

After this setting, make sure to perform calibration.

≪Setting value≫ 0: 2.5V 1:10V

\* Common to ch1 and ch2.

#### 3 Decimal place setting

Set the decimal place for load-value-related display, setting items, etc.

≪Setting value≫ 0: None 1:0.0 2: 0.00 3: 0.000

\* Calculated values are also synchronized with this setting.

Chapter

4

# 

The maximum excitation voltage value of the strain gauge sensor connected to the F350 should always be larger than the set bridge voltage.

If the excitation voltage of the F350 is larger than the maximum excitation voltage value of the strain gauge sensor, the strain gauge sensor may heat or break.

## (4)Min. scale division setting

Set the minimum unit (scale interval, scale division) of measurements.

 $\ll$ Setting value $\gg$ 

0: 1		
1: 2		
2: 5		
3: 10		
4: 20		
5: 50		
6: 100		

\* Calculated values are also synchronized with this setting

Excitation voltage, decimal place, and min. scale division setting method

<b>1.</b> Select setting mode 4.	
Press <b>FNC</b> $\rightarrow$ <b>b</b> three times.	$F 4 \qquad $
<ul> <li>2. Set "Excitation voltage," "Decimal place," and "Min. scale division."</li> <li>Press ▼ once. ⇒ "Calibration function select" is displayed.</li> <li>Press ↓, and the highest digit blinks.</li> </ul>	HI OK LO PEAK HOLD HI LO Ch1 F 4. 1
<ol> <li>Select excitation voltage. Input the excitation voltage with  , and move to the lower digit with . (Initial value: 0)</li> <li>Select decimal place. Input the decimal place with , and move</li> </ol>	
<ul> <li>Input the decimal place with  , and move to the lower digit with . (Initial value: 2)</li> <li>③ Select min. scale division.</li> <li>Input the min. scale division with  , and , and validate it with . (Initial value: 0).</li> </ul>	Decimal place     0: None     1: 0.0     2: 0.00     3: 0.000     Excitation voltage     0: 2.5V     1: 10V

**3.** Press ESC twice to go back to the indicted value display.

CALIBRATION PROCEDURE

## **5**Zero calibration

Register the zero point with the sensor unloaded. Also, if there is any initial load, such as a jig, for measurements, the zero point can be registered with the initial load applied, but the signal input range needs to be considered as the initial load is subtracted from it.

In addition, there is a way of considering the initial load by using the digital offset. See "⑦Digital offset" on page 31.

≪Setting value≫ -3.000 to +3.000mV/V

By performing zero calibration, the setting value of zero calibration becomes the sensor output value (mV/V) of the time when it was executed. The load with which actual load calibration was performed can be confirmed. However, it stays unchanged when an error occurs.

## ♦Zero calibration setting method (Example: ch1 zero calibration)

- **1.** Select setting mode 4. Press FNC  $\rightarrow$  **>** three times.
- 2. Set "Zero calibration."

Press  $\checkmark$  twice.  $\Rightarrow$  "Zero calibration" is displayed.

\* For performing ch2 zero calibration, switch with +/-.

Enter a setting value input state with  $\checkmark$ , and the entire setting value blinks. (Initial value: 0.000)

Unload the sensor, check the current load value on the sub display (ch2), and press 4.

#### **3.** Zero calibration is executed.

A message as shown on the right-hand side is displayed. If zero calibration is not executed normally, the alarm sounds and an error is displayed.

**4.** Go back to the setting item select state.

If zero calibration is executed normally, you will go back to the setting item select state, and the output (mV/V) of the time when it was performed will appear.



The example shows that zero calibration was performed at  $0.017 mV/V_{\rm \cdot}$ 

**5.** Press **ESC** twice to go back to the indicated value display.



HI LO

HI LO



Selected ch display

PEAK

нı

ų

10

HI OK

10

7

HOLD

#### 6a.Equivalent input calibration

See the test report of the sensor, and register the rated output value and the value you want to display at that time (rated capacity value).

Input the rated output value and display value (rated capacity value) successively.

Equivalent input calibration is not executed by simply inputting the rated output value.

#### ≪Setting value≫

0				
Rated output value [mV/V]:	-3.200	to	3.200	(except 0)
Display value (rated capacity):	-19999	to	19999	(except 0)

By performing equivalent input calibration, the setting value of actual load calibration becomes the input rated capacity value.

However, it stays unchanged when an error occurs.

### ♦ Equivalent input calibration setting method

(Example: ch1 equivalent input calibration)

**1.** Select setting mode 4.

Press  $FNC \rightarrow \blacktriangleright$  three times.

**2.** Set "Rated output value" of the sensor.

Press  $\checkmark$  three times.  $\Rightarrow$  "Equivalent input calibration" is displayed.

\* For performing ch2 equivalent input calibration, switch with +/-.







Enter a setting value input state with  $\checkmark$ , and the

highest digit blinks. (Initial value: 3.000)

Check the test report of the sensor in use, and input the

rated output value (mV/V) with  $\blacktriangle$ V

Move to the lower digits with **•**.

Press **v** to validate it.

#### 3. Set "Rated capacity value."

Decide the load you want to display at the rated output value, and input it with  $\blacktriangle$   $\checkmark$ .



Press **U** to validate it.

\* For inputting a negative sign, press +/-



Chapter 4 **4.** Equivalent input calibration is executed.

A message as shown on the right-hand side is displayed. If equivalent input calibration is not executed normally, the alarm sounds.



**5.** If equivalent input calibration is executed normally, you will go back to the setting item select state.



) Point

If the calibration error ( $_{C}E_{rr}$ ) is displayed, take measures according to each error, and redo calibration.

For details, see "11-7 Error/message list" on page 108.

After completion of calibration, make sure to turn on the calibration protect.

#### 6b.Actual load calibration

Apply an actual load, and register the value of the actual load (rated capacity value).

```
≪Setting value≫
-19999 to 19999 (except 0)
```

By performing actual load calibration, the setting value of equivalent input calibration becomes the sensor output value (mV/V) of the time when it was executed. The load with which actual load calibration was performed can be confirmed. However, it stays unchanged when an error occurs.

## Actual load calibration setting method

(Example: ch1 actual load calibration)

- **1.** Select setting mode 4. Press  $FNC \rightarrow \blacktriangleright$  three times.
- **2.** Set "Actual load" of the sensor.

Press  $\checkmark$  four times.  $\Rightarrow$  "Actual load calibration" is displayed.

\* For performing actual load calibration on ch2, switch with +/-.

Enter a setting value input state with  $\checkmark$ , and the highest digit blinks. (Initial value: 100.00)

Check the capacity of the actually-applied load, and input the value with  $\blacktriangle$   $\checkmark$  .

\* For inputting a negative sign, press +/-

Move to the lower digits with

Recheck that the load is properly applied on the sub display (ch2 side), and press to validate it.

**3.** Actual load calibration is executed.

If actual load calibration is executed normally, a message as shown on the right-hand side is displayed.

If actual load calibration is not executed normally, the alarm sounds and an error is displayed.

**4.** If actual load calibration is executed normally, you will go back to the setting item select state.













Chapter

## ⑦Digital offset

This function is to subtract a set value from the indicated value. This function is convenient when zero cannot be obtained with no load for some reason or for offsetting. When not using, set "0."

(Displayed value)=(Actual indicated value)-(Setting value of digital offset)

≪Setting value≫ -19999 to 19999

## Oigital offset setting method

- 1. Select setting mode 4. н LO HL LO Press FNC  $\rightarrow$ three times. Chapter IJ oFF ГŲ 2. Set "Digital offset." LO PEAK HOLD ні оĸ Press  $[\mathbf{V}]$  five times.  $\Rightarrow$  "Digital offset" is displayed. \* Switch desired ch with +/-. HI ς Press  $\checkmark$  , and the highest digit blinks. V Input the setting value with Selected ch display Move to the lower digits with ► Validate it with <u>\* For inputting a negative sign, press</u>.
  - **3.** Press ESC twice to go back to the indicated value display.

4

#### ⑧Digital Zero limit

Set the load limit that allows Digital Zero.

If the absolute value of the load at which Digital Zero is about to be performed is larger than the setting value, an error will result, and the indicated value will not be zeroed.

≪Setting value≫ 0 to 19999

\* The setting value is common to ch1 and ch2.

The amounts of Digital Zero obtained from the point where zero calibration was performed are monitored.

### ♦ Digital Zero limit setting method

**1.** Select setting mode 4.

Press **FNC**  $\rightarrow$  **b** three times.

2. Set "Digital Zero limit."

Press  $\checkmark$  six times.  $\Rightarrow$  "Digital Zero limit" is displayed. Press  $\checkmark$ , and the highest digit blinks. Input the setting value with  $\land$   $\checkmark$ .

Move to the lower digits with **•**.

Validate it with **4** 





**3.** Press **ESC** twice to go back to the indicated value display.

Chapter

### (9) Alarm HI and LO limits

Overload of the ch1 value and ch2 value is monitored.

When they exceed the alarm HI limit or fall below the alarm LO limit, the external output "ALM" turns ON.

Alarm HI limit:	-19999 to 19999	(invalid at 19999	(initial value))
Alarm LO limit:	-19999 to 19999	(invalid at -19999	(initial value))

- \* The setting value is common to ch1 and ch2.
- For initial value, since both the alarm HI and LO limits are invalid as default settings, set them again for use.
- Since the alarm HI limit and LO limit are independent, simple use of either one of them is also possible.

#### ♦Alarm HI and LO limits setting method

- 1. Select setting mode 4. HI LO HI LO FNC Press ► three times. oFF Ц  $\Sigma$ 2. Set "Alarm HI limit." HOLD seven times.  $\Rightarrow$  "Alarm HI limit" is Press V displayed. LO HL LO Press  $| \downarrow |$ , and the highest digit blinks. Input the setting value with V |. Move to the lower digits with  $\blacktriangleright$ Validate it with 4 . (Initial value: 99999) \* For inputting a negative sign, press +/- while the input digit is blinking. 3. Set "Alarm LO limit." HOLD н OM PEAK ▼ once.  $\Rightarrow$  "Alarm LO limit" is displayed. Press Press  $| \downarrow |$ , and the highest digit blinks. Input the setting value with V I Move to the lower digits with |Validate it with 4 . (Initial value: -99999)
  - <u>\* For inputting a negative sign, press</u> while the input digit is blinking.
- **4.** Press **ESC** twice to go back to the indicated value display.

Chapter

4

#### Description (Description)

Turn on the calibration protect that inhibits calibration.

#### ≪Setting value≫

display.

- 0: OFF Enables rewriting of setting values.
- 1: ON Disables rewriting of setting values.

#### ♦ Calibration protect setting method

**1.** Select setting mode 9.

Press **FNC**  $\rightarrow$  **b** five times.

2. Set "Calibration protect."





Ch1 Ch2

HI LO

《Setting value》

HI LO



Chapter

# 34

# 5 EXPLANATION OF INDICATED-VALUE-RELATED FUNCTIONS

# 5-1. A/D conversion speed select

The A/D conversion speed can be selected from 300 times/sec. or 3000 times/sec.

- ≪Setting value≫
- 0: 300 times/sec.
- 1: 3000 times/sec.

If the A/D conversion speed is changed, the processing shown below will follow it.

Comparison

According to the processing of load data, the comparison processing also follows the A/D conversion speed.

#### Digital filter

The unit time in frequency setting changes. Therefore, the average processing time will also change.

When 30 times is set at 3000 times/sec., 30 times  $\div$  3000 times/sec.= 10msec. When 30 times is set at 300 times/sec., 30 times  $\div$  300 times/sec.= 100msec.

See "5-3.Digital filter" on page 37.

I/O scan time

For example, the delay time of output signals changes. The delay time is 0.7 msec at 3000 times/sec, and 7 msec (10 times) at 300 times/sec.

#### BCD output interface (option)

The fastest setting of update rate is 300 times/sec when the A/D conversion speed is 300 times/sec.

#### D/A converter (option) output

Updating of load data follows the A/D conversion speed.

## A/D conversion speed select setting method

- **1.** Select setting mode 3. Press **FNC**  $\rightarrow$  **\blacktriangleright** twice.
- 2. Set "A/D conversion speed."

Press  $\checkmark$  five times.  $\Rightarrow$  "A/D conversion speed" is displayed.

Press **J** once, and present set value blinks.

Input the setting value with		V
Press <b>U</b> to validate it.		





**3.** Press ESC twice to go back to the indicated value display.

# 5-2. Analog filter

This is a low-pass filter for filtering input signals from the strain gauge sensor, and canceling unwanted noise components (a filter that passes only the signals with a specific frequency or less, and attenuates signals with higher frequencies). With an increase in the cut-off frequency, the response becomes faster, but noise components may be displayed. It can be set for each of the ch1 and ch2 inputs.

