

F325

OPERATION MANUAL

01JUN2015REV.1.01

UNIPULSE

Introduction

F325 is a digital indicator for strain gauge type sensors (DIN96×48mm size).

It is ideal for the quality control of production lines such as pressure load control (press, pressure, force, etc.) and torque control of rotating machines.

RS-485 (Protocol is Modbus-RTU or UNI-Format.) is equipped as standard and can be easily introduced to a constituent system using Modbus protocol.

Be sure to read this operation manual before use in order to take full advantage of the superb quality of the F325 and to use it properly and safely. Use this indicator with accurate understanding of the contents. Keep this operation manual in a safe place to be used for further reference.

Safety precautions

Be sure to read for safety.

Make sure that installation, maintenance, and inspection of the F325 are performed by personnel with electrical expertise.

In this manual, precautions for safe use of the F325 are separately described as Warning and Caution in the following text. The precautions described in this text are important contents related to safety. Use this indicator with accurate understanding of the contents.

Events that may cause death or severe injury to personnel in the event of misuse.

/ Caution

Events that may cause injury to personnel or material damage in the event of misuse.



Events that may cause death or severe injury to personnel in the event of misuse.

Design warning

- Prepare a safety circuit outside the F325 so that the entire system functions safely if the F325 fails or malfunctions.
- Be sure to contact our sales representative before use if the F325 will be used as follows:
 - if the indicator is used in an environment not described in the operation manual;
 - if the indicator is used in a way that causes substantial effects on medical devices, transportation equipment, entertainment devices, safety devices, etc.

Installation warning

- Do not disassemble, repair, or alter the F325. Fire or electric shock may occur.
- Do not install into the following environments:
 - Locations with corrosive gas or combustible gas;
 - Locations over which water, oil, or chemical splash

Wiring warning

- Do not connect commercial power supply directly to a signal I/O terminal.
- Be sure to perform class D grounding when installing the main unit
- The AC cable included is for use in Japan and the rating is AC125V, 7A. Prepare a separate AC cable if the indicator is used at a voltage higher than the rating or is used overseas.
- Be sure to check that the power is off before the following actions:
 - Removal and installation of optional connectors and so forth;
 - Wiring and connection of cables to a signal I/O terminal;
 - Connection to protective grounding terminals.
- Be sure to check signal names and pin assignment numbers and to wire cables properly before connecting to a signal I/O terminal.
- Make sure to attach the terminal block cover included after wiring power supply. Electric shock may occur.
- Be sure to check wiring and so on carefully before turning power on.

Startup/maintenance warning

- Use power supply voltage and load within the specified range and rating.
- Do not damage power cords. Fire or electric shock may occur.
- Do not touch a signal I/O terminal while the power is on. This may cause electric shock and malfunction.
- Electric shock may occur inside when the cover of the main unit is opened. Internal
 capacitors are charged even if power supply is cut off. Contact us for inspection and repair of
 internal parts.
- Turn power off and unplug power cable immediately if smoke, abnormal smell, or abnormal noise is detected.

♠ Caution

Events that may cause injury to personnel or material damage in the event of misuse.

Installation precautions

- The F325 must be incorporated into the control panel and so forth.
- Do not install into the following environments:
 - Locations where temperature or humidity exceeds specifications;
 - Locations subjected to drastic temperature fluctuations or icing and condensing;
 - Outdoors or locations above 2,000m;
 - Locations exposed to direct sunlight;
 - Locations subject to dust accumulation;
 - Locations with poor ventilation;
 - Locations with a lot of salt and metal powder;
 - Locations where the main unit is subject to direct vibration and shock.
- Perform adequate shielding if the indicator is used in the following locations:
 - Near power lines;
 - Locations subject to strong electric field and magnetic field;
 - Locations subject to noise such as static electricity and relays.
- Install as far away as possible from equipment generating high frequency, high voltage, large current, surge, etc. Perform wiring of cables separately from these power lines. Do not perform parallel wiring and identical wiring.
- Do not use the indicator if damaged.

Wiring precautions

Tighten signal I/O terminal screws to the torque specified.

Tightening torque: 0.2 to 0.6N • m

Use shielded cables for cables (sensors, external I/O, options).

Loose tightening may cause short-circuiting, fire, or malfunction.

Startup/maintenance precautions

- Be sure to have a time interval of five seconds or longer between turning power on and off.
- Use after warming up for 30 minutes or longer following the startup of power supply.
- Protective performance of the F325 may be lost if it is not used as specified.
- Care
 - Unplug the power supply during maintenance.
 - Do not wipe with a wet cloth, benzin, thinner, alcohol, etc. Doing so may cause discoloration or deformation of the F325.
 - When dirty, clean using a cloth soaked in diluted neutral detergent followed by a soft, dry cloth.



Caution

Events that may cause injury to personnel or material damage in the event of misuse.

Transportation precautions

• Although the F325 package is designed to absorb shock sufficiently during shipping, re-use of the same packaging materials may damage the indicator when shock is encountered. When sending this product to us for repair and so on, package it using sufficient shockabsorbing materials.

Disposal precautions

Dispose of as industrial waste.

Compliance with EC directives

The F325 digital indicator is a product that complies with EC Directives (based on the European Community Council) included with CE mark.

- Low Voltage Directive EN61010-1:2010 (overvoltage category II) *1

EN62311:2008 (test distance: 10cm) *1

- EMC Directive EN61326-1:2006

EN55011:2009, A1:2010 Group1, ClassA *2 EN61000-3-2:2006, A1:2009, A2:2009 *1

EN61000-3-3:2008 *1 EN61000-4-2:2009

EN61000-4-3:2006, A1:2008, A2:2010

EN61000-4-4:2004, A1:2010

EN61000-4-5:2006 EN61000-4-6:2009 EN61000-4-8:2010 EN61000-4-11:2004 *1

*1: AC spec. only

*2: Radiated only for DC spec.



Key points

Only for DC spec., the combination of the main unit of the F325 and a lightning surge protector conforms to EN61000-4-5 (lightning surge immunity) in the EMC Directives. Refer to P.23 " \diamondsuit Lightning surge protector connection" for information regarding lightning surge protector connection.

EN62311 (human exposure) in the Low Voltage Directives conforms at the distance of 10cm.

Products supporting RoHS directive

The parts and accessories used in this machine (including the operation manual, package box and so on) support RoHS Directive, which regulates the use of toxic substances that may have adverse effects on the environment and human body.



Key points |

Contact one of our sales representatives for options supporting RoHS.

RoHS directive

RoHS stands for Restriction on Hazardous Substances. This is an EU regulation regarding toxic substances. This Directive prohibits the use of six specific substances in electrical/electronic equipment products sold in the EU region. The six substances include lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyl) and PBDE (polybrominated diphenyl ether).

Contents

1	Outline	. 1
	1-1. Package contents	1
	1-2. Connection with other devices	2
	1-3. Name and function of each part	2
	Front panel	
	■ Rear panel	
	1-4. Operating procedures	0
2	Installation & Connection	. 9
	2-1. Installation to panel	. 10
	2-2. Connection to the signal I/O terminal block	. 11
	2-3. Connection of strain gauge type sensors	. 12
	2-4. Connection of analog monitor output (VOL OUT)	. 13
	2-5. Connection of RS-485 (RS-485 or SI/F standard: not specified at the time of order)	. 14
	2-6. SI/F Connection (RS-485 or SI/F specified at the time of order: SIF)	. 15
	2-7. External output connection	. 16
	2-8. External input connection	. 17
	2-9. Power input terminal connection	. 19
	■ AC spec	
3	Setting Procedure	24
	3-1. Setting mode configuration	. 24
	3-2. Setting items display	. 26
	3-3. Setting procedure	. 28
4	Calibration	29
	4-1. Calibration method	. 29
	4-2. Actual load calibration procedures	. 30
	4-3. Equivalent input calibration procedures	. 30
	4-4. Calibration LOCK release	. 31
	■ Calibration LOCK setting method	. 31
	4-5. Excitation voltage	
	■ Excitation voltage setting method	. 31

	4-6. E	Decimal place setting (Omit if there is no change.)	
		Decimal place setting method	
	4-7. N	Min. scale division setting (Omit if there is no change.)	
		Min. scale division setting method	
	4-8. Z	Zero calibration	33
		Actual load calibration	
	4-10.E	Equivalent input calibration	34
5		Calibration LOCK	35
	Setting	gs and Operations Netated to indicated values	. 50
	5-1. E	Display frequency	36
		■ Display frequency setting method	
	5-2. A	Analog filter	
		■ Analog filter setting method	36
	5-3. N	Moving average filter	
		■ Moving average filter setting method	37
	5-4. S	Sampling rate	37
		■ Sampling rate setting method	37
	5-5. E	Digital low-pass filter	38
		■ Digital low-pass filter setting method	38
	5-6. N	Motion detect	39
		■ Motion detect setting method	40
	5-7. Z	Zero tracking	40
		■ Zero tracking setting method	40
	5-8. E	Digital zero	42
		■ Digital zero by key operation■ Digital zero by external signal input	
	5-9. E	Digital offset	43
		■ Digital offset setting method	43
	5-10.Z	ZERO key valid/invalid	43
		■ ZERO key valid/invalid setting method	43
6	Setting	g and Operation Related to Comparison	. 44
	6-1. C	Output selection	44
		Output selection setting method	44
	6-2. l	HI limit / LO limit / HH limit / LL limit	
		■ HI limit / LO limit / HH limit / LL limit setting method	46
	6-3. H		
		■ HI/LO limit comparison mode setting method	48
	6-4. H	- Hysteresis	
		■ Hysteresis setting method	49

	6-5. Alarm HI limit, Alarm LO limit	50
	■ Alarm HI limit and Alarm LO limit setting method	50
	6-6. Near zero	51
	■ Near zero setting method	51
7	Settings and Operations Related to Hold	52
	7-1. Hold mode	
	Hold mode setting method	
	Sample hold (maintaining arbitrary points)	
	7-2. Peak hold selection	59
	■ Peak hold selection setting method	59
	7-3. Hold fix section	60
	■ Hold fix section setting method	60
	7-4. Renewal timing of hold value	60
	■ Renewal timing of hold value setting method	
	7-5. Hold detection wait	
	■ Hold detection wait setting method	
	7-6. HOLD key valid/invalid	62
	■ HOLD key valid/invalid setting method	62
8	Settings and Operations Related to SI/F Print	63
	O. 4. Automotio minting agreement	00
	8-1. Automatic printing command	
	■ Automatic printing setting method	64
	Automatic printing setting method	64 65
	■ Automatic printing setting method	64 65
9	Automatic printing setting method	
9	Automatic printing setting method. 8-2. Hold value printing	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password Password setting method	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password Password setting method 9-3. Self-check/Initialization	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password Password setting method	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password Password setting method 9-3. Self-check/Initialization Self-check	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password Password setting method 9-3. Self-check/Initialization Self-check Initialization	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password Password setting method 9-3. Self-check/Initialization Self-check Initialization 9-4. I/O input check	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password Password setting method 9-3. Self-check/Initialization Self-check Initialization 9-4. I/O input check 9-5. I/O output check	
9	Automatic printing setting method 8-2. Hold value printing Hold value printing setting method System Settings and Operations 9-1. Set value LOCK Set value LOCK setting method 9-2. Password Password setting method 9-3. Self-check/Initialization Self-check Initialization 9-4. I/O input check 9-5. I/O output check 9-6. BCD input check	

9-11.Option type 73 9-12.Version 73 10Analog Monitor Output (VOL OUT) 74 11RUN Output 75
9-12.Version
10Analog Monitor Output (VOL OUT)74
11RUN Output
11RUN Output
12Interface
12-1.RS-485 Interface (RS-485 or SI/F standard: not specified at the time of order) 76
Communication specifications
■ Connection of RS-485
■ UNI-Format commands80
Transmitting format for continuous transmission/printing
Modbus-RTU
12-2.SI/F (RS-485 or SI/Specified at the time of order: SIF)
■ Connection of SI/F
■ Regarding indicated values transmitted by SI/F 107
■ Regarding indicated values transmitted by SI/F
13Options
13 Options
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 108
13 Options
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117 ■ Voltage output (DAV option) 117 ■ Current output (DAI option) 119
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117 ■ Voltage output (DAV option) 117 ■ Current output (DAI option) 119 ■ Setting values related to D/A converter 121
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117 ■ Voltage output (DAV option) 117 ■ Current output (DAI option) 119 ■ Setting values related to D/A converter 121 13-3.RS-232C interface 123
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117 ■ Voltage output (DAV option) 117 ■ Current output (DAI option) 119 ■ Setting values related to D/A converter 123 13-3.RS-232C interface 123 ■ Communication specifications 123
13Options 108 13-1.BCD data output 108 Setting values related to BCD data input 109 Sink type (BCO option) 110 Source type (BSC option) 113 13-2.D/A converter 117 Voltage output (DAV option) 117 Current output (DAI option) 119 Setting values related to D/A converter 123 13-3.RS-232C interface 123 Communication specifications 123 Cables 123
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117 ■ Voltage output (DAV option) 117 ■ Current output (DAI option) 119 ■ Setting values related to D/A converter 123 13-3.RS-232C interface 123 ■ Communication specifications 123
13Options 108 13-1.BCD data output. 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117 ■ Voltage output (DAV option) 117 ■ Current output (DAI option) 119 ■ Setting values related to D/A converter 123 13-3.RS-232C interface 123 ■ Communication specifications 123 ■ Cables 123 ■ Setting values related to RS-232C 124 ■ Communication format for commands 126 ■ Setting value communication format 126
13Options 108 13-1.BCD data output 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117 ■ Voltage output (DAV option) 117 ■ Current output (DAI option) 119 ■ Setting values related to D/A converter 123 13-3.RS-232C interface 123 ■ Communication specifications 123 ■ Cables 123 ■ Setting values related to RS-232C 124 ■ Communication format for commands 126
13Options 108 13-1.BCD data output 108 Setting values related to BCD data input 109 Sink type (BCO option) 110 Source type (BSC option) 113 13-2.D/A converter 117 Voltage output (DAV option) 117 Current output (DAI option) 118 Setting values related to D/A converter 121 13-3.RS-232C interface 123 Cables 123 Setting values related to RS-232C 124 Communication format for commands 126 Setting value communication format 128 Setting value communication format 129 Continuous transmitting format 132
13Options 108 13-1.BCD data output. 108 ■ Setting values related to BCD data input 109 ■ Sink type (BCO option) 110 ■ Source type (BSC option) 113 13-2.D/A converter 117 ■ Voltage output (DAV option) 117 ■ Current output (DAI option) 119 ■ Setting values related to D/A converter 123 13-3.RS-232C interface 123 ■ Communication specifications 123 ■ Cables 123 ■ Setting values related to RS-232C 124 ■ Communication format for commands 126 ■ Setting value communication format 126
13Options 108 13-1.BCD data output 108 Setting values related to BCD data input 109 Sink type (BCO option) 110 Source type (BSC option) 113 13-2.D/A converter 117 Voltage output (DAV option) 117 Current output (DAI option) 118 Setting values related to D/A converter 121 13-3.RS-232C interface 123 Cables 123 Setting values related to RS-232C 124 Communication format for commands 126 Setting value communication format 128 Setting value communication format 129 Continuous transmitting format 132

15-1.Spe	cifications	
	Analog section	
	Display section	
	Setting section	
	External I/O signal	
	Interface	
	Options	
	General performance	
	Accessories	
15-2.Dim	ensions	
	Standard	
	When BCO/BSC option is selected	
	When DAV / DAI option is selected	
	When RS-232C option is selected	
15-3.F32	5 block diagram	

1 Outline

1-1. Package contents

The following items are included in the package box. Be sure to check the contents before use.



F325 main unit --- One unit



F325 operation manual --- One copy



F325 AC input cord*
--- One piece



Terminator
--- One piece
(included only in RS-485 specifications)



Connector for BCD output
--- One set
(BCO and BSC output option is selected)



Conversion plug for AC input cord*
--- One piece

* Included only in AC specifications



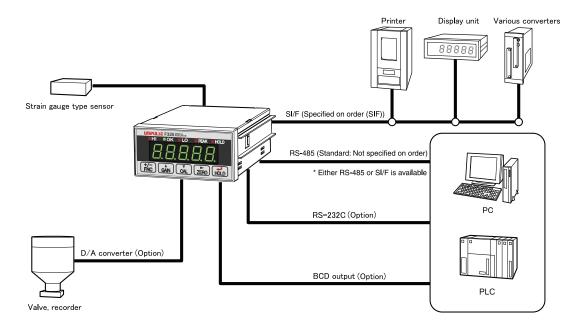
Key points

AC input cord

The input cable included as standard with this product may be used with AC100V power supply in Japan (nominal rated voltage AC125V).

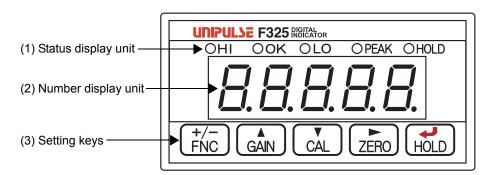
When using this product overseas, use an input cable certified in that country.

1-2. Connection with other devices



1-3. Name and function of each part

■Front panel



(1) Status display unit

Status of the F325 is displayed. Setting items are displayed when setting is performed.

