F320 *DIGITAL INDICATOR*

OPERATION MANUAL

UNIPULSE

17 May. 2012
Rev. 1.07

INTRODUCTION

The F320 is a digital indicator for a strain gauge sensor, DIN96×48mm in size.
It is best suited for quality control in production lines, including pressure load control of pressing, pressurizing, caulking, etc., and torque control of rotating devices.
The RS-485 (protocol; Modbus-RTU) is included as standard, which facilitates introduction into a system that is formed by using the Modbus protocol.

To take full advantage of the F320's excellent performance and to use it safely, carefully read this operation manual and properly understand the descriptions in this manual before use.

SAFETY PRECAUTIONS

Be sure to read for safety.

In order to have an F320 Digital Indicator used safely, notes I would like you to surely follow divide into ⚠ WARNING and ⚠ CAUTION, and are indicated by the following documents.Notes indicated here are the serious contents related safely.Please use after understanding the contents well.

⚠ WARNING

Misuse may cause the risk of death or serious injury to persons.

⚠ CAUTION

Misuse may cause the risk of injury to persons or damage to property.

⚠ WARNING

Warning on design

- For the entire system to function safely when the F320 becomes faulty or malfunctions, provide a safety circuit outside the F320.

Warning on installation

- Do not modify the F320. Doing so may cause fire or electric shocks.
- 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, 7A. 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.
  - Attachment/detachment of connectors of options, etc.
  - Wiring/connection of cables to the signal input/output terminals.
  - Connection to the ground terminal.
- 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 board cover. Otherwise, it may cause an electric shock.
- To take measures against lightning surge, install a lightning surge protector (optionally available).
- Before applying power, carefully check the wiring, etc.

⚠ WARNING

Warning during startup and maintenance

- Use at a proper power supply voltage.
- 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.

⚠ CAUTION

Caution on installation

- Use the F320 as it is incorporated in a control panel, etc.
- Do not install in the following environments.
  - Where the temperature/humidity exceeds the range of the specifications.
  - Outdoors, or where the altitude exceeds 2000m.
  - Places containing large quantities of salt or iron powder.
  - Where the main body is directly affected by vibrations or shocks.
- 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.

Caution on wiring

- Tighten the screws for the signal input/output terminals at the specified torque. If they are loose, shorts, fire or malfunctions may occur.
  Tightening torque: 0.2 – 0.6N•m
- For sensors, external inputs/outputs and options, use shielded cables.

Caution during startup and maintenance

- For turning on/off the power, be sure to keep intervals of 5 seconds or more.
- If the F320 is not used by the specified method, its protective performance may be impaired.

Caution during transportation

- When the F320 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 F320 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.

CONFORMITY TO EC DIRECTIVES

The F320 digital indicator conforms to EC directives (based on the EC Council of Ministers), carrying a CE mark.

- Low-voltage directive:IEC/EN61010-1:2001(overvoltage category II)
- EMC directives: EN61326-1:1997, A1:1998, A2:2001
  EN55011:1998, A1:1999 ClassA
  EN61000-3-2:2000
  EN61000-3-3:1995, A1:2001
  EN61000-4-2:1995, A1:1998, A2:2001
  EN61000-4-3:1996, A1:1998, A2:2001
  EN61000-4-4:1995, A1:2001
  EN61000-4-5:1995, A1:2001
  EN61000-4-6:1996, A1:2001
  EN61000-4-8:1993, A1:2001
  EN61000-4-11:1994, A1:2001

EN61000-4-5 (lightning surge immunity)in the EMC directives applies to the F320 body and lightning surge protector in combination.
For the connection of the lightning surge protector, see page 14.

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.

Please inquire of our sales person about the RoHS-compliance of the option.

What is RoHS?

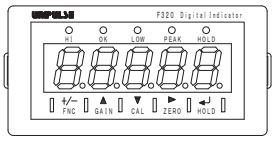
It is an abbreviation for Restriction on Hazardous Substances, which is implemented by the European Union (EU). The Directive restricts the use of six specific substances in electric and electronic equipment handled within EU borders. The six substances are lead, mercury, cadmium, hexavalent chromium,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

CONTENTS OF THE PACKAGE

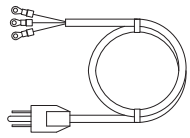
The following are contained in the package.

Be sure to check before use.

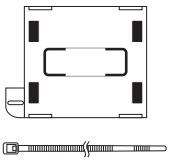
* :It is attached only at the AC power source specification.



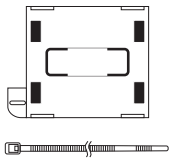
F320: One



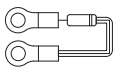
AC cable*: One



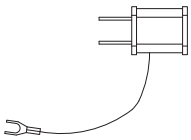
Ferrite core
for power cable*: One
(With binding band)



Ferrite core
for sensor cable: One
(With binding band)

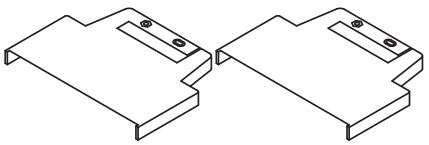


Terminating resistance: One
（For RS-485）

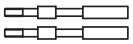


3P-2P conversion adapter*: One

F320 operation manual: One

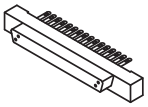


Case (FCN-360C032-B): Two



Screws: Two

M2 nuts: Four



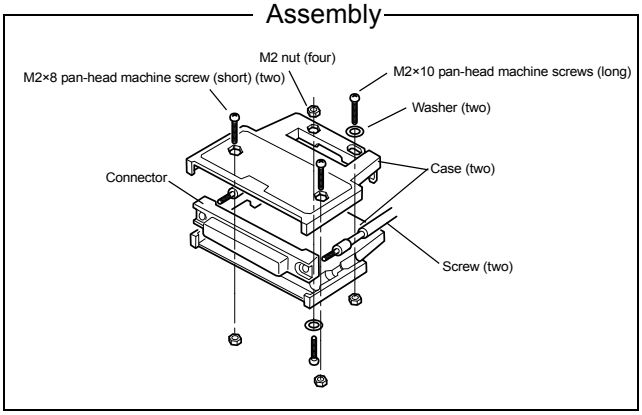
Connector (FCN-361J032-AU): One

M2×8 pan-head machine screws (short): Two

M2×10 pan-head machine screws (long): Two

Washers: Two

Assembly



BCD output connector: One set (when the BCO option is equipped)

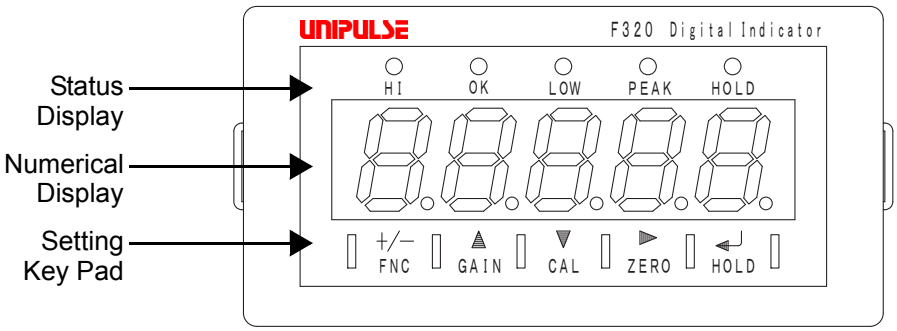
About the power cable

- The power cable attached to this product as standard equipment can be used in the AC100V power supply in Japan. (Official ratings voltage AC125V)
  Please use the power cable authorized in the country when you use this product outside Japan.

CONTENTS

1 FUNCTIONAL DESCRIPTIONS

1-1. Front Panel



1-1-1. Status Display

The F320 status is indicated. Setting items are indicated when setting.

HI: This LED turns on when the indicated value is larger than the set value of the high limit（indicated value > high limit）
Operation of the high limit relay is on.

OK: This LED turns on when the indicated value is smaller than the set value of the high limit and larger than the set value of the low limit
（low limit <= indicated value <= high limit）

LOW: This LED turns on when the indicated value is smaller than the set value of the low limit（indicated value < low limit）
Operation of the low limit relay is on.

PEAK: This LED is blinking when the Peak Hold function is activated.

HOLD: This LED turns on when the indicated value is the held value.

1-1-2. Numerical Display

The three types of display are provided.

1）Indicated value

2）Set value

3）Overflow display

- Minus overflow of the A/D converter -LoAd （- LOAD）
- Plus overflow of the A/D converter LoAd （LOAD）
- Indicated value overflowed （indicated value < -19999）

  oFL1 （OFL1）
- Indicated value overflowed （indicated value > 19999）

  oFL2 （OFL2）

1-1-3. Setting Key Pad

These are keys for commanding settings and operations.

+/− FNC	▲ GAIN	▼ CAL	▶ ZERO	↵ HOLD	Valid During Setting.
					Valid During Indicated Value Display.

+/− FNC

<During indicated value display>

Enters the setting mode.

Setting mode “F1” is displayed.

Indicated value display ⟶ (+/− FNC) Setting mode “F1” display

To cancel the setting, press +/− FNC again.

<During setting>

Switches the sign of set values between + and -.

▲ GAIN

<During indicated value display>

Enters the actual load calibration mode.

<During setting>

Increments by one the numeric in the blinking digit of the setting item selection or set value.

▼ CAL

<During indicated value display>

Enters the equivalent input calibration mode.

<During setting>

Decrements by one the numeric in the blinking digit of the setting item selection or set value.

▶ ZERO

<During indicated value display>

Enters the zero calibration mode (when the calibration LOCK is OFF).

Forcibly zeros the indicated value by the digital zero function (when the calibration LOCK is ON).

<During setting>

Selects the setting mode and the flashing digit of the setting value.

↵ HOLD

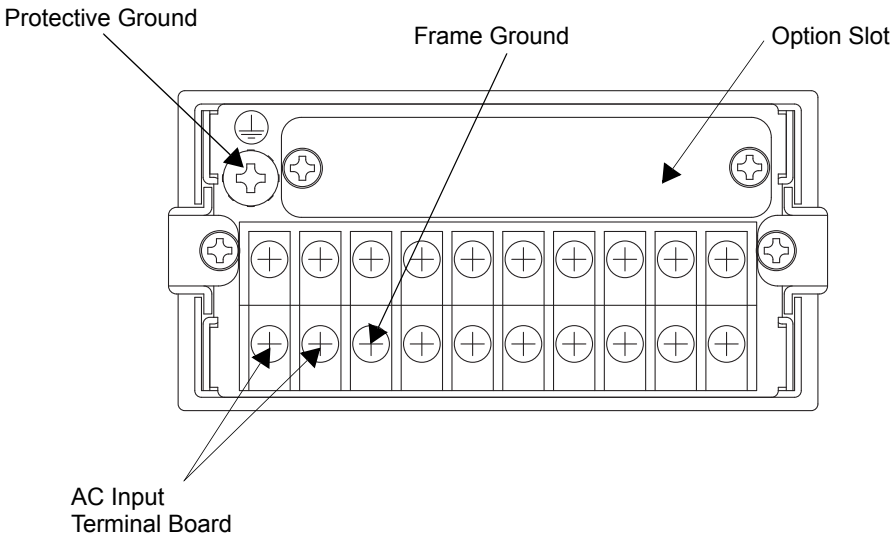
<During indicated value display>

Starts the operation of the hold function. To cancel the hold function, press ↵ HOLD again.

<During setting>

Validates setting items and set values.

1-2. Rear Panel



1-2-1. Protective Ground ⏚

This is a protective ground terminal block. Be sure to ground the protective ground terminal to prevent electric shocks and failures by static electricity. (The frame and protective ground terminal are conducted.) Do not use other screws than that attached to the main body (M4×8 binding-head machine screw with a toothed washer).

1-2-2. Frame Ground (Frame terminal) ⏚

This is a F.G terminal.（The frame and the F.G terminal are conducted.）

1-2-3. Options Slot

One option board can in stall in the option slot.

- BCD Parallel data output （BCO）
- D/A Converter（voltage output） （DAV）
- D/A Converter（current output） （DAI）

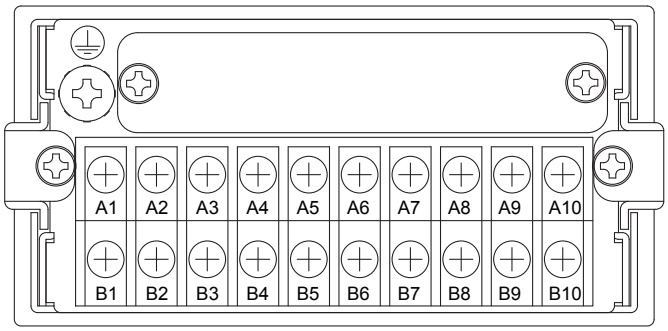
1-2-4. AC Power Input Terminal Board

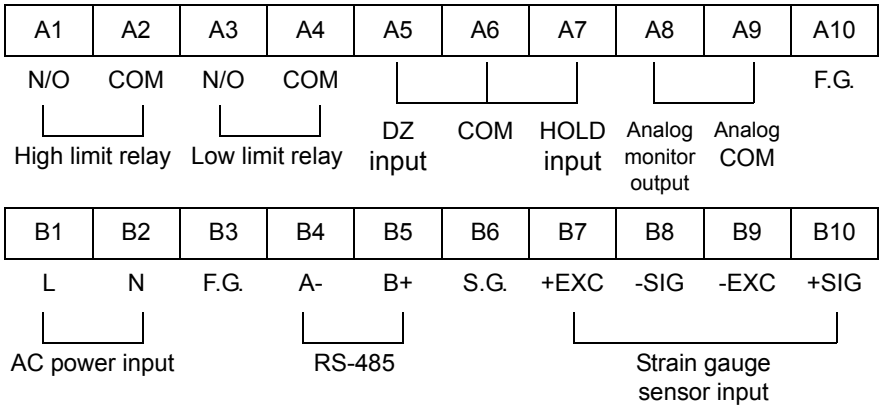
Connect AC power code. The input voltage is 100V to 240V AC.
The frequency is 50/60Hz.

1-2-5. Signal Input/Output Terminal Board

This terminal board is used for input/output of control signals and input of strain gauge sensor signals.

• Terminal board Assignment





A1-A4: Output terminals of the high/low limit relays.
(rating; 250V AC 0.5A)

A1 High limit relay （N/O）

A2 High limit COM

A3 Low limit relay （N/O）

A4 Low limit COM

A5 • A6: Terminals for inputting digital zero signals.

Available in calibration LOCK ON only.

A5 DZ input

A6 COM

A7 • A6: Terminals for inputting hold signals

A7 Hold input

A6 COM

A8 • A9: Terminal for output of a voltage proportional to the sensor input.

Output voltage is approx. 2V per 1mV/V(sensor input).

A8 Analog voltage output （0 to Approx. ± 6V）

A9 Analog COM

A10: F.G. terminal.

Connect the shielded cable of the strain gauge sensor.

B1 • B2: Terminals for inputting AC power.

The input voltage is 100 to 240V AC.

The frequency is 50/60Hz.

B1 L

B2 N

B3: F.G. terminal for AC input. (The frame and F.G. terminal are conducted.)

B4 • B5: RS-485 terminals.

B4 A -

B5 B +

B6: RS-485 signal ground terminal.

B7-B10: Terminal for connecting a strain gauge sensor

B7 + EXC

B8 - SIG

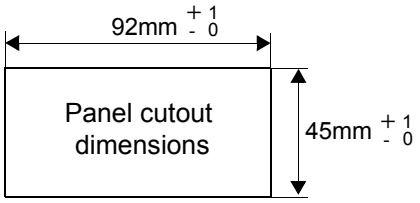
B9 - EXC

B10 + SIG

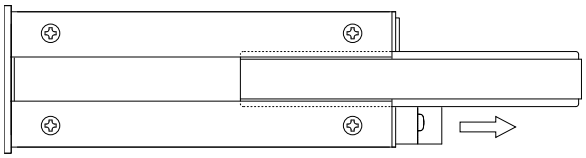
2 INSTALLING IN A CONTROL PANEL

Install the F320 in a control panel by the following procedures.

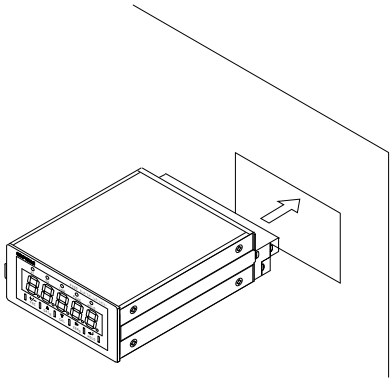
1. Make a hole in the panel according to the panel cutout dimensions.



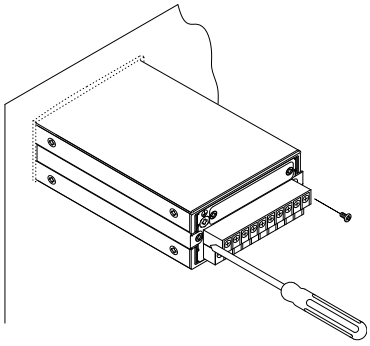
2. Remove the guide rails from both sides.



3. Insert the F320 from the front of the panel.



4. Mount the guide rails from the back, and fix them with the attached screws.



3. CONNECTION

Precautions about connection to the signal input/output terminal board are given below.The precautions described here are important for safety.
Please properly understand the descriptions before connection.

⚠ WARNING

- Do not connect a commercial power source directly to the signal input/output terminals.
- Connect to the signal input/output terminals with no power applied because it may cause an electric shock.
- For connection to the signal input/output terminals, check the signal names and pin assignment numbers, and then carry out wiring properly.
- The overvoltage applied to the signal input/output terminals should not exceed the value defined in category II.
- After wiring, be sure to mount the attached terminal board cover. Otherwise, it may cause an electric shock.
- Before applying power, carefully check the wiring, etc.
- Do not touch any signal input/output terminal while applying power. Doing so may cause electric shocks or malfunctions.

⚠ CAUTION

- Tighten the terminal screws at the specified torque.
  If they are loose, shorts, fire or malfunctions may occur.
  Tightening torque: 0.2 to 0.6N•m
- Use shielded cables.

3-1. Connecting Strain Gauge Sensor

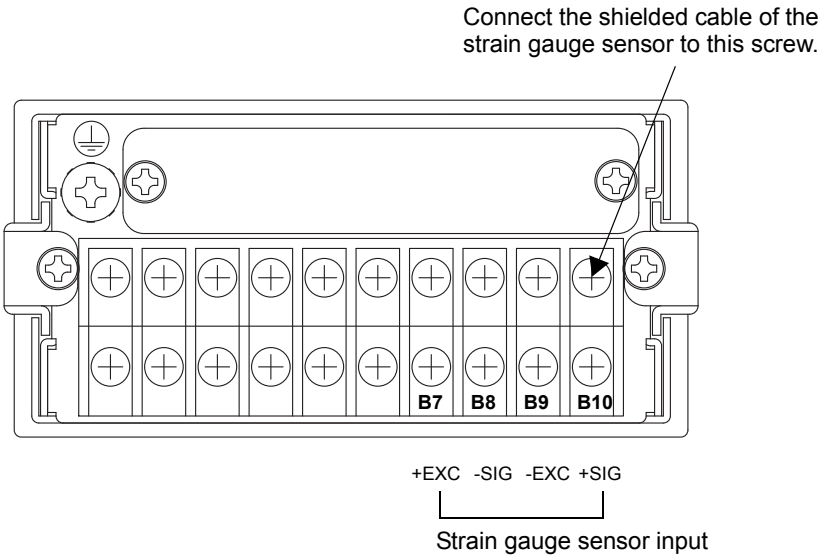
Connect a strain gauge sensor.

The excitation voltage is selectable from 2.5 and 10V.

(The factory setting is 2.5V.)

The maximum output current is 30mA.

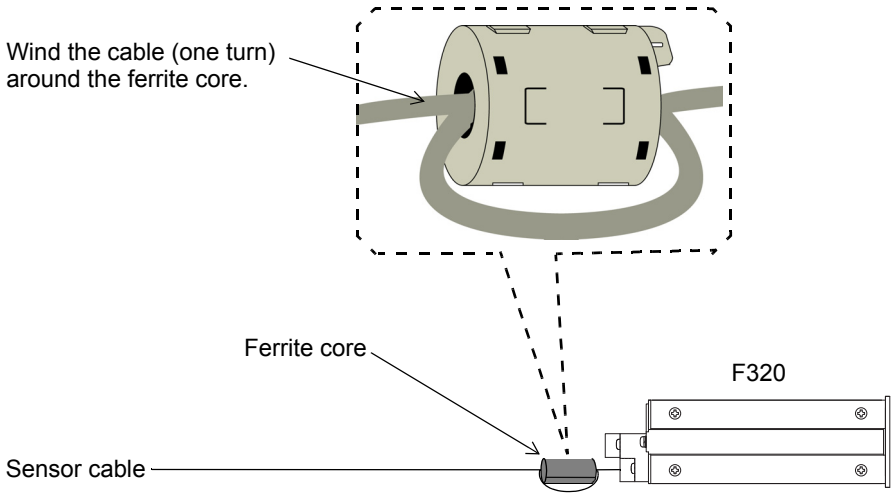
For the setting of the excitation voltage, see “Excitation Voltage” on page 65 .



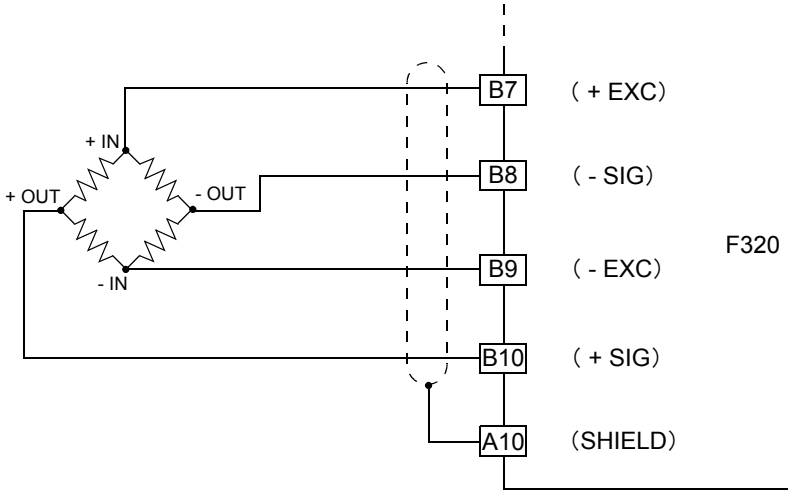
◇ Attaching a Ferrite Core

Wind the sensor cable around the attached ferrite core.

If necessary fix the binding band.

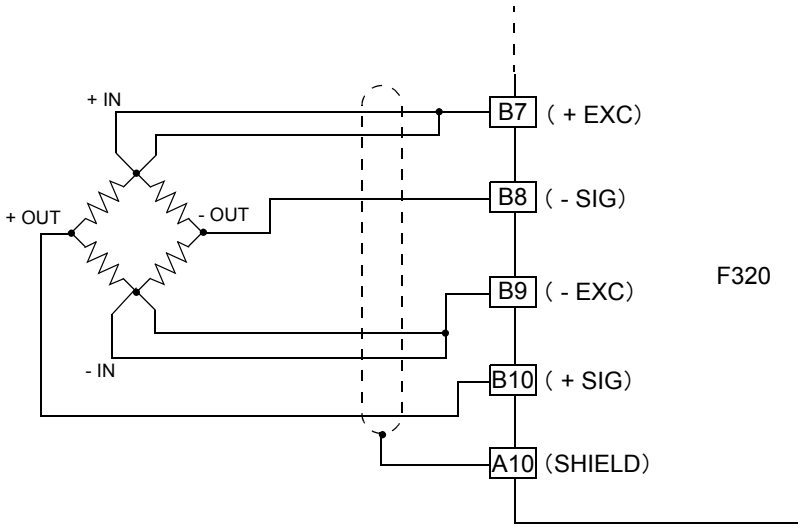


◇ 4-wire Strain Gauge Sensor



◇ 6-wire Strain Gauge Sensor

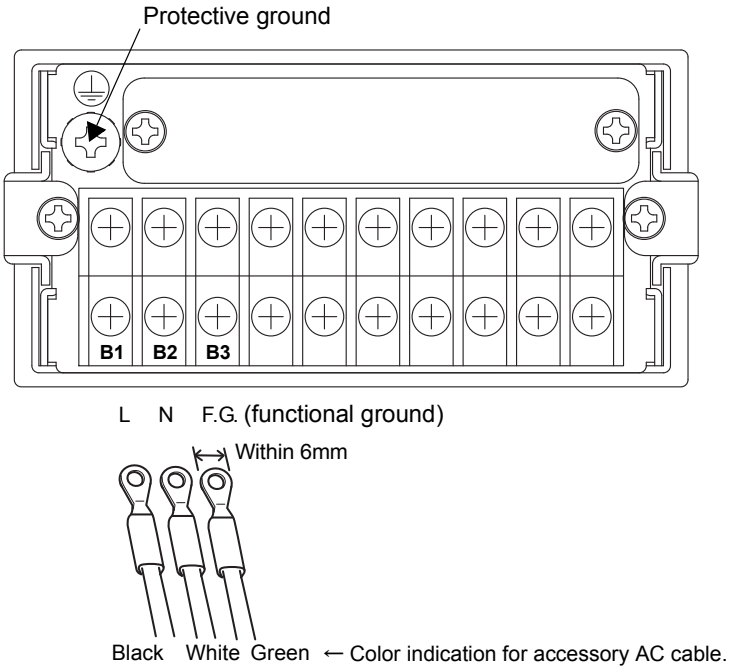
For connecting a 6-wire strain gauge sensor, short-circuit +EXC and +S, and –EXC and –S.