 $\ll$ Setting value $\gg$ 

- 0: 3Hz
- 1: 30Hz
- 2: 300Hz
- 3: 1kHz

# Analog filter setting method

2. Set "Analog filter." Press ▼ twic

Press

**1.** Select setting mode 3.

Press **FNC**  $\rightarrow$  **b** twice.

Input the setting value with

Press **u** to validate it. (Initial value: 2)



НІ	ок	LO	PEA	K I	HOLD
					J
				/	Ĺ_`_
HI	LO	Ch1	Ch 2	HI	LO
FЗ	<u>,</u> -	{			

Ch1 Ch2

μ

HI LO

oFF

HI LO

**3.** Press **ESC** twice to go back to the indicated value display.

, and present set value blinks.

**V** twice.  $\Rightarrow$  "Analog filter" is displayed.

V.

# 5-3. Digital filter

The digital filter is a function for reducing fluctuations of the indicated value by means of a moving average of data converted from analog to digital. With an increase in the number of filterings, the indicated value becomes more stable, but the response to inputs becomes slower. It can be set for each of the ch1 and ch2 values.

≪Setting value≫ OFF(0), 2 to 999 [times]

\* One time corresponds to one sampling for A/D conversion.

# Digital filter setting method

**1.** Select setting mode 3.

Press <b>FNC</b> $\rightarrow$ <b>b</b> twice.	HI LO CHI CA2 HI LO
<ul> <li>2. Set "Digital filter."</li> <li>Press ▼ once. ⇒ "Digital filter" is displayed.</li> <li><u>*It changes according to +/- to execute the setting of ch2.</u></li> <li>Press , and the highest digit blinks.</li> <li>Input the setting value with ▲ ▼.</li> <li>Press ↓ to validate it. (Initial value: 000)</li> </ul>	HI OK LO PEAK HOLD HI LO Ch1 F 3. 1 - 1 Selected ch display

**3.** Press ESC twice to go back to the indicated value display.

Chapter 5

# 5-4. Digital Zero

This function is to zero the indicated value.

## Digital Zero / Digital Zero reset by means of keys

Digital Zero can be executed for the ch1 value and ch2 value individually or at one time. Digital Zero reset can also be executed.

- **1.** Press **EPO** on the normal measurement screen.
- The display becomes as shown on the right-hand side, and execution is waited for on both ch1 and ch2.
   Press +/- once.
- The display becomes as shown on the right-hand side, and execution is waited for only on ch1.
   Press +/- once.
- The display becomes as shown on the right-hand side, and execute-waits only for ch2.
   Press +/- once more to go back to the screen in 2.,

for execute-wait of both ch1 and ch2.

**5.** During execute-wait as in 2. - 4.:

Press 🛃 once to zero the indicated value for execute-wait.

Press 
once to perform Digital Zero reset of the indicated value for executewait.

Press  $\mathbb{E}$  once to cancel the state for execute-wait and go back to the indicated value display state.

Point

• When Digital Zero is performed, if the difference from the zero calibration point exceeds the Digital Zero limit, the Digital Zero limit error ( d Z E r r ) will result.

Also, only the Digital Zero limit is subtracted.

- If the digital offset is set, even if Digital Zero is executed, zero will not result. (Indicated value = -Setting value of digital offset)
- When Digital Zero reset is performed, the condition previous to correction by
   Digital Zero is restored.

HOLD

11

PEAK

HI OK LO



# Digital Zero by means of the external signal "D/Z input"

The instant when D/Z and COM2 of the input/output connector are short-circuited from an open state (ON edge), Digital Zero functions to zero both the ch1 value and ch2 value at one time.



Keep ON for 1.0 msec or more.

For executing Digital Zero for the ch1 value and ch2 value individually, see "5-5.D/Z synchronous mode" on page 39.

# **A**CAUTION

Digital-Zeroed points are saved in SRAM. When the battery is executed, the Digital Zero is reset.

# 5-5. D/Z synchronous mode

In execution of Digital Zero by means of the external input signal, Digital Zero can be executed for the ch1 value and ch2 value individually or at one time.

≪Setting value≫	
0: ch1 and ch2 synchronous	When the external input "D/Z-1 (B11) is turned ON, Digital Zero functions on both ch1 and ch2 at the same timing.
1: ch1 and ch2 independent	When the external input "D/Z-1 (B11) is turned ON, Digital Zero functions on ch1, and when the external input "D/Z-2 (B12) is turned ON, Digital Zero
	functions on cn2.

# ■D/Z synchronous mode setting method

1.	Select setting mode 3.		051	<b>~</b> ~2	
	Press $FNC \rightarrow \blacktriangleright$ twice.	HI LO		P c	n Lo 1 <i>F F</i>
2.	Set "D/Z synchronous mode."				
	Press four times $\Rightarrow$ "D/Z synchronous mode" is	HI Oł	< LO	PEAK	HOLD
	displayed.				<u>jj</u>
	Press $\checkmark$ , and present set value blinks.	HI LO	Ch1 0	Ch2 ⊦	HI LO
	Input the setting value with $\blacksquare$ $\blacksquare$ .	r <u>1</u> .4			
	Press 🕖 to validate it.				
3.	Press ESC twice to go back to the indicated value disp	lay.			

# 5-6. Zero Tracking

This function is to automatically track and correct gradual changes in the zero point due to drifts (phenomenon in which outputs fluctuate slowly due to temperature change or change with time), etc.

≪Setting value≫		
Zero Tracking (time)	0.0 to 9.9 [second]	
Zero Tracking (range)	00 to 99 [count]	
Zero Tracking setting meth	od	
<b>1.</b> Select setting mode 3.		
Press $FNC \rightarrow \blacktriangleright$ ty	vice.	HILO Ch1 Ch2 HILO
		F3 P off
2. Set "Zero Tracking."		
Press $\checkmark$ twice. $\Rightarrow$ "Z	ero Tracking " is	HI OK LO PEAK HOLD
displayed	6	╶┧┾┟┧╺╸╎┧┟┧
displayed.		HI LO Ch1 Ch2 HI LO
*It changes according	to $+/-$ to execute the	F33-1
setting of ch2.		
	. 1 11. 1	Selected ch display
Press , and the high	lest digit blinks.	«Setting value»
①Set " Zero Tracking (time	e)."	
Input the setting value with		
input the setting value with		00 to 99
Move to the lower digits w	ith <b>•</b> .	Time [count]
(Initial value: 0.0)		[second]
②Set " Zero Tracking (ran	de)."	
Input the setting value with	n 🔺 🔻 .	
Move to the lower digits w	ith <b>•</b> . (Initial value: 00)	
Press 🛃 to validate it.		

**3.** Press ESC twice to go back to the indicated value display.



• The time (tracking delay) is set in the range of 0.1 - 9.9 sec., and the band (tracking band) is set in the range of 01 to 99.

If the time is set at 0.0 sec. and the band at 00, the zero tracking function does not work.



# 

- Zero Tracking is equal to Digital Zero functioning automatically. Therefore, the Digital Zero limit is also monitored.
- Zero Tracking does not function if the indicated value has already exceeded the tracking band.

# 5-7. Motion Detect

Set the parameters to detect stability of calculated values.

If the difference between the current indicated value and the 50-msec-previously indicated value becomes less than the set count and that condition continues for more than the set time, the indicated value is regarded as stable.

#### ≪Setting value≫

Motion Detect (time) Motion Detect (range) 0.0 to 9.9 [second] 00 to 99 [count]

## Point

When the time is 0.0 sec. and the width is 00 markings, stable is not detected. Stability detection by Motion Detect is closely related to the SI/F print (stable value) function and calculation comparison timing. For details, see "6-5.Calculation comparison timing" on page 48 and "■ SI/F print" on page 63.



When the condition of dn  $\leq$  set count (10) continues for the set time (0.4 sec.) or more (d1  $\leq$  10, and d2  $\leq$  10, and ..., and d8  $\leq$  10), the indicated value is regarded as stable.

# Motion Detect setting method

- **1.** Select setting mode2. Press  $FNC \rightarrow \blacktriangleright$  once.
- 2. Set "Motion Detect."



① Set " Mot	ion Detect time."
-------------	-------------------

(Initial value: 00)

Press  $\checkmark$  to validate it.

Input the setting value with  $\checkmark$   $\checkmark$  . Move to the lower digits with  $\triangleright$  . (Initial value: 0.0)

2 Set " Motion Detect range."
 Input the setting value with 
 Move to the lower digits with







**3.** Press ESC twice to go back to the indicated value display.

# 5-8. Display frequency

Set the per-second display update frequency of the indicated value. However, the A/D conversion speed does not change.

≪Setting value≫

- 0: 3 times
- 1: 6 times
- 2: 13 times
- 3: 25 times

Press

Press

Press

displayed.

# Display frequency setting method

- **1.** Select setting mode 2. Press  $FNC \rightarrow \blacktriangleright$  once.
- 2. Set "Display frequency."

J

J

Input the setting value with

▼ three times



HI	OK	LO	PEAK		IOLD
					E
HI	LO	Ch1 (	ሕ2	HI	LO
5,7	7				

Chapter 5

**3.** Press **ESC** twice to go back to the indicated value display.

 $\Rightarrow$ 

, and present set value blinks.

to validate it. (Initial value: 3)

"Display frequency" is

# 6 EXPLANATION OF COMPARISON FUNCTIONS

# 6-1. Calculation mode

Set the calculation method for the ch1 value and ch2 value.

0: ch1+ch2	The ch2 value is added to the ch1 value.
1: ch1-ch2	The ch2 value is subtracted from the ch1 value.
2:  ch1-ch2	The absolute value of the difference between the ch1 value and
	ch2 value is calculated.
3: High select	A larger value is always selected.
	(When the ch1 value $\geq$ ch2 value, the ch 1 value results, and when the ch1 value < ch2 value, the ch2 value results.)
4: Low select	A smaller value is always selected.
	(When the ch1 value $\leq$ ch2 value, the ch 1 value results, and when the ch1 value > ch2 value, the ch2 value results.)

# Calculation mode setting method

- **1.** Select setting mode1. Press **FNC** once.
- 2. Set "Calculation mode."
  - Press  $\checkmark$  four times  $\Rightarrow$  "Calculation mode" is displayed. Press  $\checkmark$ , and the highest digit blinks. Input the setting value with  $\land$   $\checkmark$ .

(Initial value : 0)

Press **v** to validate it.

**3.** Press ESC twice to go back to the indicated value display.







# **6-2.** HI/LO limit comparison of calculated value / ch1 value / ch2 value

Set the HI/LO limit of calculated value/ch1 value/ch2 value.

Calculated value	-99999 to 99999
Ch1 value / ch2 value	-19999 to 19999

<HI/LO output conditions>

Indicated value >	· HI limit
	Indicated value >

LO Indicated value < LO limit

<OK output conditions (calculated value)>

- OK LO limit  $\leq$  Indicated value  $\leq$  HI limit
- \* The OK output conditions basically depend on the calculated value, but it can also be output as the ch1 value and ch2 value are intertwined. See "6-6. Comparison OK output conditions" on page 49.
- ) Point

With ±LOAD, OFL1, or OFL2 on ch1 or ch2, HI/LO of the error channel is forcedly turned on.

Also, HI/LO of the calculated value is forcedly turned on, and OK is forcedly turned off.

**EXPLANATION OF COMPARISON FUNCTIONS** 

# HI/LO limit setting method

See " $\ll$  HI/LO limit setting mode function $\gg$ " on page 21.

# 6-3. Hysteresis

This function is to allow a margin for timing at which HI/LO of the HI/LO limit comparison is turned off. Normally, HI is turned on when the indicated value exceeds the HI limit and is turned off when the indicated value falls below it. However, by setting the hysteresis, HI is turned off when the indicated value falls below the HI limit further lowered by the hysteresis value. This function is effective to prevent chattering (phenomenon in which signals repeat turning on/off immediately after switching of relay contacts and switch contacts) in such a case where signals fluctuate (vibrate) subtly.

The setting is common to the calculated value, ch1 value, and ch2 value, which operates individually.

```
<Hysteresis range>
0 to 9999
```

<HI/LO output conditions>

• HI

 $\begin{array}{ll} \mbox{ON conditions} & \mbox{Indicated value} > \mbox{HI limit} \\ \mbox{OFF conditions} & \mbox{Indicated value} \leqq (\mbox{HI limit setting value} - \mbox{Hysteresis setting value}) \end{array}$ 

· LO

ON conditions Indicated value < LO limit

OFF conditions Indicated value  $\geq$  (LO limit setting value – Hysteresis setting value)

#### Hysteresis operation



## Hysteresis setting method

1.	Select setting mode1.		
	Press	FNC	once.

2. Set "Hysteresis."

Press

Press three times  $\Rightarrow$  "Hysteresis" is displayed. V and the highest digit blinks. Press J



to validate it.