HI Lighted: HI limit output condition is met Flashes: HH limit output condition is met

* Flash is prioritized.

* HI limit output condition and HH limit output condition are subject to change depending on setting values of HI/LO limit comparison mode and hysteresis.

OK Lighted: OK output condition is met

* OK output condition is subject to change depending on setting values of HI/LO limit comparison mode and hysteresis.

LO Lighted: LO limit output condition is met

Flashes: LL limit output condition is met

- * Flash is prioritized.
- * LO limit output condition and LL limit output condition are subject to change depending on setting values of HI/LO limit comparison mode and hysteresis.

PEAK Flashes when peak hold function is detectable.

Illuminated when peak hold function is fixed.

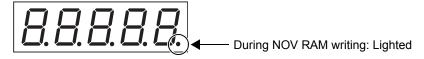
HOLD Illuminated when indicated values are held.

(2) Number display unit

The following three kinds of information are displayed.

- 1) Indicated value
- 2) Setting value

For setting value display, a dot illuminates during NOV RAM writing.



3) Error message display

Refer to P.133 "14.Error Message Display".

(3) Setting keys

These keys are for commands of various settings and operations.



+/-FNC <When indicated values are displayed>

Setting mode is on.

Display changes to setting mode "F1".

Indicated value is displayed Setting mode "F1" is displayed.

Press the $\binom{+/-}{FNC}$ key again to stop setting.

<When setting is performed>

This key changes setting value signs (+/-).

▲ GAIN <When indicated values are displayed>

Actual load calibration mode is on.

<When setting is performed>

This key selects set items and increases one value of the flashing digit of a setting value.

Outlin



<When indicated values are displayed>

Equivalent input calibration mode is on.

<When setting is performed>

This key selects set items and decreases one value of the flashing digit of a setting value.



<When indicated values are displayed>

Zero calibration mode is on (when calibration LOCK is OFF).

Indicated value is forced to be zero by digital zero (when calibration LOCK is ON).

* If setting value of ZERO key valid/invalid is set as invalid and key operation is not possible.

<When setting is performed>

This key selects a setting mode and the flashing digit of a setting value.

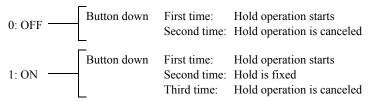


<When indicated values are displayed>

This key is used for hold function operation.

Operations change depending on setting values of hold fix section.

When hold fix section is



* If setting value of HOLD key valid/invalid is set as invalid, key operation is not possible.

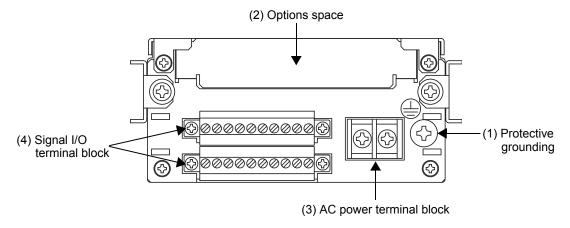
<When setting is performed>

The key fixes set items and setting values.

♠ Caution

Do not press strongly nor use sharp objects to press the switch.
 This may cause damage and malfunction.

■Rear panel



(1) Protective grounding \bigoplus

This is a protective grounding terminal block. Be sure to ground a protective grounding terminal in order to prevent electric shock and trouble arising from static electricity. (A case and protective grounding terminal are in continuity.)

Do not use screws other than the ones (with bind M4x8-tooth captive washer) for installing the main unit.

(2) Options space

One of the following options can be selected.

- BCD parallel data output (sink type)	(BCO)
- BCD parallel data output (source type)	(BSC)
- D/A converter (voltage output)	(DAV)
- D/A converter (current output)	(DAI)
- RS-232C	(232)

(3) AC power terminal block

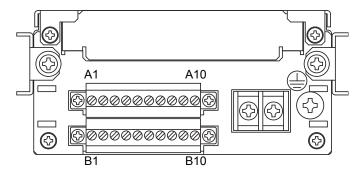
Connect AC power cord. Input power supply is AC100 to 240V. Frequency is 50/60Hz.

* Refer to P.21 "■ DC spec. (specified at the time of order)" for DC specifications.

Dutline

(4) Signal I/O terminal block

This terminal block is used for inputting/outputting control signals and for inputting strain gauge type sensor signals.



- Terminal block assignment

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
COM*	HI	OK	LO	OUT1	OUT2	DZ	HOLD	H.RESET	COM*
CONTROL OUTPUT							CONTRO	L INPUT	
* COMs of input and output are independent								pendent.	
B1 B2 B3 B4 B5 B6 B7 B8 B5							В9	B10	
SHIELD	+EXC	-SIG	-EXC	+SIG	+	G	B+	A-	SG
LOADCELL					VOL	OUT	S	IF	
								RS-485	

Upper (A) 20020009-C101B01LF made by FCI Electronics

Lower (B) 20020011-C101B01LF made by FCI Electronics

Straight type (optional) 20020000-C101B01LF made by FCI Electronics

Note: Straight type (optional) cannot be attached to both upper and lower terminal blocks.

CONTROL OUTPUT

This output terminal is used for control.

A1	COM	This is a common terminal (common within output signals) of output signals.
A2	НІ	This outputs HI signals. * 1 This is a PhotoMOS relay output (normally open contact).
A3	OK	This outputs OK signals. * 1 This is a PhotoMOS relay output (normally open contact).
A4	LO	This outputs LO signals. * 1 This is a PhotoMOS relay output (normally open contact).
A5	OUT1 (output selection1)	This output is used for selecting a function by the setting value of output selection. * 2 (HH limit, overload, RUN, hold, near zero, DZ response, default value: HH limit (HH)) This is a PhotoMOS relay output (normally open contact).
A6	OUT2 (output selection2)	This output is used for selecting a function by the setting value of output selection. * 2 (LL limit, overload, RUN, hold, near zero, DZ response, default value: LL limit (LL))

This is a PhotoMOS relay output (normally open contact).

- *1 Refer to P.45 "6-2.HI limit / LO limit / HH limit / LL limit" and P.47 "6-3.HI/LO limit comparison mode" for each signal.
- *2 Refer to P.44 "6-1.Output selection" for output selection.

CONTROL INPUT

This input terminal is used for control.

A7 DZ This input terminal is used for controlling digital zero.

Digital zero is implemented if switched OFF -> ON.

Valid only when calibration LOCK is ON.

A8 HOLD This input terminal is used for controlling hold functions.

Refer to P.52 "7-1.Hold mode" for details.

A9 H.RESET This input terminal is used for releasing hold.

Hold is released when switched OFF -> ON.

If hold fix section is set to 0: OFF, it is not necessary to control (wire) H.RESET since ON -> OFF of HOLD signals is also hold release at

the same time.

If hold fix section is set to 1: ON, hold will not be released since hold is fixed by ON -> OFF of HOLD signals. Switch H.RESET OFF ->

ON to release hold.

* When HOLD signals are switched OFF -> ON from a condition where hold is fixed, hold is released once, and it returns to the current value and detection status.

current value and detection sta

A10 COM This is a common terminal (common within input signals) of input

signals.

LOADCELL

This terminal is used for connecting strain gauge type sensors.

B1	SHIELD	This is frame ground.

Connect the shielded wires of connection cables of strain gauge

type sensors.

B2 +EXC This terminal is used for supplying voltage of strain gauge type sensors.

Connect +IN of strain gauge type sensors.

B3 -SIG This terminal is used for inputting signals of strain gauge type sensors.

Connect -OUT of strain gauge type sensors.

B4 -EXC This terminal is used for supplying voltage of strain gauge type sensors.

Connect -IN of strain gauge type sensors.

B5 +SIG This terminal is used for inputting signals of strain gauge type sensors.

Connect +OUT of strain gauge type sensors.

VOL OUT

B6 + This terminal is used for outputting voltage proportional to inputs of

strain gauge type sensors. Connect pen recorders and so on in case that inputs of strain gauge type sensors are to be simply monitored

(approx. 2V per 1mV/V).

B7 G This is a ground terminal of VOL OUT.

RS-485/SIF

This terminal is used for connectting RS-485 (standard: not specified at the time of order) or SI/F (specified at the time of order, SIF).

RS-485

This serial interface is used for retrieving indicated values and status of the F325 with protocols such as Modbus-RTU and UNI-Format and for writing settings into the F325.

B8	B+	Connect B+ of the counterpart device to be connected.
B9	A-	Connect A- of the counterpart device to be connected.
B10	SG	This is a ground terminal. Wiring is not normally required in case

the F325 and connection counterpart devices are class D grounded.

SI/F

This two-wire serial interface is used for connecting printers, external display units and so on made by UNIPULSE.

В8	SI/F	Connect with a SI/F terminal of the counterpart device to be connected (no polarity).
В9	SI/F	Connect with a SI/F terminal of the counterpart device to be connected (no polarity).
B10	SG	Not used.

1-4. Operating procedures

Set up the F325 according to the following procedures.

(1) Installation/connection	
- Installation to panel	P.10
- Connection of strain gauge type sensors	P.12
- Connection of analog monitor output	P.13
- Connection of RS-485	P.14
- Connection of SI/F	P.15
- Connection of external output	P.16
- Connection of external input	P.17
- Connection of power input terminal	P.19

(2) Calibration	
- Calibration LOCK release	P.31
 Setting of each setting value Zero calibration Actual load calibration Equivalent input calibration Calibration LOCK 	P.31~ P.33 P.33 P.34 P.35

P.36
P.44
P.52
P.63
P.66

(4) Measurement start

Installation & Connection

Chaptei

2

2 Installation & Connection

The following are precautions related to connection to the signal I/O terminal block.

The precautions described in this text are important contents regarding safety.

Connect this indicator with accurate understanding of the contents.

🛕 Warning

- Do not connect commercial power supply directly to the signal I/O terminal.
- To avoid electric shock when connecting to the signal I/O terminal, connect the indicator when power is off.
- Be sure to check signal names and pin assignment numbers and to wire cables properly before connecting to the signal I/O terminal.
- Make sure that overvoltage applied to the signal I/O terminal does not exceed the value specified in category II.
- Make sure to attach the included terminal block cover after wiring the power supply.
 Electric shock may occur.
- Be sure to check wiring and so on carefully before turning power on.
- Do not touch the I/O terminal while power is on. This may cause electric shock and malfunction.

Caution

■ Tighten power supply terminal screws to the torque specified. Loose tightening of terminal screws may cause short-circuiting, fire, or malfunction.

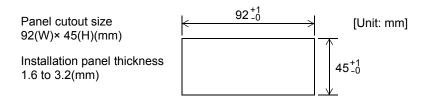
Tightening torque: 0.2 to 0.6N • m

Use shielded cables for cables.

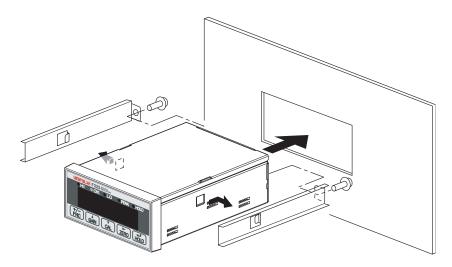
2-1. Installation to panel

Use the following procedures when installing the F325 to the control panel.

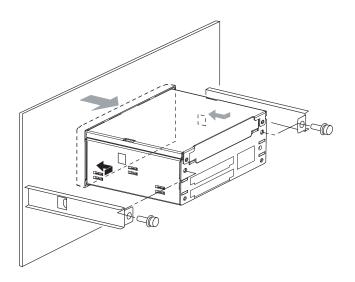
1. Create holes on the panel in accordance with the panel cutout size.



- 2. Remove guide rails on both sides.
- **3.** Fit the F325 in from the front of the panel.



4. Install the guide rails from the back and secure them using the screws included.



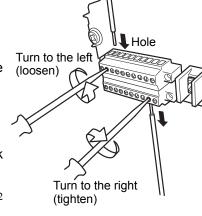
2-2. Connection to the signal I/O terminal block

- Peel off 6 to 7 mm of coating of the electric wire to be connected, and twist the tip to the extent that it is not torn apart.
- Loosen screws with a screwdriver and make holes.

A flathead screwdriver with a shaft diameter of 2.0mm is recommended (precision screwdrivers and so on).

- **3.** Insert the electric wire into the hole without tearing the tip apart.
- **4.** Tighten screws with a screwdriver.
- **5.** Pull the electric wire slightly to check that it has been securely clamped.
 - * Electric wires between 0.08 to 1.31mm² can be connected (AWG16 to 28).

The recommended tightening torque value is 0.17 to 0.21N • m.



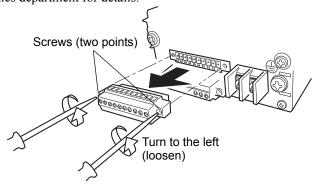
6 to 7mm

* The terminal block is removable.

Loosen the screws (two points), pull the terminal block strongly, and remove it from the main F325 unit.

If difficult to remove, make a space between the main unit and terminal block using a flathead screwdriver and try removing it again.

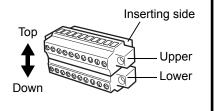
* Straight type terminal block (CN82) is also available from UNIPULSE. Contact our sales department for details.



Attention

Check the vertical direction when installing the terminal block to the main F325 unit. (Refer to the diagram to the right.)

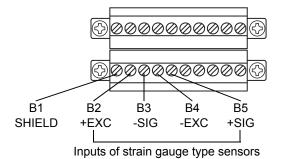
Make sure to use the indicator with both the upper and lower terminals installed during operation in order to avoid mis-insertion of the upper and lower sections.



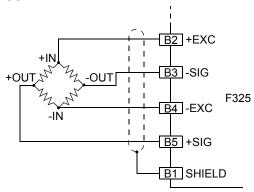
2

2-3. Connection of strain gauge type sensors

Strain gauge type sensors are connected. Excitation voltage can be selected from 2.5 or 10V (factory setting = 2.5V). Output current is 30mA maximum. Refer to P.31 "4-5.Excitation voltage" for excitation voltage settings.

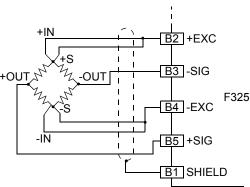


♦ Four-wire sensor



♦Six-wire sensor

Short-circuit +EXC and +S, and -EXC and -S, respectively, if connecting six-wire strain gauge type sensors.

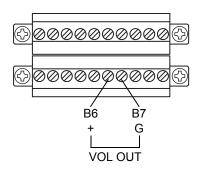


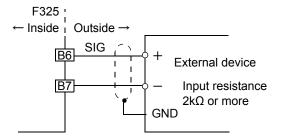
♦ Cable colors of sensors

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

2-4. Connection of analog monitor output (VOL OUT)

A voltage proportional to sensor inputs is output. The voltage to be output is approx. 2V per 1mV/V of sensor input.





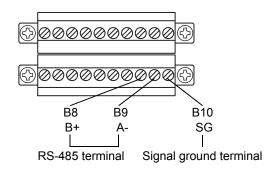
A Caution

- ◆ The VOL OUT terminal is not insulated from the internal circuit. Use shielded cables for connection with external devices, and wire the cables within 2 to 3m.
- Do not short-circuit. This may cause malfunction.
- Do not apply voltage from outside. This will cause damage.

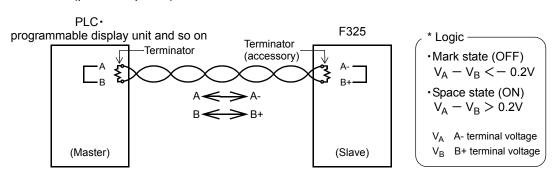
2-5. Connection of RS-485

(RS-485 or SI/F standard: not specified at the time of order)

RS-485 is an interface to read the indicated values and status of the F325 and to write the setting values into the F325. This interface is convenient for processing such as controls, totals, and records by connecting the F325 to a PLC, programmable display unit and so forth.



Two-wire (point to point)



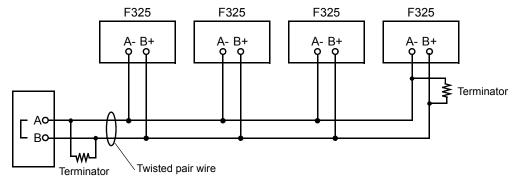
- Use twisted pair wires for connection cables. (Noise margin increases.) However, two-core parallel cables are sufficient for short-distance connection.
- Install the included terminator to the F325 if the F325 is a dead end.
- SG terminal (B10 terminal) is a ground terminal (which protects a circuit) used on the circuit.
 SG terminal is not normally required to use if the main unit of the F325 and connection counterpart device are class D grounded.

However, in case connection is necessary based on the on-site conditions, check the specifications of the counterpart device and connect it.

Attention

Depending on master devices, A and B may be reversely indicated. In case communication is not possible, switch A and B.

Two-wire (multi point)



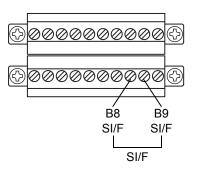
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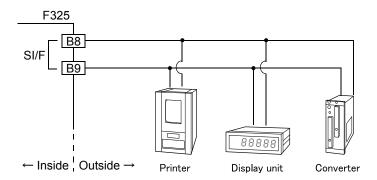
2-6. SI/F Connection

(RS-485 or SI/F specified at the time of order: SIF)

This is a two-wire serial interface for connecting printers, external display units and so on made by UNIPULSE



Up to three external devices can be connected with no polarity. Use two-core parallel cables, captire cables (electric wires with thick coating for construction) and so on for wires. In case two-core parallel cables and captire cables are used, transmission distance is approx. 30m. In case two-core shield twisted pair wires are used, transmission distance is approx. 300m. Do not parallel AC lines and high-pressure lines. This causes malfunction.