3-2. Connecting Power Input Terminal

3-2-1. AC Spec.

Connect the AC power cord. The input voltage is 100V to 240V AC.
The frequency is 50/60Hz.



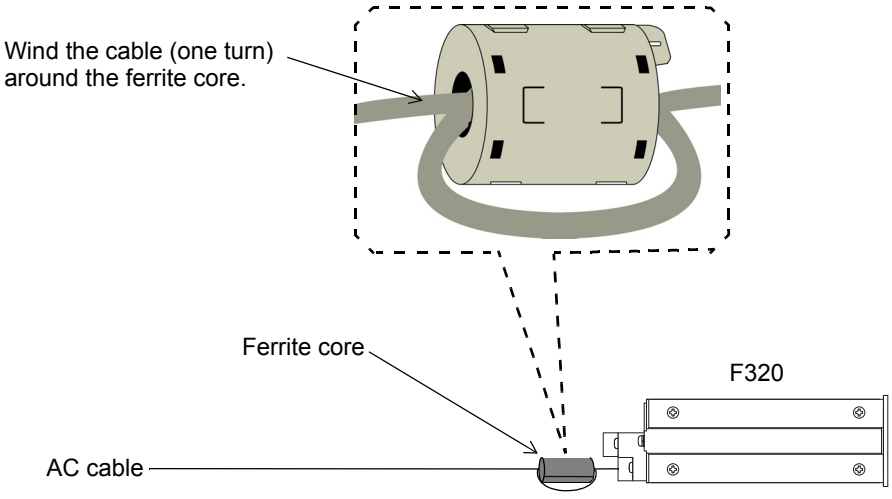
1. Make sure that no power is applied.
2. Remove the terminal board cover.
3. Remove the three screws at the lower left of the terminal board, align the crimp contacts with the screw holes, and then tighten the screws.
4. Mount the terminal board cover.

⚠ WARNING

- Connect with no power applied because it may cause an electric shock.
- The attached AC cable is designed for domestic use in Japan, and its rating is 125V AC, 7A. For use at voltages exceeding the rating and for overseas use, have a separate AC cable prepared.
- Since the F320 has no power switch, install a breaker.
- Be sure to ground the protective ground terminal to prevent electric shocks and failures by static electricity. (The frame and protective ground terminal are conducted.)
  Do not use other screws than that attached to the main body (M4×8 binding-head machine screw with a toothed washer).
- To take measures against lightning surge, install a lightning surge protector (optionally available).

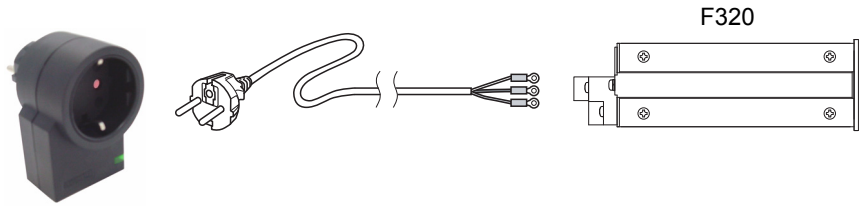
◇ Attaching a Ferrite Core

Wind the AC cable around the attached ferrite core.



◇ Connecting a Lightning Surge Protector

To take measures against lightning surge, install a lightning surge protector. EN61000-4-5 (lightning surge immunity) out of the EMC directives applies to the F320 body and lightning surge protector in combination.



Lightning surge protector
MAINTRAB MNT-1D

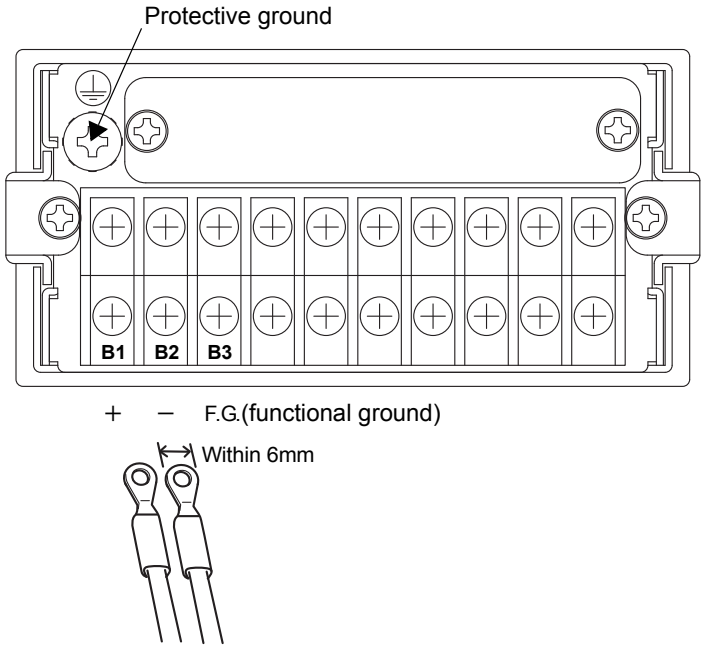
For connecting the lightning surge protector, a cable with an EU plug (optionally available) is required.

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

No lightning surge protector [MAINTRAB MNT-1D] is included as a standard. It is optionally available (TSU01) in combination with a 250V AC high-voltage cable in EU outlet form (See below: Standard product in Europe). For details, contact our sales department.

3-2-2. DC Spec. (Depending on the request at the time of order)

Connect the DC power cord. The input voltage is 12 to 24V (± 15%) DC.



1. Make sure that no power is applied.
2. Remove the terminal board cover.
3. Remove the two screws at the lower left of the terminal board.
   Connect the positive(+) side of the power source to the red screw side of the terminal block on the back of the F320, and its negative(-) side to the black screw side.
   Align the crimp contacts with the screw holes, and then tighten the screws.
4. Mount the terminal board cover.

The DC power code is not a standard accessory.

Request

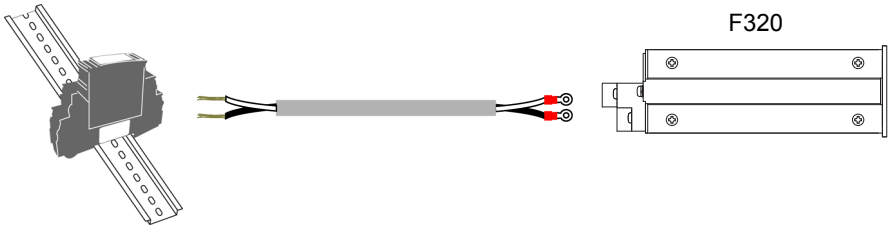
Use a source power (or battery) of 3A DC or more.

⚠ WARNING

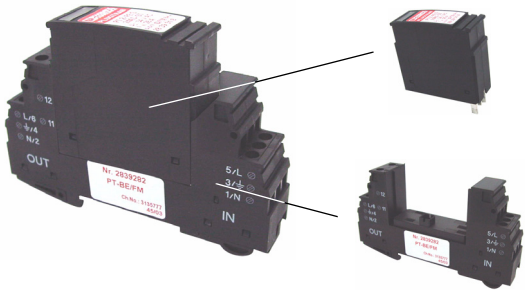
- Connect with no power applied because it may cause an electric shock.
- Be aware that the voltage drops depending on the wire thickness and length.
  Also, never input AC power source. Doing so will cause a failure.
- Since the F320 has no power switch, install a breaker.
- Be sure to ground the protective ground terminal to prevent electric shocks and failures by static electricity. (The frame and protective ground terminal are conducted.)
  Do not use other screws than that attached to the main body (M4×8 binding-head machine screw with a toothed washer).
- To take measures against lightning surge, install a lightning surge protector (optionally available).

◇ Connecting a Lightning Surge Protector

To take measures against lightning surge, install a lightning surge protector. EN61000-4-5 (lightning surge immunity) out of the EMC directives applies to the F320 body and lightning surge protector in combination.



Lightning surge protector

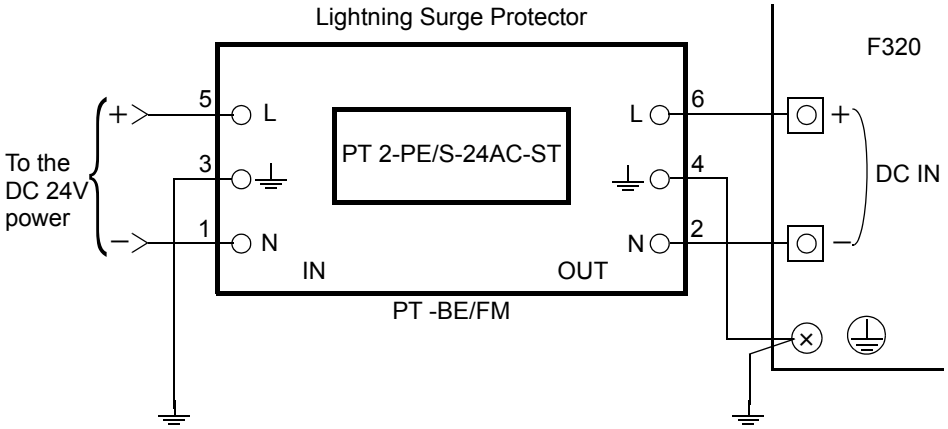


PT 2-PE/S-24AC-ST

PT-BE/FM
(DIN rail installation type)

* PT-BE/FM , PT 2-PE/S-24AC-ST is
a trademark of PHOENIX CONTACT.

[Connect]



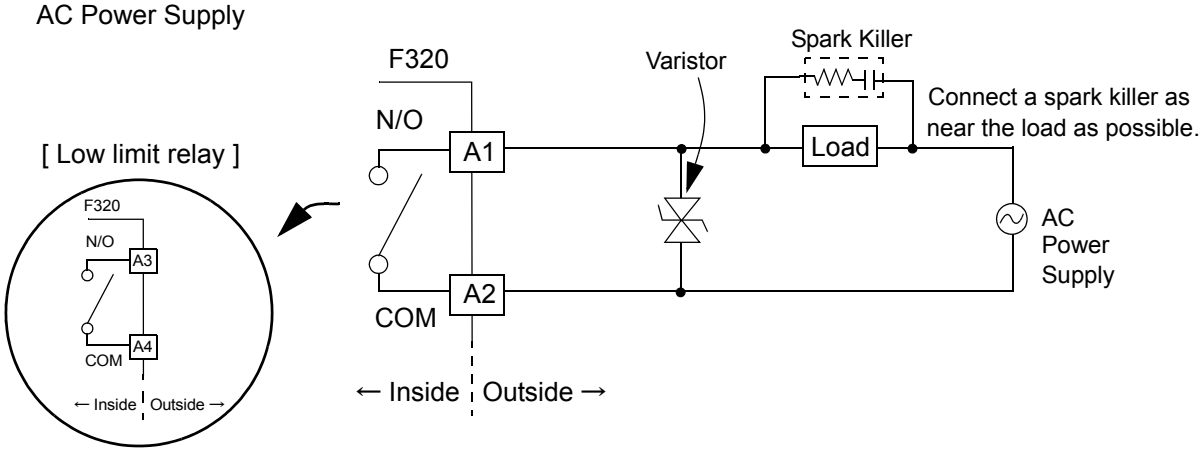
No lightning surge protector [PT-BE/FM, PT 2-PE/S-24AC-ST] is included as a standard. It is optionally available (TSU03). For details, contact our sales department.

3-3. Connecting High / Low Limit Relays

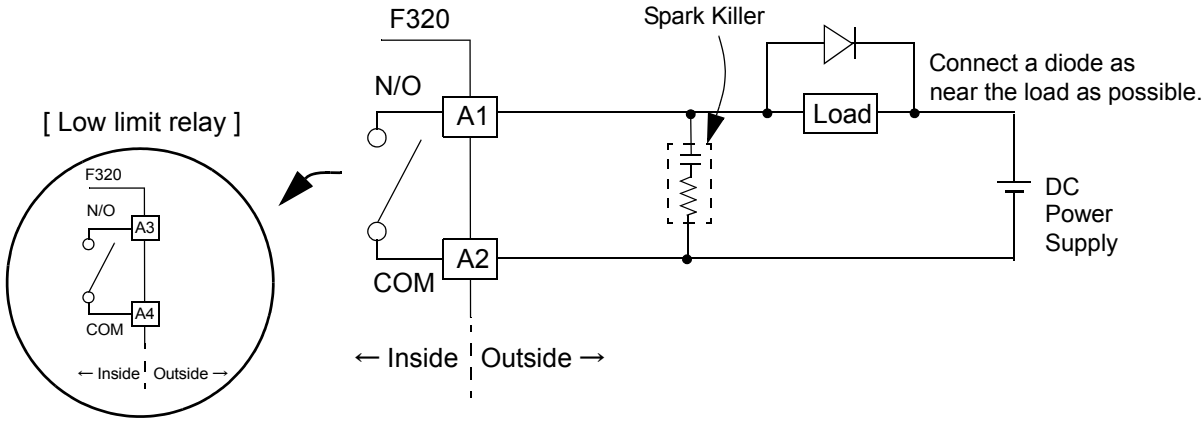
• Connecting External Load

[High limit relay]

AC Power Supply



DC Power Supply



⚠ CAUTION

Use within the rating (250V AC 0.5A).

Overvoltage and overcurrent may cause breakdown of the relay as well as shortening its life.

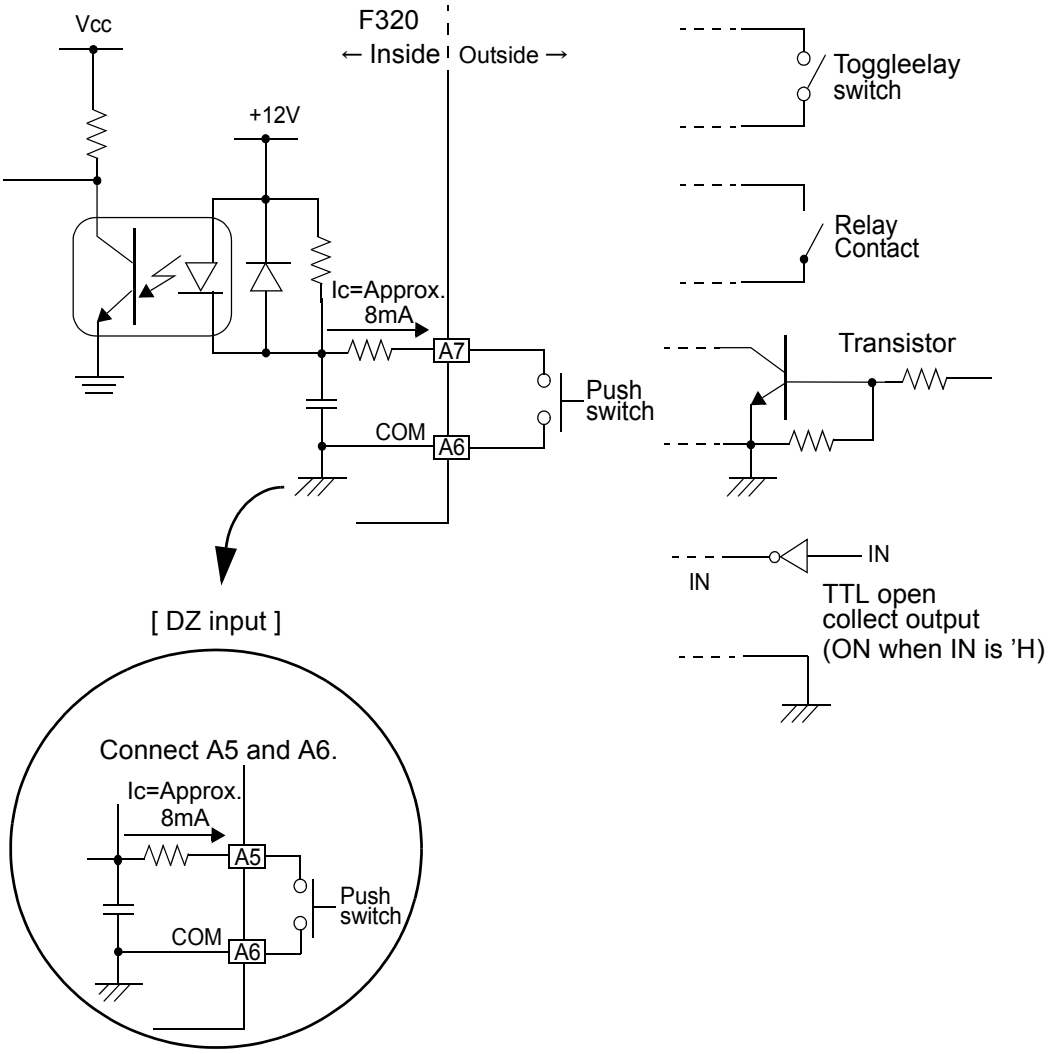
It is recommended to connect a spark killer etc. to the connected load according to AC/DC (refer to the connection examples). With a noise killer, you can make the life of the relay longer as well as making it resistible against noise.

Never short-circuit the load. Should you do it, the equipment will break down.

3-4. Connecting Hold and Digital Zero Signals

• Equivalent Circuit （Input）

[Hold input]

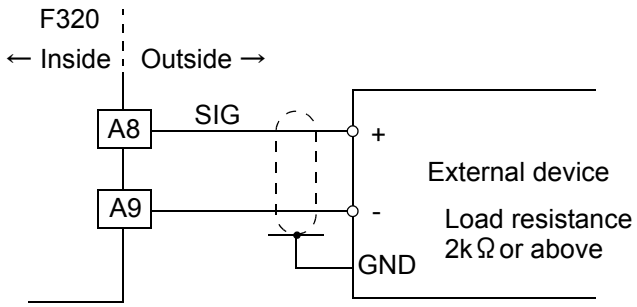


⚠ CAUTION

- Avoid applying external voltages to the signal
- Use external elements which withstands Ic=10mA
- Leakage current from external element must be 30 μ A or below

3-5. Connecting Analog monitor Output (VOL OUT)

Terminal for out put of a voltage proportional to the sensor input .
Output voltage is approx. 2V per 1mV/V(sensor input).

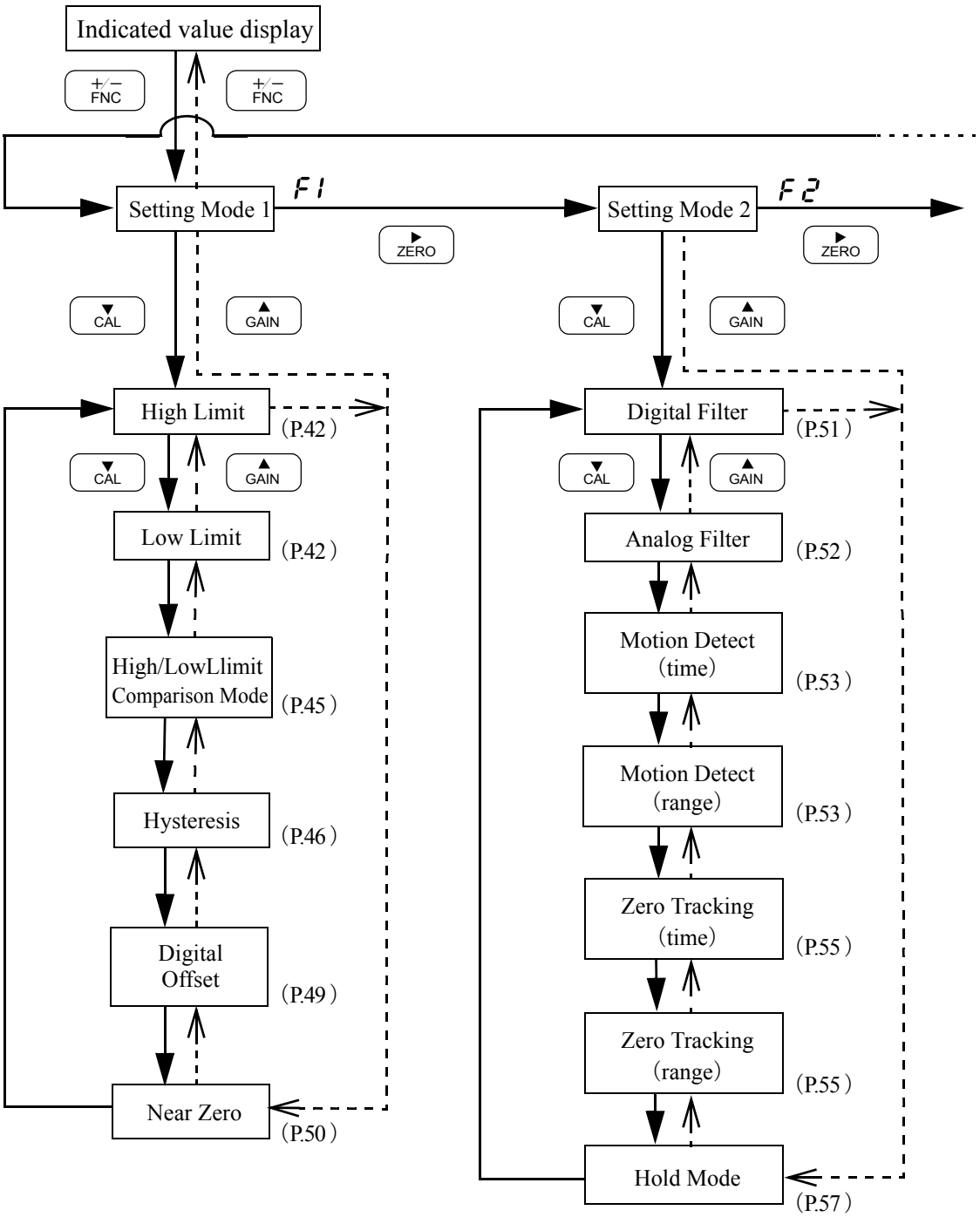


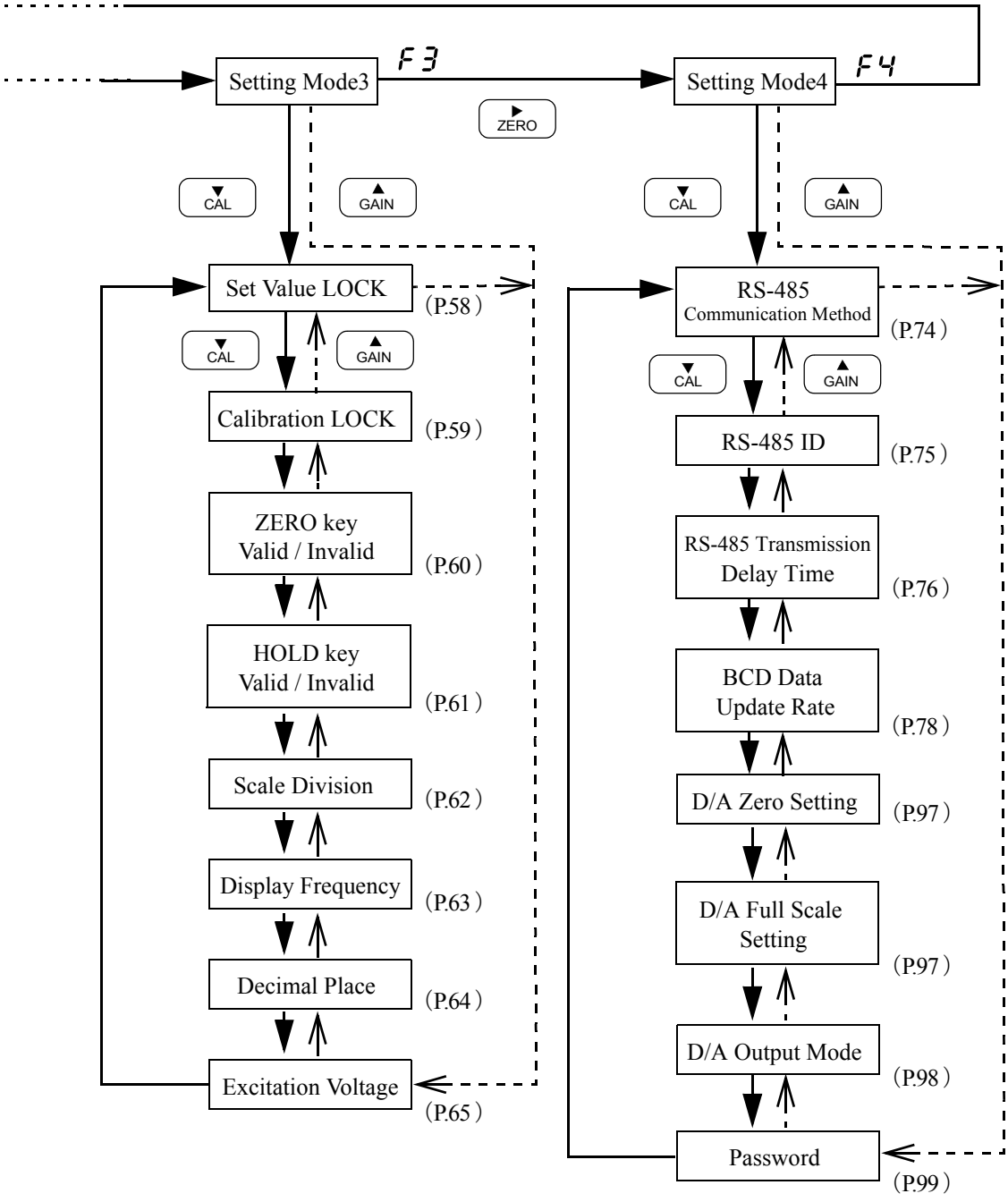
⚠ CAUTION

- Since the VOL OUT terminals are not insulated from internal circuits, use shielded cables for connection with an external device, and carry out wiring within 2 to 3m.
- Do not short-circuit them. Doing so will cause a failure.
- Do not apply external voltages. Breakage will result.