LO

HL LO

HI	ок	LO	PEAK	HOLD
				$\Pi$
		ЦŲ	<u></u> _	
HI	LO	Ch1 C	h2 ⊦	II LO
Fi	7			
· ·				

**3.** Press ESC twice to go back to the Indicated value display.

#### Point

The setting value of hysteresis is common to the HI limit and LO limit of the calculated value, ch1 value, and ch2 value.

# 6-4. Near Zero

This function is to detect that the indicated value (calculated value) is Near Zero.

Near Zero ON:	Calculated value  $\leq$ Setting value of Near Zero
Near Zero OFFF:	Calculated value  > Setting value of Near Zero
≪Setting value≫ 0 to 99999	

## Point

Near Zero ON/OFF is closely related to the SI/F print (stable value) function and calculation comparison timing.

For details, see "6-5. Calculation comparison timing" on page 48, and "■ SI/F print" on page 63.

# ■Near Zero setting method

Near Zero operates by absolute value.

<b>1.</b> Select setting mode1.	
Press <b>FNC</b> once.	F i Dirz Hi Lo
<ul> <li>2. Set "Near Zero."</li> <li>Press ▼ twice ⇒ "Near Zero" is displayed.</li> <li>Press ♥, and the highest digit blinks.</li> <li>Input the setting value with ▲ ▼.</li> <li>Move to the lower digits with ► . (Initial value: 100)</li> <li>Press ♥ to validate it.</li> </ul>	HI OK LO PEAK HOLD
<b>3.</b> Press ESC twice to go back to the indicated value displ	ay.
) Point	

Chapter

# 6-5. Calculation comparison timing

Set the operating conditions of calculation HI/LO limit comparison. Select the conditions from the following.

0: All time	HI/LO limit comparison is always performed.
1: Stable	HI/LO limit comparison is performed when the calculated
	value is stable.
2: Near Zero OFF	HI/LO limit comparison is performed when Near Zero is
	off.
3: Stable and Near Zero OFF	HI/LO limit comparison is performed when the calculated
	value is stable and Near Zero is off.
4: Hold	HI/LO limit comparison is performed when a hold is
	fixed.

## Calculation comparison timing setting method

- **1.** Select setting mode1. Press FNC once.
- 2. Set "Calculation comparison timing."

Press  $\checkmark$  once.  $\Rightarrow$  "Calculation function select" is displayed.

Press  $| \downarrow |$ , and the highest digit blinks.

Input the setting value with

(Initial value: 0)

Press 🚽 to validate it.

**3.** Press ESC twice to go back to the indicated value display.







**EXPLANATION OF COMPARISON FUNCTIONS** 

Chapter

6

# 6-6. Comparison OK output conditions

Conditions to turn on the external output "Calculation OK output" can be set.

0: Calculated value only	The output turns on when calculation HI limit/LO limit is off.
1: Calculated value & ch1	The output turns on when calculation HI limit/LO
	limit and ch1 HI limit/LO limit are all off.
2: Calculated value & ch2	The output turns on when calculation HI limit/LO
	limit and ch2 HI limit/LO limit are all off.
3: Calculated value & ch1 & ch2	The output turns on when calculation HI limit/LO
	limit, ch1 HI limit/LO limit, and ch2 HI limit/LO limit
	are all off.

# Comparison OK output conditions setting method



3: Calculated value & ch1 & ch2

Calculation comparison timing

# 7 EXPLANATION OF HOLD FUNCTIONS

# 7-1. Hold functions of calculated values

The hold functions are to take out a specific point of calculated values for HI/LO limit comparison. Here, the operation of each hold will be described in detail.

Hold mode	Hold section
0: OFF	None
1: Sample	0: All section 1: External signal
2: Peak	
3: Bottom	0: All section 1: External signal 2: External signal+Time
4: Average	

# Flow of hold measurement

- **1.** Select a hold you want to use.
- **2.** If the hold has the setting of section, set a section you want to use. For details, see "7-3.Setting of hold section" on page 54.
- **3.** Set the special setting value required for the hold used.
- **4.** After confirmation of wiring, perform hold control by external input, and start measurement.

Chapter

7

# 7-2. Setting of hold mode

# Hold mode setting method



## ■Sample hold

The start point of the specified section is held. The section is specified by the setting of "all section" or "external signal."

(Example) All section sample hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held Approximately 0.7ms (MAX.)

t2: A delay time between the instant when the T/H signal is released and the instant

when the indicated value returns to tracking

Approximately 0.7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold Approximately 0.7ms (MIN.)

The delay time and signal width expressed apply when the A/D conversion speed is 3000 times/sec.

They become 10-times when the A/D conversion speed is 300 times/sec.

### Peak hold

The maximum value in the positive direction (peak value) of the specified section is held. The section is specified by the setting of "all section," "external signal," or "external signal + time."

#### (Example) Externally specified section peak hold



t1: A delay time between the instant when the SECTION signal is inputted and the instant when the value to be held is detected Approximately 0.7ms (MAX.)

t2: A delay time between the instant when the SECTION signal is released and the instant when the value to be held is determined Approximately 0.7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold Approximately 0.7ms (MIN.)

The delay time and signal width expressed apply when the A/D conversion speed is 3000 times/sec. They become 10-times when the A/D conversion speed is 300 times/sec.

## Bottom hold

The maximum value in the negative direction (bottom value) of the specified section is held. The section is specified by the setting of "all section," "external signal," or "external signal + time."

(Example) All section Bottom hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held

Approximately 0.7ms (MAX.)

t2: A delay time between the instant when the T/H signal is released and the instant

when the indicated value returns to tracking

Approximately 0.7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold Approximately 0.7ms (MIN.)

The delay time and signal width expressed apply when the A/D conversion speed is 3000 times/sec. They become 10-times when the A/D conversion speed is 300 times/sec.

Note: During the undetermined section, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined section. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

## Average hold

The average of the sampling values over the specified section is calculated and updated, and then held.

The section is specified by the setting of "all section," "external signal," or "external signal + time."

(Example) Externally specified section average value hold



t1: A delay time between the instant when the SECTION signal is inputted and the instant when the value to be held is detected

Approximately 0.7ms (MAX.)

t2: A delay time between the instant when the SECTION signal is released and the instant when the value to be held is determined

Approximately 0.7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold Approximately 0.7ms (MIN.)

The delay time and signal width expressed apply when the A/D conversion speed is 3000 times/sec.

They become 10-times when the A/D conversion speed is 300 times/sec.

The detection section is limited by the maximum average value detection time set according to the "average sample number." If the maximum average value detection time is exceeded, detection is automatically terminated, and the average value of that time is held.

## Average sample number

In the average hold, the maximum average value detection time for average processing by each sampling depends on the A/D conversion speed as follows:

When the A/D conversion speed is 300 times/sec:50sec.When the A/D conversion speed is 3000 times/sec:5sec.

Then, if this average sample number is set at 2 or more, the sampling data used for average calculation becomes the representative value of the sampling values of the set number (average obtained according to the number). By this setting, the average value detection time can be elongated, but error causes by average calculation increase.

Example) When the A/D conversion speed is 3000 times/sec, Maximum average value detection time = Average sample number × 10 sec., and also the number of average updates will decrease. Number of average updates = 3000 times/sec. ÷ Average sample number

≪Setting value≫ 1 to 999 [times]

#### ♦ Average sample number setting method

- **1.** Select setting mode 1. Press FNC once.
- 2. Set "Average sample number."
  - Press  $\nabla$  six times  $\Rightarrow$  "Average sample number"







н LO LO

LO

HOLD

HI

a F F

**3.** Press **ESC** twice to go back to the indicated value display.

# 7-3. Setting of hold section

#### Hold section setting method **1.** Select setting mode 1. н LO ΗГ Press FNC once. n 2. Set "Hold section." ні OK Press ▼ four times $\Rightarrow$ "Calculation hold function select " is displayed. 14 Press $|\downarrow\rangle$ , and the highest digit blinks. «Setting value» Press | • | twice to make the digit of the Hold 0 0 0 section blink. (Initial value: 0001) - Auto reset Hold section Input the setting value with V 0: All section External signal to validate it. Press 2: External signal + time This setting is required only when the hold mode is other than "0: OFF." **3.** Press ESC twice to go back to the i ndicated value display. Hold mode Calculation mode

## All section

By this method, the hold detection section is specified by the T/H signal.

Detection starts with the T/H signal ON to perform each hold operation.

Control is performed simply by the T/H signal without using the SECTION signal.

Therefore, there are tracking sections and detection sections, but there are no hold deciding sections.

(Example) All section peak hold



t1: A delay time between the instant when the T/H signal is inputted and the instant when the indicated value is held

Approximately 0.7ms (MAX.)

t2: A delay time between the instant when the T/H signal is released and the instant

when the indicated value returns to tracking

Approximately 0.7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold Approximately 0.7ms (MIN.)

The delay time and signal width expressed apply when the A/D conversion speed is 3000 times/sec. They become 10-times when the A/D conversion speed is 300 times/sec.

Note: During the undetermined sections, the judging output varies with fluctuations in the input waveform. However, the H/E output remains on during the undetermined sections. Read the judging result when the indicated value becomes stable (immediately before the T/H signal rises).

## External signal

By this method, the hold detection section is specified by the SECTION signal. Detection starts with the SECTION signal ON, and ends with the SECTION signal OFF to perform each hold operation.

The hold value is maintained until the hold reset signal is turned on.

The hold is released by turning on the T/H signal as a reset signal.

There are tracking sections, detection sections, and hold deciding sections.

tant when the T/H signal is turned on.

(Example) Externally specified section peak hold



t1: A delay time between the instant when the SECTION signal is inputted and the instant when the value to be held is detected

Approximately 0.7ms (MAX.)

t2: A delay time between the instant when the SECTION signal is released and the instant when the value to be held is determined Approximately 0.7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold Approximately 0.7ms (MIN.)

The delay time and signal width expressed apply when the A/D conversion speed is 3000 times/sec. They become 10-times when the A/D conversion speed is 300 times/sec.

By turning on the SECTION signal again without turning on the T/H signal while the hold is fixed, the hold is released and re-detection is started. For details, see "7-4.Auto reset function" on page 58.

## External signal + time

By this method, the hold detection section is specified as a timer. Detection starts with the SECTION signal ON, and ends when the set time (detection time) has elapsed.

The hold value is maintained until the hold reset signal is turned on.

The hold is released by turning on the T/H signal as a reset signal.

There are tracking sections, detection sections, and hold deciding sections.

(Example) External signal+ Time specified section peak hold



t1: A minimum SECTION signal width required for beginning detection Approximately 0.7ms (MIN.)

t2: A delay time between the instant when the detection time is ended and the instant when the value to be held is determined

Approximately 0.7ms (MAX.)

t3: A minimum reset signal width required for releasing the hold Approximately 0.7ms (MIN.)

The delay time and signal width expressed apply when the A/D conversion speed is 3000 times/sec. They become 10-times when the A/D conversion speed is 300 times/sec.

By turning on the SECTION signal again without turning on the T/H signal while the hold is fixed, the hold is released and re-detection is started.

For details, see "7-4. Auto reset function" on page 58.

## Detection time

Set the hold detection time.

Setting value 0.01 to 9.99 [sec.]

#### Oetection time setting method

**1.** Select setting mode 1. Press FNC once.

Input the setting value with

4

to validate it.

2. Set "Detection time."

Press

Press

Press |



HI LO

HI LC



**3.** Press **ESC** twice to go back to the indicated value display.

 $\blacksquare$  five times  $\Rightarrow$  "Detection time" is displayed.

V

, and the highest digit blinks.

Move to the lower digits with  $\blacktriangleright$  . (Initial value: 1)

# 7-4. Auto reset function

It is factory-set that each hold is automatically reset at the start of the detection section, and therefore, simple control can be performed by one signal without releasing the hold.



Example) Auto reset in externally specified section peak hold

However, when the auto reset functions, if the signal causes chattering, the point that should be taken originally may deviate. Switching is provided so as to prevent the next detection from being performed until the T/H signal is turned on even if the SECTION signal is turned on again.

#### 《Setting value》

0: OFF After a hold is fixed, the next detection is not started until the T/H signal is turned on even if the SECTION signal is turned on.

1: ON After a hold is fixed, the next detection is started when the SECTION signal is turned on again even if the T/H signal is not turned on. This is the initial setting (factory default setting).