2

2-7. External output connection

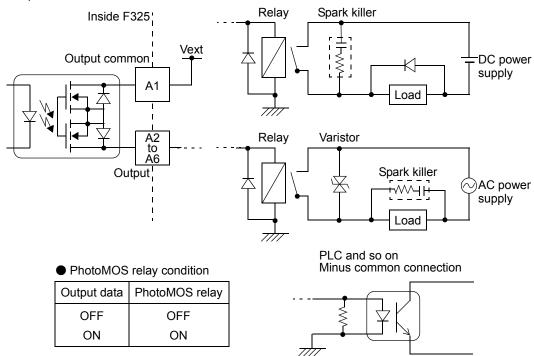
External output circuit has been set to PhotoMOS relay output. Common is A1.

The capacity of PhotoMOS relay output is 100mA, and the withstanding voltage is up to 30V.

Plus common connection and minus common connection are possible.

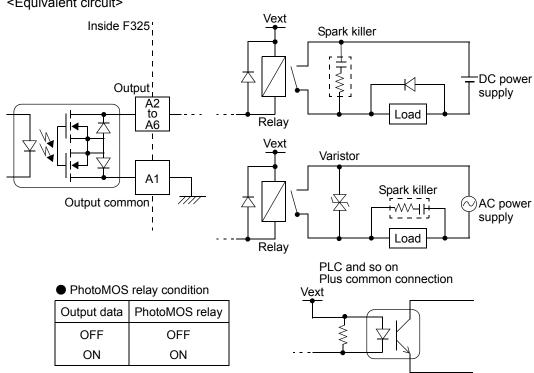
Plus common connection

<Equivalent circuit>



Minus common connection

<Equivalent circuit>



♠ Caution

- Prepare an external power supply for the relay drive (vext).
- When activating AC power supply, be sure to connect it to the F325 via relay and so on, but not directly.
- Power supply must be within the rating (DC spec.: 30V 100mA).
 Overvoltage and overcurrent cause failure.
 Never load short-circuit. This will cause damage.

2-8. External input connection

No-voltage contact input type (standard (NVI): not specified at the time of order) or DC-input type (DCI: specified at the time of order) can be selected for external input circuit.

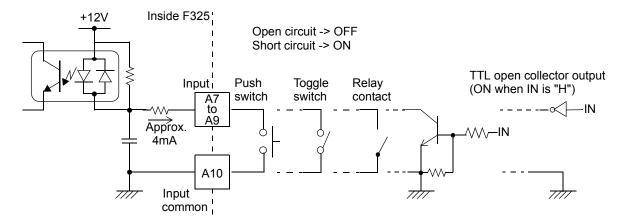
No-voltage contact input type (standard (NVI): not specified at the time of order)

This type inputs signals by making short-circuit and open-circuit between input terminals (A7 to A9) and common terminal (A10). Short-circuit is performed with contacts (relays, switches and so on) and non-contacts (transistors, TTL of open collector output and so on).

DC-input type (DCI: specified at the time of order)

This type inputs signals by applying voltage between input terminals (A7 to A9) and common terminal (A10). Plus common connections and minus common connections are possible.

Minus common connection of no-voltage contact input type (standard: NVI) <Equivalent circuit>



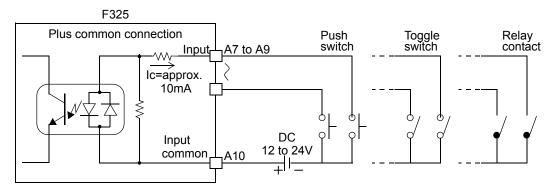
- Do not apply voltage to the signal input circuit from outside.
- An external element must be an element in which Ic=10mA or more can be applied.
- External element leak must be 400µA or below.

2

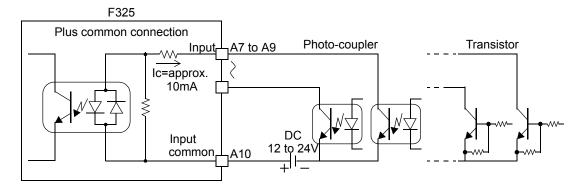
DC-input type (DCI)

- Plus common connection

When connecting relays, switches and so on

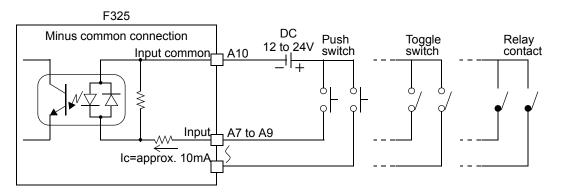


When connecting transistors, photo-couplers and so on

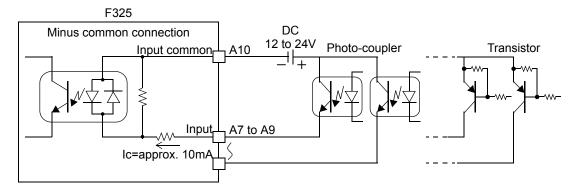


- Minus common connection

When connecting relays, switches and so on



When connecting transistors, photo-couplers and so on



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2

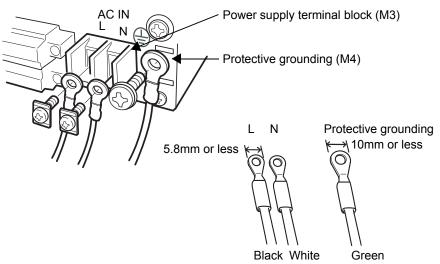
♠ Caution

- An external element must be an element in which Ic=20mA or more can be applied.
- External element leak must be 400µA or below.
- ON: DC9V or above, OFF: DC3V or below

2-9. Power input terminal connection

■AC spec.

AC input cord is connected. Input voltage is AC100 to 240V. Frequency is 50/60Hz.



(The indicated colors correspond to the AC cable included.)

- **1.** Ensure that the power is off.
- 2. Remove the terminal block cover.
- **3.** Remove screws of the power input terminal block (two points) and protective grounding.
- **4.** Fit crimping terminals into screw holes and secure them with screws.

L: Black
N: White
Protective grounding: Green

5. Attach the terminal block cover.

The following print on the sticker affixed to the main unit.





2

M Warning

- To avoid electric shock, connect the indicator when power is off.
- The included AC cable is for use in Japan and the rating is AC125V, 7A. Prepare a separate AC cable if the indicator is used at a voltage higher than the rating or is used overseas.
- The F325 has no power switch. Make sure to install a breaker and so on as needed.
- Be sure to ground a protective grounding terminal in order to prevent electric shock and trouble arising from static electricity. (A case and protective grounding terminal are in continuity.)

Do not use screws other than ones (with bind M4x8-tooth captive washer) for installing the main unit.

• When inserting breakers and so on into power lines, use ones with a stationary current rating per one unit of 0.2A or more. Rush current flows when power supply is switched on. Select breakers appropriate for actual use taking the following rush currents into consideration.

<Rush currents>

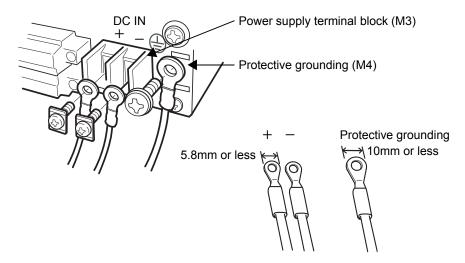
At AC100V: 2A within 1msec At AC200V: 4A within 1msec

- Allowable rush currents differ considerably depending on the manufacturer and series even for breakers of the same rated current. Selecting breakers based only on the stationary rated currents will not lead to a selection of appropriate breakers. Consult with breaker manufacturers, showing them the above rush currents as needed.
- When power supply is switched ON and OFF successively, the circuit that controls internal rush currents will not function properly, a current larger than the above rush currents will flow, and built-in fuses may blow. Wait five seconds or more before turning the power back on.
- ◆ The above rush currents indicate the current values that may flow if a supply source is capable of supplying, but not the current values required for startup operation.
- Rush currents for cases in which the number of connecting units is increased at one time are values multiplied by the number for both a current value and time (at AC100V: 4A 2msec for two units, 6A 3msec for three units). If a current exceeds the supply capability of the power supply source, the current value stays at the supply capability limit and the time for which the current flows extends. In this case (excluding cases such as where a current is stopped by the current limit of a supply source), the extended time depends on the condition of the supply source power. Make sure to use it after checking carefully that no trouble occurs at the actual machine in use.

■DC spec. (specified at the time of order)

DC power supply may be used on the F325 if specified at the time of ordering. DC power cord is connected.

Input voltage is DC12V to 24V between F325 terminals.



- **1.** Ensure that the power is off.
- 2. Remove the terminal block cover.
- 3. Remove the power input terminal block screws (two points) and protective grounding.
- 4. Fit crimping terminals into screw holes and secure them with screws.

Red screw

Black screw

The following print on the sticker affixed to the main unit.





5. Attach the terminal block cover.



Key points

DC power cord is not included as standard.

2

♠ Warning

- To avoid electric shock, connect the indicator when power is off.
- Ensure that voltage drops depending on diameters and length of wires. Never connect AC power supply. This may cause failure.
- The F325 has no power switch. Make sure to install a breaker and so on as
- Be sure to ground a protective grounding terminal in order to prevent electric shock and trouble arising from static electricity. (A case and protective grounding terminal are in continuity.)
 - Do not use screws other than ones (with bind M4x8-tooth captive washer) for installing the main unit.
- The lightning surge protector "PT 2-PE/S-24AC-ST" and socket "PT-BE/FM" are for DC24V. Never use them in AC spec.

Caution

When inserting breakers and so on into power lines, use ones with a stationary current rating per one unit of 1A or more. Rush current flows when power supply is switched on. Select breakers appropriate for actual use taking the following rush currents into consideration.

<Rush currents>

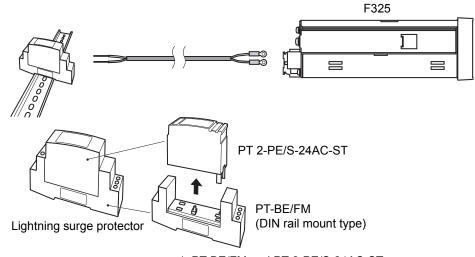
At DC12V: 2A within 20msec At DC24V: 1A within 50msec

- Allowable rush currents differ considerably depending on the manufacturer and series even for breakers of the same rated current. Selecting breakers based only on the stationary rated currents will not lead to a selection of appropriate breakers. Consult with breaker manufacturers, showing them the above rush currents as needed.
- When power supply is switched ON and OFF successively, the circuit that controls internal rush currents will not function properly, a current larger than the above rush currents will flow, and built-in fuses may blow. Wait five seconds or more before turning the power back on.
- The above rush currents indicate the current values that may flow if a supply source is capable of supplying, but not the current values required for startup operation.
- The rush currents for cases where the number of connecting units increased at one time are values multiplied by the number for both a current value and time (at DC12V: 4A 40msec for two units, 6A 60msec for three units). If a current exceeds the supply capability of the power supply source, the current value stays at the supply capability limit and the time for which the current flows extends. In this case (excluding cases such as where a current is stopped by the current limit of a supply source), the extended time depends on the condition of the supply source power. Make sure to use it after checking carefully that no trouble occurs at the actual machine in use.

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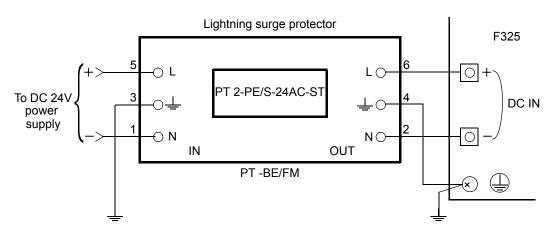
♦ Lightning surge protector connection

For DC spec. only, install a lightning surge protector to guard from lightning surges as necessary. The combination of the main unit of the F325 and a lightning surge protector conforms to EN61000-4-5 (lightning surge immunity) in the EMC Directives.



* PT-BE/FM and PT 2-PE/S-24AC-ST are registered trademarks of PHOENIX CONTACT.

<Connection>



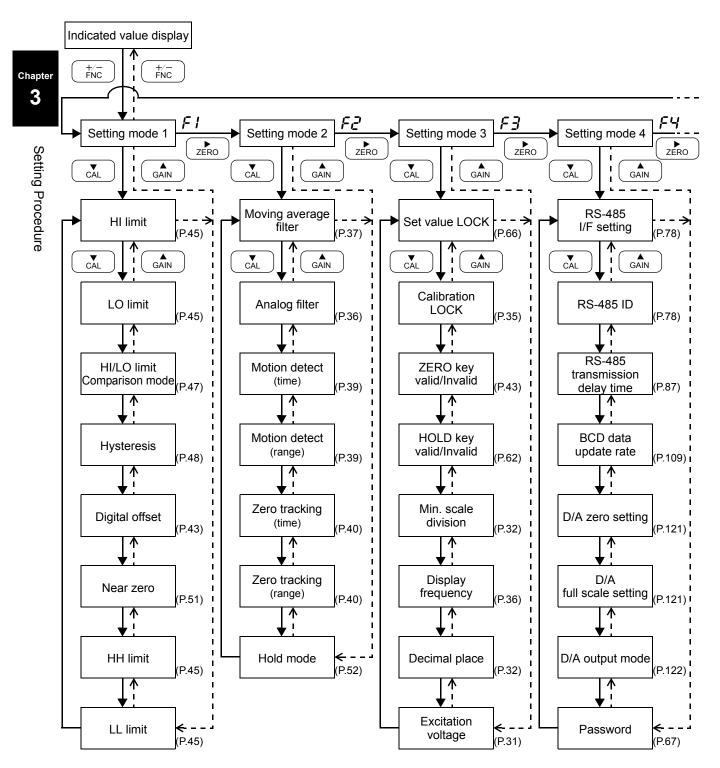


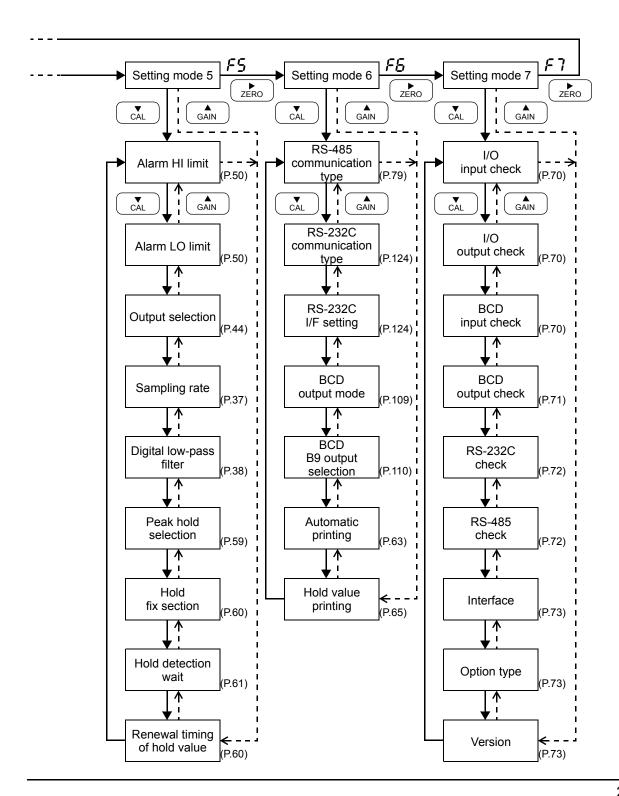
Key points

A lightning surge protector is not included as standard (optional). Our company carries an optional lightning surge protector (TSU03). Contact our sales department for details.