4. SETTING MODE CONFIGURATION

4-1. Selection of Setting Items

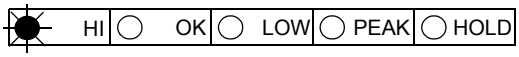



F3
Setting Mode3
ZERO
F4
Setting Mode4
CAL
GAIN
CAL
GAIN
Set Value LOCK
(P.58)
CAL
GAIN
Calibration LOCK
(P.59)
ZERO key
Valid / Invalid
(P.60)
HOLD key
Valid / Invalid
(P.61)
Scale Division
(P.62)
Display Frequency
(P.63)
Decimal Place
(P.64)
Excitation Voltage
(P.65)
RS-485
Communication Method
(P.74)
CAL
GAIN
RS-485 ID
(P.75)
RS-485 Transmission
Delay Time
(P.76)
BCD Data
Update Rate
(P.78)
D/A Zero Setting
(P.97)
D/A Full Scale
Setting
(P.97)
D/A Output Mode
(P.98)
Password
(P.99)

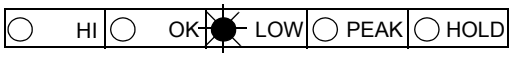
4-2. Display of Setting Items

• Mode1

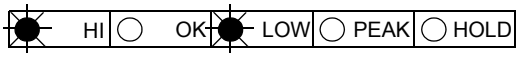
（1） High Limit



（2） Low Limit

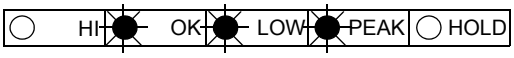


（3） High/Low Limit Comparison Mode

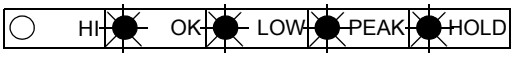


（4） Hysteresis

（5） Digital Offset

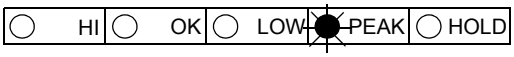


（6） Near Zero

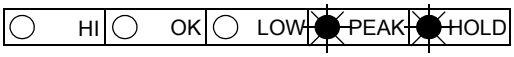


• Mode2

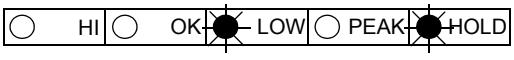
（1） Digital Filter



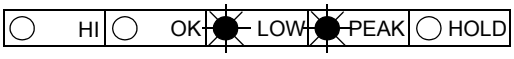
（2） Analog Filter



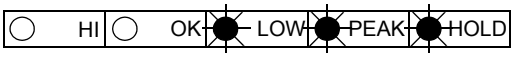
（3） Motion Detect（time）



（4） Motion Detect（range）

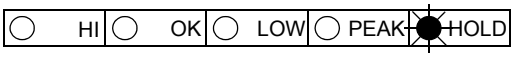


（5）Zero Tracking （time）



（6） Zero Tracking（range）

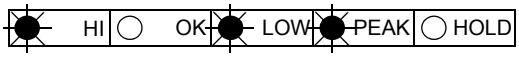
（7） Hold Mode



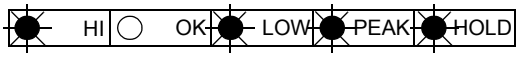
• Mode3

（1） Set Value LOCK

（2） Calibration LOCK



（3） ZERO key Valid / Invalid

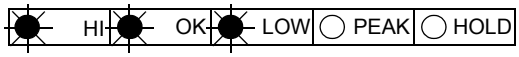


（4） HOLD key Valid / Invalid

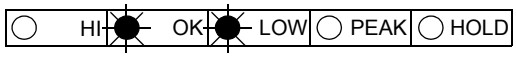
（5） Scale Division

（6） Display Frequency

（7） Decimal Place



（8） Excitation Voltage

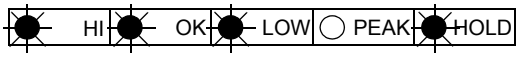


• Mode4

（1） RS-485 Communication Method

（2） RS-485 ID

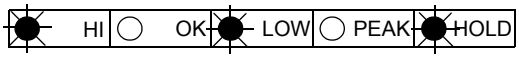
（3） RS-485 Transmission Delay Time



（4） BCD Data Update Rate

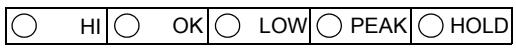
（5） D/A Zero Setting

（6） D/A Full Scale Setting



（7） D/A Output Mode

（8） Password



4-3. List of Values

Setting Mode1

	Item	Default	Setting range	Set Value LOCK	Calibration LOCK	Reference page
1	High Limit	075.00	-19999 to 19999 *	○		P.42
2	Low Limit	025.00	-19999 to 19999 *	○		P.42
3	High/Low Limit Comparison Mode	0	3 : Comparison is made at stable status except for near zero. 2 : Comparison is always made except for near zero 1 : Comparison is made in the stabl status. 0 : Comparison is always made.	○		P.45
4	Hysteresis	00.00	0000 to 9999 *	○		P.46
5	Digital Offset	000.00	-19999 to 19999 *	○		P.49
6	Near Zero	001.00	00000 to 19999 *	○		P.50

*Decimal point position synchronizes with the setting of decimal place of setting mode 3.

Setting Mode2

	Item	Default	Setting range	Set Value LOCK	Calibration LOCK	Reference page
1	Digital Filter	020	000 to 256	○		P.51
2	Analog Filter	3	5 : 1kHz 4 : 300Hz 3 : 100Hz 2 : 30Hz 1 : 10Hz 0 : 3Hz	○		P.52
3	Motion Detect（time）	1.5	0.0 to 9.9	○		P.53
4	Motion Detect（range）	05	00 to 99	○		P.53
5	Zero Tracking（time）	0.0	0.0 to 9.9	○		P.55
6	Zero Tracking（range）	00	00 to 99	○		P.55
7	Hold Mode	0	1 : Peak Hold 0 : Sample Hold	○		P.57

Setting Mode3

	Item	Default	Setting range	Set Value LOCK	Calibration LOCK	Reference page
1	Set Value LOCK	0	1 : ON 0 : OFF			P.58
2	Calibration LOCK	0	1 : ON 0 : OFF			P.59
3	ZERO key Valid / Invalid	0	1 : Invalid 0 : Valid			P.60
4	HOLD key Valid / Invalid	0	1 : Invalid 0 : Valid			P.61
5	Scale Division	0.01	001 to 100 *		○	P.62
6	Display Frequency	3	3 : 25/sec. 2 : 13/sec. 1 : 6/sec. 0 : 3/sec.		○	P.63
7	Decimal Place	2	3 : 88 . 888 2 : 888 . 88 1 : 8888 . 8 0 : 88888		○	P.64
8	Excitation Voltage	0	1 : 10V 0 : 2.5V		○	P.65

*Decimal point position synchronizes with the setting of decimal place.

Setting Mode4

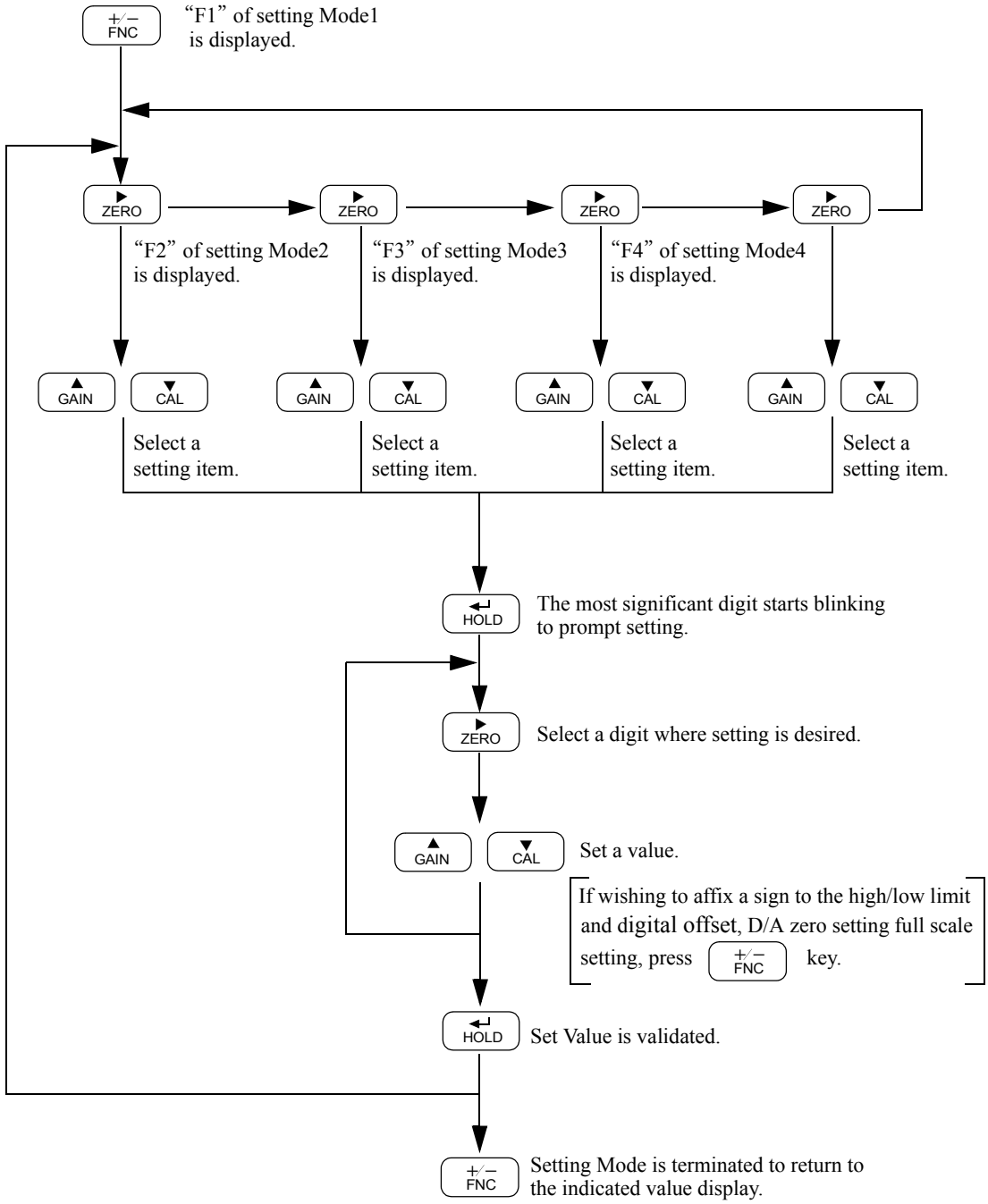
	Item		Default	Setting range	Set Value LOCK	Calibration LOCK	Reference page
1	RS-485 Commu-nication Method	Baud rate	4	5 : 38400bps 4 : 19200bps 3 : 9600bps 2 : 4800bps 1 : 2400bps 0 : 1200bps	○		P.74
		Character length	1	Fixed at 8 bits			
		Parity bit	2	2 : Even 1 : Odd 0 : None			
		Stop bit	0	Fixed at 1 bit			
2	RS-485 ID		01	01 to 32	○		P.75
3	RS-485 Transmission DeLay Time		00	00 to 99	○		P.76
4	BCD Data Update Rate		4	4 : 2000 times 3 : 1000 times 2 : 100 times 1 : 10 times 0 : 1 times	○		P.78
5	D/A Zero Setting		000.00	-19999 to 19999 *	○		P.97
6	D/A Full Scale Setting		100.00	-19999 to 19999 *	○		P.97
7	D/A Output Mode		0	3 : 20mA (10V) fixed output 2 : 4mA (0V) fixed output 1 : Linked with indicated value 0 : Not linked with indicated value	○		P.98
8	Password		0000	1239 : Initialization			P.99

*Decimal point position synchronizes with the setting of decimal place of setting mode 3.

Set values can be rewritten to factory-set values（default）.

For simple initialization, see “Password” on page 99 , and for simultaneous self-check and initialization, see “Initialization” on page 103 .

4-4. Setting Procedure



If one minute has elapsed after +/− FNC key is pressed without any key hit before HOLD key is pressed,the setting is canceled and the indicated value is displayed again. The set value is not stored in this case.

5. CALIBRATION

"Calibration" refers to an operation whereby matching between the F320 and a strain gauge sensor is obtained. The F320 uses the two calibration methods as described below.

◇ Equivalent Input Calibration

This approach uses no actual loads but key entry of the rated output value of the strain gauge sensor (mV/V) and the rating value (value to be displayed).
This method is simple and employed when actual loads cannot be applied.
For example
Gain will be automatically decided by registering the values indicated as follows:

for load: 2.001mV/V - 100.0kgf
for pressure: 2.002mV/V - 10.00kgf/cm2, and
for torque: 2.502mV/V - 15.00kgf•m.

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

Capacity ..... Load (unit: Kg, t, etc.)
Rated Output..... Voltage (unit: mV/V)
Non-Linearity, Hysterisis,
Input Resistance, Output Resistance,
Zero Balance, etc.

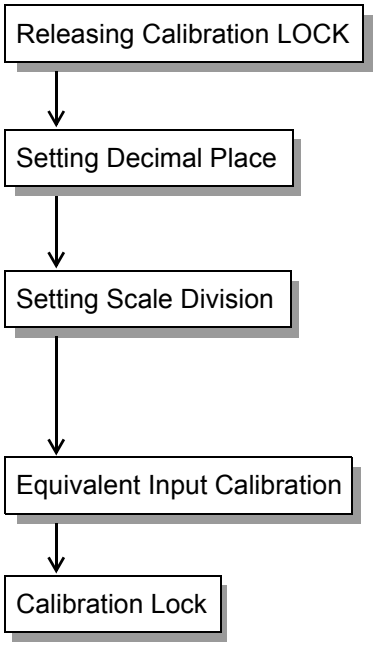
The Capacity and the Rated Output are necessary values for the equivalent input calibration. Input these two values to F320.

◇ 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.

5-1. Equivalent Input Calibration Procedure

The equivalent input calibration uses the following procedure :



Release the Calibration LOCK that inhibits calibration.

Set the decimal place.
（omissible if no desired value is present）

Set the minimum value of the digital change desired
（omissible if no desired value is present）

Set the rated output vale and zero point of the strain gauge sensor.

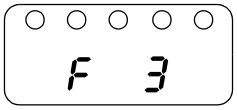
Set the calibration of ON to prevent misoperation.

• Releasing Calibration LOCK

Releasing Calibration LOCK

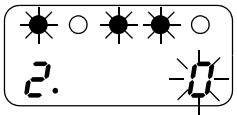
1) Select setting mode 3.

+/− FNC ⇨ ▶ ZERO ⇨ ▶ ZERO



2) Select calibration lock.

▼ CAL
↵ HOLD
Press twice.



Calibration LOCK
1 : ON
0 : OFF

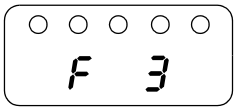
Use ▲ GAIN and ▼ CAL key to set the calibration lock of OFF (0). then use ↵ HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

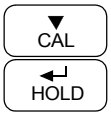
- **Setting of Decimal Place （Omissible if no change is needed）**

Setting of Decimal Place

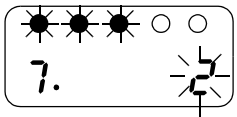
1) Select setting mode 3.



2) Select decimal place.



Press
seven times.



Decimal Place

3 : 88 . 888
2 : 888 . 88
1 : 8888 . 8
0 : 88888

Use GAIN and CAL keys to set the decimal place,

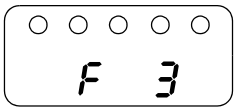
then use HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

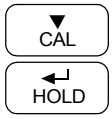
• Setting of Scale Division （Omissible if no change is needed）

Setting of Scale Division

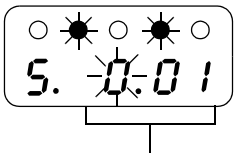
1) Select setting mode 3.



2) Select scale division.



Press five times.

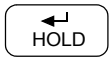


Scale Division（001 to 100）

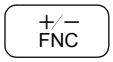
Use 

and 

key to set the scale division,

then use 

key to validate the setting.

To return to the indicated value display, press 

key.

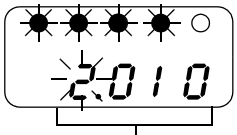
• Equivalent Input Calibration

Equivalent Input Calibration

1) Start the equivalent input calibration.

CAL ⇨ HOLD

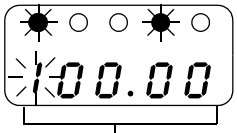
Example of a sensor having the output value of 2.010mV/V for rated 100.00kgf(N)



Rated Output Value(0.500 to 3.000mV/V)

2) Set the rated output value of the sensor.

Use GAIN CAL and ZERO keys to set the rated output value,



Rated Value(00000 to 19999)

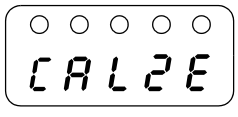
then use HOLD key to validata the setting.

3) Set the rated value.

Use GAIN CAL and ZERO keys to set the rated output value,

then use HOLD key to validata the setting.

4) Place the sensor without load and set the zero point. Check that the sensor is unloaded,then press ZERO and HOLD keys in this order.

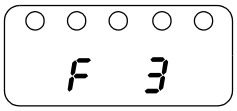


If the indicated value following the display CALZE is zero, the equivalent input calibration is terminated.

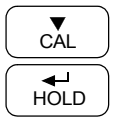
• Calibration LOCK

CalibrationLOCK

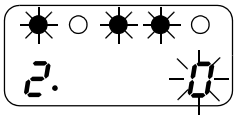
1) Select setting mode 3.



2) Select calibration lock.



Press twice.



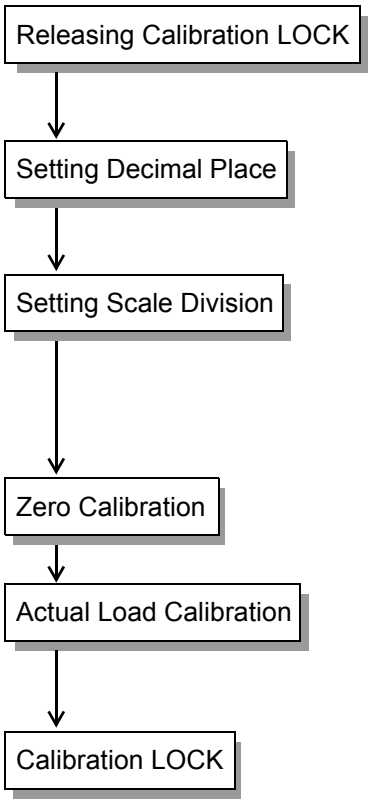
Calibration LOCK
1 : ON
0 : OFF

Use GAIN and CAL key to set the calibration lock of ON（1）. then use HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

5-2. Actual Load Calibration

The actual load calibration uses the following procedure



Release the calibration LOCK that inhibits calibration.

Set the decimal place.
（omissible if no desired value is present）

Set the minimum value of the digital change desired.
（omissible if no desired value is present.）

Set the zero point of the strain gauge sensor.

Set the span(gain) point of the strain gage sensor.

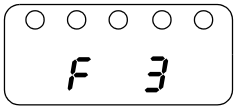
Set the calibration of ON to prevent misoperation.

• Releasing Calibration LOCK

Releasing Calibration LOCK

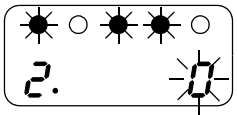
1) Select setting mode 3.

[+/− FNC] ⇨ [▶ ZERO] ⇨ [▶ ZERO]



2) Select calibration lock.

[▼ CAL] [↵ HOLD] Press twice.



Calibration LOCK
1 : ON
0 : OFF

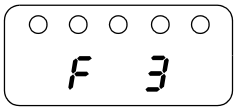
Use [▲ GAIN] and [▼ CAL] key to set the calibration lock of OFF (0). then use [↵ HOLD] key to validate the setting.

To return to the indicated value display, press [+/− FNC] key.

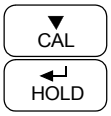
- **Setting of Decimal Place （Omissible if no change is needed）**

Setting of Decimal Place

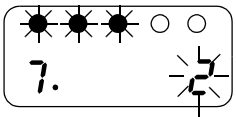
1) Select setting mode 3.



2) Select decimal place.



Press
seven times.



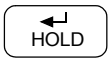
Decimal Place

3 : 88 . 888
2 : 888 . 88
1 : 8888 . 8
0 : 88888

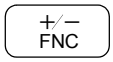
Use 

and 

keys to set the decimal place,

then use 

key to validate the setting.

To return to the indicated value display, press 

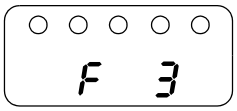
key.

• Setting of Scale Division （Omissible if no change is needed）

Setting of Scale Division

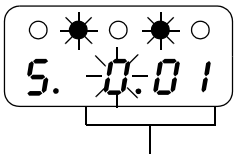
1) Select setting mode 3.

[+/− FNC] ⇨ [▶ ZERO] ⇨ [▶ ZERO]



2) Select scale division.

[▼ CAL] [↵ HOLD] Press five times.



Scale Division（001 to 100）

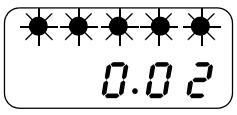
Use [▲ GAIN] [▼ CAL] and [▶ ZERO] key to set the scale division, then use [↵ HOLD] key to validate the setting.

To return to the indicated value display, press [+/− FNC] key.

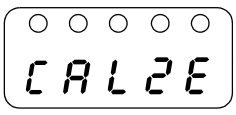
• Zero Calibration

Zero Calibration

1) Check that the sensor is unloaded, then press [▶ ZERO] key.



2) Press [↵ HOLD] key.