HI LO

0

# ■Auto reset setting method

- **1.** Select setting mode 1. Press FNC once.
- 2. Set "Auto reset."



Press  $| \downarrow |$ , and the highest digit blinks.





3. Press ESC twice to go back to the indicated value display.



Ch1 Ch2

HI LO


# **8** STANDARD INTERFACE

# 8-1. External I/O

## Connector pin assignment

A1		COM1	B1		COM1
A2	OUT	HI(Calculated)	B2	OUT	ALM(ch2)
A3	OUT	OK(Calculated)	B3	OUT	H/E
A4	OUT	LO(Calculated)	B4	OUT	
A5	OUT	HI(ch1)	B5	OUT	
A6	OUT	LO(ch1)	B6	OUT	RUN
A7		COM1	B7		COM2
A8	OUT	ALM(ch1)	B8	IN	SECTION
A9	OUT	HI(ch2)	B9	IN	T/H
A10	OUT	LO(ch2)	B10	IN	
A11	OUT	SI/F	B11	IN	D/Z-1
A12	OUT	SI/F	B12	IN	D/Z-2

Compatible connector:FCN-361J024-AU(manufactured by FUJITSU COMPONENT or equivalent)Connector cover:FCN-360C024-B(manufactured by FUJITSU COMPONENT or equivalent)(connector & cover optional type: CN50)

# ■About outputs

A1, A7, B1	Common for external output signals.	→ " ■ External I/O connection " on page 14	
A2	Outputs the calculated value HI limit signal.		
A3	Outputs the calculated value OK signal.		
A4	Outputs the calculated value LO limit signal.	→ "6. EXPLANATION OF COMPARISON FUNCTIONS " on page 44	
A5	Outputs the ch1 value HI limit signal.		
A6	Outputs the ch1 value LO limit signal.		
A8	Outputs the ch1 value alarm signal.	→ "4. CALIBRATION PROCEDURE " on page 23	
A9	Outputs the ch2 value HI limit signal.	→ "6. EXPLANATION OF COMPARISON	
A10	Outputs the ch2 value LO limit signal.	FUNCTIONS " on page 44	
B2	Outputs the ch2 alarm signal.	→ "4. CALIBRATION PROCEDURE " on page 23	
B3	Outputs the hold complete signal.	→ "7. EXPLANATION OF HOLD FUNCTIONS " on page 50	
B6	Outputs the normal run signal.	→ " ■ About the RUN signal " on page 61	

A11, A12	2-wire serial interface for connecting a UNIPULSE-manufactured printer, external display, etc.	<ul> <li>→ " ■ SI/F interface connection " on page 15</li> <li>"8-2 SI/F (Serial interface) " on page 62</li> </ul>

# ■About inputs

B7	Common for external input signals.	→ " ■ External I/O connection " on page 14
B8, B9	Inputs the hold control signal.	→ "7. EXPLANATION OF HOLD FUNCTIONS " on page 50
B11, B12	Inputs the Digital Zero signal.	$\rightarrow$ "5-4. Digital Zero " on page 38

# ■About the RUN signal

The RUN output stops when an abnormal state of the indicated value is detected. The conditions under which the output stops as in an abnormal state are as follows.

• ±LOAD

- OFL1, OFL2
- Calibration error
- Digital Zero limit error

Refer to "11-7. Error/message list " on page 108 about the contents of errors.



- \* By the error factor removal, ON-OFF operation restarts in 3.0 sec.
- \* RUN turns off when the power is turned off.

# 8-2. SI/F (Serial interface)

# ■SI/F expansion format

It is output the calculated value, ch1 value and ch2 value when set to ON.

<pre>《Setting value》</pre>		
0: OFF	The output dep	bend on the SI/F indicated value format.
1: ON	GROSS area:	calculated value (hold synchronized)
(hold synchronized)	NET area:	ch1 value
	TARE area:	ch2 value
2: ON	GROSS area:	calculated value (hold not synchronized)
(hold not synchronized)	NET area:	ch1 value
	TARE area:	ch2 value

#### ♦SI/F expansion format setting method

- **1.** Select setting mode 2. Press FNC  $\rightarrow$   $\blacktriangleright$  once.
- 2. Set "SI/F expansion format."

Press  $\checkmark$  twice  $\Rightarrow$  "SI/F function select " is displayed.

- Press  $\checkmark$  , and the highest digit blinks.
- Press **b** twice to make the digit of the SI/F expansion format blink.

Input the setting value with

(Initial value: 0)

Press **I** to validate it.

**3.** Press ESC twice to go back to the indicated value display.







Chapter

8

### ■SI/F indicated value format

For the SI/F, indicated value data exist in two areas: GROSS area and NET area. Select the data.

#### 《Setting value》

- 0: Calculated value/ch1 value
- 1: Calculated value/ch2 value
- 2: ch1 value/ch2 value
- GROSS area: calculated value GROSS area: calculated value

GROSS area: ch1 value

NET area: ch1 value NET area: ch2 value NET area: ch2 value

#### ♦SI/F indicated value format setting method

- **1.** Select setting mode 2. Press FNC  $\rightarrow$   $\blacktriangleright$  once.
- 2. Set "SI/F indicated value format."
  - Press  $\checkmark$  twice  $\Rightarrow$  "SI/F function select " is displayed.
  - Press  $\checkmark$  , and the highest digit blinks.
  - Press **>** once to make the digit of the SI/F
  - indicated value format blink.

Input the setting value with

(Initial value: 0)

■SI/F print

«S



**3.** Press ESC twice to go back to the indicated value display.





F Z.Z

etting value》	
0: None	No print command is sent.
1: Stable value	When stability of the calculated value is detected, a print command
	is sent to the SI/F to make the connected printer print automatically.
	When Near Zero is OFF, the calculated value is held until Near Zero
	ON after stable ON.
	Hold is reset in 1.5 sec. after Near Zero ON.
2: Hold value	When hold is reset, a print command is sent to make the connected
	printer print the hold value automatically. In this case, the hold value
	is forcedly taken in the GROSS area in sending.

O Point		
When stable value p performed in the foll	print is selected, be aware that automat owing case.	ic printing is not
When Motion De	etect is set in time: 0.0 sec, count: 00.	
Also, the indicate	ed value is not held in the following cas	e.
Hold mode:	When any item other than none is s	elected.
♦SI/F print setting mether	hod	
1. Select setting mod	de 2.	
Press $FNC \rightarrow$	► once.	FZ P OFF
2. Set "SI/F print."		
Press <b>V</b> twice	$e \Rightarrow$ "SI/F function select" is	
displayed.		
Press 귖 , and	the highest digit blinks.	
Select the digit of	the SI/F print.	
Input the setting v	alue with <b>A V</b> . «Settin	ng value》
(Initial value: 0)		
Press 🛃 to va	alidate it.	SI/F expansion format
<b>3.</b> Press ESC twice value display.	to go back to the indicated	- SI/F print 0: None 1: Stable value 2: Hold value
<ul> <li>Operation of the indic</li> </ul>	ated value hold function	
Indicated value	*Hold function Indicated value	
	SI/F	Time
	Near Zero	
		Indicated value
	I Internal calcul	ated value
Near Zerc		
	Time _	
Stable OFF OFF	Stable OFF	ON OFF
Near Zero	Near Zero OFF	
Hold Automatic printing		Hold
· -	Automatic pri	nung

For the "Stable" parameter, see "5-7. Motion Detect " on page 41, and for the "Near Zero" parameter, see "6-4. Near Zero " on page 47.

Near Zero

# **9** OPTION INTERFACE

# 9-1. BCD interface

The BCD data output is an interface to extract the indicated value of the F350 as BCD data. This interface is convenient to process controls, totals, records, etc., by connecting the F350 to a computer, process controller, sequencer or the like.

The I/O and internal circuits are electrically insulated by photocoupler.



# ■ Connection

# Output

The signal output circuit employs the open collector output.







# 

• Do not apply external voltage to the signal input circuit.

The external element is required to withstand Ic=10mA.

Leakage from the external element is required to be 30µA or below.

### Connector pin assignment

A1	*	СОМ	B1	*	СОМ
A2	OUT	1	B2	OUT	1000
A3	OUT	2	B3	OUT	2000
A4	OUT	4	B4	OUT	4000
A5	OUT	8	B5	OUT	8000
A6	OUT	10	B6	OUT	10000
A7	OUT	20	B7	OUT	20000
A8	OUT	40	B8	OUT	40000
A9	OUT	80	B9	OUT	80000
A10	OUT	100	B10	OUT	Minus (Polarity)
A11	OUT	200	B11	OUT	OVER
A12	OUT	400	B12	OUT	STAB
A13	OUT	800	B13	OUT	STROBE
A14	IN	Data Hold	B14	IN	Logic Switching
A15	IN	Data Switching 0	B15	IN	Data Switching 1
A16	—		B16	—	

Compatible connector: FCN-361J032-AU (manufactured by FUJITSU COMPONENT or equivalent) Connector cover: FCN-360C032-B (manufactured by FUJITSU COMPONENT or equivalent) (connector & cover optional type: CN51)

# ■Output data select

#### 《Setting value》

- 0: Calculated value
- 1: ch1 value
- 2: ch2 value
- 3: External select
- Data selected by the data select input (A15, B15) is output.

The calculated value is output.

The ch1 value is output.

The ch2 value is output.

Data select 1	Data select 0	Output data
OFF	OFF	Calculated value (hold synchronized)
OFF	ON	ch1 value
ON	OFF	ch2 value
ON	ON	Calculated value (hold not synchronized)

\* In the case of external selection, read after at least 2 cycles.

#### ♦ Output data select setting method

- 1. Select setting mode 5.
  - Press FNC ► four times.
- 2. Set "Output data select."

Press $\blacksquare$ once. $\Rightarrow$ "Output data select" is displayed.
Press • once, and present set value blinks.
Input the setting value with $\checkmark$ $\checkmark$ .
(Initial value:0)
Press 🛃 to validate it.



ні	ок	LO	PEA	<	HOLD
					Ϋ́
				,	
HI	LO	Ch1	Ch 2	HI	LO
F 5.	1				

**3.** Press ESC twice to go back to the indicated value display.

### ■ Signal timing

Minus	Turns on when the output indicated value data is negative.
• OVER	Turns on at over-scale time. -LOAD, +LOAD, OFL1, OFL2
● STAB	Turns on at stable-time. See "5-7. Motion Detect" on page 41.
● STROBE	Strobe pulses are output in synchronization with BCD data. For reading the data, use the rising edges of the pulses when the logic is negative, and the falling edges of the pulses when the logic is positive.



## ■Logic switching

Select the logic of the BCD data output signal. Make selection with B14.

When COM and B14 are open	: Negative logic
When COM and B14 are short-circuited	: Positive logic

Read at least 2 cycles after inputting the logic switching.

# ■BCD data hold

Updating of the BCD data output signal is stopped. Also, the STROBE output turns OFF. Make selection with A14.

When COM and A14 are open: Update stop canceledWhen COM and A14 are short-circuited: Update stopped



Read at least 2 cycles after inputting the BCD data hold.

As long as the BCD data hold is input, data can be read reliably, but because the data is not updated, it may be different from original data.

### ■Output rate

«

Setting value》	
0: 10	4: 300
1: 30	5: 500
2: 50	6: 1000
3 :100	[times/sec.]

\* When the A/D conversion speed is 300 times/sec., settings are available up to 4: 300 [times/sec.].

#### Point

Even if this setting is changed, A/D conversions speed does not change. Make the output rate slower when reading fails due to a low processing performance of the device that should receive BCD.

#### ♦Output rate setting method

1. Select setting mode 5.

Press **FNC**  $\rightarrow$  **b** four times.



2. Set "Output rate."

Press $\blacksquare$ Twice. $\Rightarrow$ "Output rate" is displayed.
Press $\checkmark$ , and present set value blinks.
Input the setting value with $\blacksquare$ $\blacksquare$ .
(Initial value: 3)
Press 🛃 to validate it.



**3.** Press ESC twice to go back to the indicated value display.

# ■BCD/binary select

The output data selection can be changed to binary.

《Setting value》 0: BCD 1: Binary

#### ♦BCD/binary setting method

- **1.** Select setting mode 5. Press **FNC**  $\rightarrow$  **b** four times.
- **2.** Select "BCD/binary select."
  - Press  $\checkmark$  three times.  $\Rightarrow$  "BCD/binary select" is displayed.
  - Press , and present set value blinks.
  - Input the setting value with (Initial value: 0) Press  $\checkmark$  to validate it.





**3.** Press ESC twice to go back to the indicated value display.

▼ |.