Setting Procedure

Setting mode configuration





3-2. Setting items display

Status display LED



Mode 1

- (1) HI limit
- (2) LO limit
- (3) HI/LO limit comparison mode
- (4) Hysteresis
- (5) Digital offset
- (6) Near zero
- (7) HH limit
- (8) LL limit

Mode 2

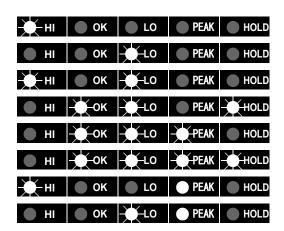
- (1) Moving average filter
- (2) Analog filter
- (3) Motion detect (time)
- (4) Motion detect (range)
- (5) Zero tracking (time)
- (6) Zero tracking (range)
- (7) Hold mode

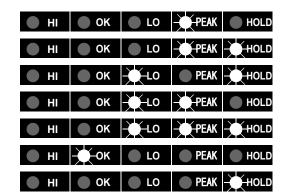
Mode 3

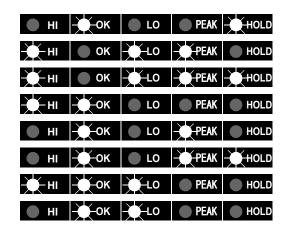
- (1) Set value LOCK
- (2) Calibration LOCK
- (3) ZERO key valid/invalid
- (4) HOLD key valid/invalid
- (5) Min. scale division
- (6) Display frequency
- (7) Decimal place
- (8) Excitation voltage

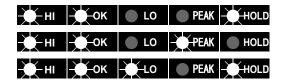
Mode 4

- (1) RS-485 I/F setting
- (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

Mode 5

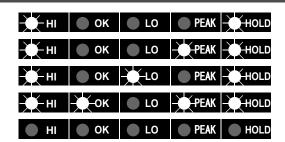
- (1) Alarm HI limit
- (2) Alarm LO limit
- (3) Output selection
- (4) Sampling rate
- (5) Digital low-pass filter
- (6) Peak hold selection
- (7) Hold fix section
- (8) Hold detection wait
- (9) Renewal timing of hold value

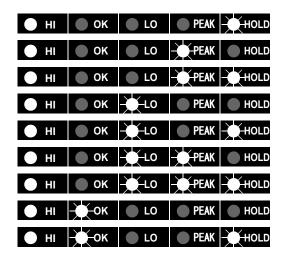
Mode 6

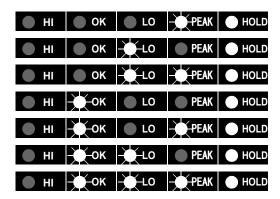
- (1) RS-485 communication type
- (2) RS-232C communication type
- (3) RS-232C I/F setting
- (4) BCD output mode
- (5) BCD B9 output selection
- (6) Automatic printing
- (7) Hold value printing

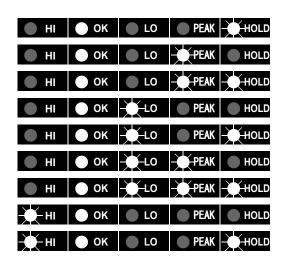
Mode 7

- (1) I/O input check
- (2) I/O output check
- (3) BCD input check
- (4) BCD output check
- (5) RS-232C check
- (6) RS-485 check
- (7) Interface
- (8) Option type
- (9) Version

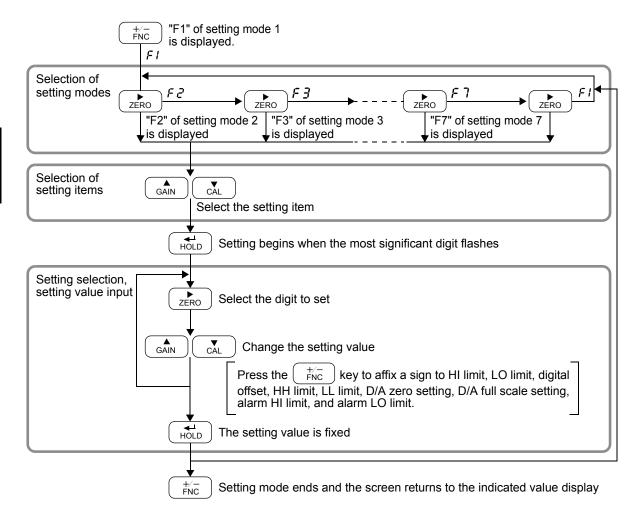








3-3. Setting procedure



Key points

In case no key is operated for one minute after pressing the +/-FNC key and before HOLD key, setting will be interrupted and the indicator confirming the value with the will return to the indicated value display. In this case, a setting value is not recorded.

Calibration

4-1. Calibration method

"Calibration" is the operation of matching the F325 with a strain gauge type sensor. The following two kinds of calibration methods are available for the F325.

♦ Actual load calibration

In this calibration method, actual load is applied to a strain gauge type sensor, and the value of the actual load is input using the keys.

Accurate calibration with minimal error can be performed.

In this calibration method, only the rated output value (mV/V) and the rated capacity value (one to be displayed) of a strain gauge type sensor is input using the keys. This method does not involve actual load. Calibration can be easily performed even when actual load cannot be applied.

For example, the gain is automatically determined by entering values as follows:

Force: 2.001 mV/V - 100.0 kgfPressure: $2.002 \text{mV/V} - 10.00 \text{kgf/cm}^2$ $2.502 \text{mV/V} - 15.00 \text{kgf} \cdot \text{m}$ Torque:

Key points

A data sheet is included with a strain gauge type sensor when purchased.

The following values are indicated in the data sheet.

Capacity ---- Force (unit: kg, t and so on) Rated output ----- Voltage (unit: mV/V) Non-linearity, Hysteresis, Input resistance, Output resistance,

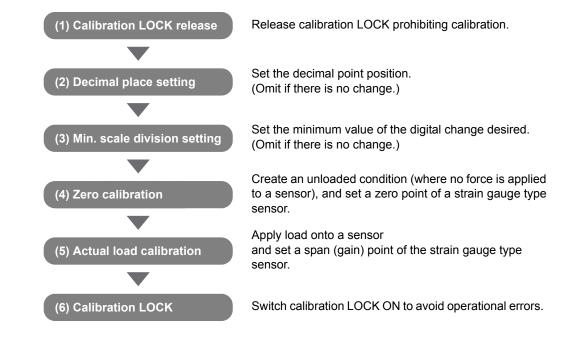
Zero balance

The two values required in equivalent input calibration are the capacity and rated output. Input these two values into the F325.

* Perform either equivalent input calibration or actual load calibration.

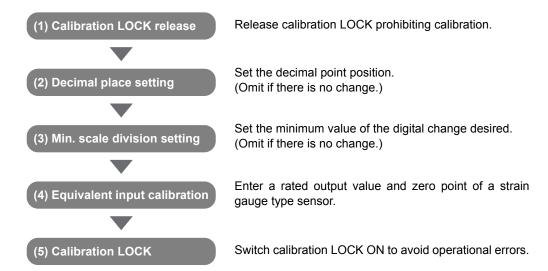
4-2. Actual load calibration procedures

Follow the procedures below for actual load calibration.



4-3. Equivalent input calibration procedures

Follow the procedures below for equivalent input calibration.

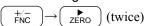


4-4. Calibration LOCK release

Calibration LOCK prohibiting calibration is released.

■Calibration LOCK setting method

1. Select setting mode 3.

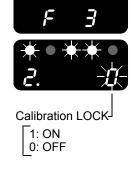


2. Select "calibration LOCK".

Press the CAL key twice.



Switch the "calibration LOCK" to OFF (0) using the (AL) (AL) keys, and confirm it with the (AL) key.



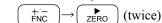
3. Press the $\begin{pmatrix} +/-\\ FNC \end{pmatrix}$ key to return to the indicated value display.

4-5. Excitation voltage

The excitation voltage to supply to a strain gauge type sensor is selected.

■Excitation voltage setting method

1. Select setting mode 3.



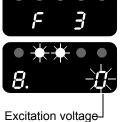
2. Select "excitation voltage".



Set the excitation voltage using the

keys, and confirm it with the (HOLD) key.





0: 2.5V

1: 10 V

3. Press the $\begin{pmatrix} \frac{t}{FNC} \end{pmatrix}$ key to return to the indicated value display.

A strain gauge type sensor to be connected to the F325 must always have a maximum excitation voltage value higher than the set bridge voltage.

In cases where the excitation voltage of the F325 is larger than the maximum excitation voltage value of the sensor, the sensor might generate heat or break down.

Calibration

4-6. Decimal place setting (Omit if there is no change.)

The decimal point position is set.

■ Decimal place setting method

1. Select setting mode 3.

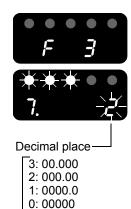


2. Select "decimal place".

Press the CAL key seven times.

Set the decimal place using the \bigcirc GAIN \bigcirc keys, and confirm it with the \bigcirc HOLD key.

3. Press the FNC key to return to the indicated value display.



4-7. Min. scale division setting (Omit if there is no change.)

The minimum value of digital change is set.

■Min. scale division setting method

1. Select setting mode 3.

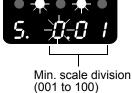


2. Set "min. scale division".

Press the CAL key five times.

Set the min. scale division using the GAIN CAL (numerical value input) and ZERO (shift) keys, and confirm it with the HOLD key.





3. Press the $\begin{pmatrix} \frac{t}{FNC} \end{pmatrix}$ key to return to the indicated value display.

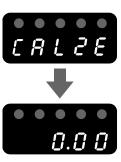
4-8. Zero calibration

1. Start zero calibration.

Check that a sensor is in an unloaded condition, and press the $(Z_{ERO}) \rightarrow (H_{OLD})$ keys.

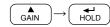


As soon as an indicated value becomes zero, zero calibration is complete.

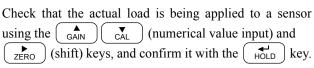


4-9. Actual load calibration

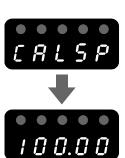
1. Start actual load calibration.



2. Apply actual load to a sensor and set the value of the actual load.



As soon as an indicated value becomes the actual load value, actual load calibration is complete.



Value of the actual load

(00001 to 99999)



Key points

In case a calibration error is displayed, perform countermeasures according to each error and re-perform the calibration.

The output of a strain gauge type sensor does not reach the span adjustment range (approx. 0.05mV/V).

Check that actual load is being applied to the strain gauge type sensor. Calibration cannot be implemented in an unloaded condition.

Check that + SIG and - SIG wires of a strain gauge type sensor are not reversely connected.

As soon as calibration is complete, make sure to switch calibration LOCK ON.

4-10. Equivalent input calibration

1. Start equivalent input calibration.



2. Set the "rated output" of the sensor.

Set the rated output using the \bigcirc (numerical value input) and \bigcirc (shift) keys, and confirm it with the \bigcirc key.



Rated output value (0.050 to 9.999mV/V) e.g. Rated output value: 2.010mV/V

3. Set the "capacity".

Set the capacity using the \bigcirc (numerical value input) and \bigcirc (shift) keys, and confirm it with the \bigcirc key.

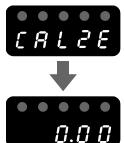


Capacity value (00001 to 99999kg(N)) e.g. Capacity value: 100.00kg(N)

4. Set the zero point of the sensor in an unloaded condition.

Check that a sensor is in an unloaded condition, and press the $\left(\begin{array}{c} \downarrow \\ ZERO \end{array}\right) \rightarrow \left(\begin{array}{c} \downarrow \\ HOLD \end{array}\right)$ keys.

As soon as an indicated value becomes zero, equivalent input calibration is complete.





Key points

In case a calibration error is displayed, perform countermeasures according to each error and re-perform the calibration.

cErr5 Span setting value is set as "00000". Correct the span setting value.

As soon as calibration is complete, make sure to switch calibration LOCK ON.

4-11. Calibration LOCK

This function prohibits changes to the setting to prevent calibration values from being changed by operational errors.

■Calibration LOCK setting method

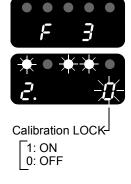
1. Select setting mode 3.



2. Select "calibration LOCK".



Switch the "calibration LOCK" to ON (1) using the All CAL keys, and confirm it with the HOLD key.

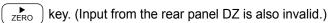


3. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

Key points

Refer to P.146 "16.Setting Values List" for setting items locked by the calibration LOCK.

When the calibration LOCK is released, digital zero is not valid from the front panel



As soon as calibration is complete, make sure to switch the calibration LOCK ON.

5 Settings and Operations Related to Indicated Values

5-1. Display frequency

The display frequency of an indicated value per second is selected.

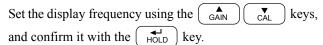
■ Display frequency setting method

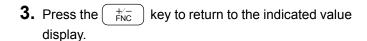
1. Select setting mode 3.



2. Select "display frequency".











Display frequency

3: 25 times/sec. 2: 13 times/sec.

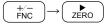
1: 6 times/sec.
0: 3 times/sec.

5-2. Analog filter

This low-pass filter screens input signals from a strain gauge type sensor and cancels unnecessary noise. A cut-off frequency of a low-pass filter can be selected between 10Hz and 30kHz. This filter suppresses frequency components higher than the set frequency. The higher the cut-off frequency, the quicker the response to an input signal, but noise may also be displayed.

■Analog filter setting method

1. Select setting mode 2.



2. Select "analog filter".

Press the CAL key twice.

Set the analog filter using the GAIN CAL keys, and confirm it with the HOLD key.

3. Press the FNC key to return to the indicated value display.





Analog filter -

7: 30kHz 6: 10kHz 5: 3kHz 4: 1kHz 3: 300Hz 2: 100Hz 1: 30Hz 0: 10Hz

5-3. Moving average filter

This filter takes the moving averages of sampled data and reduces fluctuation of indicated values. The number of moving averages can be selected from OFF (zero, once) to 999 times. The more the number of moving averages, the more stable the indicated values, but response will be slower. Conversely, the less the number, the quicker the response, but indicated values will be more likely to fluctuate. Set the most appropriate value in accordance with the kinds of measurements.

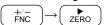


Key points

Remove noise with an analog filter and stabilize minute fluctuations with a moving average filter.

■ Moving average filter setting method

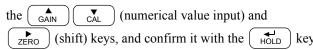
1. Select setting mode 2.

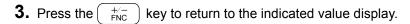


2. Select "moving average filter".



Set the moving average filter using





5-4. Sampling rate

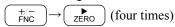
This function changes a rate of referring to the sampled data.

Set the fast sampling rate for high-speed measurement.

Set the slow sampling rate for measurement requiring stability.

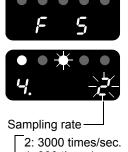
■Sampling rate setting method

1. Select setting mode 5.



2. Select "sampling rate".

Set the sampling rate using the GAIN CAL keys, and confirm it with the HOLD key.



Moving average filter

(0 to 999)

- 1: 300 times/sec. 0: 30 times/sec.
- **3.** Press the $\begin{pmatrix} +/- \\ FNC \end{pmatrix}$ key to return to the indicated value display.



5-5. Digital low-pass filter

This low-pass filter screens the sampled data and cancels unnecessary noise.

Like the analog filter, set the cut-off frequency.

A settable cut-off frequency changes according to the sampling rate. Select the most appropriate value in accordance with kinds of measurements and setting environments.

Sampling rate	Digital low-pass filter
3000 times/sec.	10 to 300 Hz
300 times/sec.	1.0 to 30.0 Hz
30 times/sec.	0.1 to 3.00 Hz

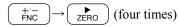


Key points

Use this filter in case noises have not been removed only by an analog filter. In order to remove lower frequency noises, slow the sampling rate so that a low-pass filter of lower frequency can be set.

■Digital low-pass filter setting method

1. Select setting mode 5.



2. Select "digital low-pass filter".

Press the (vAL) key five times.

HOLD

Set the digital low-pass filter using the GAIN CAL (numerical value input) and EERO (shift) keys, and confirm it with the HOLD key.

3. Press the key to return to the indicated value display.





Digital low-pass filter (0, 10 to 300)

Sampling rate

3000 times/sec.: 10 to 300 300 times/sec.: 1.0 to 30.0 30 times/sec.: 0.10 to 3.00

5-6. Motion detect

Parameters are set to detect stability.

Indicated values are deemed stable if the difference between the current indicated value and the indicated value before 100 msec become the set range or less, and if this condition continues for the set period of time or longer.

When stability is detected, a moving average filter* will be automatically inserted to reduce fluctuation of weight values. The setting of this moving average filter at the time of stability is different from the setting of the moving average filter in operation mode.

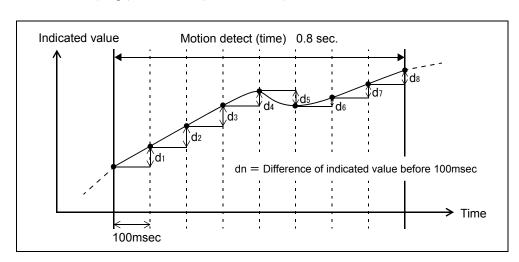
*: The number of times will change according to the sampling rate.

Sampling rate	Moving average filter
3000 times/sec.	128 times
300 times/sec.	64 times
30 times/sec.	16 times

Setting sample

Motion detect (time) 0.8 sec.

Motion detect (range) 10 scales (min. scale unit)



When d_n < set range (10 scales) continues successively for the set period of time (0.8 sec.) or longer (d_1 < 10 and d_2 < 10 and ... and d_8 <10), it is considered stable.



Key points

- Stability/instability is closely related to HI/LO limit.

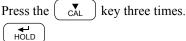
 Refer to P.47 "6-3.HI/LO limit comparison mode" for details.
- When motion detect time is 0.0 sec. and motion detect range is 00 scale, the moving average filter at the time of stability is always OFF.

■Motion detect setting method

1. Select setting mode 2.

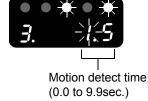


2. Set "motion detect (time)".



Set the motion detect (time) using the GAIN CAL (numerical value input) and ZERO (shift) keys, and confirm it with the HOLD key.

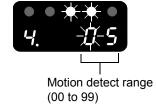




3. Set "motion detect (range)".

Press the CAL key once.

Set the motion detect (range) using the GAIN CAL (numerical value input) and ZERO (shift) keys, and confirm it with the HOLD key.



4. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

5-7. Zero tracking

This function tracks automatically slow changes of zero points by drifts and so on and corrects them.