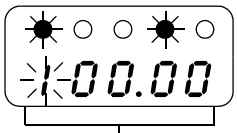


If the indicated value following the display CALZE is zero, the zero calibration is terminated.

• Actual Load Calibration

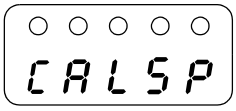
Actual Load Calibration

1) Apply an actual load to the sensor and set the actual load value.



Indicated Value of
Actual Load Value

Use GAIN CAL and ZERO keys to set the actual load value, then HOLD key to validate the setting.



If the indicated value following the display CALSP is Actual Load, the Actual Load calibration is terminated.

If a calibration error display appears, take a proper action according to the error, then perform calibration again.

cErr6 ···Output of the strain gauge sensor does not reach the span adjustment range.
Confirm whether an actual load is put on the strain gauge sensor. Calibration may not be performed without load

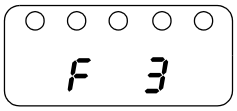
cErr7 ···Output of the strain gauge sensor is on the minus side.
Check to see if the +SIG and -SIG wiring if the sensor is reversed.

On completion of calibration, turn on the calibration LOCK.

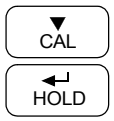
• Calibration LOCK

CalibrationLOCK

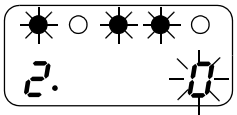
1) Select setting mode 3.



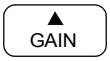
2) Select calibration lock.



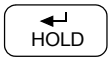
Press twice.



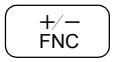
Calibration LOCK
1 : ON
0 : OFF

Use 

and 

key to set the calibration lock of ON（1）. then use 

key to validate the setting.

To return to the indicated value display, press 

key.

6. SETTING OF FUNCTIONS

6-1. High /Low Limit Value

High / Low limit value are functions whereby the high output is turned on when the indicated value exceeds the high / low output is turned on when it drops below the low limit.

〈HIGH/LOW output conditions〉

• HI

ON: Indicated value > High limit value

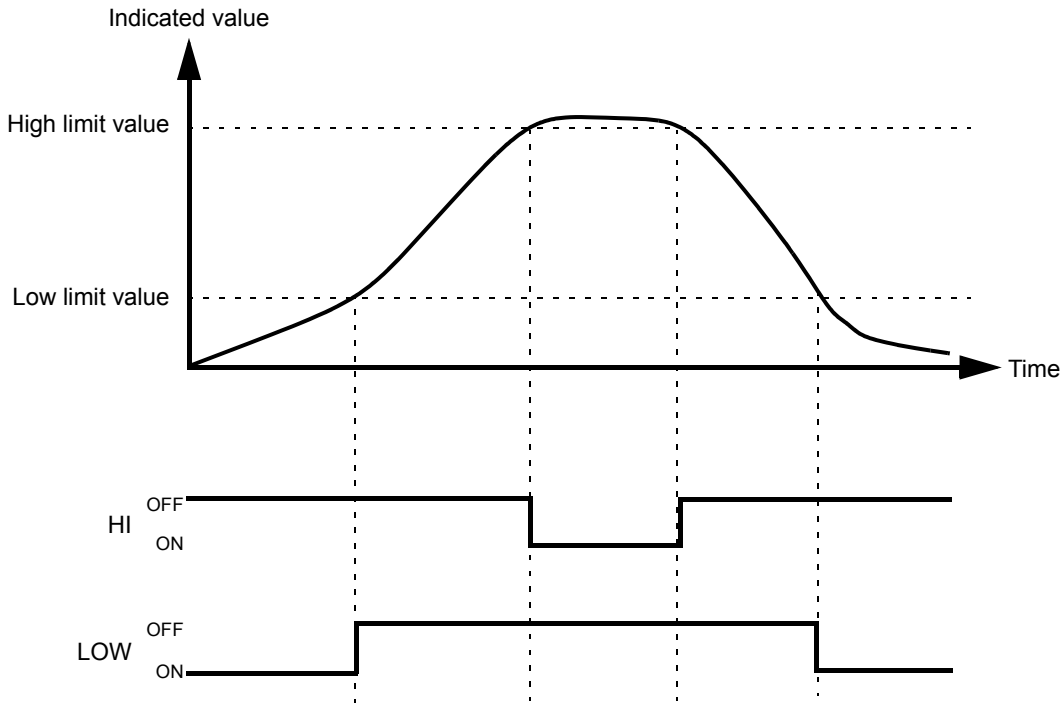
OFF: Indicated value <= High limit value

• LOW

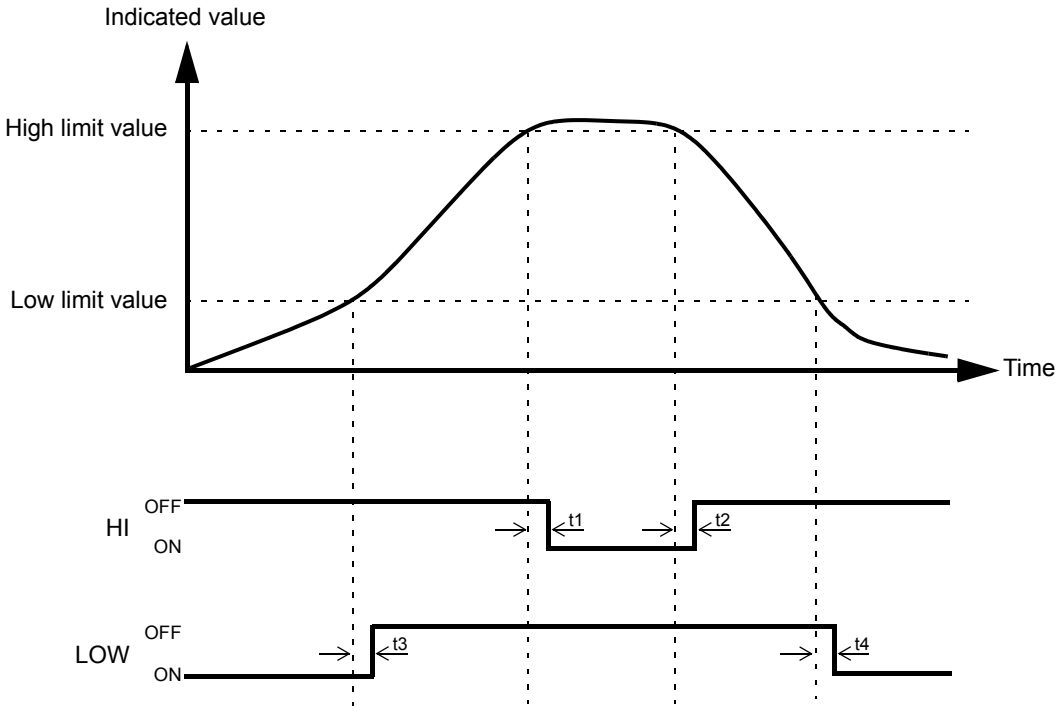
ON: Indicated value < Low limit value

OFF: Indicated value >= Low limit value

• **High/Low Limit Output Operation**



• Timing Chart



t1 to t4: MAX 15mS (relay operating time: MAX 10mS)

t1 : Time from when the indicated value exceeds the high limit set value to when the relay turns ON

t2 : Time from when the indicated value becomes the high limit set value or less to when the relay turns OFF

t3 : Time from when the indicated value becomes the low limit set value or more to when the relay turns OFF

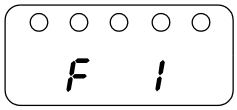
t4 : Time from when the indicated value falls below the low limit set value to when the relay turns ON

- To prevent the relay from chattering, hysteresis can be set.
  For details, see “Hysteresis” on page 46 .
- For the connection of the high/low limit relay output terminals, see “Connecting High/Low Limit Relays” on page 18 .

Setting of High/Low Limit Value

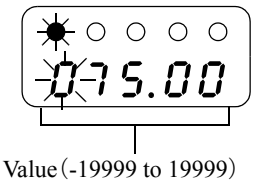
1) Select setting mode 1.

[+/− FNC]



2) Select high limit value.

[▼ CAL]
[↵ HOLD]



High Limit Value (-19999 to 19999)

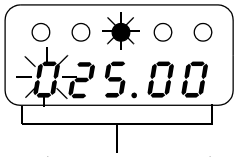
Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the high limit value.

Press [+/− FNC] key to place a minus sign.

Press [↵ HOLD] key to validate the setting.

3) Select low limit value.

[▼ CAL]
[↵ HOLD]



Low Limit Value (-19999 to 19999)

Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the low limit value.

Press [+/− FNC] key to place a minus sign.

Press [↵ HOLD] key to validate the setting

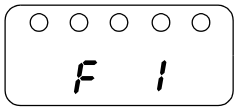
To return to the indicated value display, press [+/− FNC] key.

6-2. High / Low Limit Comparison Mode

Setting of High / Low Limit Comparison Mode

1) Select setting mode 1.

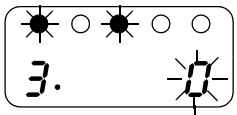
+/− FNC



2) Select high / low limit comparison mode.

▼ CAL Press three times.

↵ HOLD



High / Low Limit Comparison Mode

- 3 : Comparison is made at stable status except for near zero.
- 2 : Comparison is always made except for near zero
- 1 : Comparison is made in the stabl status.
- 0 : Comparison is always made.

Use ▲ GAIN and ▼ CAL keys to set the high / low Limit Comparison Mode,

then use ↵ HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

Except for Mode 0 （Comparison is always made）of the High / Low Limit Comparison Mode, setting is closely related to Near Zero and Motion Detect functions. For details, see Near Zero on page 50 and Motion Detect on page 53 .

6-3. Hysteresis

The Hysteresis function provides a range of high/low limit comparison off. Usually the high limit comparison is turned on when the indicated value is above the high limit value and turned off when below. If you set a hysteresis range, the comparison is turned off when the indicated value is below the high limit value by the hysteresis setting. This is effective in preventing chattering caused when signals are slightly varying （vibrating）.

〈Comparison conditions〉

• High limit

ON conditions : Indicated value > High limit value

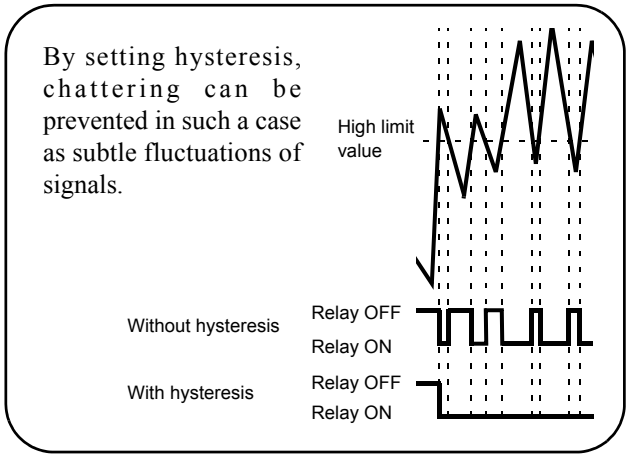
OFF conditions : Indicated value <=（High limit value - Hysteresis set value）

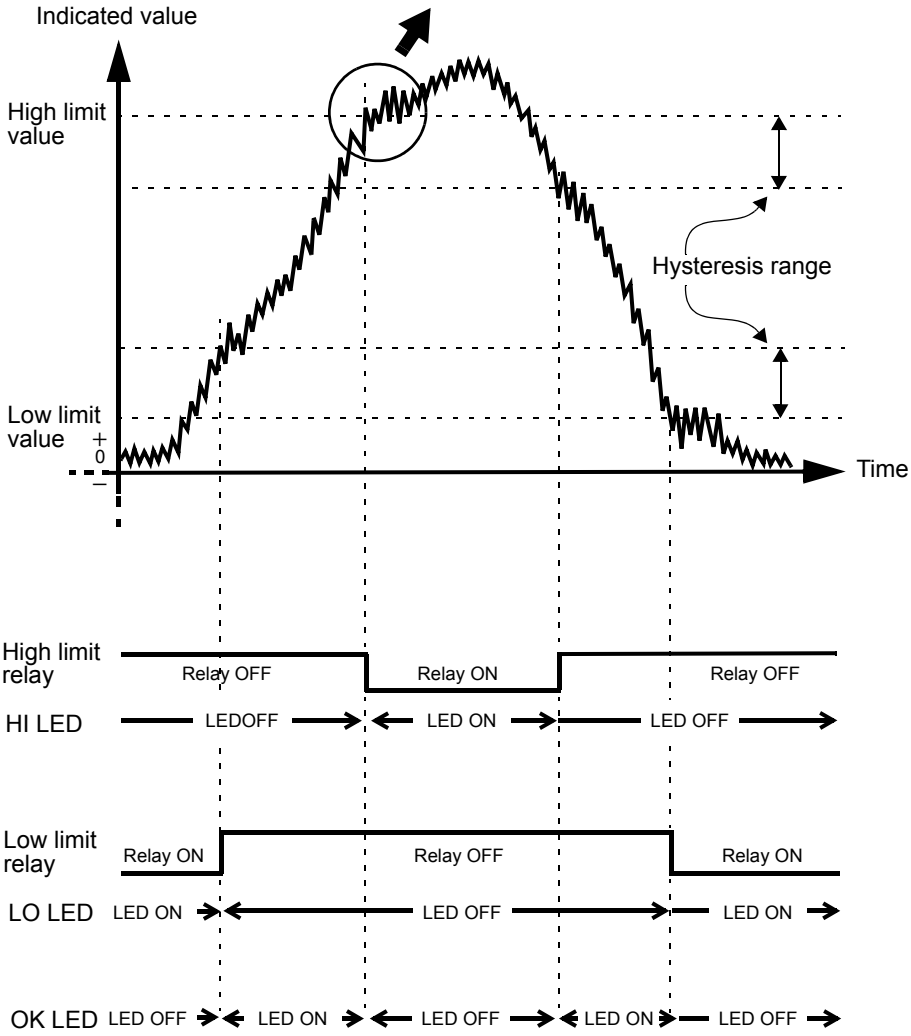
• Low limit

ON conditions : Indicated value < Low limit value

OFF conditions : Indicated value >=（Low limit value + Hysteresis set value）

• Hysteresis Operation

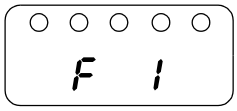




Setting of Hysteresis

1) Select setting mode 1.

+/− FNC

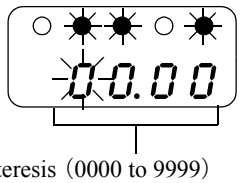


2) Select hysteresis.

▼ CAL

↵ HOLD

Press four times.



Hysteresis（0000 to 9999）

Use ▲ GAIN ▼ CAL and ▶ ZERO keys to set the hysteresis range, then use ↵ HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

Hysteresis setting is the same for high / low limit.

6-4. Digital Offset

This function subtracts a set value from the indicated value. If you make digital offset , the value which is obtained by subtracting the set value from the indicated value will be displayed. This is convenient when you cannot obtain zero by unloading the equipment for some reason or when you want to give offset.

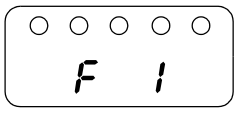
(Indicated value to be displayed)

= (Actual indicated value) - (Digital offset setting value)

Setting of Digital Offset

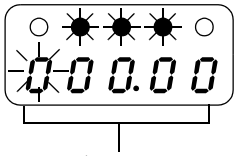
1) Select setting mode 1.

[+/− FNC]



2) Select digital offset.

[▼ CAL] [↵ HOLD] Press five times.



Digital Offset (-19999 to 19999)

Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the digital offset setting value.

Press [+/− FNC] key to place a minus sign.

then use [↵ HOLD] key to validate the setting.

To return to the indicated value display, press [+/− FNC] key.

6-5. Near Zero

The Near Zero function detects that the indicated value is near zero.

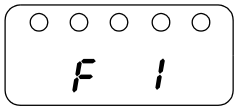
Near Zero ON/OFF is closely related to High and Low Limit Comparison Mode.

For details, see High and Low Limit Comparison Mode on page 45 .

Setting of Near Zero

1) Select setting mode 1.

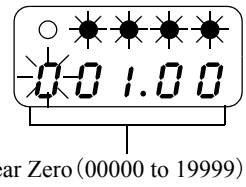
[+/− FNC]



2) Select near zero.

[▼ CAL] Press six times.

[↵ HOLD]



Near Zero (00000 to 19999)

Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the near zero.

then use [↵ HOLD] key to validate the setting.

To return to the indicated value display, press [+/− FNC] key.

The Near Zero function operates at an absolute value.

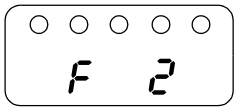
6-6. Digital Filter

This function minimizes instability of the weight value by calculating the average frequency of the data converted from analog to digital. The frequency of the moving average selected from OFF(0 or 1) to 256 times. A higher frequency will make a more stable display with slower response.
A lower frequency will have quicker response but more unstable display.

Setting of Digital Filter

1) Select setting mode 2.

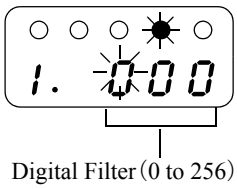
+/− FNC ⇨ ▶ ZERO



2) Select digital filter.

▼ CAL

↵ HOLD



Digital Filter (0 to 256)

Use ▲ GAIN ▼ CAL and ▶ ZERO keys to set the digtal filter,

then use ↵ HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

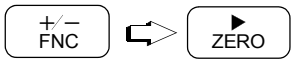
6-7. Analog Filter

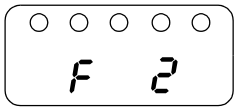
This is a lowpass filter filtering the strain gage sensors input signal and cutout the noise element.

Lowpass filter cutout freguency is selectable in the 3/10/30/100/300/1k Hz.

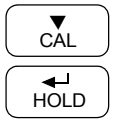
Setting of Analog Filter

1) Select setting mode 2.

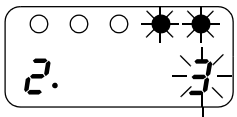




2) Select analog filter.



Press twice.



Analog Filter

5 : 1kHz
4 : 300Hz
3 : 100Hz
2 : 30Hz
1 : 10Hz
0 : 3Hz

Use GAIN and CAL keys to set the analog filter,

then use HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

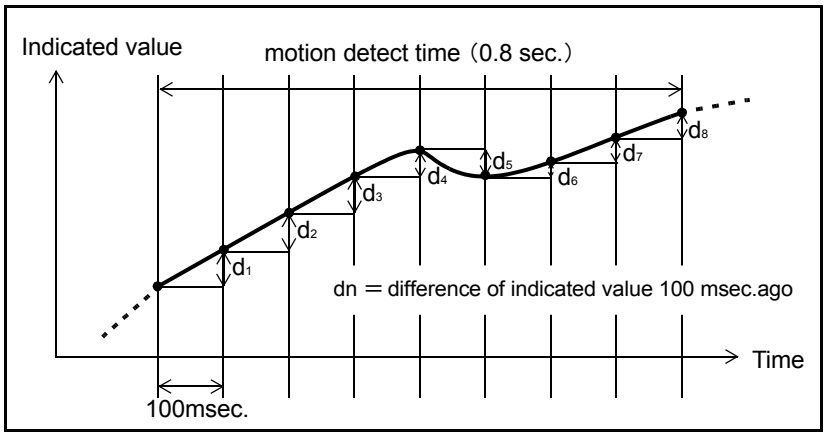
6-8. Motion Detect

Setting of parameters for detecting stable measurement is required.
If the difference between the current indicated value and that of 100msec before fall within the specified range and the status last for a specified time, indicated values are assumed stable.
When stability is detected, the digital filter to restrain the unsteadiness of the weight value (fixed at 128 times) is automatically inserted. This stable-time digital filter differs from the digital filter setting in the operation mode.

Setting example

motion detect（time） 0.8 sec.

motion detect（range） 10



When dn < specified range(10 division) is consecutive and specified time(0.8sec.) or more continues（d_1<10 and d_2<10 and • • • and d_8<10）, indicated values are assumed stable.

Whether the indicated value is stable or not is closely related to High and Low Limit Comparison Mode. For details, see High and Low Limit Comparison Mode on page 45 .

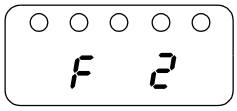
⚠ CAUTION

When the motion detect time is 0.0 sec. and the motion detect range is 00 division, the stable-time digital filter is always off.

Setting of Motion Detect

1) Select setting mode 2.

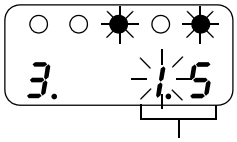
[+/− FNC] ⇨ [▶ ZERO]



2) Select motion detect（time）.

[▼ CAL] Press three times.

[↵ HOLD]



Motion Detect (time)
（0.0 to 9.9 sec.）

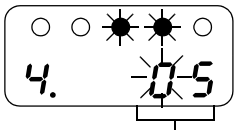
Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the motion detect（time）

then use [↵ HOLD] key to validate the setting.

3) Select motion detect（range）.

[▼ CAL]

[↵ HOLD]



Motion Detect（range）
（00 to 99）

Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the motion detect（range）

then use [↵ HOLD] key to validate the setting.

To return to the indicated value display, press [+/− FNC] key.

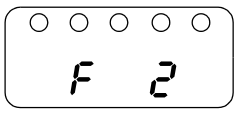
6-9. Zero Tracking

The Zero Tracking function automatically tracks and compensates a fine shift of the zero point due to a factor such as a drift.

Setting of Zero Tracking

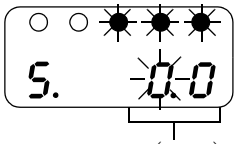
1) Select setting mode 2.

[+/− FNC] ⇨ [▶ ZERO]



2) Select zero tracking （Time）.

[▼ CAL] Press five times.
[↵ HOLD]

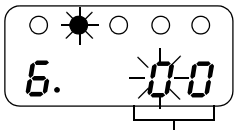


Zero Tracking（Time）
（0.0 to 9.9 sec.）

Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the zero tracking （time）, then use [↵ HOLD] key to validate the setting.

3) Select zero tracking （range）.

[▼ CAL]
[↵ HOLD]

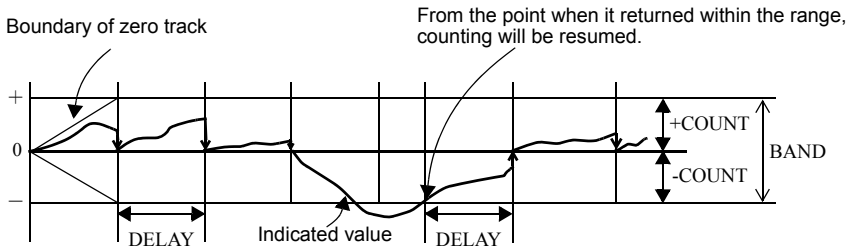


Zero Tracking（range）
（00 to 99）

Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the zero tracking （range）, then use [↵ HOLD] key to validate the setting.

To return to the indicated value display, press [+/− FNC] key.

- When displacement of the zero point is within the set count of tracking and it continues more than the set time, it is automatically made zero by Zero Tracking function.
- 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.



Band=count × 2

⚠ CAUTION

Since the zero tracking function works from where the indicated value is at the calibrated zero point, it does not work if the indicated value already exceeds the tracking band. In this case, retake the zero point by zero calibration.

The zero tracking function does not work if the calibration LOCK is OFF.
It works only when the calibration LOCK is ON.
Also, the zero tracking function is reset when the power is turned off.

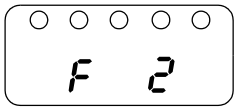
6-10. Hold Mode

The F320 provides the Peak Hold function to hold and display the peak value (maximum value) of the input signal, and the Sample Hold function to hold and display an optional point.

Setting of Hold Mode

1) Select setting mode 2.

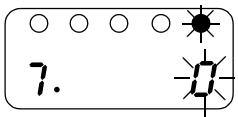
[+/− FNC] ⇨ [▶ ZERO]



2) Select hold mode.

[▼ CAL] Press seven times.

[↵ HOLD]



Hold Mode

1 : Peak Hold
0 : Sample Hold

Use [▲ GAIN] and [▼ CAL] keys to set the hold mode,

then use [↵ HOLD] key to validate the setting.

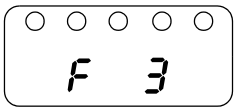
To return to the indicated value display, press [+/− FNC] key.