### Pin assignment at binary

A1	*	СОМ	B1	*	СОМ
A2	OUT	2 <sup>0</sup>	B2	OUT	2 <sup>12</sup>
A3	OUT	2 <sup>1</sup>	B3	OUT	2 <sup>13</sup>
A4	OUT	2 <sup>2</sup>	B4	OUT	2 <sup>14</sup>
A5	OUT	2 <sup>3</sup>	B5	OUT	2 <sup>15</sup>
A6	OUT	2 <sup>4</sup>	B6	OUT	2 <sup>16</sup>
A7	OUT	2 <sup>5</sup>	B7	OUT	
A8	OUT	2 <sup>6</sup>	B8	OUT	Data Switching 0 (Response)
A9	OUT	2 <sup>7</sup>	B9	OUT	Data Switching 1 (Response)
A10	OUT	2 <sup>8</sup>	B10	OUT	Minus (Polarity)
A11	OUT	2 <sup>9</sup>	B11	OUT	OVER
A12	OUT	2 <sup>10</sup>	B12	OUT	STAB
A13	OUT	2 <sup>11</sup>	B13	OUT	STROBE
A14	IN	Data Hold	B14	IN	Logic Switching
A15	IN	Data Switching 0	B15	IN	Data Switching1
A16	_		B16	_	

\* With the B8 and B9 outputs, the data specified by the output data selection or by A15 and B15 (data select) can be checked.

# 9-2. RS-232C interface

The RS-232C is an interface to read the indicated value and status of the F350 and to write parameters into the F350.

This interface is convenient to process controls, totals, records, etc., by connecting the F350 to a computer, process controller, sequencer or the like.

# Communication specifications

Signal level:	Based on RS-2320	C
Transmitting distance:	Approx.15m	
Transmitting method:	Asynchronous, Fu	ull duplex
Baud rate:	9600, 19200, 3840	00, 57600bps Selectable
Bit configuration:	Start bit:	1bit
	Character length:	7 or 8 bit Selectable
	Stop bit:	1 or 2 bit Selectable
	Parity:	Parity none, odd or even Selectable
	Delimiter:	CR, CR+LFSelectable
Code:	ASCII	

#### Connector pin assignment

1	_	
2	IN	RXD
3	OUT	TXD
4	OUT	DTR
5	*	GND
6	_	
7	OUT	RTS
8	IN	CTS
9	_	
Case	*	SHIELD

Adaptable connector 9-pin D-SUB connector

Connector: XM3D-0921(Omron) or equivalent

Cover: XM2S-0913(with inch screw thread #4-40)(Omron) or equivalent (connector & cover optional type: CN34)

#### ■ Connection

Example) F XM3D-09	-350 921 or equivalent	D	PC etc. -sub9pin
1		1	CD
2	RXD	2	RXD
3	TXD	3	TXD
4	DTR	4	DTR
5	GND	5	GND
6		6	DSR
7	RTS	7	RTS
8	CTS	8	CTS
9		9	RI

\* This connection diagram shows cabling applicable to the case where your PC is DTE (data terminal equipment). For connection with DCE (data circuit-terminating equipment), such as a modem, use straight type cabling.

\* Prepare cabling after reconfirmation of the connector shape and signal lines (pin assignments) of the equipment you use.

#### Communication mode

#### «Setting value»

0: Send/receive mode

This mode performs communication by a command from the host computer. In this mode, you can read out the indicated value, status, set values and write in set values.

- 1: Continuous transmission (hold synchronized) mode This mode continuously transmits the indicated values and the status. Indicated value and status are synchronized with hold.
- 2: Printed transmission mode

When the indicated value is printed (a print command is output to the SI/F), the indicated value and status are sent from the F350 to host.

3: Continuous transmission (hold not synchronized) mode This mode continuously transmits the indicated values and the status. Only indicated value is not synchronized with hold.

#### ♦ Communication mode setting method

- 1. Select setting mode 5. Press FNC four times.
- 2. Set "Communication mode."
  - Press  $\lor$  once.  $\Rightarrow$ "Communication mode" is displayed. Press [ ] , and present set value blinks. Input the setting value with V
  - (Initial value: 0)

Press 4 to validate it.





**3.** Press **ESC** twice to go back to the indicated value display.

Communication conditions

Set the communication conditions according to the host.

#### Communication conditions setting method

- Select setting mode 5. Press FNC  $\rightarrow$ four times.
- 2. Set "Communication conditions."

Press **V** twice.  $\Rightarrow$  "Communication conditions" is displayed.

Press 4, and present set value blinks.

Input the setting value with ▼ |.

(Initial value: 11100)

Move to the lower digits with 

Press 🚽 to validate it.

**3.** Press ESC twice to go back to the indicated value display.



1

HL LO

0: 9600 bps 2: 38400 bps 1: 19200 bps 3: 57600 bps

LO HL

#### Delimiter

Set the delimiter for sending messages from the F350.

《Setting value》 0: CR 1: CR+LF

#### ♦ Delimiter setting method

2. Set "Delimiter."

(Initial value: 11100) Press 🛃 to validate it.

1. Select setting mode 5. Press FNC  $\rightarrow$ four times.



ΗΙ LO OK PEAK HOLD Press  $\forall$  three times.  $\Rightarrow$  "Delimiter" is displayed. Ch1 Ch2 HI LO HI LO 53

**3.** Press **ESC** twice to go back to the indicated value display.

### ■Communication format

#### 1.Send/receive [Reading the indicated value/status]

Press  $| \downarrow |$ , and present set value blinks.

Input the setting value with  $| \mathbf{A} | | \mathbf{V} |$ .

Reading the indicated value/status				
Function	Hea	ader	Protocol	
1 difetion	Main	Sub		
Indicated value (Calculated value)	R	A	Host R A CR F350 R A + 1 2 3 . 4 5 Delimiter Sign, decimal point, 5-digit indicated value.	
Indicated value (ch1)	R	В	Host R B CR F350 R B + 1 2 3 . 4 5 Delimiter Sign, decimal point, 5-digit indicated value.	
Indicated value (ch2)	R	С	Host R C CR F350 R C + 1 2 3 . 4 5 Delimiter Sign, decimal point, 5-digit indicated value.	

#### 9 OPTION INTERFACE

Reading the indicated value/status					
Function	Hea	der	Protocol		
	Main	Sub			
Status1 (Calculated value)	R	D	Host       R       D       CR         F350       R       D       0		
Status2 (ch1,ch2)	R	E	Host       R       E       CR         F350       R       E       0		
Status 3 (ch1)	R	F	Host       R       F       CR         F350       R       F       0		

#### 9 OPTION INTERFACE

	Reading the indicated value/status				
Function	Hea	ader Sub	Protocol		
Status 4 (ch2)	R	G	Host       R       G       CR         F350       R       G       0       0       0       0       0       0       0       Delimiter         -LOAD(ch2)       0: OFF       1: ON		
Read all (Hold synchronized)	R	I	$\begin{array}{c c c c c c c c c c c c c c c c c c c $		
Indicated value (Real time Calculated value)	R	J	Host R J CR F350 R J + 1 2 3 . 4 5 Delimiter Sign, decimal point, 5-digit indicated value.		
Read all (Hold not synchronized)	R	К	Host       R       K       CR       0       1       2       3       4       5       6       7       8       9       10         F350       R       K       ,       +       1       7       4       .       8       6       ,         Galculated value (Sign, decimal point, 5-digit indicated value.)       Image: Colored colore		

		- Cł	nannel selection (Setting value with channel switching)	
Header				
Function	Main	Sub	Protocol	
channel switching	W	_	Host       W       0       0       0       0       0       0       1       CR         F350	
		1	Setting value writing	
	Hea	ader		
Function	Main	Sub	Protocol	
			Host W 1 1 + 1 2 3 4 5 CR F350 Sign, decimal point, 5-digit indicated value. (For a setting value with a decimal point, simply write	
Various settings	Various w – settings	_	* When the number of digits of the setting value is smaller than five, put a zero in the higher digit(s).         Example) 3 digits         W       * + 0       0       1       2       3       CR         * When the setting value is unsigned, put a zero in the sign digit.         W       * * 0       0       0       3       CR         * When the setting value is unsigned, put a zero in the sign digit.         W       * * 0       0       0       0       3       CR         * For Motion Detect and Zero Tracking, put a zero in the 3rd digit.       Example)Time 1.5sec.       1       0       CR	
			Setting value reading	
Function	Hea	ader	Protocol	
	Main	Sub		
Various settings	w	_	Host W 1 1 CR F350 W 1 1 CR W 1 1 + 1 2 3 4 5 Delimiter command Sign, decimal point, 5-digit indicated value. (A setting value with a decimal point results in the numerical value excluding the decimal point.)	
* Command 1 S Poi •"Se •"Init	I definitio	n etting val ode numb ect" and " d "passw	<ul> <li>* The mode number of the setting value of HI/LO limit is "0."</li> <li>* For setting mode numbers and setting item numbers, see "11-1 The list of initial setting value" on page 98.</li> <li>key protect" can be read but cannot be written.</li> <li>ord" cannot be either read or written.</li> </ul>	

- When the protect of the setting value you are going to write is ON, it cannot be written. Turn OFF the protect by key operation.
- •If an output value is written in command 42 (zero calibration), simulated zero calibration is executed with the written value. Also, if an output value is written in command 43 (equivalent input calibration), equivalent input calibration is executed.

Movement directive				
Function	Header		Drat!	
Function	Main	Sub	PTOLOCOI	
Zero calibration (with channel switching)	С	Z	Host C Z CR F350	
Equivalent input calibration (with channel switching)	С	S	Host C S CR F350	
Digital Zero (simultaneous on both channels)	С	E	Host C E CR F350	
Digital Zero reset (simultaneous on both channels)	С	F	Host C F CR F350	
Digital Zero (with channel switching)	С	G	Host C G CR F350	
Digital Zero reset (with channel switching)	С	Н	Host C H CR F350	
SI/F print command	С	I	Host C I CR F350	
SECTION ON	С	1	Host C 1 CR F350	
SECTION OFF	С	2	Host C 2 CR F350	
T/H ON	С	3	Host C 3 CR F350	
T/H OFF	С	4	Host C 4 CR F350	

#### 3. Send/receive [Command]

Chapter 9

Give commands with channel switching after setting the channel by ch switching. For details, see " 1.Send/receive [Reading the indicated value/status]" on page 74.
If the calibration protect is ON, zero calibration and span calibration cannot be performed.

Point

# 4. Send/receive [Returning an error]

Returning an error				
Eunction He		ader	Protocol	
1 dhouon	Main			
Error occurrence (send/receive mode)	E	R	Host       E       R       * Delimiter         F350       -       -         1: The command or message length is improper.         2: The protect of the setting value you are going to write is ON, or a calibration command is received while the calibration protect is ON.         3: The format (whether or not to sign, the number of digits, other than the numerical value) of the setting value you are going to write is improper.         4: Other communication errors (parity error, frame error, etc.)	



# Continuousness / printed transmission mode

Chapter

9

About the timing for continuous transmission

Point

According to the communication baud rate setting, the continuous transmission intervals in the case where the communication modes "Continuous" is selected are as follows:

Communication baud rate	Continuous transmission interval
57600 bps	100 times/sec.
38400 bps	50 times/sec.
19200 bps	25 times/sec.
9600 bps	12 times/sec.

# 9-3. D/A converter voltage output (3ch)

This converter is used for obtaining analog outputs synchronized with calculated value, ch1 value and ch2 value.

The analog output ranges are -10 to +10V output.

By using the D/A zero setting and D/A full scale setting functions, analog output can be obtained between zero (0V) and full scale (+10V) with respect to the predetermined digital value.

The output circuit and the main unit circuit are isolated.

The resolution is 1/10000 with respect to the ranges of -10 to +10V, and the conversion speed follows the A/D conversion speed.

The maximum voltage output range are about  $\pm 11$ V.



# Connector pin assignment

1	calculated value	+	VOUT
1		—	GND
2	ch1 valuo	+	VOUT
2		—	GND
3	ch2 value	+	VOUT
		_	GND

Compatible plug 734-106 Operating tool 734-230

734-106/037-000

#### ■ Connection

A two-piece terminal block is used. Perform wiring with the plug pulled out from the option. Use of the operating tool included is recommended to facilitate wiring.

**1.** Strip the casing 6.5 to 7.5mm on the cable to be connected.

Twist the bare wire to fit the terminal hole.

- **2.** Press the operating tool attached to the operation slot at the upper part with a finger and push down the spring.
- **3.** While pressing the operating tool, insert the electric wire into the insertion opening until it hits the wall.



**4.** The wire will be connected once the operating tool is released. For confirmation, tug the electric wire gently.

The wire can be connected likewise without the operating tool by using a tool such as a flathead screwdriver to press down the spring from the top.