■Zero tracking setting method

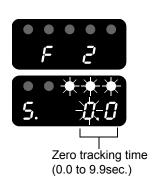
1. Select setting mode 2.

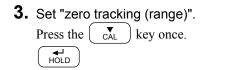
 $\begin{pmatrix} +/- \\ FNC \end{pmatrix} \rightarrow \begin{pmatrix} \blacktriangleright \\ ZERO \end{pmatrix}$

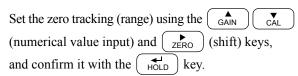
2. Set "zero tracking (time)".

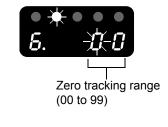
Press the (AL) key five times.

Set the zero tracking (time) using the $\binom{\blacktriangle}{GAIN}$ (call numerical value input) and $\binom{\blacktriangleright}{ZERO}$ (shift) keys, and confirm it with the $\binom{\blacktriangleleft}{HOLD}$ key.







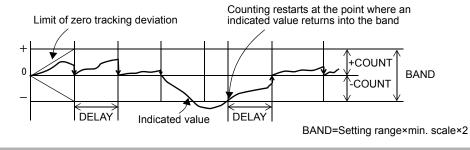


4. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

Key points

- Zero tracking is a function that sets automatically to 0 (zero) when the travel of zero point is within the set tracking range continues for the set period of time or longer.
- Set the time (tracking delay) in the range of 0.1 to 9.9 sec. and the band (tracking band) in the range of 01 to 99.

Also, when the time is set to 0.0 sec. and the band is set to 00, zero tracking does not work.



Key points

- Zero tracking functions from the calibrated zero point when power is turned on.* When an indicated value exceeds the tracking band, zero tracking does not function. In this case, reset the zero point by zero calibration.
 - * When power is turned on, the digital zero value is cleared.
- Zero tracking does not function if the calibration LOCK is OFF.
 It functions only when the calibration LOCK is ON.
 Zero tracking is reset when power is turned off.

5-8. Digital zero

This is a function to set the indicated value to zero.

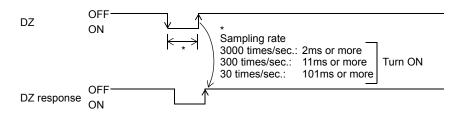
■ Digital zero by key operation

- **1.** Press the ZERO key.
- **2.** As soon as an indicated value becomes zero, digital zero is complete.



■Digital zero by external signal input

Digital zero functions at the moment DZ input (A7) of rear signal I/O terminal block and COM (A10) are turned from OFF to ON and sets the indicated value to zero. If digital zero functions, DZ response turns ON, and if DZ input is turned OFF, DZ response turns OFF.



* DZ response is output if DZ response is set to output selection 1 or output selection 2.



Key points

- Digital zero does not function if the calibration LOCK is OFF.
 It functions only when the calibration LOCK is ON.
 Digital zero is reset when power is turned off.
- Digital zero does not function during peak hold if it is used in analog peak hold (peak hold selection = 1: analog, hold mode = 1: peak hold).
- Refer to P.17 "2-8.External input connection" for details regarding digital zero input terminals.

5-9. Digital offset

This is a function to subtract a setting value from an indicated value. The value obtained by subtracting a setting value from an indicated value is displayed when digital offset is set. This function is convenient when zero cannot be obtained with no load for some reason or when offset is implemented.

(Indicated value displayed) = (actual indicated value) - (digital offset setting value)

■ Digital offset setting method

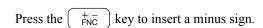
1. Select setting mode 1.

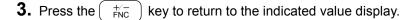
+/-FNC

2. Set "digital offset".

Press the CAL key five times.

Set the digital offset using the GAIN CAL (numerical value input) and EERO (shift) keys, and confirm it with the HOLD key.





5-10.ZERO key valid/invalid

This function validates/invalidates ZERO key operations.

■ZERO key valid/invalid setting method

1. Select setting mode 3.

$$\xrightarrow{+/-}$$
 \rightarrow $\xrightarrow{\triangleright}$ $\xrightarrow{\text{twice}}$

2. Set "ZERO key valid/invalid".

Set the ZERO key valid/invalid using

the
$$(A)$$
 (CAL) keys, and confirm it with the (A) key.



Digital offset

(-19999 to 19999)



Zero key operation

1: Invalid 0: Valid

3. Press the $\binom{+-}{FNC}$ key to return to the indicated value display.

6

Setting and Operation Related to Comparison

6-1. Output selection

A function to output OUT1 (A5) and OUT2 (A6) of I/O output is selected.

HH limit, LL limit: This function outputs results of comparisons of HH limit and LL limit against indicated values. (Refer to P.45 "6-2.HI limit / LO limit / HH limit / LL limit"

and P.47 "6-3.HI/LO limit comparison mode" for details.)

Overload:

(HH, LL)

Use this function to monitor overload and so on against sensor input values (excluding analog peak hold*) even when indicated values are on hold. (Refer to P.50 "6-5. Alarm HI limit, Alarm LO limit" for details.)

* Overload and so on are monitored against indicated values (hold values when on hold), but not against sensor input values, if used in analog peak hold (peak hold selection = 1: analog, hold mode = 1: peak hold).

RUN:

Use this function to monitor abnormal conditions. (Refer to P.75 "11.RUN Output" for details.)

Hold:

Use this function to obtain synchronization of hold and decision.

(Refer to P.52 "7-1. Hold mode" for details.)

Near zero (NZ):

Use this function to check if indicated values are near zero.

(Refer to P.51 "6-6.Near zero" for details.)

DZ response:

Use this function to check if digital zero is recognized.

(Refer to P.42 "5-8.Digital zero" for details.)

■ Output selection setting method

1. Select setting mode 5.

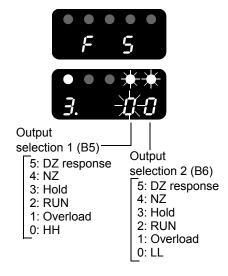
2. Select "output selection".

Press the | V | key three times. ₩

Set the output selection using

(numerical value input) and (shift) keys, and confirm it with HOLD

3. Press the key to return to the indicated value display.



6-2. HI limit / LO limit / HH limit / LL limit

This function sets the HI limit and LO limit, turns the HI output ON when an indicated value exceeds the HI limit value, and turns LO output ON when an indicated value falls below the LO limit value. HH limit and LL limit can also be set outside of these HI/LO limit comparisons. HH output is turned ON when an indicated value exceeds the HH limit value, and LL output is turned ON when the indicated value falls below the LL limit value. When HI, HH output, LO, and LL output are all OFF, OK output is turned ON.

- * HH output and LL output are output if HH limit and LL limit are set in output selection 1 and output selection 2.
- * Decision output timing changes depending on setting values of HI/LO limit comparison mode and hysteresis.

<HI/LO output conditions>

HI: Indicated value > HI limit setting value
LO: Indicated value < LO limit setting value

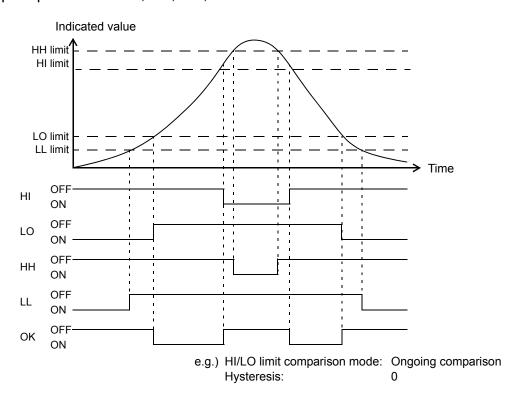
<HH/LL output conditions>

HH: Indicated value > HH limit setting value LL: Indicated value < LL limit setting value

<OK output conditions>

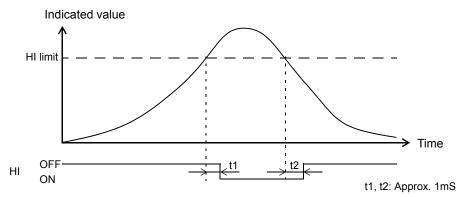
OK: When HH, HI, LO, and LL are all OFF

Output operations of HI, LO, HH, and LL



6

Timing chart



e.g.) HI/LO limit comparison mode: Ongoing comparison Hysteresis: 0

- t1: Time from the point where the indicated value exceeds the HI limit setting value to the point where PhotoMOS relay is ON.
- t2: Time from the point where the indicated value falls to the HI limit setting value or below the point where PhotoMOS relay is OFF.

Key points

Hysteresis can be set in order to prevent chattering of PhotoMOS relay. Refer to P.48 "6-4.Hysteresis" for details.

■HI limit / LO limit / HH limit / LL limit setting method

1. Select setting mode 1.

2. Set "HI limit".

Press the CAL key once.

Set the HI limit value using the (A) (calculated numerical value input) and (A) (shift) keys, and confirm it with the (A) key.

Press the $\frac{+/-}{FNC}$ key to insert a minus sign.

3. Set "LO limit".

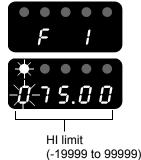
Press the

CAL key once.

HOLD

Set the LO limit value using the GAIN CAL (numerical value input) and ERRO (shift) keys, and confirm it with the HOLD key.

Press the $\binom{+/-}{FNC}$ key to insert a minus sign.

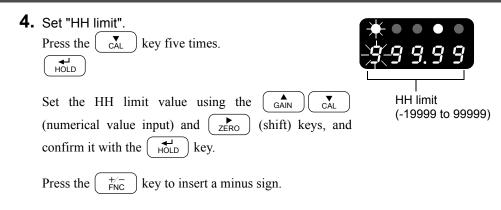


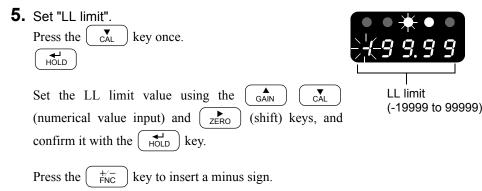


46

^{*} Only HI output is indicated. Likewise with other signals.







6. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

6-3. HI/LO limit comparison mode

This function specifies the comparison timing.

Ongoing comparison (ALL):

HI/LO limit comparison is continuously performed.

Comparison at the time of stability (MD):

HI/LO limit comparison is performed when stable. Stability parameters are set with motion detect.

Ongoing comparison except for near zero (NZ):

HI/LO limit comparison is performed except for near zero.

Parameters near zero are set near zero.

Comparison when stable except for near zero (MD+NZ):

HI/LO limit comparison when stable is performed except for near zero.

At the time of hold (Hold):

HI/LO limit comparison is performed when on hold (the timing where hold output is ON).

■HI/LO limit comparison mode setting method

1. Select setting mode 1.



2. Select "HI/LO limit comparison mode".

Press the CAL key three times.



Set the HI/LO limit comparison mode using

▼ CAL keys, and confirm it with the HOLD key.



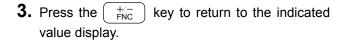


4: Hold

3: MD+NZ

comparison mode

- 2: NZ
- 1: MD
- 0: ALL





Key points

HI/LO limit comparison modes excluding mode 0 (ALL) are closely associated with near zero and motion detect.

Refer to P.51 "6-6.Near zero" and P.39 "5-6.Motion detect" for details.

6-4. **Hysteresis**

This function provides off timing range of HI/LO limit comparison. Normally, the comparison is turned ON when an indicated value exceeds the HI limit setting value and is turned OFF when an indicated value falls below the HI limit setting value. However, by setting hysteresis, the comparison is turned OFF when an indicated value falls to the hysteresis setting value below the HI limit setting value.

This function is effective for chattering prevention when signals fluctuate (vibrate) subtly.

<Comparison conditions>

- HI limit

ON condition: Indicated value > HI limit setting value

Indicated value \leq (HI limit setting value - Hysteresis setting value) OFF condition:

- LO limit

ON condition: Indicated value < LO limit setting value

OFF condition: Indicated value \geq (LO limit setting value + Hysteresis setting value)

- HH limit

ON condition: Indicated value > HH limit setting value

OFF condition: Indicated value \leq (HH limit setting value - Hysteresis setting value)

- LL limit

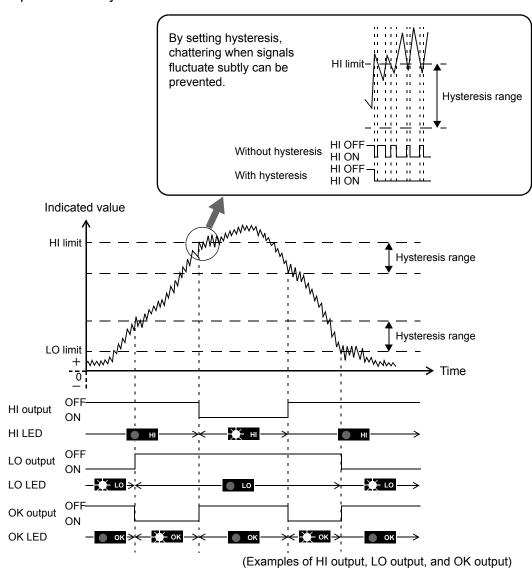
ON condition: Indicated value < LL limit setting value

OFF condition: Indicated value \geq (LL limit setting value + Hysteresis setting value)

Chapter

6

Operation of hysteresis



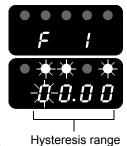
■ Hysteresis setting method

1. Select setting mode 1. +/-FNC

2. Set "hysteresis". Press the key four times.

↓ HOLD

Set the hysteresis using the ▼ CAL (numerical value input) and ZERO) (shift) keys, and confirm it with **↓** HOLD the key.



(0000 to 9999)

3. Press the key to return to the indicated value display.

Key points

A hysteresis setting value is common to HI limit, LO limit, HH limit, and LL limit.

6-5. Alarm HI limit, Alarm LO limit

A sensor input value is always compared with the alarm HI limit and alarm LO limit (excluding analog peak hold*1). This function allows users to monitor if sensor input value becomes abnormal (overload and so on) when on hold.

If the value exceeds alarm HI limit or falls below alarm LO limit, an OVERLOAD error will occur and the alarm output *2 turns ON. (oLoAd will be displayed.)

The alarm output is also turned ON when the following indicated values error is detected.

- LoAd - -LoAd - oFl1

- oF12

Refer to P.133 "14.Error Message Display" for error details.

*1: Overload and so on are monitored against indicated values (hold values when on hold), but not against sensor input values if used in analog peak hold (peak hold selection = 1: analog, hold mode = 1: peak hold), but is monitored against indicated values (hold values during hold).

Alarm HI limit value

Alarm LO limit value

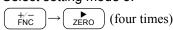
(-19999 to 99999)

(-19999 to 99999)

*2: Alarm output is output if an alarm is set to output selection 1 or output selection 2.

■Alarm HI limit and Alarm LO limit setting method

1. Select setting mode 5.



2. Set "alarm HI limit".

Press the CAL key once.

Set the alarm HI limit using the (A_{AIN}) (A_{CAL}) (numerical value input) and (A_{ERO}) (shift) keys, and confirm it with the (A_{HOLD}) key.

Press the $\begin{pmatrix} +/-\\ FNC \end{pmatrix}$ key to insert a minus sign.

3. Set "alarm LO limit".

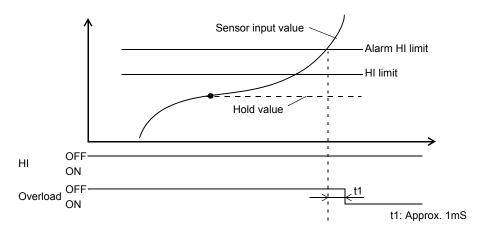
Press the CAL key once.

Set the alarm LO limit using the \bigcirc GAIN \bigcirc CAL (numerical value input) and \bigcirc ZERO (shift) keys, and confirm it with the \bigcirc HOLD key.

Press the $\binom{+/-}{FNC}$ key to insert a minus sign.

4. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.





t1: The time from the point where a sensor input value exceeds the alarm HI limit to the point where the alarm output is turned ON.



Key points

- The default values of the alarm HI limit and the LO limit are set as invalid. Re-set the values before use.
- Since the alarm HI limit and LO limit are independent, they can be separately used.

6-6. Near zero

This function detects that an indicated value is a value near zero.

ON condition: | Indicated value | \leq Setting value near zero (excluding 0)

OFF condition: | Indicated value | > Setting value near zero



Key points

Turning ON/OFF near zero influences HI/LO limit comparison and automatic printing. Refer to P.47 "6-3.HI/LO limit comparison mode" and P.63 "8-1.Automatic printing command" for details.

■ Near zero setting method

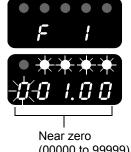
1. Select setting mode 1.



2. Set "near zero".

Press the CAL key six times.

Set the near zero using the \bigcirc (numerical value input) and \bigcirc (shift) keys, and confirm it with the \bigcirc key.



(00000 to 99999)

3. Press the $\binom{+-}{FNC}$ key to return to the indicated value display.



Key points

Near zero operates in absolute values.

Settings and Operations Related to Hold

7-1. **Hold mode**

F325 has a peak hold function that maintains and displays a peak value (maximum value) of input signals and a sample hold function that maintains and displays an arbitrary point.