6-11. Set Value LOCK

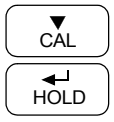
This function inhibits changes to setting to prevent set values from being changed by misoperation.

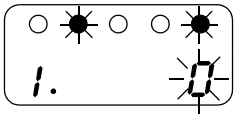
Set value LOCK

1) Select setting mode 3.



2) Select set value LOCK.





Set Value LOCK
1 : ON
0 : OFF

Use GAIN and CAL key to set the set value lock of ON（1）.

then use HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

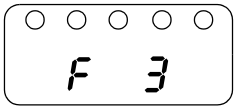
For the setting items protected by the set value LOCK, see the “List of Values” on ppage 25 .

6-12. Calibration LOCK

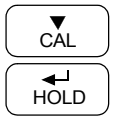
The Setting value LOCK function inhibits changes to setting to prevent changes to set values or calibrated values through misoperation.

CalibrationLOCK

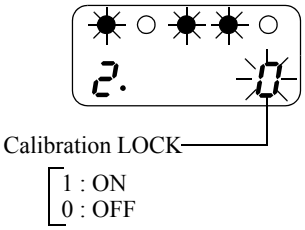
1) Select setting mode 3.



2) Select calibration lock.



Press twice.



Use GAIN and CAL key to set the calibration lock of ON (1).

then use HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

For setting items locked by using calibration LOCK , see the set value list on page 25 .

The Digital Zero function by using the ZERO key on the front panel is not effective when the calibration LOCK is released（nor is it effective from the rear panel DZ）.

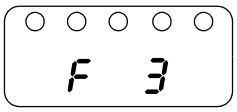
On completion of calibration set the calibration LOCK.

6-13. ZERO Key Valid / Invalid

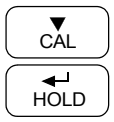
This function validates/invalidates the operation of the ZERO key.

ZERO Key Valid / Invalid

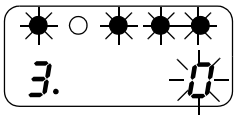
1) Select setting mode 3.



2) Select zero key valid / invalid.



Press three times.



Zero Key Operation

1 : Invalid
0 : Valid

Use GAIN and CAL keys to set the zero key valid / invalid, then use HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

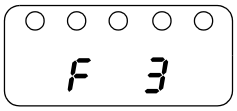
6-14. HOLD Key Valid / Invalid

This function validates/invalidates the operation of the HOLD key.

HOLD Key Valid / Invalid

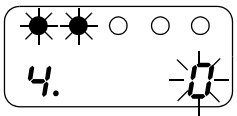
1) Select setting mode 3.

+/− FNC ⇨ ▶ ZERO ⇨ ▶ ZERO



2) Select hold key valid / invalid

▼ CAL
↵ HOLD
Press four times.



Hold Key Operation
1 : Invalid
0 : Valid

Use ▲ GAIN and ▼ CAL keys to set the hold key valid / invalid, then use ↵ HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

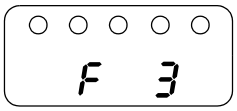
6-15. Scale Division

This function sets the minimum value of the digital change.

Setting of Scale Division

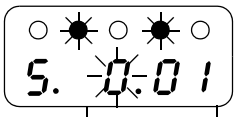
1) Select setting mode 3.

+/− FNC ⇨ ▶ ZERO ⇨ ▶ ZERO



2) Select scale division.

▼ CAL
↵ HOLD
Press five times.



Scale Division (001 to 100)

Use ▲ GAIN ▼ CAL and ▶ ZERO key to set the scale division,

then use ↵ HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

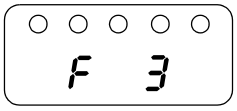
6-16. Display Frequency

The Display frequency function is used to select the times the indicated values are displayed per second. A/D conversion count is fixed to 2000 per second.

Setting of Display Frequency

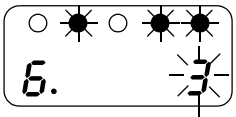
1) Select setting mode 3.

+/− FNC ⇨ ▶ ZERO ⇨ ▶ ZERO



2) Select display frequency.

▼ CAL
↵ HOLD
Press six times.



Display Frequency

3 : 25times/sec.
2 : 13times/sec.
1 : 6times/sec.
0 : 3times/sec.

Use ▲ GAIN ▼ CAL and ▶ ZERO key to set the display frequency, then use ↵ HOLD key to validate the setting.

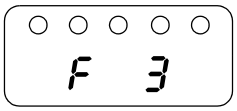
To return to the indicated value display, press +/− FNC key.

6-17. Decimal Place

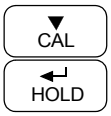
This function sets the Position of decimal point.

Setting of Decimal Place

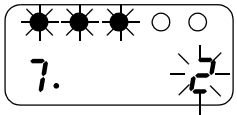
1) Select setting mode 3.



2) Select decimal place.

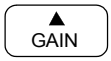


Press
seven times.



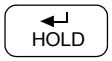
Decimal Place

3 : 88 . 888
2 : 888 . 88
1 : 8888 . 8
0 : 88888

Use 

and 

keys to set the decimal place,

and then use 

key to validate the setting.

To return to the indicated value display, press 

key.

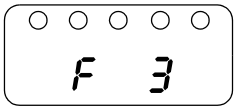
6-18. Excitation Voltage

This function selects the bridge excitation voltage to be supplied to the strain gauge sensor.

Setting Excitation Voltage

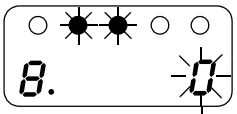
1) Select setting mode 3.

+/− FNC ⇨ ▶ ZERO ⇨ ▶ ZERO



2) Select excitation voltage.

▼ CAL
↵ HOLD
Press eight times.



Excitation Voltage
1 : 10 V
0 : 2.5V

Use ▲ GAIN and ▼ CAL keys to set the excitation voltage, then use ↵ HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

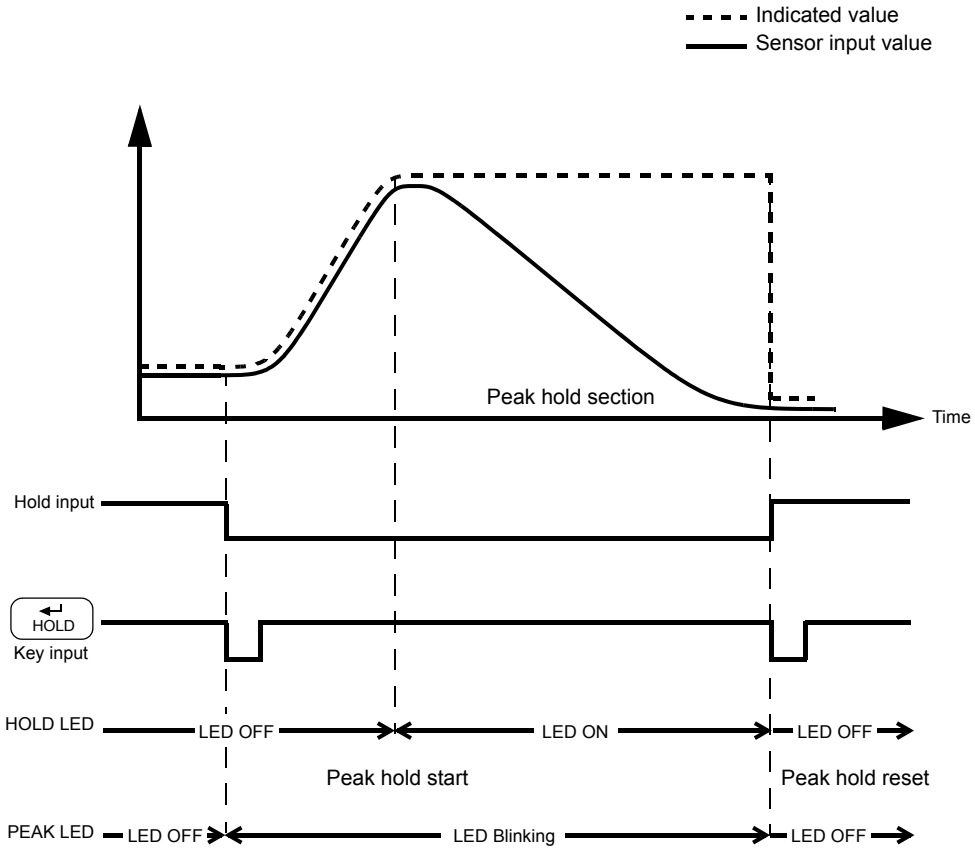
⚠ CAUTION

Use a strain gauge sensor to be connected to the F320 whose maximum excitation voltage is above the bridge excitation voltage specified.
If the bridge excitation voltage is greater than the maximum excitation voltage of the sensor, the sensor may overheat or may be damaged.

7 HOLD FUNCTION

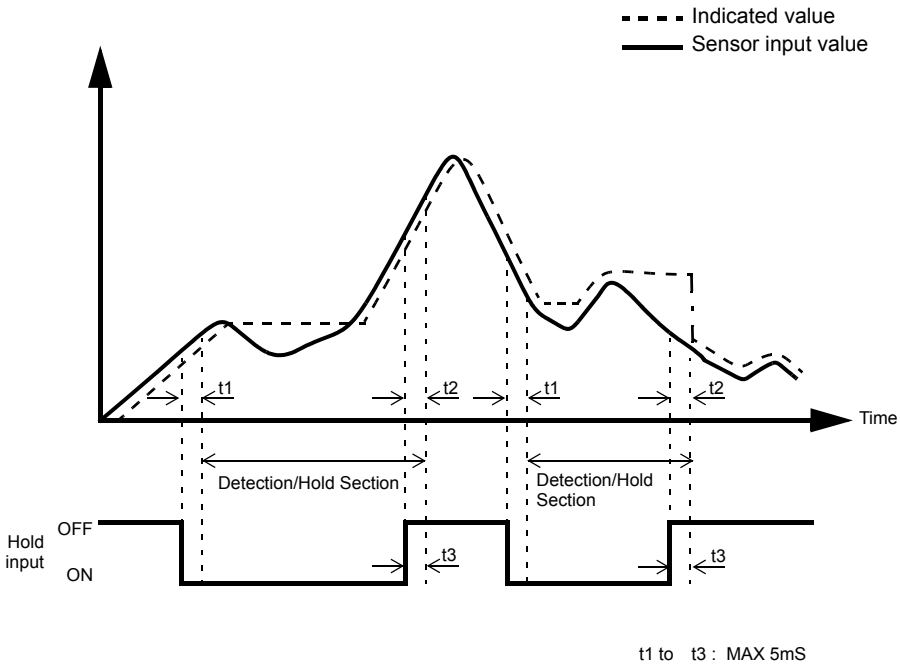
7-1. Peak Hold

• Peak Hold Operation



- If the hold function is turned ON by external signal input, turn OFF the hold function by external signal input, and if the hold function is turned ON by key input, turn OFF the hold function by key input.
- For the connection of the hold input terminals, see "Connecting Hold and Digital Zero Signals"on page 19.

• Timing Chart



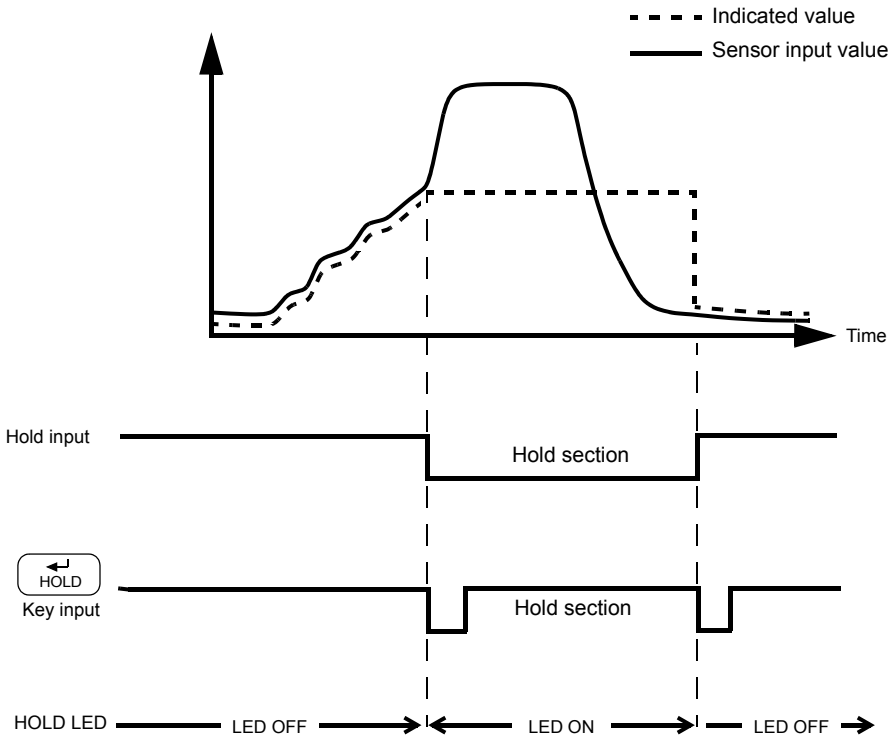
t1 : Time from when the hold signal is inputted to when the indicated value is held

t2 : Time from when the hold signal is cancelled to when the indicated value returns to tracking

t3 : Minimum reset signal width required for canceling the hold

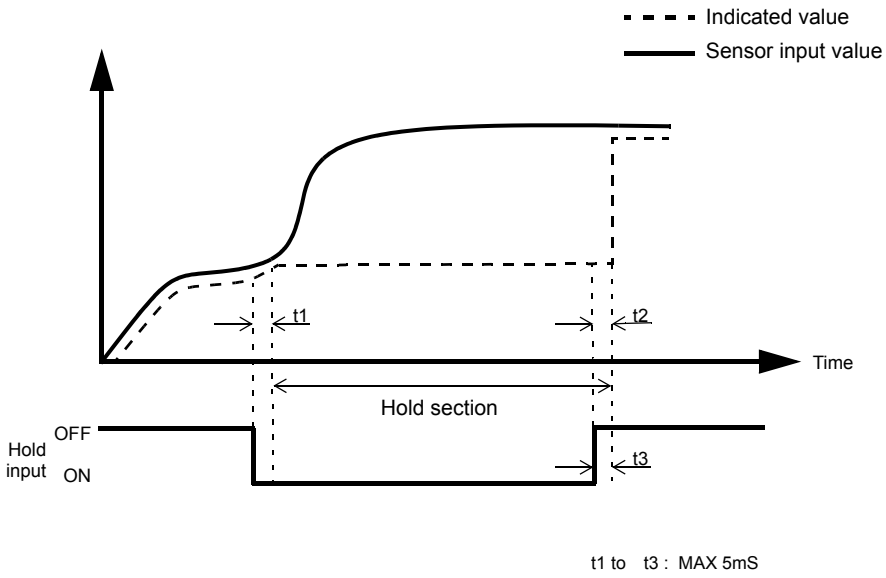
7-2. Sample Hold

• Sample Hold Operation



- If the hold function is turned ON by external signal input, turn OFF the hold function by external signal input, and if the hold function is turned ON by key input, turn OFF the hold function by key input.
- For the connection of the hold input terminals, see "Connecting Hold and Digital Zero Signals"on page 19.

• Timing Chart



t1 to t3 : MAX 5mS

t1 : Time from when the hold signal is inputted to when the indicated value is held

t2 : Time from when the hold signal is cancelled to when the indicated value returns to tracking

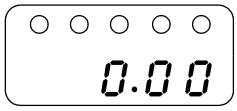
t3 : Minimum reset signal width required for canceling the hold

8. DIGITAL ZERO FUNCTION

This function zeros the indicated value.

Digital Zero by Key Operation

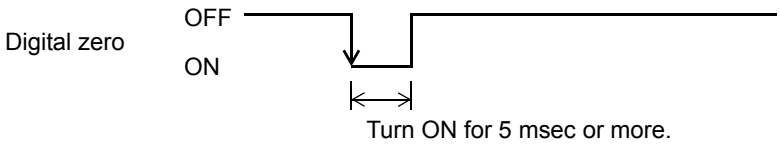
1) Perform digital zero.



2) When the indicated value becomes zero, digital zero is completed.

Digital Zero by External Signal Input

At the instant when the digital zero input (A5) and COM (A6) on the signal input/output terminal board at the back are short-circuited, the digital zero function works to zero the indicated value.

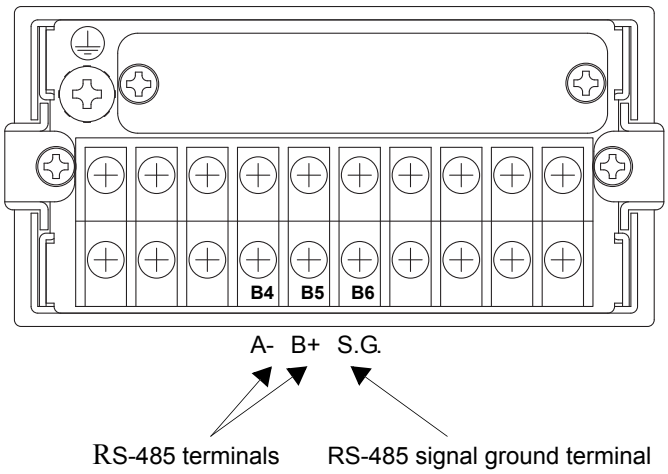


- The digital zero function does not work if the calibration LOCK is OFF.
  It works only when the calibration LOCK is ON.
  Also, the digital zero function is reset when the power is turned off.
- For the connection of the digital zero input terminals, see "Connecting Hold and Digital Zero Signals" on page 19.

9. RS-485 INTERFACE

(Communication protocol; Modbus-RTU)

The RS-485 interface is used to read out the indicated value and the state of the F320 and to write set values into the F320. It is convenient for connecting the F320 with a PLC/programmable display, etc., to perform processing, such as controlling, aggregating, and recording.



9-1. Communication Specifications

9-1-1. Standards

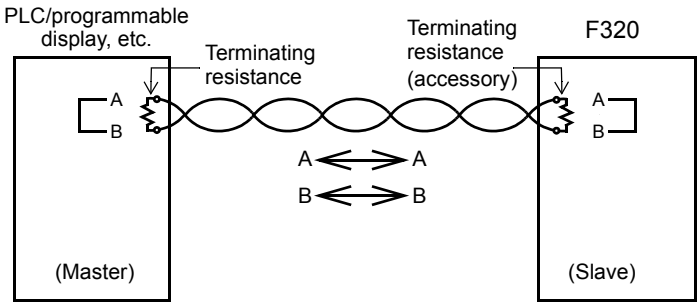
Signal level:	Based on RS-485	
Transmission distance:	Approx. 1km	
Transmission method:	Asynchronous, half-duplex	
Transmission speed:	Selectable from 1200, 2400, 4800, 9600, 19200, and 38400bps	
Number of units connected:	32 at maximum(including one master)	
Bit configuration:	Start bit:	1 bit
	Character length:	Fixed at 8 bits
	Stop bit:	Fixed at 1 bit
	Parity bit:	Selectable from none, odd, and even

9-1-2. Data Address

Data type	Address	Data name	Data form
Coil 0XXXX	1	Hold	1bit
	2	Holding reset	
	3	Digital zero	
	4	Digital zero reset	
Input Status 1XXXX	1	Hold	1bit
	2	Stable	
	3	Near zero output	
	4	Overload（LOAD,OFL）	
	5	Zero tracking	
	6	HI output	
	7	LO output	
	8	OK output	
Input Register 3XXXX	1	Decimal place	0,1,2,3
	2	Fixed at 0 (reserve for unit)	Fixed at 0
	3	Linked with indicated value	Signed 16 bits
	5	Not linked with indicated value	Signed 16 bits
Holding Register 4XXXX	1	High limit	Signed 16 bits
	2	Low limit	
	3	High/low limit comparison mode	
	4	Hysteresis	
	5	Digital offset	
	6	Near zero	
	7	Digital filter	
	8	Analog filter	
	9	Motion detect（time）	
	10	Motion detect（range）	
	11	Zero tracking（time）	
	12	Zero tracking（range）	
	13	Hold mode	
	14	ZERO key valid / invalid	
	15	HOLD key valid / invalid	
	16	Scale division	
	17	Display frequency	
	18	Decimal place	
	19	Excitation voltage	
	20	BCD data update rate	
	21	D/A zero setting	
	22	D/A full scale setting	
	23	D/A output mode	

9-2. Connecting RS-485

9-2-1. One-to-one Connection



* Logic

- Mark state (OFF)
  V_A-V_B<-0.2V
- Space state (ON)
  V_A-V_B>0.2V

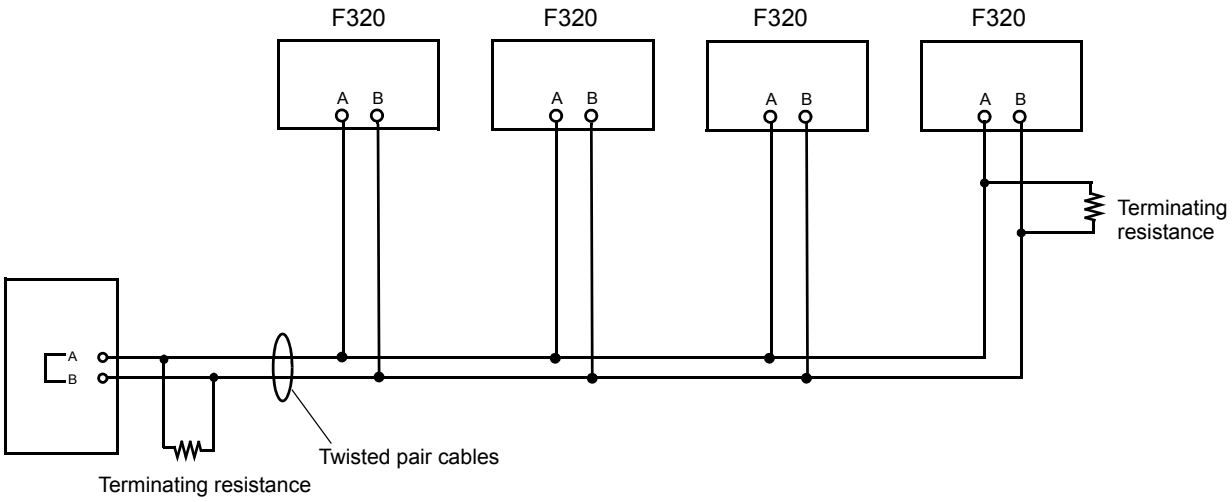
V_A: Voltage of terminal A
V_B: Voltage of terminal B

- For connection, use twisted pair cables. (The noise margin will rise.) However, a parallel two-core cable is good enough for short-distance connection.
- On the F320 side, mount the attached terminating resistance.
- The terminal SG (the terminal B6) is a grand terminal used on the circuit for protecting the circuit.When the main body of F320 and the device connected to F320 are grounded by D type ground, there is usually no need to use the terminal SG. However, confirm the specifications of the devise connected before connecting the terminal SG, when it is necessary to connect it according to the situation of the site.

Request

On some master devices, A and B may be indicated reversely. If communications are unsuccessful, interchange A and B.

9-2-2. Multiple Connection

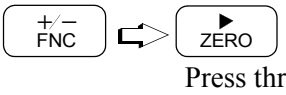


9-2-3. RS-485 Communication Method

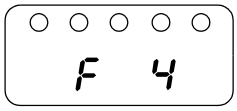
1. Set the RS-485 communication method of the F320.

Setting of RS-485 Communication Method

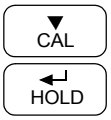
1) Select setting mode 4.

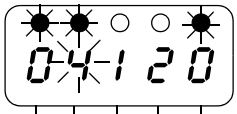


Press three times.



2) Select RS-485 communication method.



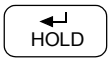


Not Used
Baud Rate
5 : 38400 bps
4 : 19200 bps
3 : 9600 bps
2 : 4800 bps
1 : 2400 bps
0 : 1200 bps
Character Length
1 : Fixed at 8 bits
Stop Bit
0: Fixed at 1 bit
Parity Bit
2 : Even
1 : Odd
0 : None

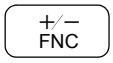
Use 

and 

keys to set the RS-485 communication method,

then use 

key to validate the setting.

To return to the indicated value display, press 

key.

2. According to the setting of the F320, make the initial setting of the RS-485 communication method of the connected Programmable display, PLC, etc.

⚠ CAUTION

Please do not set parity bit to "0: None" in Modbus communication.