# 

- Cable can be from 28 to 14AWG (0.08 to 1.5mm<sup>2</sup>).
- It is not necessary to solder the cable wires or to fix a solderless terminal.
- If several cables to be inserted to the same hole, twist those cable wires together and insert.
- Connect the cable with the power supply of the main body turned off without fail.
- For the protection from the damage, do not operate the lever without removing the plug.

#### ■Output mode

<pre>《Setting value》</pre>	
0: Data select	The output of each channel corresponds to the data select setting.
1: Zero scale fix	All outputs of the channels are fixed to zero scale output (0V). After confirmation, it will enter the output adjustment mode and zero adjustment for each channel will be enabled.
2: Full scale fix	All outputs of the channels are fixed to full scale output (+10V). After confirmation, it will enter the output adjustment mode and gain adjustment for each channel will be enabled.

#### Data select

When the output mode is "0: Data select", the analog output for calculated value, ch1 value and ch2 value will be synchronized with the indicated value.

The output data for each indicated value can be selected.

#### 《Setting value》

- 0: Hold synchronized Outputs value synchronized with the indicated value.
- 1: Hold not synchronized

Outputs value without hold even when the indicated value is on hold.

#### ♦ Output mode/ data select setting method

1. Select setting mode 5.

Press **FNC**  $\rightarrow$  **b** four times.

- 2. Set "Output data select."
  - Press  $\checkmark$  once.  $\Rightarrow$  "Output data select" is displayed.

Press , and the highest digit blinks.

#### ①Set "Output mode."

Input the Output mode with  $\blacktriangle$   $\checkmark$  . Press  $\blacktriangleright$  three times and move and move

three times and move and mo

to the lower digit. (Initial value: 0)

2 Set "Data select 1 (calculated value)."

Input the data select 1 (calculated value) with

▲ ▼ . (Initial value: 0)

Press 🛃 to validate it.







**3.** Press ESC twice to go back to the indicated value display.

■Zero/Full scale se	etting		
Zero scale 1 to 3	Set the indicated value to output 0V.		
Full scale 1 to 3	Set the indicated value to output 10V. The gain will be "full scale - zero scale". Outputs value within the range of ±gain the center.	with the set zero scale at	
《Setting value》 Zero/Full scale	value -99999 to 99999		
	tting method		
1. Select setting	mode 5.		
Press <b>FNC</b>	$\rightarrow$ <b>b</b> four times.	FS P oFF	
2. Set "Zero scal scale value 1	le value 1 (calculated value)," and "Full (calculated value)."		
①Set "Zero so	cale value 1 (calculated value)."		
value)" is disr	twice. $\rightarrow$ Zero scale value 1 (calculated	/	
Press	and the highest digit blinks		
Input the setti	ng value with $\blacktriangle$ , and move to the	lower digit with <b>•</b> .	
(Initial value:	0)		
<u>* For inputtin</u>	ıg a negative sign, press +/−.		
Press 🛃 t	o validate it.		
②Set "Full sca	ale value 1 (calculated value)."		
Press <b>V</b>	once. $\Rightarrow$ "Full scale value 1 (calculated	1	
value)" is disp	blayed.	HI OK LO PEAK HOLD	
Press 🦊,	and the highest digit blinks.		
Input the setti	ng value with $\blacksquare$ $\bigtriangledown$ , and move to the		
lower digit wi	ith 🕨 . (Initial value: 10000)		
<u>* For inputtin</u>	ig a negative sign, press <mark>[+/−]</mark> .		
Press 🛃 t	o validate it.		

3.	Set "Zero scale value 2 (ch1)," and "Full scale value 2 (ch1)."
	①Set "Zero scale value 2 (ch1)."
	Press $\checkmark$ once. $\Rightarrow$ "Zero scale value 2 (ch1)" is
	displayed.
	Press , and the highest digit blinks.
	Input the setting value with $\land$ , and move to the lower digit with $\triangleright$ .
	(Initial value: 0)
	Press to validate it
	②Set "Full scale value 2 (ch1)."
	Press $\checkmark$ once. $\Rightarrow$ "Full scale value 2 (ch1)" is
	Press , and the highest digit blinks.
	Input the setting value with (initial value: 10000)
	* For inputting a negative sign, press +/-
	Press $\checkmark$ to validate it.
4.	Set "Zero scale value 3 (ch2)," and "Full scale value 3
	Uset "Zero scale value 3 (ch2)." Press $\square$ once $\implies$ "Zero scale value 3 (ch2)" is
	displayed.
	Press $\checkmark$ , and the highest digit blinks.
	Input the setting value with $\blacksquare$ $\blacksquare$ , and move to the lower digit with $\blacksquare$ .
	(Initial value: 0)
	<u>* For inputting a negative sign, press +/</u>
	Press $\checkmark$ to validate it.
	②Set "Full scale value 3 (ch2)."
	Press $\blacksquare$ once. $\Rightarrow$ "Full scale value 3 (ch2)" is
	displayed.
	Press , and the highest digit blinks.
	Input the setting value with $\land$ , and move to the $F 5.7$
	lower digit with $\blacktriangleright$ . (Initial value: 10000)
	<u>realized a negative sign, press</u> .
	riess et lo validate it.
5.	Press ESC twice to go back to the indicated value display.

Chapter 9

**OPTION INTERFACE** 

# Adjustment by fixed output

Make output adjustment on the adjustment screen appearing after selecting each fixed output by

D/A output data select setting and pressing

Select the adjusting output channel with +/-, and make fine adjustment of the output with while monitoring the output value.

The adjustment values (%) is registered by pressing  $\checkmark$  and confirming adjustment after completing adjustments for all channels to be adjusted.

#### 



#### ♦Full fixed output



- \* Keeping on pressing **() ()** results in continuous operation.
- \* The adjustable range is approximately  $\pm 2.0$ V.
- \* Press  $\mathbb{ZERO}$  to bring the adjusted value back to the central point (0%).
- \* Press ESC to stop adjustment and go back to the indicated value display screen.
- \* By initializing the system settings, the adjusted value is cleared to go back to 0%.

# 9-4. D/A converter output

A D/A converter is provided for obtaining analog output synchronized with the indicated value of the F350.The analog output ranges are -10 - +10V output and 4 - 20mA constant-current output. By using the D/A zero setting and D/A full scale setting functions, analog output can be obtained between zero (0V, 4mA) and full scale (10V, 20mA) with respect to the predetermined digital value. The output circuit and the main unit circuit are isolated.

The resolution is 1/10000 with respect to the ranges of -10 to +10V and of 4 to 20mA, and the conversion speed follows the A/D conversion speed.

The maximum voltage output range are about  $\pm 11$  V, the maximum current output range are about 2.4 - 21.6 mA

# ■Connection



For the output terminals of the D/A converter option, a cage clamp type terminal block is used. Make connections by the following procedure.

# Connecting to cage clamp terminal block

 Strip the casing 0.2in (6mm) on the cable to be connected.

Twist the bare wire to fit the terminal hole.

- **2.** Insert the supplied screwdriver into the upper hole and lift upward.
- **3.** Insert the twisted wires into the lower hole.
- **4.** Pull the screwdriver out from the upper hole.
- **5.** Make sure cable is clamped securely and does not come out with a slight tug.





# 

- Cable can be from 24 ~ 14AWG ( $0.2 \sim 2.5 \text{mm}^2$ ).
- It is not necessary to solder the cable wires or to fix a solderless terminal.
- If several cables to be inserted to the same hole, twist those cable wires together and insert.
- Connect the cable with the power supply of the main body turned off without fail.

### ■Output data select

#### 《Setting value》

0: Calculated value (hold synchronized)

The calculated value synchronized with a hold is output.

- 1: ch1 value Output is made in synchronization with the ch1 value.
- 2: ch2 value Output is made in synchronization with the ch2 value.
- 3: Calculated value (hold not synchronized)

The calculated value in real time is output.

4: Zero fix Output is fixed at the zero output (0V for voltage output, 4mA for current output). After fixing, you will go to the output adjustment mode, so that zero adjustment can be made.

See "■ Adjustment by fixed output" on page 90.

5: Full scale fix Output is fixed at the full scale (10V for voltage output, 20mA for current output). After fixing, you will go to the output adjustment mode, so that gain adjustment can be made.

See "■ Adjustment by fixed output" on page 90.

# $\diamondsuit$ Output data select setting method

<b>1.</b> Select setting mode 5. Press FNC $\rightarrow$ <b>b</b> four times.	HI LO Ch1 Ch2 HI LO F5 P oFF
<ul> <li>2. Set "Output data select."</li> <li>Press ▼ once. ⇒ "Output data select" is displayed.</li> <li>Press ↓ , and the highest digit blinks.</li> </ul>	HI OK LO PEAK HOLD HI LO Ch1 Ch2 HI LO
<ul> <li>Press  three times to make the digit of the output data select blink. (Initial value: 0) Input the setting value with  .</li> <li>Press  to validate it.</li> <li><b>3.</b> Press  ESC twice to go back to the indicated value display.</li> </ul>	Setting value》          0       0       0         0       0       0         0       0       0         0       0       0         0       0       0         0       0       0         0       0       0         0       0       0         0       0       0         0       0       0         0       0       0         0       Calculated value         (hold not synchronized)         4:       Zero fix         5:       Full scale fix         Undefined       Undefined
■Zero/Full scale setting	Ondenned
Zero scale Set the indicated value to output.	ut 0V for voltage output, and 4mA for
Full scale Set the indicated value to output current output.	t 10V for voltage output, and 20mA for
《Setting value》 Zero/Full scale value -99999 to	99999
* Set so that <u>the Zero scale value &lt; Full scale value</u>	<u>).</u>
$\diamond$ Zero/Full scale setting method	
<b>1.</b> Select setting mode 5. Press FNC $\rightarrow$ <b>b</b> four times.	HI LO Ch1 Ch2 HI LO F5 P oFF
<ul> <li>2. Set "Zero scale value," and "Full scale value</li> <li>① Set "Zero scale value."</li> <li>Press ▼ twice. ⇒ "Zero scale value displayed.</li> <li>Press ♥, and the highest digit blinks.</li> </ul>	HI OK LO PEAK HOLD HI LO Ch1 Ch2 HI LO F 5.2
Input the setting value with $\checkmark$ , ar	nd move to the lower digit with $\blacktriangleright$ .
* For inputting a negative sign, press +/	<u> </u>
Press <i>v</i> to validate it.	

Chapter 9

**OPTION INTERFACE** 

② Set "Full scale value."	HI OK LO PEAK HOLD
Press $\blacksquare$ once. $\Rightarrow$ "Full scale value" is	<u>}{</u>
displayed.	HI LO Ch1 Ch2 HI LO
Press $\checkmark$ , and the highest digit blinks.	F 5.3
Input the setting value with $\square$ , and move to the setting value with $\square$ , and move to the setting value with $\square$ , and move to the setting value with $\square$ .	he lower digit with $\blacktriangleright$ .
* For inputting a negative sign, press $+-$ .	
Press <i>v</i> to validate it.	
<b>3.</b> Press ESC twice to go back to the indicated value dis	splay.

# Adjustment by fixed output

Make output adjustment on the adjustment screen appearing after selecting each fixed output by D/A output data select setting and pressing 

While monitoring the output value, make fine adjustment of the output with V , and Use to validate it, so that the adjusted value (%) is registered. press

#### 



#### ♦ Full fixed output



Full scale adjusted value

- \* Keeping on pressing V results in continuous operation.
- \* The adjustable range of voltage output is approximately ±2.0V, and that of current output is approximately  $\pm 1.6$ mA.
- \* Press |**ZERO**| to bring the adjusted value back to the central point (0%).
- \* Press **ESC** to stop adjustment and go back to the indicated value display screen.
- \* By initializing the system settings, the adjusted value is cleared to go back to 0%.