When hold fix section is set as 1: ON, detection section and fix section can be distinguished.

- * Peak hold can be switched between analog and digital. Refer to P.59 "7-2.Peak hold selection".
- * Hold value display renewal timing can be changed. Refer to P.60 "7-4. Renewal timing of hold value".
- * Prohibition time for preventing chattering of HOLD signals can be set. Refer to P.61 "7-5. Hold detection wait".

■ Hold mode setting method

1. Select setting mode 2.

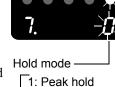


2. Select "hold mode".



Set the hold mode using the GAIN keys, and confirm it with the $\begin{pmatrix} \checkmark \\ HOLD \end{pmatrix}$ key.





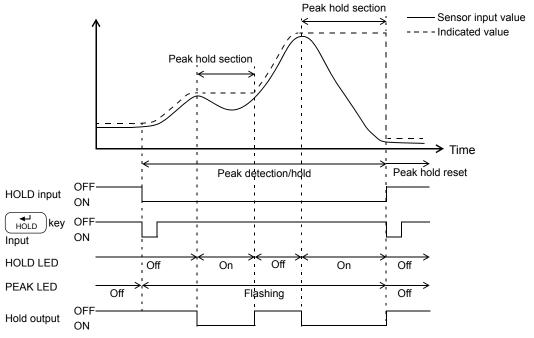
1: Peak hold 0: Sample hold

3. Press the key to return to the indicated value display.

■ Peak hold (maintaining a maximum point)

When hold fix section is 0: OFF

Operation of peak hold

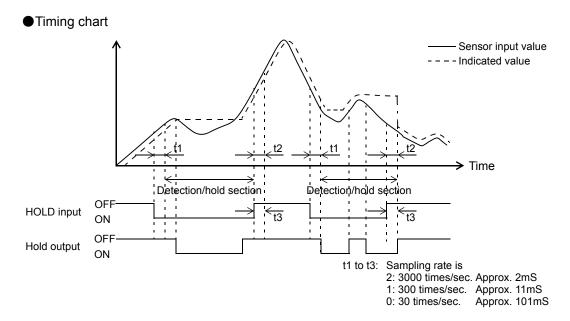


* Hold output is performed if a hold is set to output selection 1 or output selection 2.



Key points

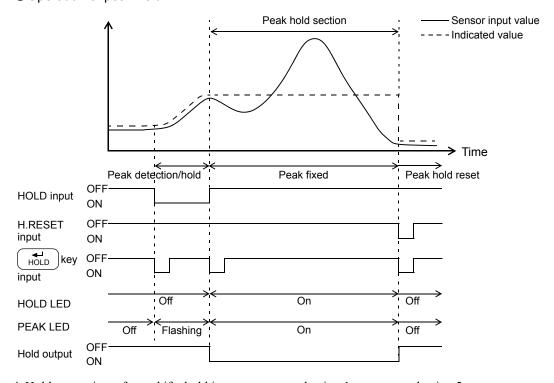
- When hold is turned ON with external signals, turn it OFF with external signals. When hold is turned ON with key inputs, turn it OFF with key inputs.
- Refer to P.17 "2-8.External input connection" for connection of hold input terminals.



- * Hold output is performed if a hold is set to output selection 1 or output selection 2.
- t1: The time from the point where a HOLD signal is input to the point where an indicated value is held.
- t2: The time from the point where a HOLD signal is canceled to the point where an indicated value returns to tracking.
- t3: Minimum reset signal range required for releasing a hold.

When hold fix section is 1: ON

Operation of peak hold



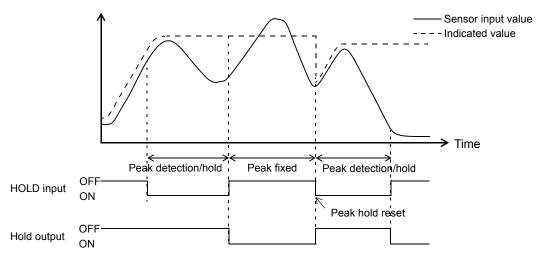
^{*} Hold output is performed if a hold is set to output selection 1 or output selection 2.

Chapter

Key points

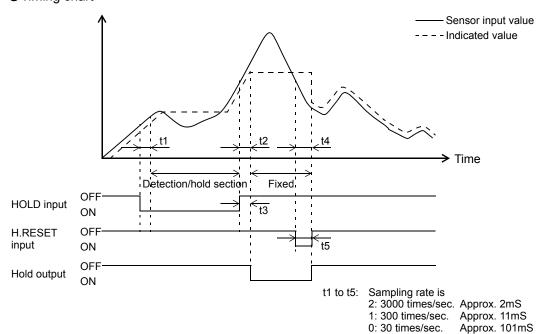
- When hold is turned ON with external signals, turn it OFF with external signals. When hold is turned ON with key inputs, turn it OFF with key inputs.
- Refer to P.17 "2-8.External input connection" for details regarding hold input terminal connection.

When HOLD input is turned ON again without releasing a hold (H.RESET input is ON) after fixing the hold, peak hold is reset and a section becomes peak detection/hold.



* Hold output is performed if a hold is set to output selection 1 or output selection 2.

Timing chart



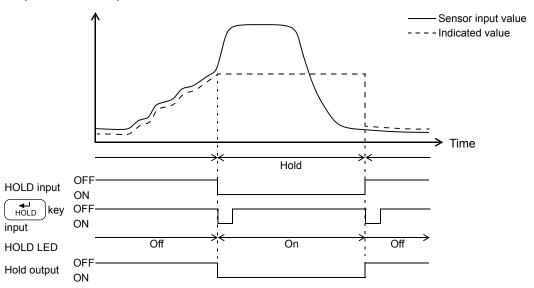
* Hold output is performed if a hold is set to output selection 1 or output selection 2.

- t1: The time from the point where a HOLD signal is input to the point where a peak is detected/held.
- t2: The time from the point where a HOLD signal is canceled to the point where a peak is fixed.
- t3: Minimum reset signal range required for fixing a hold.
- t4: The time from the point where a H.RESET is input to the point where an indicated value returns to tracking.
- t5: Minimum reset signal range required for releasing a hold.

■ Sample hold (maintaining arbitrary points)

When hold fix section is 0: OFF

Operation of sample hold

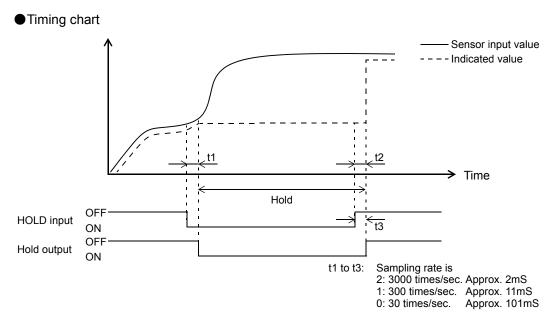


* Hold output is performed if a hold is set to output selection 1 or output selection 2.



Key points

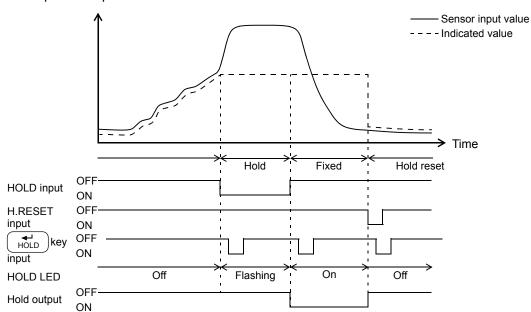
- When hold is turned ON with external signals, turn it OFF with external signals. When hold is turned ON with key inputs, turn it OFF with key inputs.
- Refer to P.17 "2-8.External input connection" for connection of hold input terminals.



- * Hold output is performed if a hold is set to output selection 1 or output selection 2.
- t1: The time from the point where a HOLD signal is input to the point where an indicated value is
- t2: The time from the point where a HOLD signal is canceled to the point where an indicated value returns to tracking.
- t3: Minimum reset signal range required for releasing a hold.

When hold fix section is 1: ON

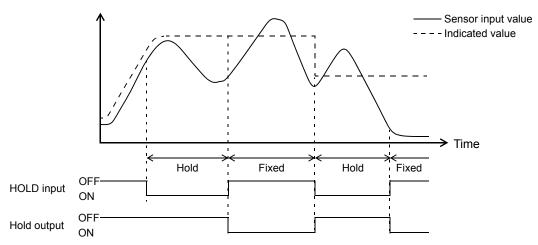
Sample hold operation



^{*} Hold output is performed if a hold is set to output selection 1 or output selection 2.

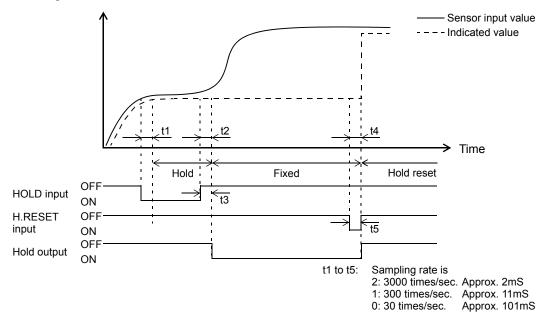
- When hold is turned ON with external signals, turn it OFF with external signals. When hold is turned ON with key inputs, turn it OFF with key inputs.
- Refer to P.17 "2-8.External input connection" for details regarding hold input terminal connection.

When HOLD input is turned ON again without releasing a hold (H.RESET input is ON) after fixing the hold, hold is reset and a section becomes hold.



* Hold output is performed if a hold is set to output selection 1 or output selection 2.

Timing chart



^{*} Hold output is performed if a hold is set to output selection 1 or output selection 2.

- t1: The time from the point where a HOLD signal is input to the point where the signal is held.
- t2: The time from the point where a HOLD signal is canceled to the point where a hold is fixed.
- t3: Minimum reset signal range required for fixing a hold.
- t4: The time from the point where a H.RESET is input to the point where an indicated value returns to tracking.
- t5: Minimum reset signal range required for releasing a hold.

7-2. Peak hold selection

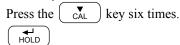
Performance of peak hold can be switched between digital and analog.

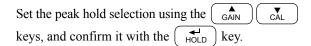
■Peak hold selection setting method

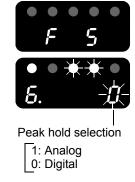
1. Select setting mode 5.



2. Select "peak hold selection".







3. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

Key points

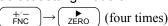
- If peak hold is performed in analog, higher speed peak can be captured since it is not affected by the sampling rate and so forth. However, the effects of the moving average filter and digital low-pass filter will be lost. Performing peak hold in digital is recommended for measurement that weighs stability such as low-speed measurement.
- Peak hold (analog) uses a peak hold (capacitor charge) circuit. Therefore, when HOLD is ON, a displayed value may be increased due to influence of signal noise. The higher the calibration gain (high-resolution display at low sensor out), the higher the value.
- When peak hold is performed in analog, the current sensor input value cannot be checked since an analog circuit is held during peak hold. Therefore, the following limitations are imposed during peak hold.
 - Digital zero cannot be performed.
 - Digital zero reset cannot be performed.
 - Alarm output monitors hold values, not sensor input values.
 - Indicated values non-linked (SI/F, RS-485, BCO, BSC, DAV, DAI)
 all become outputs linked with indicated values.
 - * Analog monitor input does not perform peak hold. It outputs against the current sensor input values.

7-3. Hold fix section

Whether or not a fix section is inserted into hold motion can be selected.

■Hold fix section setting method

1. Select setting mode 5.



2. Select "hold fix section".

Press the CAL key seven times.

Set the hold fix section using the $\begin{pmatrix} A \\ GAIN \end{pmatrix}$ $\begin{pmatrix} V \\ CAL \end{pmatrix}$ keys, and confirm it with the $\begin{pmatrix} A \\ HOLD \end{pmatrix}$ key.

3. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

7-4. Renewal timing of hold value

Renewal timing of hold value display can be changed.

Normally, it is 0: detection start, but if only hold values are to be displayed or indicated values are to be held at high-speed measurement, 1: detection stop is set.

Hold fix section

Renewal timing of hold value

1: Detection stop

0: Detection start

1: ON

0: OFF

At detection start: The previous hold value is canceled at detection start, and an indicated value

is returned to the current value display.

Indicated values are held once hold conditions are met.

At detection stop: The previous hold value is retained at detection start and will not return to the

current value display.

Hold values are renewed at detection stop.

* Only when the hold fix section is set to 1: ON, an operation of 1: detection stop is valid. Therefore, when detection stop is selected, set hold fix section to 1: ON.

■Renewal timing of hold value setting method

1. Select setting mode 5.



2. Select "renewal timing of hold value".

Press the CAL key nine times.

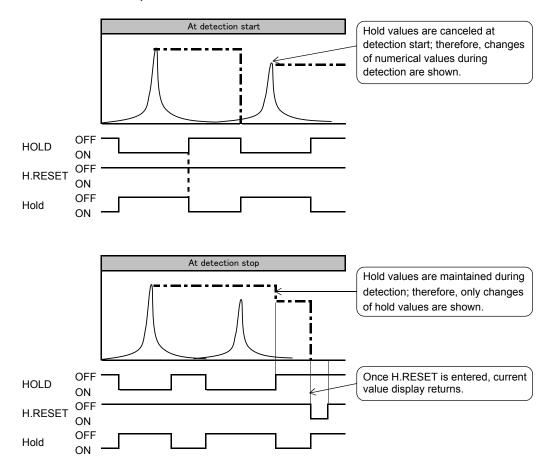


Set the renewal timing of hold value using

3. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.



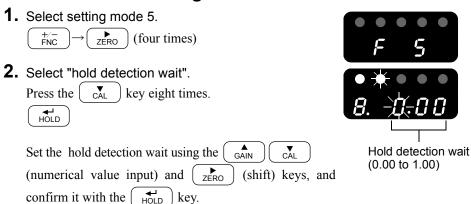
Section definition peak hold



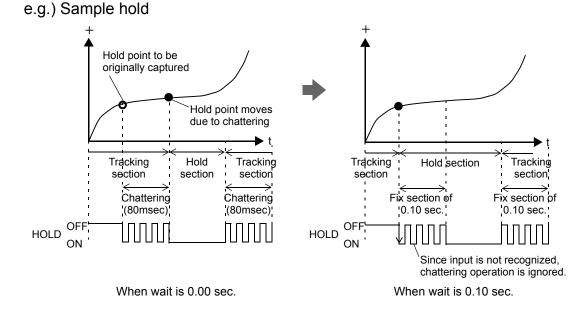
7-5. Hold detection wait

Detection wait of hold input is set. Changes of hold input will not be recognized within the time set as detection wait after capturing the changes (ON -> OFF, OFF -> ON). This function is useful to ignore chattering parts.

■ Hold detection wait setting method



3. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.



7-6. HOLD key valid/invalid

This function validates/invalidates HOLD key operations.

■HOLD key valid/invalid setting method

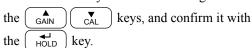
1. Select setting mode 3.



2. Set "HOLD key valid/invalid".

Press the CAL key four times.

Set the HOLD key valid/invalid using







1: Invalid 0: Valid

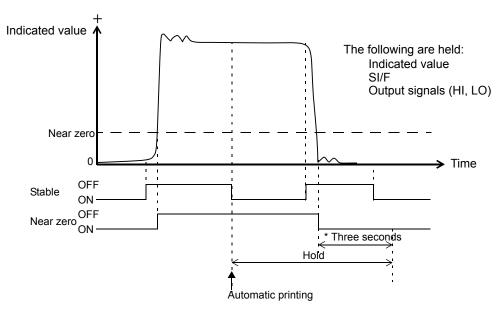
3. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

8 Settings and Operations Related to SI/F Print

8-1. Automatic printing command

This function prints the indicated values automatically with the UNIPULSE printer connected to the F325 and SI/F. Print is performed when indicated values are stable. (Stability parameters are set with motion detect.) The then indicated values can also be held for three seconds (indicated value hold function).

Indicated value hold function operations

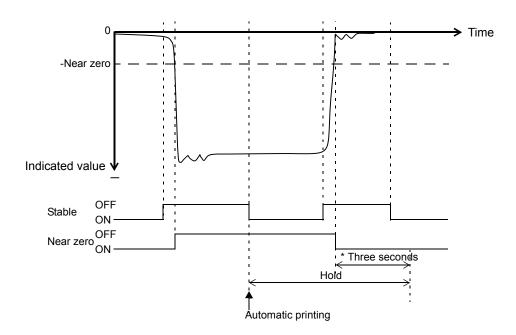


Key points

- Hold will not be released unless the ON condition near zero is retained for three seconds.
- Automatic printing is affected by near zero and motion detect.

 Refer to P.51 "6-6.Near zero" and P.39 "5-6.Motion detect" for details.

8



■Automatic printing setting method

1. Select setting mode 6.

zero (five times)

2. Select "automatic printing".

Press the CAL key six times. ₩

Set the automatic printing using

keys, and confirm it with **↓** HOLD the key.

3. Press the $\begin{pmatrix} +/- \\ FNC \end{pmatrix}$ key to return to the indicated value display.





2: Automatic printing ON, Indicated value hold (On+hold)

Automatic printing

1: Automatic printing ON (ON) 0: Automatic printing OFF (OFF)

8-2. Hold value printing

This function prints the hold values automatically with the UNIPULSE printer connected to the F325 and SI/F when hold is released.