9-2-4. RS-485 ID

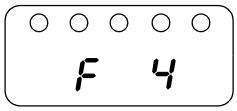
Set the ID of the F320.

Setting of RS-485 ID

1) Select setting mode 4.

+/− FNC ⇨ ▶ ZERO

Press three times.

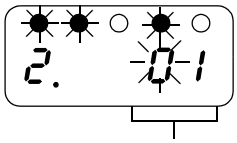


2) Select RS-485 ID.

▼ CAL

↵ HOLD

Press twice.



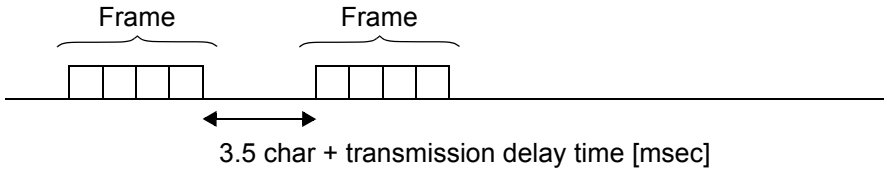
RS-485 ID (01 to 32)

Use ▲ GAIN ▼ CAL and ▶ ZERO keys to set the RS-485 ID, then use ↵ HOLD key to validate the setting.

To return to the indicated value display, press +/− FNC key.

9-2-5. RS-485 Transmission Delay Time

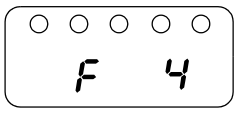
Set this time if the master device cannot process the responses from the F320.



Setting of RS-485 Transmission Delay Time

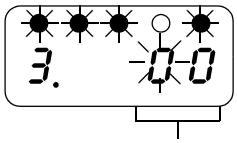
1) Select setting mode 4.

[+/− FNC] ⇨ [▶ ZERO] Press three times.



2) Select transmission delay time.

[▼ CAL] [↵ HOLD] Press three times.



Transmission Delay Time (00 to 99)

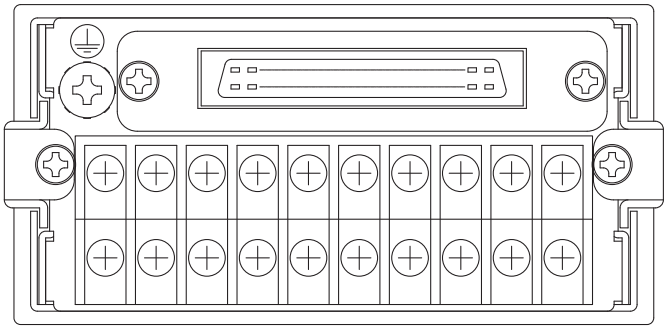
Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the transmission delay time,

then use [↵ HOLD] key to validate the setting.

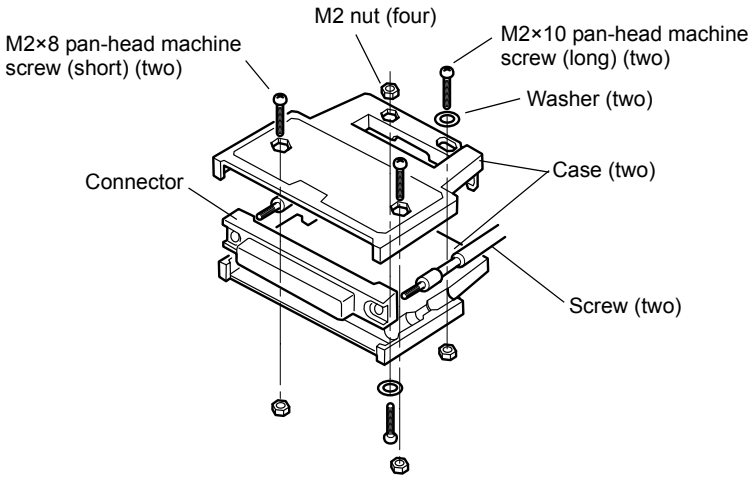
To return to the indicated value display, press [+/− FNC] key.

10. BCD DATA OUTPUT

The BCD data output interface is used to obtain the indicated value of the F320 as BCD data. It is convenient for connecting the F320 with a computer, process controller, PLC, etc., to perform processing, such as controlling, aggregating, and recording.



Assembling Connector



(1) Align the connector and each screw (two) in the groove in one case.

(2) Put the other case on it, and fit the cases together.

(3) Tighten each M2×8 pan-head machine screw (two).
Tighten each M2×10 pan-head machine screw (two).
Be aware that the M2×10 pan-head machine screw should be combined with a washer.

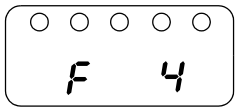
10-1. BCD Data Update Rate Selection

Setting of BCD Data Update Rate Selection

1) Select setting mode 4.

[+/− FNC] ⇨ [▶ ZERO]

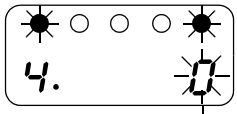
Press three times.



2) Set the update rate of BCD parallel data output.

[▼ CAL]
[↵ HOLD]

Press four times.



BCD Data Update Rate

4 :	2000times/sec.	STROBE Range	0.25msec
3 :	1000times/sec.	〃	0.5msec
2 :	100times/sec.	〃	5msec
1 :	10times/sec.	〃	50msec
0 :	1times/sec.	〃	500msec

Use [▲ GAIN] [▼ CAL] and [▶ ZERO] keys to set the BCD Update rate, then use [↵ HOLD] key to validate the setting.

To return to the indicated value display, press [+/− FNC] key.

Normaly, BCD data update synchronous the A/D conversion (2000 times/sec).

When the BCD input equipment is low ability and can not read out the high rate of 2000 times/sec., set the BCD data update rate is low.

10-2. Sink Type (BCO Option)

Output

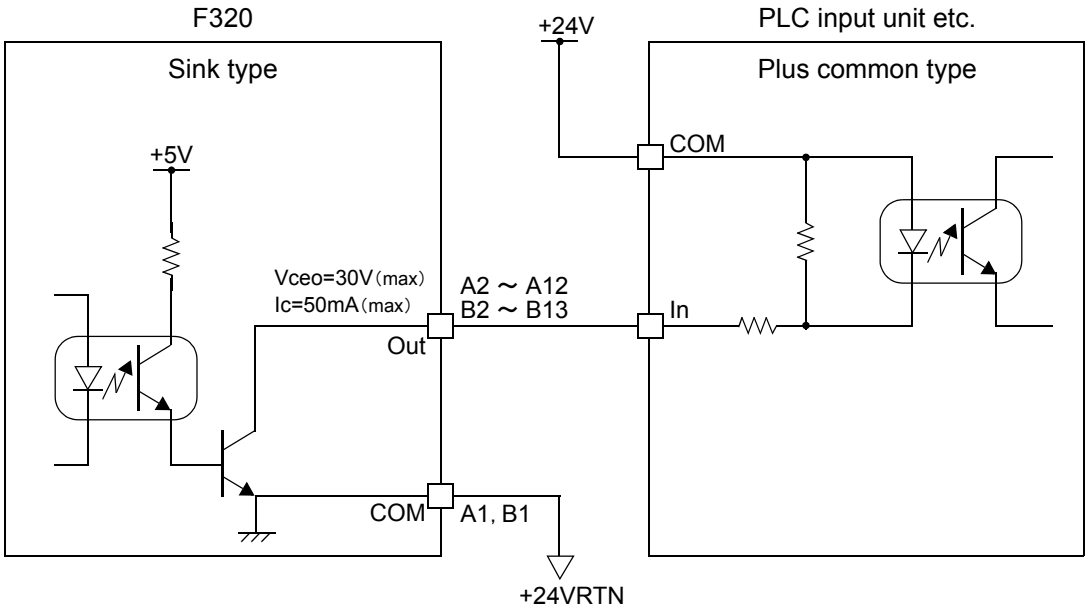
Output signal:	Indicated value data (5-digit), near zero, minus, over, stable, strobe
Output logic:	Switching between positive logic and negative logic
Output type:	Sink type When signal ON, output transistor ON. When the input unit such as PLC is connected, plus common is connected.
Rated voltage:	30V
Rated current:	50mA
Insulation method:	Photo coupler insulation

Input

Input signal:	BCD data hold, logic switching
Input type:	Dead-front contact input (self-contained power supply) Relay, switch, and transistor, etc. can be connected. The signal is inputed by short-circuited and opening the input terminal of the terminal COM. When the transistor is connected, NPN output type (sink type) is connected.
Current when short-circuited	About 6mA
Insulation method:	Photo coupler insulation

10-2-1. Equivalent Circuit

• Output



● Internal transistor status

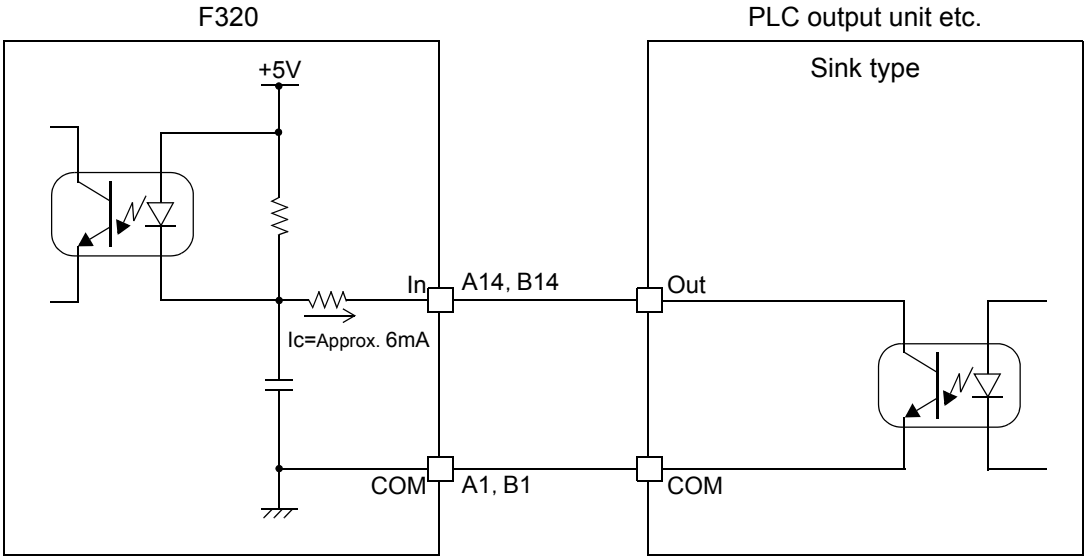
Output data	Negative	Positive
0	OFF	ON
1	ON	OFF

Through logic switching (pin B14)

● Output pin level

Output data	Negative	Positive
0	H	L
1	L	H

• **Input**



⚠ CAUTION

- Avoid applying external voltages to the signal input circuit.
- Use external elements which withstands Ic=10mA or above
- Leakage current from external element must be 30 μ A or below.

10-2-2. Connector Pin Assignment

No.		Signal	No.		Signal
A1	⁎	COM	B1	⁎	COM
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	
A8	Out	40	B8	Out	
A9	Out	80	B9	Out	Near Zero
A10	Out	100	B10	Out	Minus (polarity)
A11	Out	200	B11	Out	Over
A12	Out	400	B12	Out	P.C(stable)
A13	Out	800	B13	Out	Strobe
A14	In	BCD Data Hold	B14	In	Logic Switching
A15			B15		
A16			B16		

Compatible connector:

FCN-361J032-AU (manufactured by Fujitsu Component or an equivalent)

Connector cover:

FCN-360C032-B (manufactured by Fujitsu Component or an equivalent)

Near Zero

The state of near zero is outputted.

Minus (polarity)

The polarity of the indicated value as BCD data is outputted.

P.C

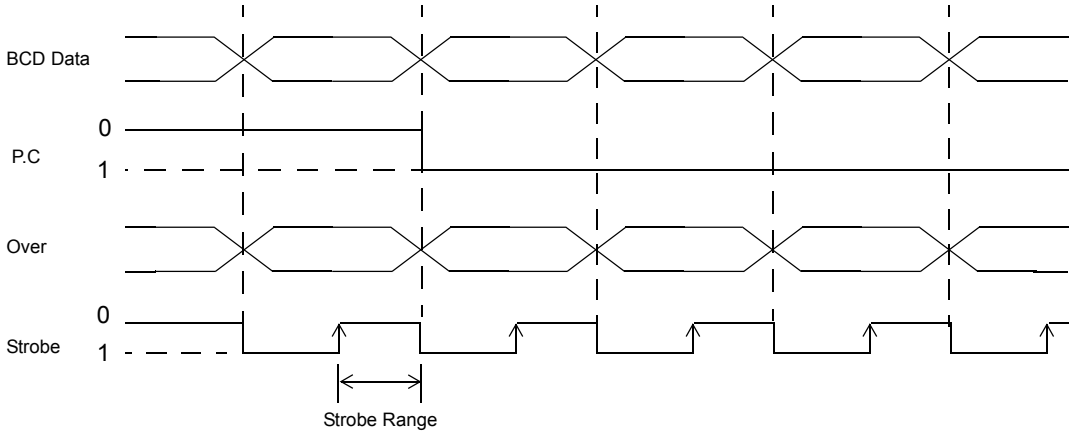
P.C and BCD data are outputted simultaneously when stable.

Over

It is outputted at the time of over scale(-LOAD, +LOAD, OFL1 or OFL2).

Strobe

Strobe pulses are outputted in synchronization with BCD data. Read data using the rising edges of the pulses. The setting of BCD data update rate can be changed.



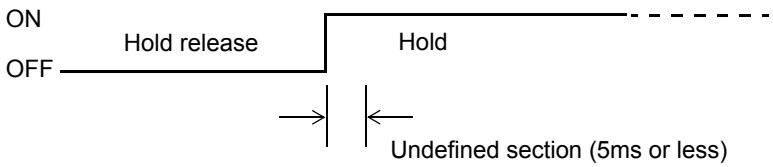
BCD Data Hold ― Level input ―

The BCD data output signal is held. (The indicated value is not held.)

It is carried out by pin A14.

When level input is OFF, output signal is hold release.

When level input is ON, output signal is hold.

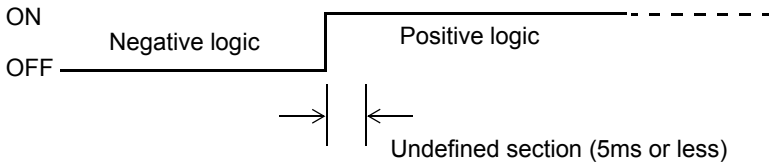


Logic Switching ― Level input ―

Switch the output signal logic with pin B14.

When level input is OFF, output signal is negative logic.

When level input is ON, output signal is positive logic.



10-3. Source Type (BSC Option)

Output

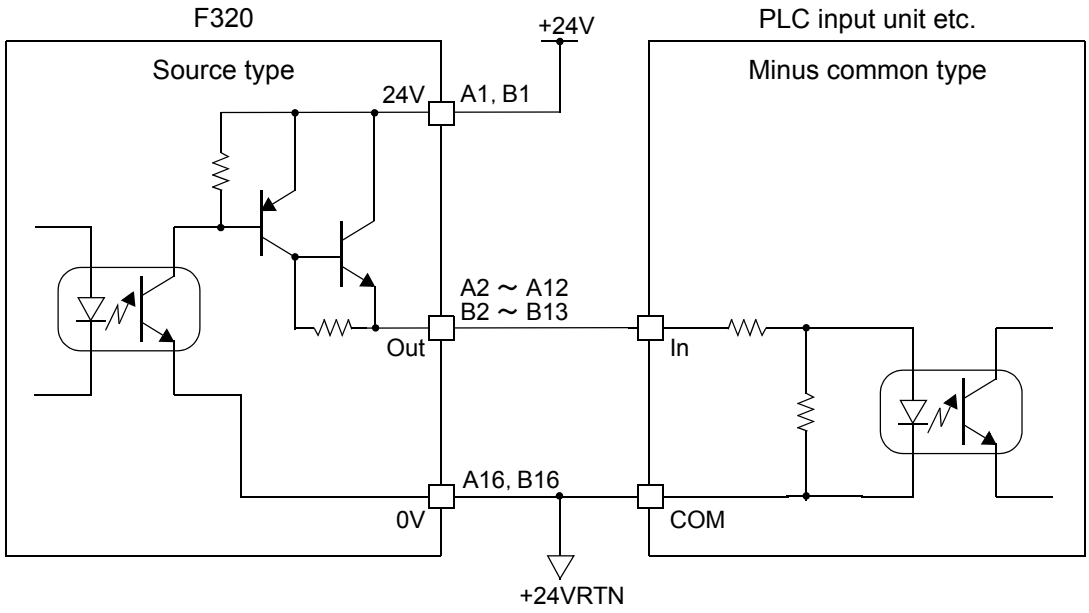
Output signal:	Indicated value data (5-digit), near zero, minus, over, stable, strobe
Output logic:	Switching between positive logic and negative logic
Output type:	Source type When signal ON, output transistor ON. When the input unit such as PLC is connected, minus common is connected.
Rated voltage:	30V
Rated current:	20mA
Insulation method:	Photo coupler insulation

Input

Input signal:	BCD data hold, logic switching
Input type:	Minus common When the transistor is connected, PNP output type (source type) is connected.
ON voltage:	9V or more
OFF voltage:	3V or less
At 24V load:	About 5mA
Insulation method:	Photo coupler insulation

10-3-1. Equivalent Circuit

• Output



● Internal transistor status

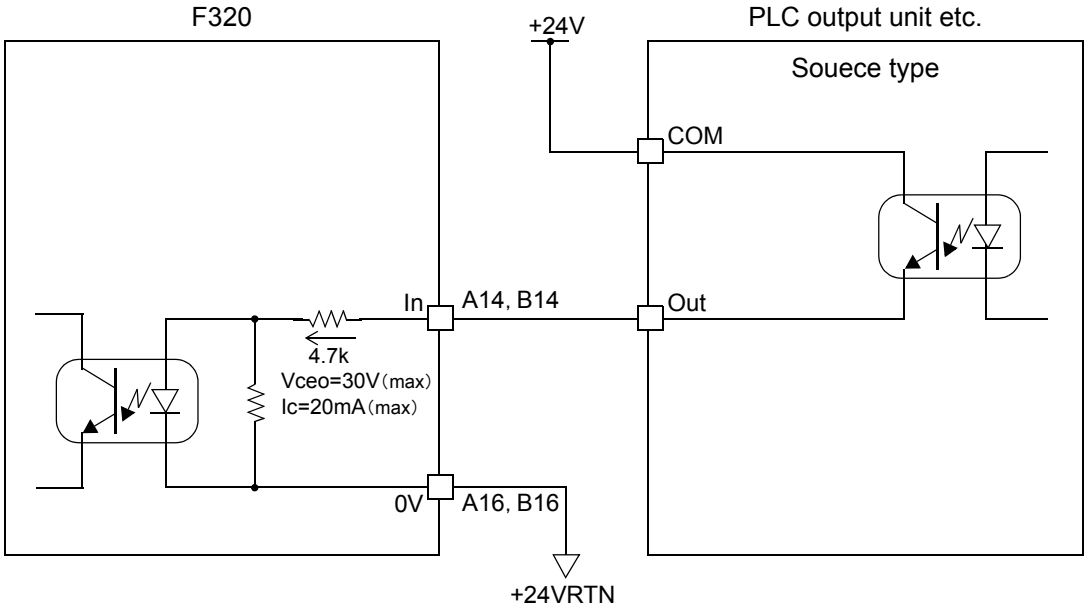
Output data	Positive	Negative
0	OFF	ON
1	ON	OFF

Through logic switching（pin B14）

● Output pin level

Output data	Positive	Negative
0	L	H
1	H	L

• **Input**



⚠ CAUTION

- Avoid applying external voltages to the signal input circuit.
- Use external elements which withstands Ic=10mA or above
- Leakage current from external element must be 30 μ A or below.

10-3-2. Connector Pin Assignment

No.		Signal	No.		Signal
A1	In	+24V	B1	In	+24V
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	
A8	Out	40	B8	Out	
A9	Out	80	B9	Out	Near Zero
A10	Out	100	B10	Out	Minus (polarity)
A11	Out	200	B11	Out	Over
A12	Out	400	B12	Out	P.C(stable)
A13	Out	800	B13	Out	Strobe
A14	In	BCD Data Hold	B14	In	Logic Switching
A15			B15		
A16	*	0V	B16	*	0V

Compatible connector:

FCN-361J032-AU (manufactured by Fujitsu Component or an equivalent)

Connector cover:

FCN-360C032-B (manufactured by Fujitsu Component or an equivalent)

Near Zero

The state of near zero is outputted.

Minus (polarity)

The polarity of the indicated value as BCD data is outputted.

P.C

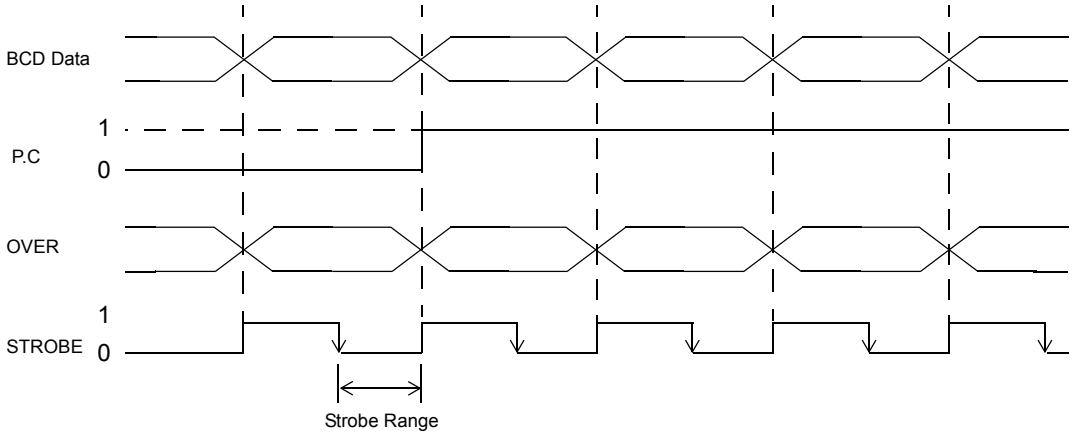
P.C and BCD data are outputted simultaneously when stable.

Over

It is outputted at the time of over scale(-LOAD, +LOAD, OFL1 or OFL2).

Strobe

Strobe pulses are outputted in synchronization with BCD data. Read data using the falling edges of the pulses. The setting of BCD data update rate can be changed.



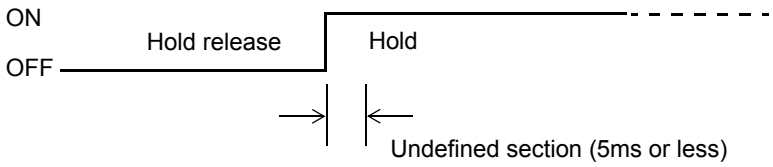
BCD data hold ― Level input ―

The BCD data output signal is held. (The indicated value is not held.)

It is carried out by pin A14.

When level input is OFF (non-conducting), output signal is hold release.

When level input is ON (conducting), output signal is hold.

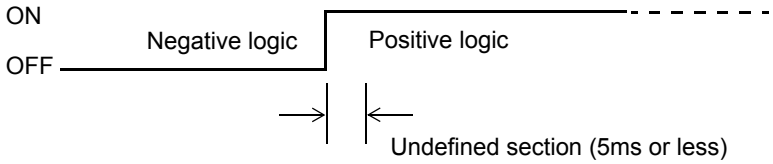


Logic Switching ― Level input ―

Switch the output signal with pin B14.

When level input is OFF (non-conducting), output signal is negative logic.

When level input is ON (conducting), output signal is positive logic.



11. D/A CONVERTER

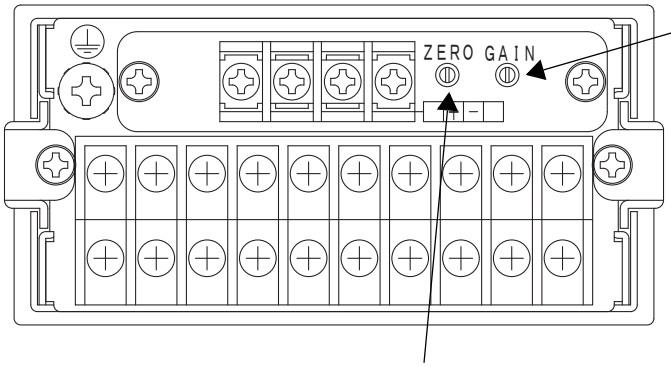
11-1. Voltage Output (DAV Option)

This converter is used to obtain an analog output which is linked with the indicated value of the F320.