# **10** SPECIFICATIONS

# **10-1.** Specifications

# ■Analog section

	Number of sensor inputs	2 inputs		
	Sensor excitation	DC10V, 2.5V±5% (It depends on the setting.) Output current: Within 60mA (2 channels total)		
	* The following are co	ommon to each input.		
	Signal input range	-3.0  to  +3.0 mV/V		
	Accuracy	Non-linearity: Zero drift: Gain drift:	Within 0.02%FS±1 digit (at a 3.0mV/V input) Within 0.5µV/ ℃RTI Within 0.01%/ ℃	
	A/D converter	Rate: Resolution:	Selectable from 3000 times/sec and 300 times/sec 24 bits (binary), 1/10000 with respect to 1mV/V	
Voltage outputApproximately 2V per load ce load resistance $2k\Omega$ or more		2V per load cell input of 1mV/V, 2kΩ or more		
■Display section				
	Display	7-segment LED, LED lamps		
		Main display:	Character height 15mm,	
		Sub display:	6-digit, indicated value – 99999 to 99999 Character height 8mm,	
			5-digit, indicated value $-19999$ to 19999	
		(At the highest o	ligit of the display, <b>/</b> or nothing is displayed.)	
		Status display:	HI, OK, LO, PEAK, HOLD	
		Desimal point:		
		(Calculated valu	ues and ch1/ch2 values are all synchronized.)	
	Display item	Display frequen	cy: Selectable from 3, 6, 13, and 25 times/sec.	
∎S	etting section			
_	Setting method	Setting by inputting with membrane keys		
	Setting value	NOVRAM (non lithium-battery-	-volatile RAM) or backed-up C-MOS RAM	

**SPECIFICATIONS** 

External input/or	utput section		
External input	Dry contact input circuit (minus common type) for hold control, etc. (internal circuit power supply voltage 12V)		
External output	Open collector output circuit (sink type) for comparison output, etc. Rated voltage: 30V, driving current: 30mA or less		
Interface			
SIF	<ul> <li>2-wire serial interface for connecting a UNIPULSE-manufactured printer, external display, etc.</li> <li>Transmitting method: Asynchronous</li> <li>Baud rate: 600bps</li> <li>Output data: Allocations to the GROSS area and NET area are selected by the setting of "calculated value &amp; ch1 value " "aelgulated value &amp; ch2 value " or "ab1</li> </ul>		
Ontiona		value & ch2 value."	

## Options

BCD parallel data output (BCD)

Open collector output of	circuit (sink type)
Data format:	BCD or binary selectable
Output rate:	10, 30, 50, 100, 300, 500, 1000 times/sec.
Rated voltage:	30V
Driving current:	30mA or less
Output data:	Selected by the setting of "calculated
	value," "ch1 value," or "ch2 value," or

externally.

#### RS-232C interface (232)

Transmitting method:	Asynchronous
Baud rate:	9600bps to 57600bps
Flow control:	RTS/CTS controllable

#### D/A converter voltage output (3ch) (D3V)

Output range:	±10V	
Load resistance:	$2k\Omega$ or more	
D/A conversion speed:	Follows the original	
	A/D conversion speed	Common for all channels
Resolution:	1/10000	un enumers
Zero/span adjustment range:	±10%F.S.	
Non-linearity:	±0.05%F.S.	
Output data:	"Calculated value," "ch1 value," and	
	"ch2 value" at the same time.	

D/A converter voltage output (DAV)

Output range:	$\pm 10 \mathrm{V}$
Load resistance:	$2k\Omega$ or more
D/A conversion speed:	Follows the original A/D conversion speed
Resolution:	1/10000
Zero/span adjustment range:	±10%F.S.
Non-linearity:	±0.05%F.S.
Output data:	Selected by the setting of "calculated
	value," "ch1 value," or "ch2 value."

#### D/A converter current output (DAI)

Output range:4 to 20mALoad resistance:350Ω or lessD/A conversion speed:Follows the original A/D conversion speedResolution:1/10000Zero/span adjustment range:±10%F.S.Non-linearity:±0.05%F.S.Output data:Selected by the setting of "calculated value," "ch1 value," or "ch2 value."

### ■General performance

Power supply voltage	AC100 to AC240V (-15%, +10%)
	[free power source 50/60Hz]

Power consumption	10W max		
Operating conditions	Temperature: Humidity:	Operation Storage 85%RH or less	$-10$ to $+40^{\circ}$ C $-40$ to $+80^{\circ}$ C (non-condensing)
Dimension	96 (W) × 96 (	H) × 138 (D) mm	n (Projections excluded)
Panel cutout size	92×92 $^{+1}_{-0}$	mm	
Weight	Approximatel	y 1.0 kg	

## ■ Attachment

External input/output connector1
AC input cord (with solderless terminal) <sup>*</sup> 1
Conversion plug for AC input code1
Ferritic core (with unity band)2
Connector for BCD output (with BCD output option)1
Operating tool (with D/A converter (3ch) option)1
Mini screwdriver for terminal block connection (with D/A converter option)1
Operation manual1

\* The attached AC input cord is intended for 100V AC power in Japan.

# 10-2. Dimensions

# Standard equipment



Equipped with BCD parallel data output interface option







Equipped with D/A converter (3ch) option


## Equipped with D/A converter option

Unit: mm  $\square$ Current output Voltage output 西 而 [Top] [Top] Voltage output Current output R ⊗  $\otimes$  $\otimes$ ً⊗ ⊗ ⊗  $\otimes$  $\otimes$  $\otimes$ Ø ହ  $\otimes$  $\otimes$ e D/A CONVERTER V OUT  $\otimes$ D/A CONVERTER I OUT  $\otimes$ ٢ θ e ⊗ ø Ø ⊗ Ø 8 MADEINJAP 91 91 [Rear] [Rear] UNPULSE F 3 5 0 %81284 PEAK οк LO ні HOLD Ľ 3 88888 8.8.8.8.8. ESC HI/LO ZERO FNC HOLD /-)[] ک 120 (18) [Front] [Side]

Chapter

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# **11** SUPPLEMENTS

## 11-1. The list of initial setting value

* Initial value	Factory defa	ctory default value					
* Setting by ch	©: No mark:	With ch1/ch2 switching One setting only					
* Operation	○: ⊚: No mark:	Functions on calculation only Functions on ch1/ch2 Functions generally					
* Protect	○: ◎: ●:	Work protect System protect Calibration protect					
*NOVRAM	©: No mark:	Saved in NOVRAM Saved in SRAM (lithium-battery-backed-up)					
* Reference	Reference p	ge on which the details of each item are described					

#### ■ (Mode 0) work setting (comparison)

	Setting item	Initial value	Soffing range	Setting	Operat	Drotoot	NOV	Refere
No.	Name		Setting range	by ch	ion	FIDIECI	RAM	nce
1	Calculated value HI limit	2000	-99999 to 99999		0	0		
2	Calculated value LO limit	-2000	-99999 to 99999		0	0		P21
3	Ch HI limit	7500	-19999 to 19999	0	0	0		P45
4	Ch LO limit	2500	-19999 to 19999	0	0	0		
5								
6								
7								
8								
9								

#### ■ Mode 1; work setting (comparison/hold)



	Setting item	Initial	Setting range	Setting	Operat	Protect	NOV	Refere
No.	Name	value		by ch	ion	Troteor	RAM	nce
1	Comparison function select	0000	0 0 0 0 Undefined Undefined Calculation comparison OK output condition 0: Calculated value OK only 1: Calculated value OK & ch1 value OK 2: Calculated value OK & ch2 value OK 3: Calculated value OK & ch2 value OK 3: Calculated value OK & ch1 value OK Calculation comparison timing 0: All time 1: Stable 2: Near Zero OFF 3: Stable and Near Zero OFF 4: Hold		0	0	O	P48 P49
2	Near Zero	100	0 to 99999		0	0	$\bigcirc$	P47
3	Hysteresis	0	0 to 9999			0	0	P45
4	Calculation hold function select	0001	0 0 0 1 Auto reset 0: OFF 1: ON * This setting is required when the hold section is "external signal" or "external signal + time." Hold section 1: External signal 2: External signal 2: External signal + time * This setting is required only when the hold mode is other than "0: OFF." * When the hold mold is "1: Sample", settings are available up to "1: External signal." Hold mode 0: OFF 1: Sample 2: Peak 3: Bottom 4: Average Calculation mode 0: Ch1+Ch2 1: Ch1-Ch2 2:  CH1-CH2  3: High select 4: Low select		0	0	O	P44 P50
5	Detection time * This setting is required only when the hold section is "external signal + time."	1.00	0.01 to 9.99 [sec]		0	0	0	P57
6	Average sample number * This setting is required only when the hold mode is "average."	1	1 to 999 [times]		0	0	0	P53
7								
8								
9								

Chapter 11

### ■ Mode 2; system setting (calculation/common operation)

# HI OK LO PEAK HOLD

	Setting item	Initial	Setting range	Setting	Operat	Protect	NOV	Refere
No.	Name	value		by ch	ion	1 101001	RAM	nce
1	Motion Detect	0.0-00	0.0.0 - 0.0 Times Range 0.0 to 9.9 [sec.] 00 to 99 [count]		0	O	O	P40
2	SI/F function select	000	0 0 0 SI/F expansion format 0: OFF 1: ON(hold synchronized) 2: ON(hold not synchronized) SI/F Indicated value format 0: Calculated value/ch1 1: Calculated value/ch2 2: ch1/ch2 SI/F print 0: None 1: Stable value 2: Hold value			Ø	Ø	P62
3	Display frequency	3	0: 3 1: 6 2: 13 3: 25 [times/sec.]			O	0	P43
4								
5								
6								
7								
8								
9								

### ■ Mode 3; system setting (ch operation)



	Setting item	Initial	Setting range	Setting	Operat	Protect	NOV	Refere
No.	Name	value		by ch	ion	1 101001	RAM	nce
1	Digital filter	0	0: OFF 2 to 999 [times]	0	0	0	0	P37
2	Analog filter	2	0: 3 1: 30 2: 300 3: 1k [Hz]	0	0	0	0	P36
3	Zero Tracking	0.0-00	0.0.0.0.0.00 Times 0.0 to 9.9 [sec.] 00 to 99 [count]	0	0	0	0	P43
4	D/Z synchronous mode	0	0: ch1 and ch2 synchronous 1: ch1 and ch2 independent		0	0	0	P39
5	A/D conversion speed select	1	0: 300 1: 3000 [times/sec.]		0	0	0	P35
6								
7								
8								
9								

■Mode 4; calibration setting (ch calibration)



	Setting item	Initial	Setting range	Setting	Operat	Protect	NOV	Refere
No.	Name	value		by ch	ion		RAM	nce
1	Calibration function select	020	0 2 0 Min. scale division 0:1 1:2 Decimal place 2:5 0: None 3: 10 1: 0.0 4: 20 2: 0.00 5: 50 3: 0.000 6: 100 Excitation voltage 0: 2.5V 1: 10V			•	O	P25
2	Zero calibration	0.000	-3.000 to 3.000 [mV/V]	0	0	•	0	P27
3	Equivalent input calibration	3.000	-3.200 to 3.200 [mV/V] (except 0)	0	0	•	0	P28
4	Actual load calibration	10000	-19999 to 19999 (except 0)	0	0	•	0	P30
5	Digital offset	0	-19999 to 19999	0	0	•	0	P31
6	Digital Zero limit	19999	0 to 19999		0	•	0	P32
7	Alarm HI limit	19999	-19999 to 19999		$\odot$	•	0	P33
8	Alarm LO limit	-19999	-19999 to 19999		0	•	0	P33
9								

# ■Mode 5; system setting (BCD option)



	O atting items			1		1		
	Setting item	Initial	Setting range	Setting	Operat	Protect	NOV	Refere
No.	Name	value		by ch	ion		RAM	nce
1	Output data select	0	0: Calculated value 1: ch1 2: ch2 3: External selection			0	0	P67
2	Output rate	3	0: 10 4: 300 1: 30 5: 500 2: 50 6: 1000 3: 100 [times/sec.] * When the conversion speed is 300 [times/sec.], settings are available up to 4.			O	0	P69
3	BCD/binary select	0	0: BCD 1: Binary			0	0	P69
4								
5								
6								
7								
8								
9								

# Mode 5; system setting (232 option)



	Setting item	Initial	Setting range	Setting	Operat	Protect	NOV	Refere
No.	Name	value		by ch	ion		RAM	nce
1	Communication mode	0	<ul> <li>0: Send/receive</li> <li>1: Continuous transmission (hold synchronized)</li> <li>2: Printed transmission</li> <li>3: Continuous transmission (hold not synchronized)</li> </ul>			Ø	O	P72
2	Communication condition	11100	1       1       1       0       0         Image: Construction of the system       0       None       1         Image: Construction of the system       0       None       1         Image: Construction of the system       0       1       1         Image: Construction of the system       0       1       1       1         Image: Construction of the system       0       1 </td <td></td> <td></td> <td>Ó</td> <td>Ó</td> <td>P73</td>			Ó	Ó	P73
3	Delimiter	0	0: CR 1: CR+LF			0	0	P74
4								
5								
6								
7								
8								
9								

■ Mode 5; system setting (D3V option)