* When hold fix section is ON, the hold values are printed at hold fix.

■Hold value printing setting method

1. Select setting mode 6.



2. Select "hold value printing".

Press the $\begin{pmatrix} \checkmark \\ \text{CAL} \end{pmatrix}$ key seven times.

Set the hold value printing using the GAIN keys, and confirm it with the HOLD key.





Hold value printing

1: Hold value printing ON 0: Hold value printing OFF

3. Press the $f_{NC}^{+/-}$ key to return to the indicated value display.

P

Key points

Automatic printing is not performed when hold value printing is set to ON. Indicated value hold by automatic printing is not performed either.

9 System Settings and Operations

9-1. Set value LOCK

This function prohibits changes to settings to prevent setting values from being changed by operational errors.

■Set value LOCK setting method

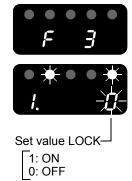
1. Select setting mode 3.



2. Select "set value LOCK".



Switch the set value LOCK to ON (1) using the GAIN CAL keys, and confirm it with the HOLD key.



- **3.** Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.
- Key point

Refer to P.146 "16.Setting Values List" for setting items prohibited by set value LOCK.

9-2. Password

By inputting a password, memory contents can be rewritten (initialized) to the factory default contents.

Calibration values (zero calibration, span calibration) remain unchanged; however, other setting values can be rewritten to the factory default values.

■Password setting method

1. Select setting mode 4.



2. Set "password".

Press the CAL key eight times.

Set the password using the \bigcirc GAIN \bigcirc CAL (numerical value input) and \bigcirc (shift) keys, and confirm it with the \bigcirc key.

Initialization is complete once the tone sounds.

(Do not operate keys until the tone sounds.)





Password 1239: Initialization

P

Key points

- Refer to P.146 "16.Setting Values List" for initialized values.
- Refer to P.68 "9-3.Self-check/Initialization" if self-check and initialization are to be simultaneously performed.

System Settings and Operations

Chapter

9-3. Self-check/Initialization

■Self-check

Self-check function has a memory check that inspects the memory automatically and detects errors and a visual check that inspects the display unit visually.

■Self-check setting method

- 1. Turn OFF the F325 power supply.
- **2.** Turn the power supply ON while pressing the HOLD key. Self-check completes in approx. 30 seconds. The memory condition of the F325 is considered normal if " PRS5" and an indicated value are displayed at the end.

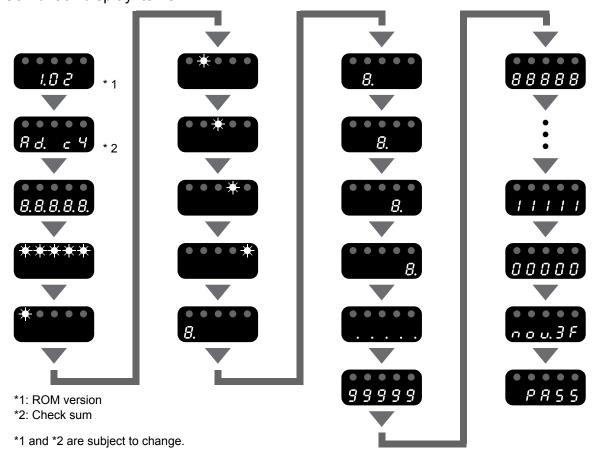
If " **PRS5** " is not displayed in the end, it may be a sign of failure. (Contact us for further details.)



Key points

Self-check is a function that performs check sum of software, operation check of non-volatile RAM (NOV RAM), and check of display lighting. An analog circuit cannot be diagnosed.

Self-check display items



■Initialization

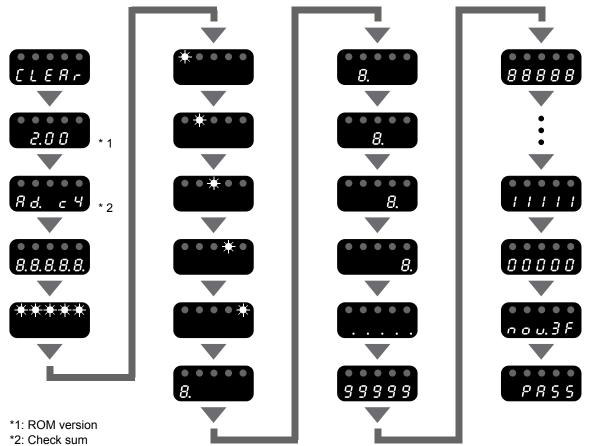
This operation rewrites memory contents into the factory default contents.

In this operation, calibration values (zero calibration, span calibration) remain unchanged; however, other setting values can be rewritten to the factory default values.

■Initialization setting method

- **1.** Turn OFF the F325 power supply.
- **2.** Turn the power supply ON while pressing the key and the hold key Initialization is performed after self-check.

Memory clear display items



^{*1} and *2 are subject to change.



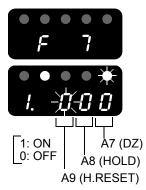
Key points

- Refer to P.146 "16.Setting Values List" for initialized values.
- Initialization is possible by inputting a password if self-check is not necessary. Refer to P.67 "9-2.Password" for details.

9-4. I/O input check

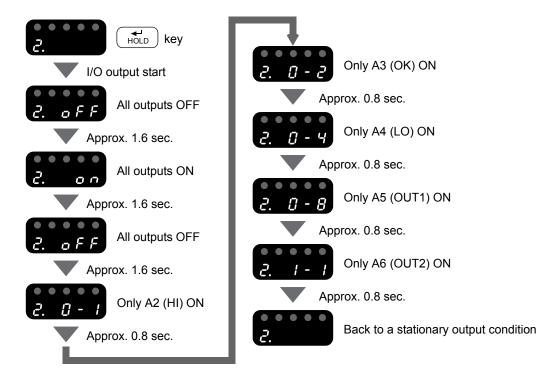
The current condition of I/O input is displayed.

* In I/O input check display, the panel does not return to the indicated value display even without key operation.



9-5. I/O output check

Each bit of I/O output is turned ON and OFF.



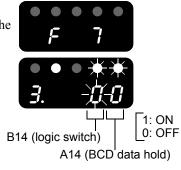
- * In I/O output check display, the panel does not return to the indicated value display even without key operation.
- * Output check will not be canceled even if the setting mode is switched.

 A stationary output condition returns after all are completed.

9-6. BCD input check

The current condition of BCD input is displayed.

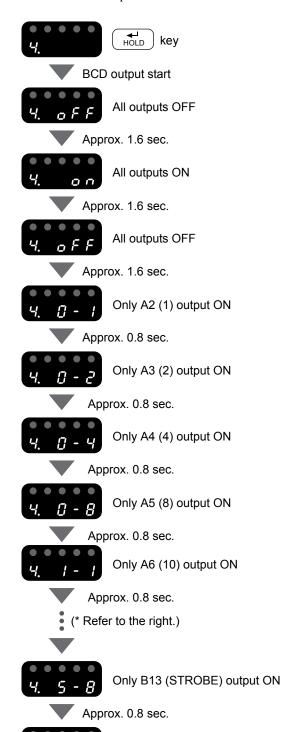
* In BCD input check display, the panel does not return to the indicated value display even without key operation.



Chapter

9-7. BCD output check

Each bit of BCD output is turned ON and OFF.



(*)			
• •	•		
4.	0	-	I
	Dis	l spla	ay

Display	No.	Signal
0-1	A2	1
0-2	A3	2
0-4	A4	4
0-8	A5	8
1-1	A6	10
1-2	A7	20
1-4	A8	40
1-8	A9	80
2-1	A10	100
2-2	A11	200
2-4	A12	400
2-8	A13	800
3-1	B2	1000
3-2	В3	2000
3-4	B4	4000
3-8	В5	8000
4-1	В6	10000
4-2	В7	20000
4-4	В8	40000
4-8	В9	80000/NZ
5-1	B10	Minus (polarity)
5-2	B11	OVER
5-4	B12	P.C (stable)
5-8	B13	STROBE

- * In BCD output check display, the panel does not return to the indicated value display even without key operation.
- * Output check condition will not be canceled even if setting mode is switched.

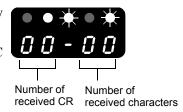
 A stationary output condition returns after all are completed.

Back to a stationary output condition

9-8. RS-232C check

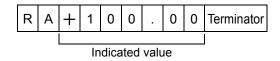
Checking of receiving data of RS-232C and compulsory transmitting of data are implemented.

When implementing the check, set the mode of RS-232C communication type to 0: Command in advance.



- * Valid only when a mode of RS-232C communication type is 0: Command
- * The number of received characters and the number of received CR are cleared once the power supply is turned OFF. They are also cleared when a mode of RS-232C communication type and I/F setting of RS-232C are changed.

When the HOLD key is pressed, the same message is output as a linked value reading command.

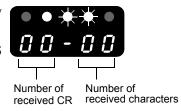


* In RS-232C check display, the panel does not return to indicated value display even without key operation.

9**-**9. RS-485 check

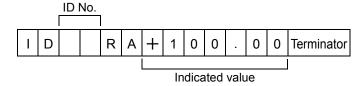
Checking of receiving data of RS-485 and compulsory transmitting of data are implemented.

When implementing the check, set the mode of RS-485 communication type to 0: Command in advance.



- * Valid only when a mode of RS-485 communication type is 0: Command
- * The number of received characters and the number of received CR are cleared once the power supply is turned OFF. They are also cleared when a mode of RS-485 communication type and I/F setting of RS-485 are changed.

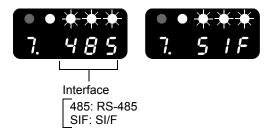
When the HOLD key is pressed, the same message is output as a linked value reading command.



* In RS-485 check display, the panel does not return to the indicated value display even key operation.

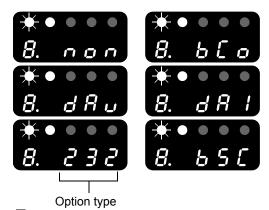
9-10.Interface

A condition of standard interface installation is displayed (RS-485 or SI/F).



9-11. Option type

A condition of option installation is displayed (optional slot).



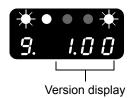
non: None

BCO: BCD parallel data output (sink type)
dAV: D/A converter (voltage output)
dAI: D/A converter (current output)
232: RS-232C

BSC: BCD parallel data output (source type)

9-12. Version

A version is displayed.



System Settings and Operations

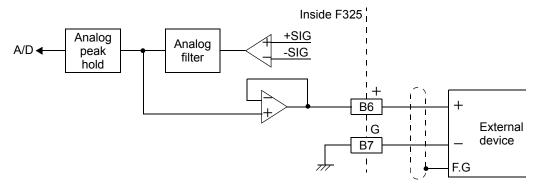
73

10

OAnalog Monitor Output (VOL OUT)

This interface is used for retrieving an analog voltage proportional to a sensor input signal. This interface connects a recorder and so on and is useful for measuring and recording waveforms. An output level is approx. 2V per sensor input 1mV/V.

Example of connecting output equivalent circuit and external device



The output voltage is not an indicated value since it is retrieved from the front stage where sensor input signals are A/D converted.

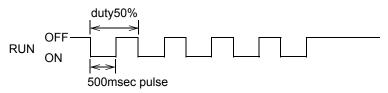
Therefore, this output voltage is not linked with indicated values digitally processed such as digital zero and moving average filter. An output linked with indicated values requires an optional D/A converter.

74

11 RUN Output

Signals that repeat a ON-OFF operation are output to check if CPU is operating properly. If ON or OFF for a few seconds, consider it as an error.

RUN output specification



* RUN output is performed if a RUN is set to output selection 1 or output selection 2.

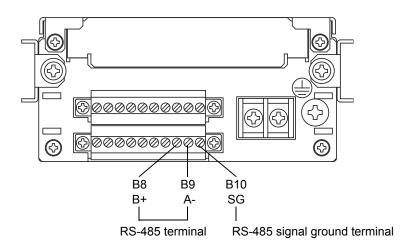
12Interface

Chapter 12

12-1.RS-485 Interface

(RS-485 or SI/F standard: not specified at the time of order)

RS-485 is an interface to read the indicated values and status of the F325 and to write the setting values into the F325. This interface is convenient for processing such as controls, totals, and records by connecting the F325 to a PLC, programmable display unit and so forth.



■Communication specifications

Specifications

Modbus-RTU, UNI-Format Message format:

Signal level: Based on RS-485 Two-wire

Transmitting distance: Approx. 1 km

Transmitting method: Asynchronous, half duplex

Transmitting speed: Selectable from 1200, 2400, 4800, 9600, 19200, 38400 bps

Number of connectible units: Maximum 32 (including one master unit)

Bit configuration: Start bit

> Character lengt Selectable from 7 or 8 bit

> > (8 bit for Modbus-RTU)

Selectable from 1 or 2 bit Stop bit

Parity bit Selectable from none, odd or even

Terminator Selectable from CR, CR-LF

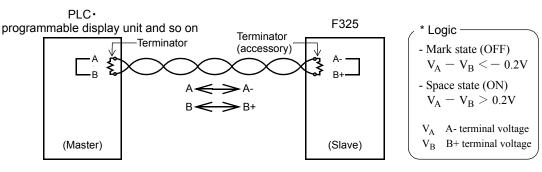
Code: Binary (for Modbus-RTU)

ASCII (for UNI-Format)

rface

■Connection of RS-485

Two-wire (point to point)



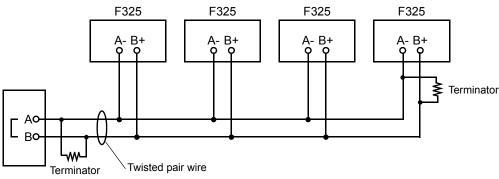
- Use twisted pair wires for connection cables. (Noise margin increases.) However, two-core parallel cables are sufficient for short-distance connection.
- Install the included terminator to the F325 if the F325 is a dead end.
- SG terminal (B10 terminal) is a ground terminal (which protects circuits) used on the circuit. SG terminal is not normally required to use if the main unit of the F325 and connection counterpart device are class D grounded.

However, in case connection is necessary based on the on-site conditions, check the specifications of the counterpart device and connect it.



Depending on master devices, A and B may be reversely indicated. In case that communication is not possible, switch A and B.

Two-wire (multi point)



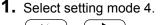
12

■ Setting values related to RS-485

■RS-485 I/F setting

RS-485 I/F setting of the F325 is changed.

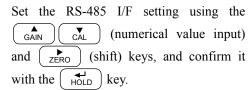
■RS-485 I/F setting method





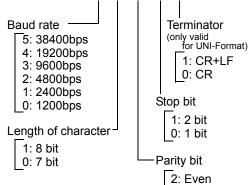
2. Select "RS-485 I/F setting".





* When communication mode is Modbus-RTU, set 8-bit for the length of character and 1 bit for the stop bit ("1:2 bit" for the stop bit if "0: None" is selected for the parity bit).





1: Odd

0: None

3. Press the key to return to the indicated value display.



Key points

Initialize the RS-485 I/F setting of the connecting computer and PLC to the F325 setting.

■RS-485 ID (slave address for Modbus-RTU)

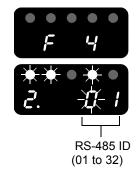
The ID number of the F325 is set.

■RS-485 ID setting method



2. Select "RS-485 ID".

Set the RS-485 ID using the CAL (numerical value input) and **▶** ZERO keys, and confirm it with the HOLD key.

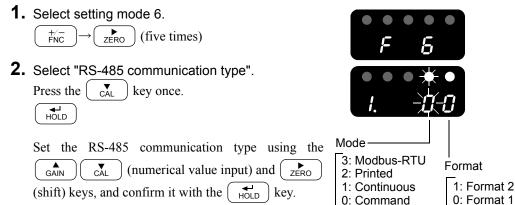


3. Press the +/-FNC key to return to the indicated value display.

■ Setting RS-485 communication type

RS-485 communication type of F325 is set.

■RS-485 communication type setting method



3. Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

Communication type

- Mode =0: Command (UNI-Format)

Communication is commanded from the host computer.

(Indicated value will not be automatically transmitted.)

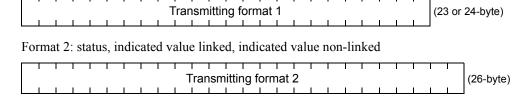
Terminators can be selected from CR or CR-LF.

Mode =1: Continuous (UNI-Format)

Message in UNI-Format is continuously transmitted.

R, W, and C commands are ignored.

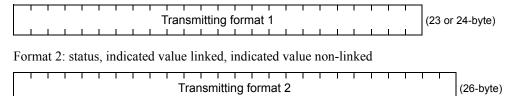
Format 1: status, indicated value linked



- Mode =2: Printed (UNI-Format)

Message in the UNI-Format is transmitted when printing is performed.

Format 1: status, indicated value linked



- Mode =3: Modbus-RTU

Communication is requested from the host computer.

(Communication protocol is Modbus-RTU.)

R, W, and C commands are ignored.

Attention

Refer to P.86 "■ Transmitting format for continuous transmission/printing" for transmitting specifications.