The range of the analog output is from -10 to +10V.

An analog output from 0V to ±10V can be obtained with respect to any digital values set by the D/A zero setting and the D/A full scale setting functions.

The output circuit and the main circuit are isolated.



Voltage output terminals

Terminals for obtaining voltage signal.
"+" is for signal, and "-" is for ground.
0 to ±10V can be obtained.

Gain adjustment trimmer

Trimmer to adjust so that the indication becomes as registered by the D/A full scale setting function.
The gain adjustment range is approx. 9.5 to 10.5V (at the time of full scale output).

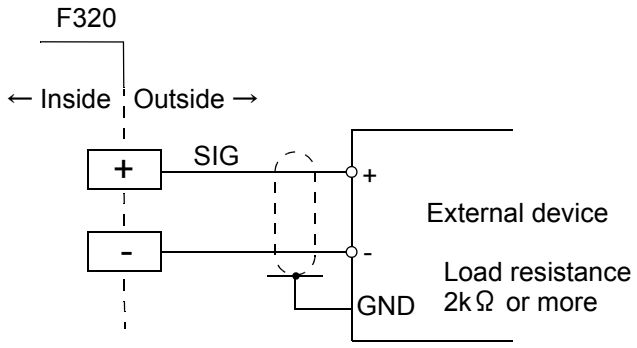
Zero adjustment trimmer

Trimmer to adjust so that the voltage output becomes zero when the indication is as registered by the D/A zero setting function.
The zero adjustment range is approx. -1.0 to +1.0V (at the time of zero output).

Voltage output:	-10 to 10V (load resistance; 2kΩ or more)
D/A conversion speed:	2000 times/sec.
Resolution:	1/10000
Over range:	-11.0 to +11.0V
Zero adjustment range:	Approx. -1.0 to +1.0V (at the time of zero output)
Gain adjustment range:	Approx. 9.5 to 10.5V (at the time of full scale output)
Zero drift:	Within 0.6mV/℃
Gain drift:	Within 50ppm/℃
Non-linearityv	Within 0.05%FS
	* Not including the drift of the analog input section
Output connector:	Screw type terminal board (two-pole)

11-1-1. Obtaining Voltage Output Signal

Use the + and - terminals of the F320 for connection with an external device (2kΩ or more load resistance).

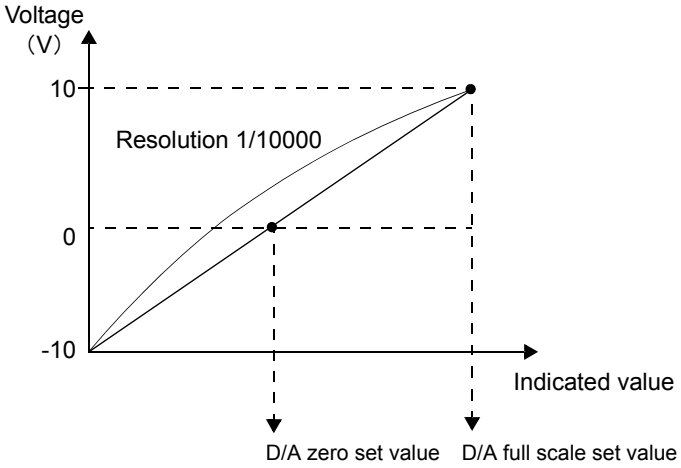


⚠ CAUTION

- The D/A converter voltage output is an option.
- Do not apply external voltages. Breakage will result.
- Do not short-circuit the voltage output. Doing so will cause a failure.
  Also, connecting a capacity load may cause oscillation.

11-1-2. Setting of D/A Zero and Gain

With the D/A converter of the F320, an analog output is obtained by setting the indicated value to output 0V (D/A zero set value) and the indicated value to output 10V (D/A full scale set value). Respective set values are inputted by the D/A zero and full scale setting functions.



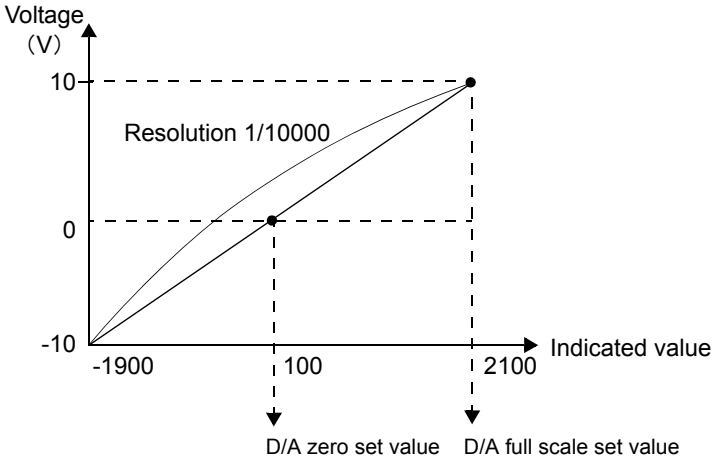
Example of Setting

In the case where:

D/A output mode.....0 (linked with indicated value)

D/A zero setting 00100

D/A full scale setting 02100



	Indicated value	Voltage (V)
Full scale →	-1900	-10.00
Zero →	100	0.00
	1100	5.00
	1600	7.50
Full scale →	2100	10.0
	2120	10.1

11-1-3. About D/A Resolution

The resolution of the D/A converter is 1/10000 with respect to 0 to ±10V.
In other words, the minimum unit of voltage is:

(+10 to (-10V)) × 1/10000 = 2mV.

Also, the minimum unit of indicated value is:

(D/A full scale set value - D/A zero set value) × 2 × 1/10000.

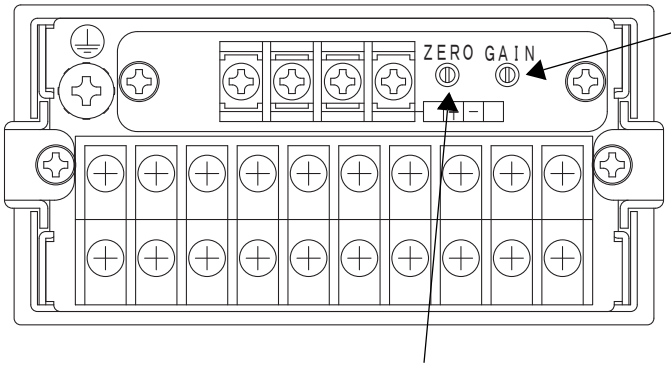
11-2. Current Output (DAI Option)

This converter is used to obtain an analog output which is linked with the indicated value of the F320.

The range of the analog output is from 4 to 20mA.

An analog output from 4mA to 20mA can be obtained with respect to any digital values set by the D/A zero setting and the D/A full scale setting functions.

The output circuit and the main circuit are isolated.



Current output terminals

Terminals for obtaining current signal.
"+" is for signal, and "-" is for ground.
4 to 20mA can be obtained.

Gain adjustment trimmer

Trimmer to adjust so that the indication becomes as registered by the D/A full scale setting function.
The gain adjustment range is approx. 19.6 to 20.4mA (at the time of full scale output).

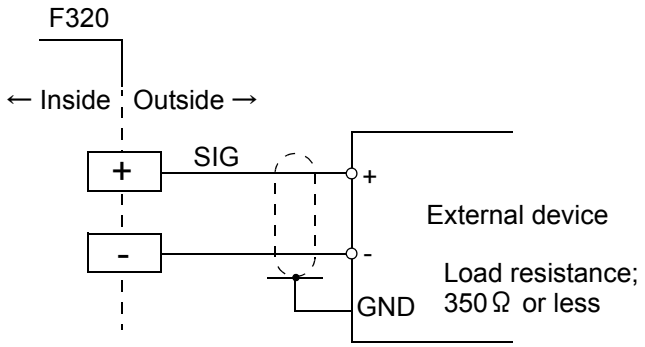
Zero adjustment trimmer

Trimmer to adjust so that the current output becomes zero when the indication is as registered by the D/A zero setting function.
The zero adjustment range is approx. 3.6 to 4.4mA (at the time of zero output).

Current output:	4 to 20mA (load resistance; 350Ω or less)
D/A conversion speed:	2000 times/sec.
Resolution:	1/10000
Over range:	3.2 to 20.8mA
Zero adjustment range:	Approx. 3.6 to 4.4mA (at the time of zero output)
Gain adjustment range:	Approx. 19.6 to 20.4mA (at the time of full scale output)
Zero drift:	Within 0.5μA/℃
Gain drift:	Within 50ppm/℃
Non-linearity:	Within 0.05%FS * Not including the drift of the analog input section
Output connector:	Screw type terminal board (two-pole)

11-2-1. Obtaining Current Output Signal

Use the + and - terminals of the F320 for connection with an external device (350Ω or less load resistance).

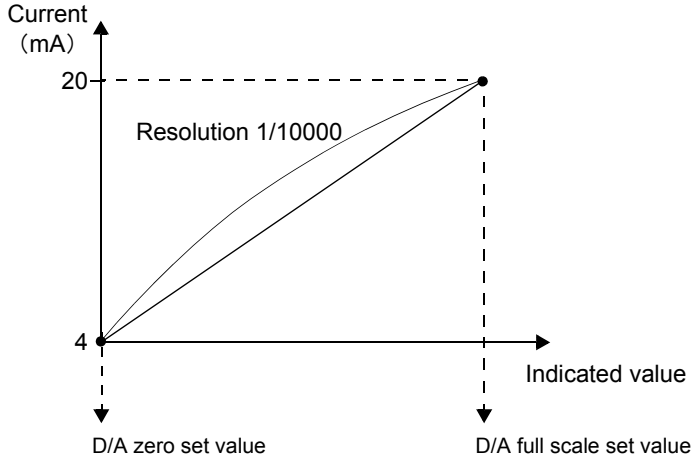


⚠ CAUTION

- The D/A converter current output is an option.
- Do not apply external currents. Breakage will result.
  Also, connecting a capacity load may cause oscillation.

11-2-2. Setting of D/A Zero and Gain

With the D/A converter of the F320, an analog output is obtained by setting the indicated value to output 4mA (D/A zero set value) and the indicated value to output 20mA (D/A full scale set value). Respective set values are inputted by the D/A zero and full scale setting functions.



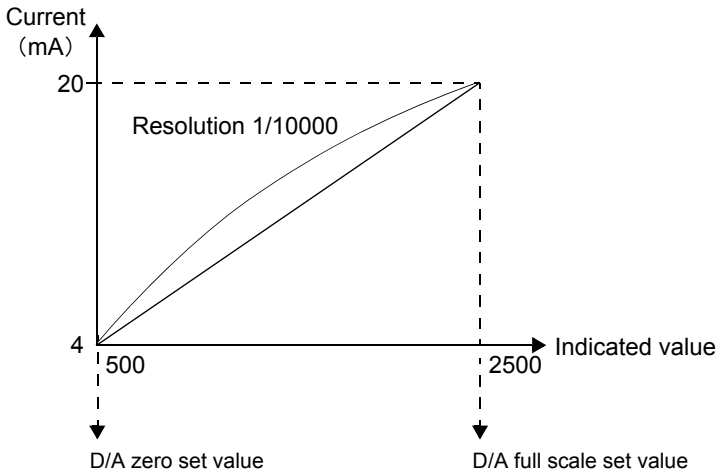
Example of setting

In the case where:

D/A output mode.....0 (linked with indicated value)

D/A zero setting 00500

D/A full scale setting 02500



	Net weight	Current (mA)
	480	3.84
Zero →	500	4.00
	1000	8.00
	1500	12.00
Full scale →	2500	20.00
	2520	20.16

11-2-3. About D/A Resolution

The resolution of the D/A converter is 1/10000 with respect to 4 to 20mA.
In other words, the minimum unit of voltage is:

$$(20 - 4\text{mA}) \times 1/10000 = 1.6\mu\text{A}.$$

Also, the minimum unit of indicated value is:

(D/A full scale set value - D/A zero set value) × 1/10000.

11-3. D/A Zero and Full Scale

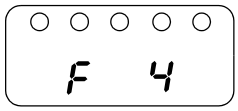
Set the D/A zero and full scale of the F320 as follows:

Setting of D/A Zero and Full Scale

1) Select setting mode 4.

[+/−] FNC ⇨ [▶] ZERO

Press three times.



2) Select D/A zero.

[▼] CAL

[↵] HOLD

Press five times.

D/A Zero Value (-19999 to 19999)

Use [▲] GAIN [▼] CAL and [▶] ZERO keys to set the D/A zero.

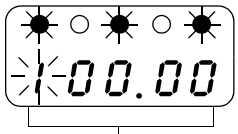
Press [+/−] FNC key to place a minus sign.

Press [↵] HOLD key to validate the setting

3) Select D/A full scale.

[▼] CAL

[↵] HOLD



D/A Full Scale Value (-19999 to 19999)

Use [▲] GAIN [▼] CAL and [▶] ZERO keys to set the D/A full scale.

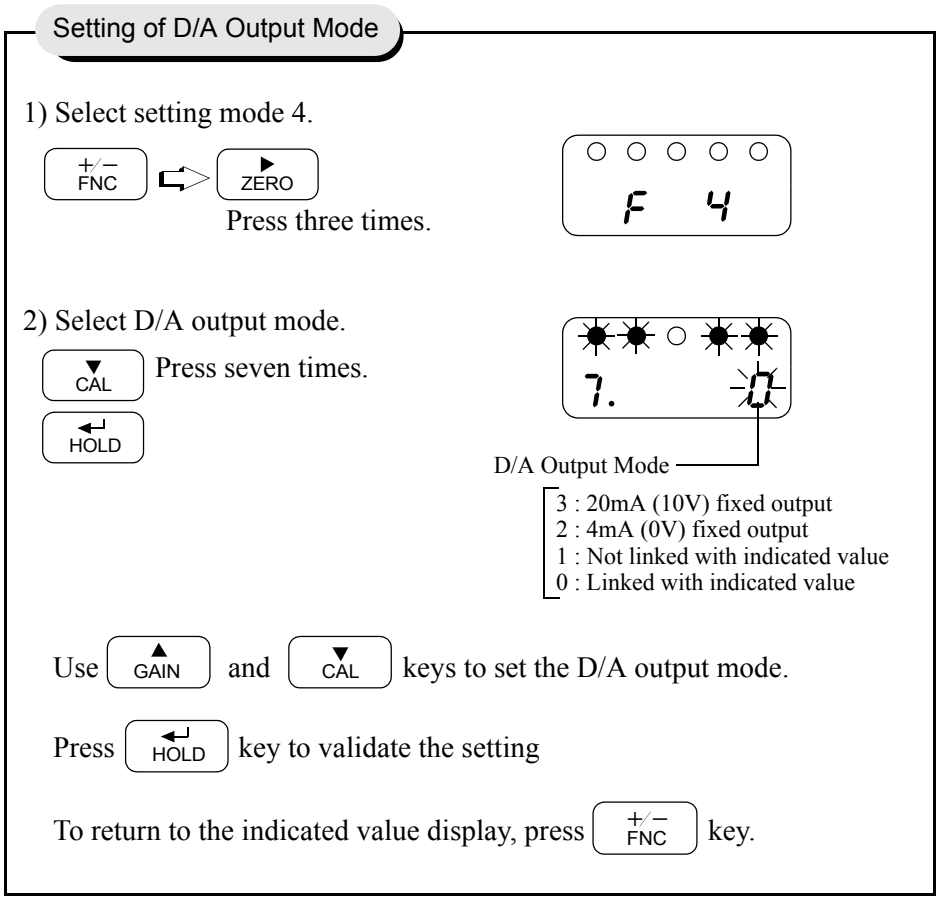
Press [+/−] FNC key to place a minus sign.

Press [↵] HOLD key to validate the setting

To return to the indicated value display, press [+/−] FNC key.

11-4. D/A Output Mode

Set the D/A output mode of the F320 as follows:



20mA (10V) fixed output

When the current output option is equipped, a fixed output of 20mA is made, and when the voltage output option is equipped, a fixed output of 10V is made.

4mA (0V) fixed output

When the current output option is equipped, a fixed output of 4mA is made, and when the voltage output option is equipped, a fixed output of 0V is made.

Not linked with indicated value

Scaled analog output linked with sensor input.
Even if the indicated value is held, an output is made according to the changes in sensor input signal.

Linked with indicated value

Analog output linked with indicated value.
When the indicated value is held, the held value is outputted even if the sensor input signal changes.

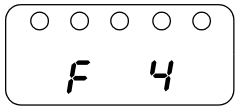
12. PASSWORD

By inputting the password, the contents of the memory can be rewritten (initialized) to factory-shipped ones.
Though calibrated values (zero calibration and span calibration) stay unchanged, all the other set values are rewritten to factory-shipped values.

Setting of Password

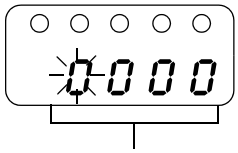
1) Select setting mode 4.

+/− FNC ⇨ ▶ ZERO
Press three times.



2) Select password.

▼ CAL Press eight times.
↵ HOLD



Password
1239 : Initialization

Use ▲ GAIN ▼ CAL and ▶ ZERO keys to set the password.

Press ↵ HOLD key to validate the setting

When you hear a beep, initialization is completed.

(Do not operate any key until you hear a beep.)

- For the initialized values, see the “List of Values” on page 25.
- For simultaneous self-check and initialization, see “Initialization” on page 103.

13. OVERSCALE/ERROR DISPLAYS

13-1. Overscale Display

Minus overflow of the A/D converter (under -3.2mV/V between ± SIG)	-LoAd
Plus overflow of the A/D converter (over 3.2mV/V between ± SIG)	LoAd
Indicated value overflowed (indicated value<-19999)	oFL1
Indicated value overflowed (indicated value>19999)	oFL2

13-2. Calibration Error Display

Output of the strain gauge sensor does not reach the span adjustment range.	cErr6
Output of the strain gauge sensor is on the minus (negative) side.	cErr7

14. SELF-CHECK FUNCTION AND INITIALIZATION

14-1. Self-Check

The F320 incorporates the Self-check Function to detect errors in the internal circuits and in programs and the Visual-check Function to visually check the indicator.

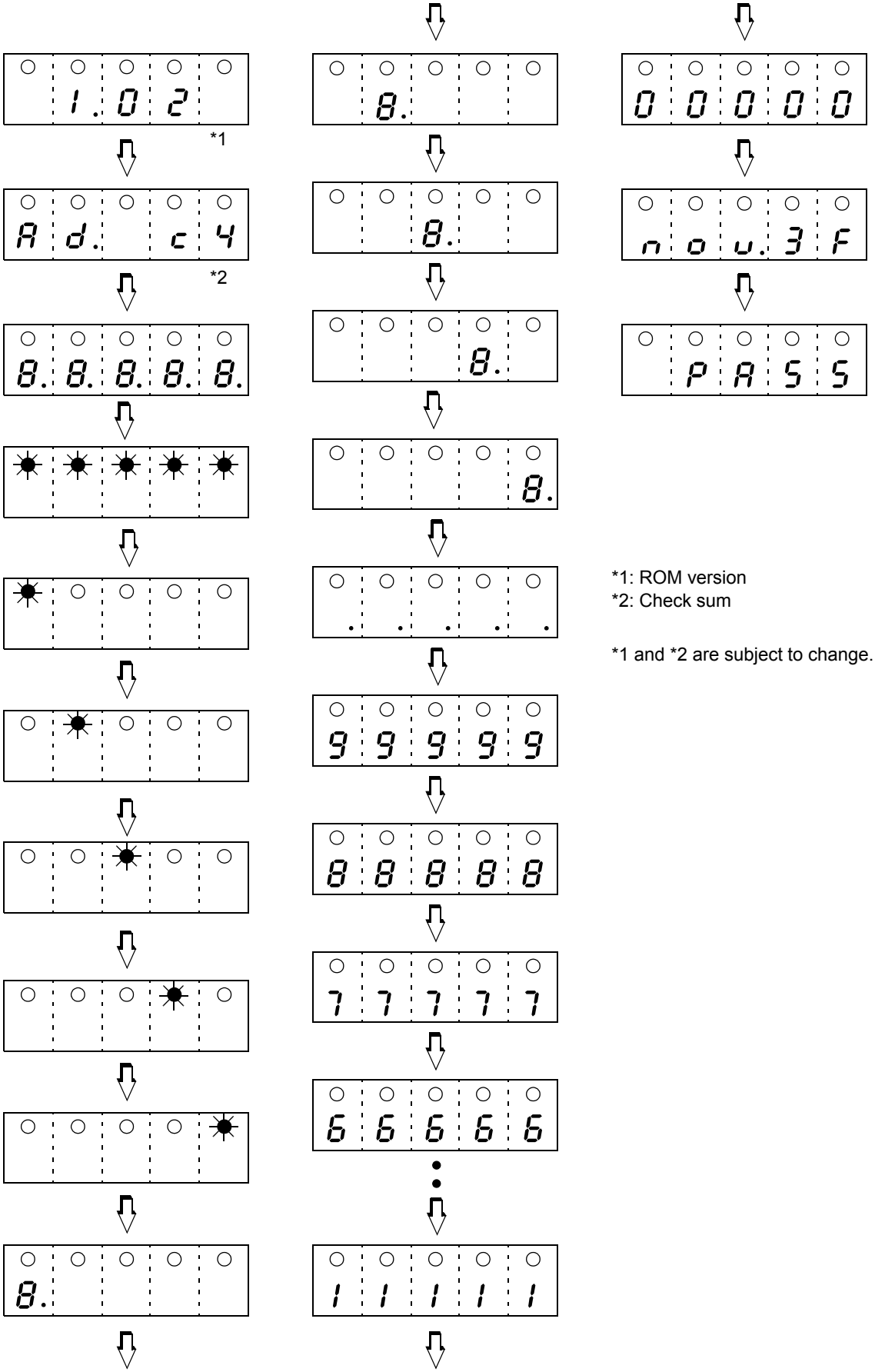
Setting Method

1） Turn off the power to the F320.

2） Turn on the power with HOLD key held down.

The self-check is completed in 30 seconds. The display " PASS " should appear, then the indicate value should follow.This ensures that the F320 is in normal operation.

Self-check（Visual-Check Sequence）



*1: ROM version
*2: Check sum

*1 and *2 are subject to change.