	Setting item	Initial	Setting range	Setting	Operat	Protect	NOV	Refere
No.	Name	value		by ch	ion	THOLOGI	RAM	nce
1	Output data select	0000	0 0 0 0 Data select 1 (calculated value) 0: Hold synchronized 1: Hold not synchronized Undefined Undefined 0: Output mode 0: Output data select 1: Zero scale fix 2: Full scale fix			Ø	Ø	P82
2	Zero scale value 1 (calculated value)	0	-99999 to 99999			0	0	P84
3	Full scale value 1 (calculated value)	10000	-99999 to 99999			0	0	P84
4	Zero scale value 2 (ch1 value)	0	-99999 to 99999			0	$\odot$	P84
5	Full scale value 2 (ch1 value)	10000	-99999 to 99999			0	0	P84
6	Zero scale value 3 (ch2 value)	0	-99999 to 99999			0	$\odot$	P84
7	Full scale value 3 (ch2 value)	10000	-99999 to 99999			$\odot$	0	P84
8								
9								

# Mode 5; system setting (DAC option)



	Setting item	Initial	itial Sotting range		Operat	Protect	NOV	Refere
No.	Name	value		by ch	ion	FIDIECI	RAM	nce
1	Output data select	0000	0 0 0 0 Output data select 0: Calculated value (hold synchronized) 1: ch1 2: ch2 3: Calculated value (hold not synchronized) 4: Zero fix 5: Full fix Undefined Undefined			Ø	0	P88
2	Zero scale value	0	-99999 to 99999			0	$\odot$	P89
3	Full scale value	10000	-99999 to 99999			$\odot$	$\odot$	P89
4								
5								
6								
7								
8								
9								

## ■ Mode 9; protect/initialize



	Setting item	Initial	Setting range	Setting	Operat	Protect	NOV	Refere
No.	Name	value		Dy Ch	IUII		RAIVI	nce
1	Setting protect	000	0 0 0 Calibration protect 0: OFF 1: ON System protect 0: OFF 1: ON Work protect 0: OFF 1: ON Work protect 0: OFF 1: ON				Ø	P106
2	Key protect	000	0 0 0 Undefined HOLD key protect 0: OFF 1: ON ZERO key protect 0: OFF 1: ON			0	0	P107
3	Initialize	0	<ul><li>(0: Undefined)</li><li>1: Work setting</li><li>2: System setting</li><li>3: Calibration setting</li></ul>			$\odot$	_	P108
4	Password	0000			—	-		P108
5								
6								
7								
8								
9								

# 11-2. Self-check function

The self-check function is to automatically check the memory and detect problems. This function is to checksum the software, check the NOVRAM operation, check the SRAM operation, and check the lighting of indicators. This function is not to diagnose the analog circuit.

## Self-check method

- **1.** Turn off the power of the F350.
- **2.** Turn on the power while pressing [ESC].
- **3.** If "PASS" is displayed at the end, it is normal.



Self-check display items



\*3: Status indications light in sequence.

## 11-3.Setting protect

Each category of setting values can be locked to prevent rewriting. For each category, see the setting value list.

- 0: OFF Enables rewriting of setting values.
- 1: ON Disables rewriting of setting values.



### Setting protect setting method

- **1.** Select setting mode 9. Press  $[FNC] \rightarrow [FNC]$  five times.
- **2.** Set "setting protect."



Ch1

HI LC

н

F q

**3.** Press **ESC** twice to go back to the indicated value display.

## Point

For the setting items protected by the setting protect, see "11-1.The list of initial setting value" on page 98.

# 11-4.Key protect

display.

ZERO key and HOLD key operations are disabled to prevent misoperation. 0: OFF Enables key operations. 1: ON Disables key operations. «Setting value» 0 0 0 Undefined HOLD Key protect 0: OFF 1: ON ZERO Key protect 0: OFF 1: ON Key protect setting method 1. Select setting mode 9. HI LO HI LO Press  $|\mathsf{FNC}| \rightarrow |\mathsf{FNC}|$  five times. : ų 2. Set "Key protect." н OK LO HOLD Press  $\left[ \mathbf{V} \right]$  twice.  $\Rightarrow$  "Key protect" is displayed. Press  $\downarrow$ , and the highest digit blinks. Ch1 Input the setting value of "ZERO key protect" with LO F 9,2 V Move to the lower digit with  $\blacktriangleright$ 《Setting value》 Input the setting values of "HOLD key protect" in a like 0 0 0 manner. -Undefined Press to validate it. HOLD Key protect 0: OFF 1: ON ZERO Key protect 0: OFF 1: ON 3. Press ESC twice to go back to the indicated value

# 11-5.Initialize

Each category of setting values can be initialized. For each category, see the setting value list.

#### $\ll$ Setting value $\gg$

- (0: Undefined)
- 1: Work setting
- 2: System setting (Including setting protect and key protect)
- 3: Calibration setting

After inputting the number of the setting value category you want to initialize, press validate it, and initialization is executed.

However, if the category is protected, initialization cannot be performed.

Normally, the setting value of "initialize" is "0 (undefined)."

### Initialize setting method

Press

- **1.** Select setting mode 9.
  - Press **FNC**  $\rightarrow$  **i** five times.
- **2.** Excecute initialization.
  - Press **T** three times.  $\Rightarrow$  "Initialize" is displayed.
  - Press , and blinks.

V

Input the setting value for initialization with

U to validate it.



Ch1 Ch2

HI LO

HI LO

Fg



\* Upon validation, initialization is executed and the setting value goes back to "0."

**3.** Press ESC twice to go back to the indicated value display.

# 11-6.Password

This setting is for maintenance and inspection. Do not operate it.

# 11-7.Error/message list

## Main numerical display section

Lo bAt Lithium battery backup voltage drop	The voltage of the lithium battery for internal memory backup has dropped. The battery needs to be replaced. Ask us for replacement of the battery.
--	---

-LoAd <b>- L o Å d</b>	Beyond the signal input range -3.2mV/V	The input electric signal greatly exceeds the signal input range. This also occurs when an excessive load is applied to the sensor or the input terminal is opened due to a break in the cabling, etc.	
LoAd LoAd	Beyond the signal input range +3.2mV/V		
ALA <b>R L R</b>	Exceeds the alarm HI limit	This occurs when a larger load than expected is applied to the sensor or calibration is performed below the measurement range. Check the calibration and measuring object.	
-ALA - <b>ALA</b>	Below the alarm LO limit		
oFL1 <b>oFL 1</b>	Below 19999	This occurs when a larger load than expected is applied to the sensor, or calibration is performed below the measurement range. Check the calibration and measuring object.	
oFL2 <b>oFL2</b>	Exceeds -19999		
cErr2 c	Beyond the zero calibration range in the positive direction	The signal input range is greatly exceeded when zero calibration is performed. Check for an excessive load applied to the sensor and for breaks.	
cErr3 c Err 3	Beyond the zero calibration range in the negative direction		
cErr4 cErr4	Beyond the rated output value in the positive direction/negative direction. Beyond the rated capacity value.	The signal input range is greatly exceeded when calibration is performed. In the case of equivalent input calibration, check the rated output value, and in the case of actual load calibration, check for an excessive load applied to the sensor and for breaks. Also, Check the setting of rated capacity value (display value) sets it exceeding "±19999".	
cErr5 cErr5	Rated capacity value = 0	Check the setting of rated capacity value (display value) for being "0" when calibration is performed.	
сЕгг6 сЕггб	Rated output value 0.000mV/V at the time of equivalent input calibration Rated output value in the range of -0.005 to +0.005mV/V at the time of actual load calibration	Check the rated output value for being 0.000mV/V when equivalent input calibration is performed, and the load for being too light in weight when actual load calibration is performed.	
dZ Err d2Err	Digital Zero limit error	When the range of zero point correction (deviation from the zero calibration registered point) by Digital Zero or Zero Tracking exceeds the setting value of Digital Zero limit, Digital Zero limit error occurs. Perform Digital Zero, etc., in a proper range.	
CALZE <b>[ AL 2E</b>	Zero calibration in progress		
CALSP <b>[ AL 5 P</b>	Actual load calibration in progress These are not errors. They indicate that each calibration is in execution.		
CALEq [ALE9	Equivalent input calibration in progress		

## ■Sub numerical display section

# 11-8. Troubleshooting

Item	Question	Answer/remedy
Sensor	Can four sensors be connected?	In the F350, the excitation voltage is shared by 2 channels. There is a need to use it in a range of output current that the 2 channels total does not exceed 60mA. For example, one $350\Omega$ sensor the excitation voltage of which is 10V can be connected to each channel at the maximum.
	Is a correct indicated value displayed by simply connecting sensor(s)?	Match the sensor output and indicator by equivalent input calibration or actual load calibration. Then, the indicated value is displayed in proportion to the sensor output.
Wiring and connection	The power cannot be turned on.	Check to see if the power cord is properly connected. If not, connect the power cord properly.
		Check to see if the power source is within the specified range. If not, use a power source within the specified range.
	The indicated value is abnormal.	Check to see if the sensor is properly connected. If not, connect the sensor properly.
		Check the sensor for damage. Connect a normal sensor.
		Check the sensor for a mechanical load. Prevent such a load.
		When normal, if not improved in spite of the above measures, remove the sensor, and short-circuit +SIG, -SIG, and -EXC on the terminal block, so that the error goes out and the value becomes stable.
Setting and operation	It is desired to decrease the number of digits of the numerical value.	Since there is a need to decrease the number of digits of the value input during equivalent input calibration or actual load calibration, perform calibration again. Also, set the load-related setting values, such as HI and LO limit values, again according to that number of digits.
	How to get hold is unclear.	The control method may differ according to the hold mode used. See "7-1 Hold functions of calculated values" on page 50.
	Judgment results are not output.	Check to see if the output cable is properly connected. If not, connect the output cable properly.
		In the case of calculation comparison output, the output conditions differ according to the setting of comparison timing. See "6-5 Calculation comparison timing" on page 48.
	Lower digit(s) of the indicated value fluctuates.	Check for calibration exceeding 10000 at 1mV/V. Since the resolution is approximately 10000 with respect to 1mV/V, calibration exceeding it will cause coarseness, and the indicated value will fluctuate and not become stable. For using as it is, ignore the lower digit(s), or set the min. scale division again.
	Is the voltage output and D/A option different?	The voltage output outputs the sensor input as it is amplified. It is different from the D/A converter that converts from digital to analog through digital processing. Consider that the D/A converter is synchronized with the indicated value.

Item	Question	Answer/remedy
SI/F	The output is abnormal.	Check for parallel wiring with AC lines. Carry out wiring again so as not to become parallel with AC lines.
	The print on the printer is abnormal.	Check to see if the printer side print data setting corresponds to the print data areas of the F350. GROSS area and NET area exist. Check that the areas and setting correspond.
	Automatic printing cannot be performed.	Check to see if the SI/F print setting of the F350 is correct. Check the setting.
		Check to see if the printer side print setting is automatic printing. Check the setting.
Option	Can two or more options be mounted?	Cannot be mounted. Only one optional function can be mounted.
BCD output option	The output is abnormal.	Check to see if wiring is correct. Check the wiring, and connect the communication cable properly.
		Check to see if the logic is recognized properly. Negative logic/positive logic selection is available.
		Check to see if synchronization is maintained with the strobe signal. Check the setting.
		Check to see if it is in synchronization with the strobe signal. Make the output rate slower or use the BCD data hold if the processing performance of the device that should receive BCD is low.
	Hold values do not result.	The output data differ according to the setting or external selection. Check to see if it is a calculated value.
RS-232C option	Communications fail.	Check to see if the communication cable is properly connected. After turning off the power, connect the communication cable properly.
		Check to see if a proper communication cable is used. Check to see if wiring is correct. Check the wiring, and connect the communication cable properly.
		Check to see if the communication conditions of the master and F350 correspond. Check the communication conditions, and match the settings.
	Reading cannot be performed.	Check to see if the transmission command from the master is correct. Check for any unwanted code included at the head of the transmission command. Check the transmission command.
	Is any program necessary for communicating with PC?	Some program or tool for serial communication is necessary. Create software to exchange commands at required timing.
D3V / DAV / DAI option	The output is abnormal.	Check for greatly exceeding the scale.
		Check for fixed output setting. Set the output setting properly again.

## 11-9. About disposal of the lithium battery

When disposing of the F350, make sure to remove the lithium battery and collect it separately. Also, after power-off, take sufficient time to discharge the internal capacitor.

## Removal of the lithium battery

- 1. Disconnect all cables.
- **2.** Open the top plate.



**3.** Pull out the connector at the tip of the cable of the lithium battery. Pinch and pull out the connector while tilting it upward for easy removal.



- 4. Cut the binding band that fixes the lithium battery with nippers or the like.
- **5.** Cut the red and black cables one by one at the root of the lithium battery with nippers or the like so as not to short-circuit them.

#### \* Make sure to collect the lithium battery separately.

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