14-2. Initialization

The Initialization is an operation to reset the memory to the factory setting. This operation resets all set values except calibrated values （obtained through zero calibration and span calibration）to the factory setting

Setting Method

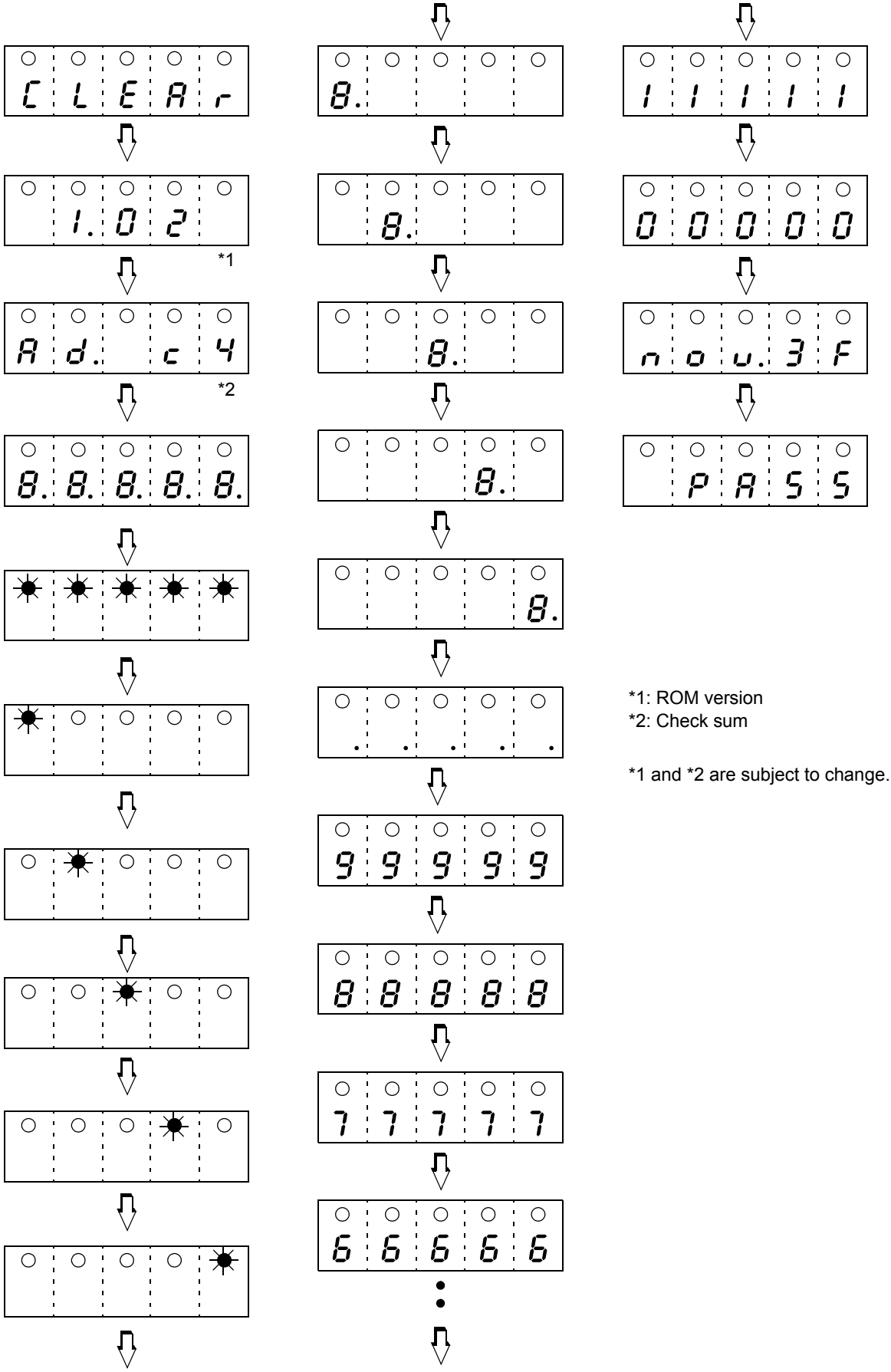
1） Turn off the power to the F320.

2） Turn on the power with ▶ ZERO and ↵ HOLD keys held down.

The initialization follows the self-check.

- For the initialized values, see the “List of Values” on page 25.
- If self-check is not needed, initialization can also be performed by inputting the password.
  For details, see “Password” on page 99.

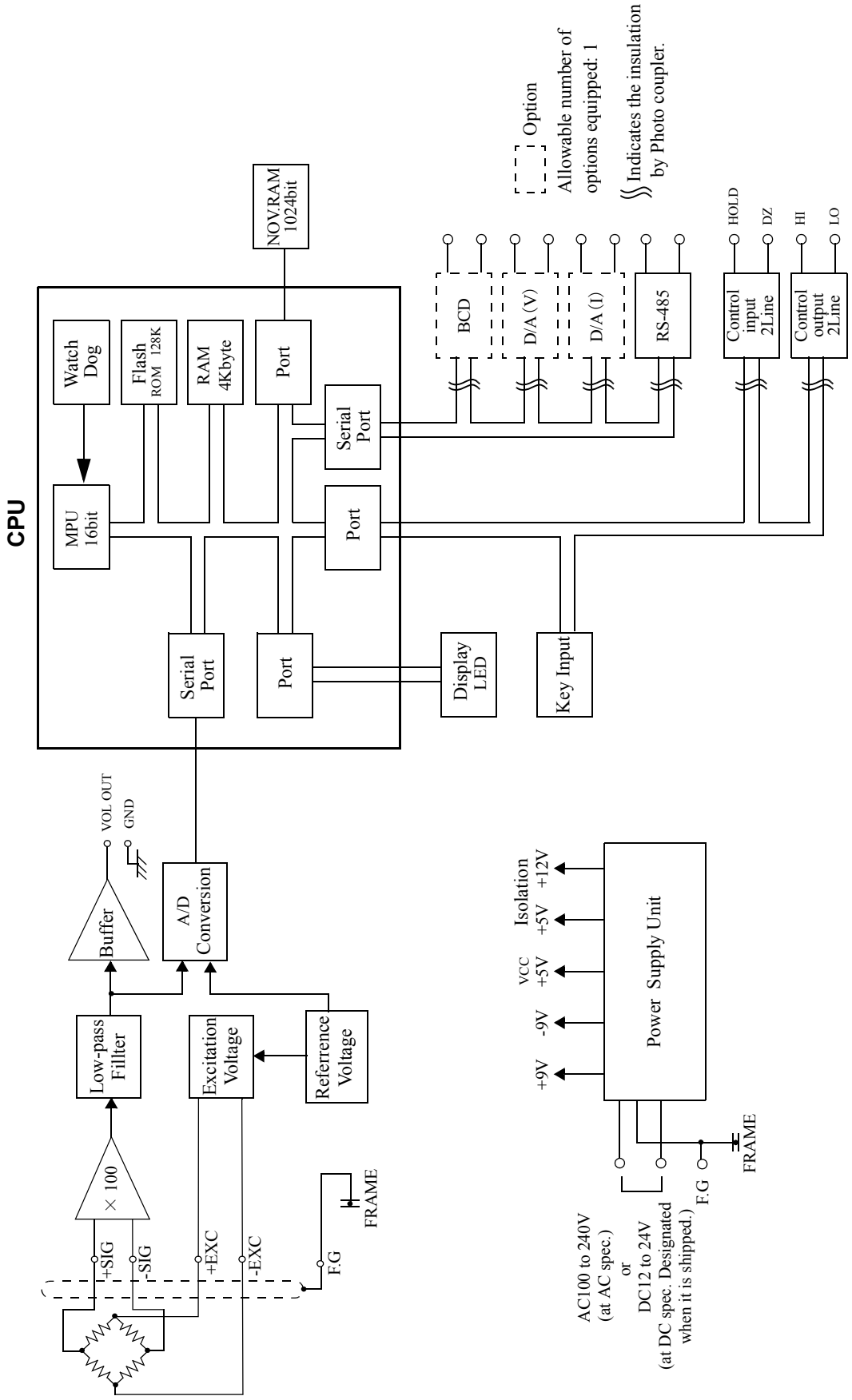
Initialization Sequence



*1: ROM version
*2: Check sum

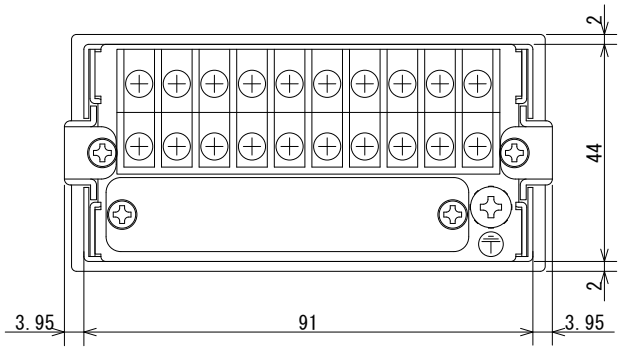
*1 and *2 are subject to change.

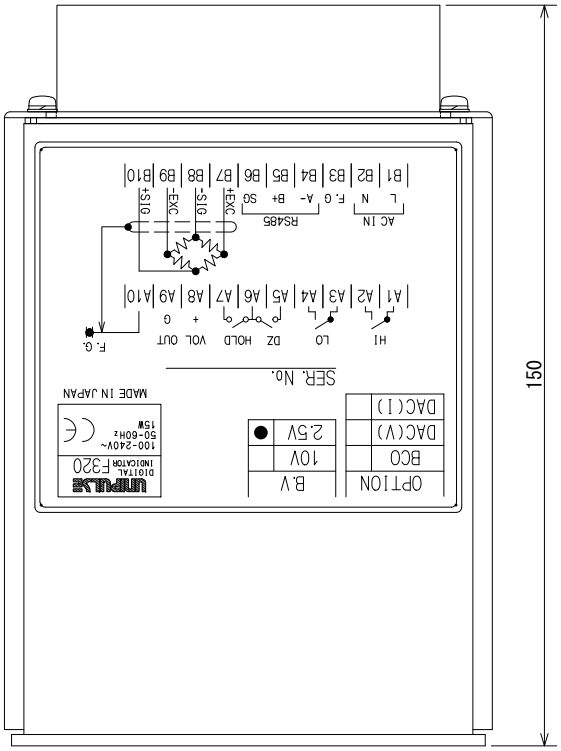
14-3. F320 Block Diagram

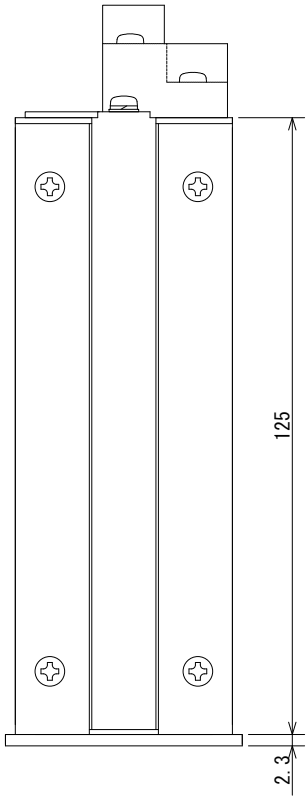


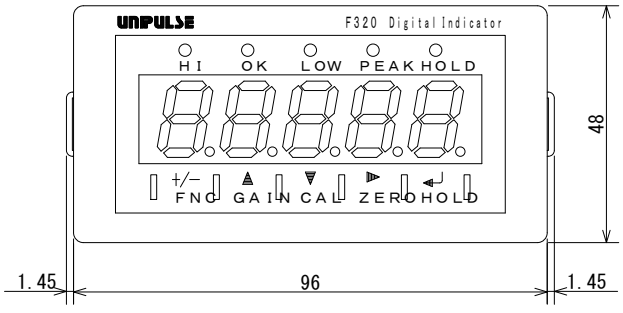
15. DIMENSIONS (Standard)

Unit : mm



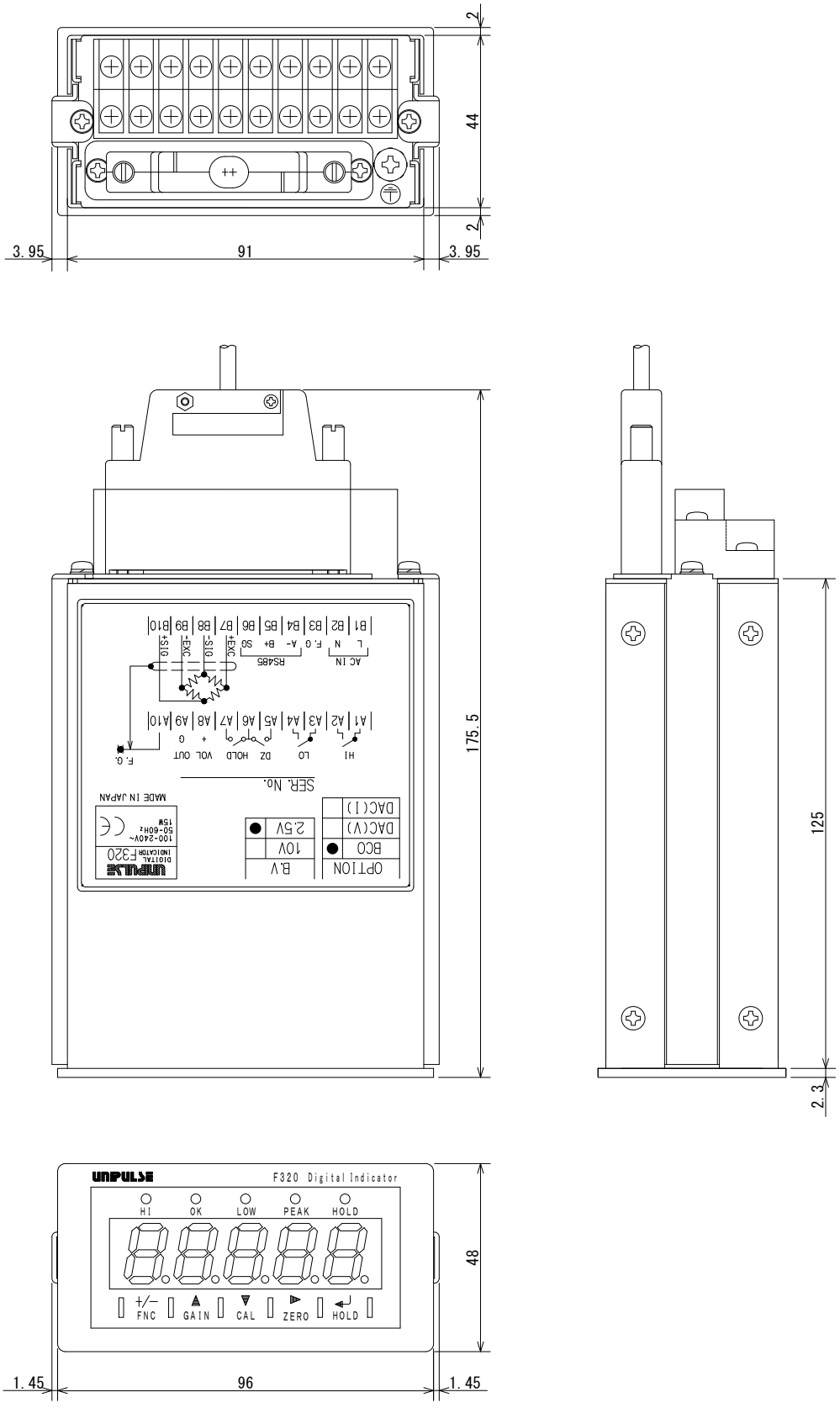






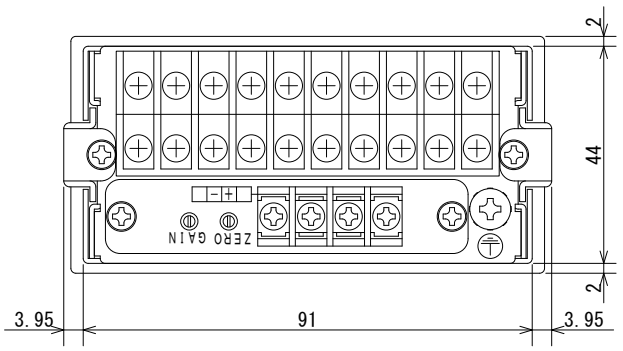
15-1. Dimensions (When the BCO option is equipped)

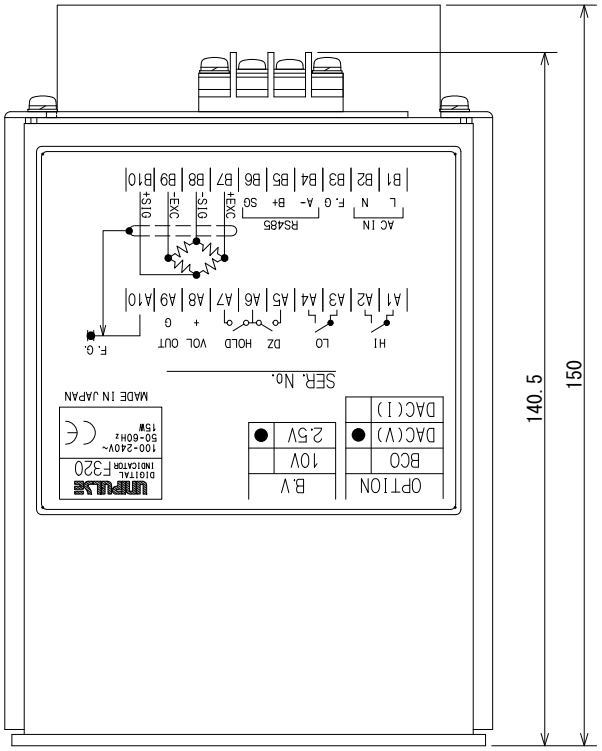
Unit : mm

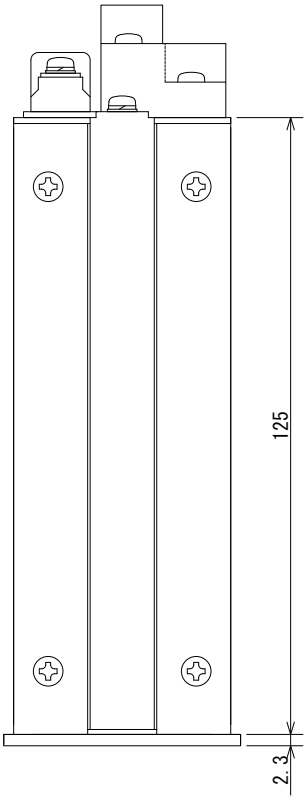


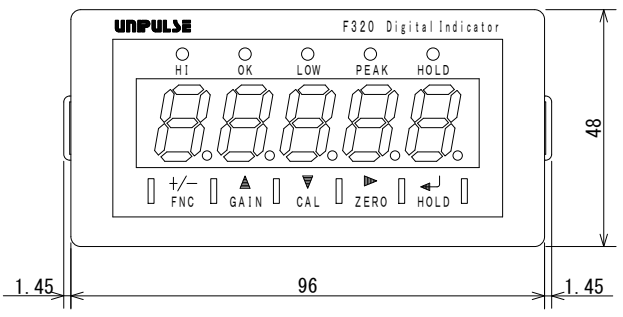
15-2. Dimensions (When the DAV/DAI option is equipped)

Unit : mm









16. SPECIFICATIONS

16-1. Analog Section

Sensor excitationvoltage	10V or 2.5V DC±10% (The factory-shipped initial value is 2.5V.) Output current within 30mA
Signal input range	-3.0 to +3.0mV/V
Equivalent input calibration range	+0.5 to +3.0mV/V
Equivalent input calibration error	Within 0.1％FS（0.5mV/V input）
Zero adjustment range	0 to ± 2.0mV/V
Gain adjustment range	+0.5 to +3.0mV/V
Analog input signal sensitivity	1 μ V/count (1/10000 can be assured with 1mV/V or more input.)
Accuracy	Non-linearity Within 0.02%FS （of 3mV/V input） Zero drift Within 0.5 μ V/ ℃ Gain drift Within 25ppm/ ℃
A/D converter	2000 times /sec. Resolution:24 bits（binary）
Analog filter	3, 10, 30, 100, 300, 1kHz
Peak hold function	Digital peak hold at 2000 times/sec.

16-2. Indicator Section

Indicator	Numerical display (5-digit), 15mm in character height, by 7-segment red LED	
	Numeric	5digits ±88888 (" 1 " or nothing is displayed at the high order position of the indicator.)
	Indicatid value	-19999 to 19999
	Decimal point	The display position is selectable. 88.888, 888.88, 8888.8, 88888
Items	Status	HI, OK, LOW, PEAK, HOLD Red LED 5
	Count	3, 6, 13, 25times/sec. Selectable

16-3. Setting Section

Key switch

FNC (+/-)	GAIN (▲)	CAL (▼)	ZERO (▶)	HOLD (↵)	(5key)

Items

Calibration:Zero/Span calibration（actual load calibration, equivalent input calibration）

<Setting mode 1>
High limit value, Low limit value, High/Low limit comparison mode, Hysteresis, Digital offset, Near zero

<Setting mode 2>
Digital filter, Analogfilter, Motion detect（time）,
Motion detect（range）, Zero tracking（time）,
Zero tracking（range）,Hold mode

<Setting mode 3>
Set value LOCK, Calibration LOCK, ZERO key valid/invalid, HOLD key valid/invalid, Scale division, Display frequency, Decimal place, Excitation voltage

<Setting mode 4>
RS-485 communication method, RS-485 ID,
RS-485 transmission delay time, BCD data update rate,
D/A zero setting, D/A full scale setting , D/A output mode,
Password

16-4. External Signals

High limit relay, Low limit relay, Analog monitor output,
Hold signal input, Digital zero signal input.

16-5. Interface

RS-485 communication interface
(Communication protocol; Modbus-RTU)

Signal level	Based on RS-485	
Transmission distance	Approx. 1km	
Transmission method	Asynchronous, half-duplex	
Transmission speed	Selectable from 1200, 2400, 4800, 9600, 19200, and 38400bps	
Number of units connected	32 at maximum (including one master)	
Bit configuration	Start bit	1 bit
	Character length	Fixed at 8 bits
	Stop bit	Fixed at 1 bit
	Parity bit	Selectable from none, odd, and even

16-6. Option

BCD parallel data output interface (sink type) [BCO]

Output signal:	Indicated value data (5-digit), near zero, minus, over, stable, strobe
Output logic:	Switching between positive logic and negative logic
Output type:	Sink type When signal ON, output transistor ON. When the input unit such as PLC is connected, plus common is connected.
Rated voltage:	30V
Rated current:	50mA
Insulation method:	Photo coupler insulation

Input signal:	BCD data hold, logic switching
Input type:	Dead-front contact input (self-contained power supply) Relay, switch, and transistor, etc. can be connected. The signal is inputed by short-circuited and opening the input terminal of the terminal COM. When the transistor is connected, NPN output type (sink type) is connected.
Current when short-circuited	About 6mA
Insulation method:	Photo coupler insulation

BCD parallel data output interface (source type) [BSC]

Output signal:	Indicated value data (5-digit), near zero, minus, over, stable, strobe
Output logic:	Switching between positive logic and negative logic
Output type:	Source type When signal ON, output transistor ON. When the input unit such as PLC is connected, minus common is connected.
Rated voltage:	30V
Rated current:	20mA
Insulation method:	Photo coupler insulation

Input signal:	BCD data hold, logic switching
Input type:	Minus common Relay, switch, and transistor, etc. can be connected. The signal is inputed by short-circuited and opening the input terminal of the terminal COM. When the transistor is connected, PNP output type (source type) is connected.
ON voltage:	9V or more
OFF voltage:	3V or less
At 24V load:	About 5mA
Insulation method:	Photo coupler insulation

D/A converter (voltage output) [DAV]

Voltage output	-10 to +10V (load resistance; 2kΩ or more)
D/A conversion speed	2000 times/sec.
Resolution	1/10000
Over range	-11.0 to +11.0V
Zero adjustment range	Approx. -1.0 to +1.0V (at the time of zero output)
Gain adjustment range	Approx. 9.5 to 10.5V (at the time of full scale output)
Zero drift	Within 0.6mV/℃
Gain drift	Within 50ppm/℃
Non-linearity	Within 0.05%FS * Not including the drift of the analog input section
Output connector	Screw type terminal board (two-pole)

D/A converter (current output) [DAI]

Current output	4 to 20mA (load resistance; 350Ω or less)
D/A conversion speed	2000 times/sec.
Resolution	1/10000
Over range	3.2 to 20.8mA
Zero adjustment range	Approx. 3.6 to 4.4mA (at the time of zero output)
Gain adjustment range	Approx. 19.6 to 20.4mA (at the time of full scale output)
Zero drift	Within 0.5μA/℃
Gain drift	Within 50ppm/℃
Non-linearity	Within 0.05%FS * Not including the drift of the analog input section
Output connector	Screw type terminal board (two-pole)

16-7. General Specifications

Power voltage	AC spec:	100V to 240V AC（+10% -15%）
		[Free power supply 50Hz/60Hz]
	DC spec:	12V to 24V DC (± 15%)
		(Depending on the request at the time of order)
Power consumption	AC spec:	15W max.
	DC spec:	15W max.

Rush current（Reference value）

AC spec:

15A, 2msec:100V AC mean load state
(ordinary temperature, at cold-start time)
30A, 2msec:200V AC mean load state
(ordinary temperature, at cold-start time)

DC spec:

4A, 25msec:12V DC mean load state
(ordinary temperature, at cold-start time)
3A, 20msec:24V DC mean load state
(ordinary temperature, at cold-start time)

Ambient conditions	Temperature:	Operation	-10 ℃ to +40 ℃
		Storage	-40 ℃ to +80 ℃
	Humidity:	85％RH（non-condensation）	
Dimensions	96W × 48H × 127.3D（mm）（excluding protrusions）		
Panelcutout dimension	92 × 45 $^{+1}_{-0}$ （mm）		
Weight	Approx.700g		

16-8. Accessories

AC cable*	One
Ferrite core for power cable*	One
Ferrite core for sensor cable	One
Terminating resistance	One
3P-2P conversion adapter*	One
BCD output connector	One set (when the BCO option is equipped)
Operation manual	One

* :It is attached only at the AC power source specification.

UNIPULSE

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