Key points

Timing of continuous transmission

When Mode 1 or 2 is selected, the remote continuous transmissions are as follows according to the communication baud rate settings.

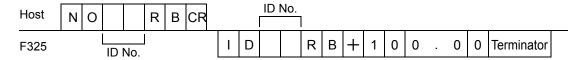
Communication baud rate	Remote continuous transmission
38400 bps	100 times/sec.
19200 bps	50 times/sec.
9600 bps	25 times/sec.
4800 bps	12 times/sec.
2400 bps	6 times/sec.
1200 bps	3 times/sec.

■UNI-Format commands

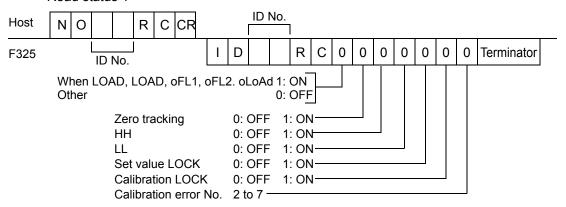
- Communication format for commands
 - Read linked indicated values (sign, 5-digit, decimal point)



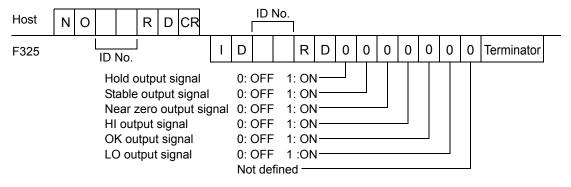
- Read non-linked indicated values (sign, 5-digit, decimal point)



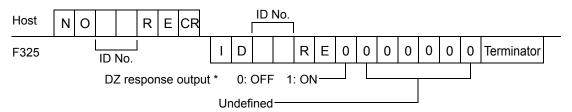
Read status 1



- Read status 2

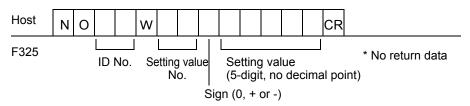


- Read status 3



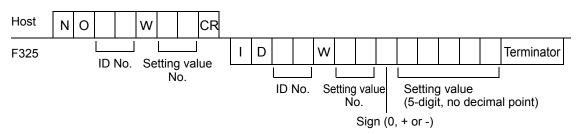
* When read after digital zero is performed, it turns ON only once. It remains OFF until digital zero is performed again.

- Write setting values



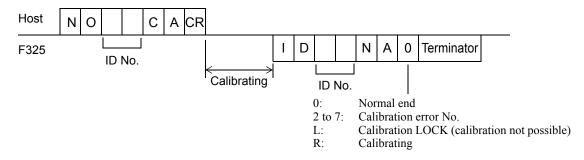
* Refer to P.83 " Setting value communication format" for setting value No.

- Read setting value

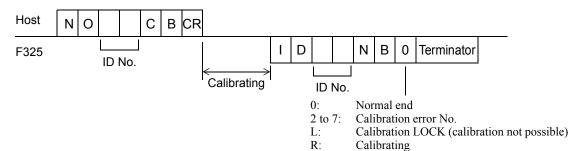


* Refer to P.83 " Setting value communication format" for setting value No.

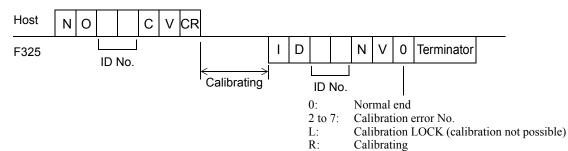
- Zero calibration



- Actual load calibration



- Equivalent input calibration

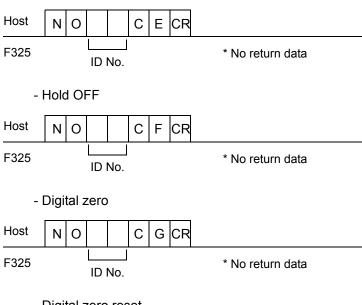


Attention

Set the rated capacity value before sending a command for actual load calibration.

Set the rated output value and rated capacity value before sending a command for equivalent input calibration.

- Hold ON

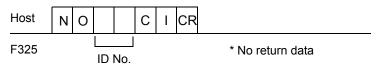


- Digital zero reset



Chaptei



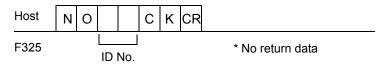


A command to print on the printer via SIF.

- Hold reset



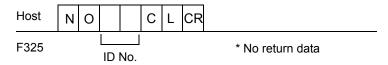
- I/O output check



I/O output check is performed.

Refer to P.70 "9-5.I/O output check" for items checked.

- BCD output check

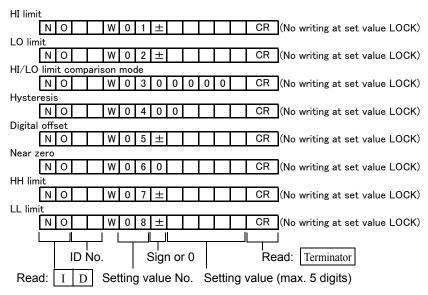


BCD output check is performed.

Refer to P.71 "9-7.BCD output check" for items checked.

■ Setting value communication format

Transmitted data when writing the setting value, return data when reading the setting value.



^{*} Only input 0 where the setting value is 0.

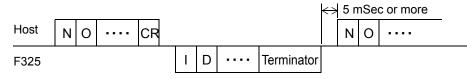
Maying average filter
Moving average filter NO W111000
Analog filter NO W 1 2 0 0 0 0 0 CR (No writing at set value LOCK)
Motion detect (time)
No writing at set value LOCK) Motion detect (range)
N O W 1 4 0 0 0 0 CR (No writing at set value LOCK)
Zero tracking (time) NO W150000 CR (No writing at set value LOCK)
Zero tracking (range)
No writing at set value LOCK) No writing at set value LOCK
N O W 1 7 0 0 0 0 CR (No writing at set value LOCK)
Automatic printing NO W 1 8 0 0 0 0 0 CR (No writing at set value LOCK)
Hold value printing
N O W 1 9 0 0 0 0 0 CR (No writing at set value LOCK)
Set value LOCK, calibration LOCK, ZERO key valid/invalid, HOLD key valid/invalid
NO W 2 1 0 0 (1)(2)(3)(4) CR (1) Set value LOCK 1: ON 0: OFF
(2) Calibration LOCK 1: ON 0: OFF
(3) ZERO key valid/invalid 1:Invalid 0:Valid (4) HOLD key valid/invalid 1:Invalid 0:Valid
Min. scale division
NO Writing at calibration LOCK) Display frequency
N O W 2 3 0 0 0 0 CR (No writing at calibration LOCK) Excitation voltage
N O W 2 4 0 0 0 0 CR (No writing at calibration LOCK)
Decimal place NO W 2 5 0 0 0 0 0 CR (No writing at calibration LOCK)
NO WILLING AT CAMBURATURE ACCUMULATION LOOK
BCD data update rate NO W 3 1 0 0 0 0 CR (No writing at set value LOCK)
RS-232 I/F setting
N O W 3 2 0 (1) (2) (3) (4) (5) CR (No writing at set value LOCK) (1) Baud rate 5:38400bps 4:19200bps 3:9600bps 2:4800bps 1:2400bps 0:1200bps
(2) Length of character 1:8 bit 0:7 bit
(3) Parity bit 2: Even 1: Odd 0: None (4) Stop bit 1:2 bit 0:1 bit
(5) Terminator 1: CR+LF 0: CR
D/A zero setting N O W 3 3 ± CR (No writing at set value LOCK)
D/A full scale setting
N O W 3 4 ± CR (No writing at set value LOCK) D/A output mode
N O W 3 5 0 0 0 0 CR (No writing at set value LOCK)
RS-485 I/F setting N O W 3 6 0 (1) (2) (3) (4) (5) CR (Read only)
(1) Baud rate 5:38400bps 4:19200bps 3:9600bps 2:4800bps 1:2400bps 0:1200bps
(2) Length of character 1:8 bit 0:7 bit (3) Parity bit 2: Even 1: Odd 0: None
(4) Stop bit 1:2 bit 0:1 bit
(5) Terminator 1 : CR+LF 0 : CR RS-485 ID
NO W37000 CR (Read only)
RS-485 transmission delay time NOW W 3 8 0 0 0 0 0 CR (Read only)
ID No. Sign or 0 Read: Terminator
Read: I D Setting value No. Setting value (max. 5 digits)
* Only input 0 where the setting value is 0.

Alarm	HI I	imit													_	
	Z	0		٧	V 4	1	±						С	R	(No writing at set value LOCK)	
Alarm	LO	limit													_	
	Ν	0		٧	V 4	2	±						С	R	(No writing at set value LOCK)	
Outpu	t se	lecti	on												_	
	Ν	0		٧	V 4	3	0	0	0	0	(1)	(2)	С	R	(No writing at set value LOCK)	
	(1)	Outp	ut se	electi	on 1 (I	B5)	5: I	DZ i	resp	ons	e 4	: N2	Z 3:	Hol	ld 2: RUN 1: Overload 0: HH	
	(2)	Outp	ut se	election	on 2 (I	B6)	5: I	DZ r	esp	ons	e 4	: N2	Z 3:	Hol	ld 2: RUN 1: Overload 0: LL	
Sampli	ng	rate													•	
	Ν	0		٧	N 4	4	0	0	0	0	0		С	R	(No writing at set value LOCK)	
Digital	low	/−pas	s fil	ter											•	
	Ν	0		٧	N 4	5	0	0	0				С	R	(No writing at set value LOCK)	
Peak h	old	sele	ctio												•	
	Ν	0		٧	V 4	6	0	0	0	0	0		С	R	(No writing at set value LOCK)	
Hold fi	X S	ectio	n _												•	
	Ν	0		٧	N 4	7	0	0	0	0	0		С	R	(No writing at set value LOCK)	
Hold d	ete	ction	wa	it											-	
	Ν	0		٧	N 4	8	0	0	0				С	R	(No writing at set value LOCK)	
Renew	al t	iming	g of	holo	l valu	ıe									-	
	Ν	0		٧	N 4	9	0	0	0	0	0		С	R	(No writing at set value LOCK)	
RS-48	5 c	omm	unic	atio	n typ	е									1	
	Ν			٧	N 5	1	0	0	0		(1)	• •			(Read only)	
	(1)	Mod	е		3:	Mod	lbus	-R1	TU 2	2: Pi	rinte	ed	1: Co	ont	inuous 0: Command	
		Forn				For	nat	2		0 : F	orn	nat	1			
RS-23	2C	comi	mun	_	_	ype									1	
	Ν	0		٧	N 5	2	0	0	0	0	(1)	(2)	С	R	(No writing at set value LOCK)	
		Mod											Com		and	
		Forn			2:	For	mat	3 1:	For	mat	2 0	: Fo	orma	ıt1		
BCD o	utp	ut m	ode												•	
	Ν	0			N 5	4	0	0	0	0	0		С	R	(No writing at set value LOCK)	
BCD E	39 c	utpu	t se	_	_										1	
	Ν	0		٧	N 5	5	0	0	0	0	0		С	R	(No writing at set value LOCK)	
Actual	loa	id cal	libra	ıtion	(cap	aci	(y)								•	
	Ν	0			N 7	1	0						С	R	(No writing at calibration value LOCK)	1
Equiva	len [.]	t inpu	ıt c	alibr	ation	(ra	ted	out	put))					1	
	Ν	0		٧	N 7	2	0	0					С	R	(No writing at calibration value LOCK)	1
				╝	<u></u>		$oldsymbol{\perp}$						Щ,		I	
		IE) N	0.		5	ı Sigr	n or	0				F	Rea	ad: Terminator	
Rea	d:	I	D	S	ettin	ļ.				Se	ettir	ıg י	valu	ıe ((max. 5 digits)	

* Only input 0 where the setting value is 0.

Attention

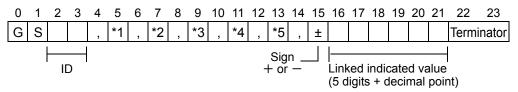
- After receiving a response from the F325, leave an interval of 5 mSec or more before sending the next command from the host.



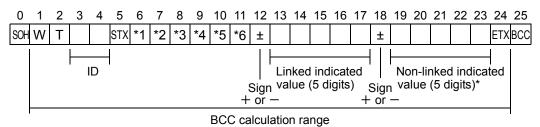
Data is simultaneously transmitted from the host to all when ID No. is "99".
 This should only be carried out when writing the setting value and not when reading.

■ Transmitting format for continuous transmission/printing

- Transmitting format 1



- Transmitting format 2



Each ASCII code of SOH, STX, ETX BC0

SOH: 01

STX: 02 ETX: 03 BCC calculation method

and is XORed with all data.

For BCC, each code in the BCC calculation range is represented in hexadecimals

- *: When analog peak hold (peak hold selection = 1: analog, and hold mode = 1: peak hold) is used, the 5 digits will be the same as the linked indicated values.
 - *1 O: Overload (LOAD,OFL,OVERLOAD)
 - S: Stable M: Unstable H: Hold

Priority: H > O > (S or M)

- *2 A: Zero tracking OFF T: Zero tracking ON
- *3 H: HI limit ON
 L: LO limit ON
 - G: HI limit and LO limit OFF N: HI limit and LO limit ON

F: Compare OFF

Priority: N > (H or L) F > G

- *4 N: Near zero OFF
 - Z: Near zero ON
- *5 H: HH limit ON
 - L: LL limit ON
 - G: HH limit and LL limit OFF
 - N: HH limit and LL limit ON
 - F: Compare OFF

Priority: N > (H or L) F > G

- *6 Decimal place
 - 3: 0.000
 - 2: 00.00
 - 1: 000.0
 - 0: None

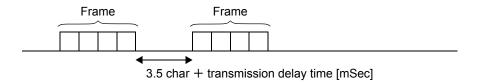
Attention

Do not specify continuous mode when there are multiple F325s connected.

■Modbus-RTU

■RS-485 transmission delay time

Set delay time when the master device cannot process a response from the F325.



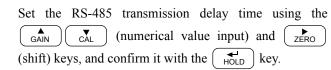
■RS-485 transmission delay time setting method

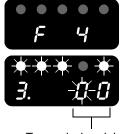




2. Select "RS-485 transmission delay time".







Transmission delay time (00 to 99)

3. Press the $\begin{pmatrix} \frac{+}{FNC} \end{pmatrix}$ key to return to the indicated value display.

■Function code for Modbus

Function code details are described.

This chapter describes the function field and the data field that changes with the function code.

The actual message frame consists of the address field, function field, data field, and the error-check field, and is transmitted in this order.

Function code list

Code	Function name	Command
01 (0x01)	Read Coils	Read coils
02 (0x02)	Read Discrete Inputs	Read discrete inputs
03 (0x03)	Read Holding Registers	Read holding registers
04 (0x04)	Read Input Register	Read input register
05 (0x05)	Write Single Coil	Write in single coil
06 (0x06)	Write Single Register	Write in single holding register
15 (0x0F)	Write Multiple Coils	Write in multiple coils
16 (0x10)	Write Multiple Registers	Write in multiple holding register
08 (0x08)	Diagnostics	Diagnostic mode
11 (0x0B)	Get Comm Event Counter	Read event counters
12 (0x0C)	Get Comm Event Log	Read communication events
17 (0x11)	Report Slave ID	Read slave ID information

12

01 (0x01) Read Coils

The ON/OFF status of slave coils is read.

Broadcast cannot be specified for read commands.

The start address of the coil and the number of coils is specified.

[Request]

Function	1 byte	0x01
Start address	2 byte	0x0000 to 0xFFFF
Number of coils	2 byte	1 to 2000 (0x07D0)

[Response]

Function	1 byte	0x01
Data bytes	1 byte	N *1
Coil status	N byte	*2

*1: N = Number of coils/8, N = N+1 in case division is not possible.

[Error response]

Error code	1 byte	0x81 (function +0x80)
Exception code	1 byte	01 or 02 or 03

e.g.) The digital zero (address 00003) status is read.

[Request]

Function	01
Start address (HI)	00
Start address (LO)	02
Number of coils (HI)	00
Number of coils (LO)	01

[Response]

Function	01
Data bytes	01
Digital zero	00

Note that the relative address is 0x02 when reading the digital zero value.

The remaining bit is 0 when less than 8 bits.

*2: The F325 response (coil status) is constantly 0.

(The process is performed the moment the command is read.)

Consider the read/write of coil to be completed by the normal response from the function codes 05 (0x05) Write Signal Coil or 15 (0x0F) Write Multiple Coils.

02 (0x02) Read Discrete Inputs

The ON/OFF status of discrete input is read.

Broadcast cannot be specified.

The start address of the input and the number of inputs is specified.

[Request]

Function	1 byte	0x02
Start address	2 byte	0x0000 to 0xFFFF
Number of inputs	2 byte	1 to 2000 (0x07D0)

[Response]

Function	1 byte	0x02
Data bytes	1 byte	N *
Input status	N byte	0x00 to 0xFF

*: N = Number of inputs/8, N = N+1 in case division is not possible.

[Error response]

Error code	1 byte	0x82 (function +0x80)
Exception code	1 byte	01 or 02 or 03

e.g.) Status from Hold (address 10001) to OK output (address 10008) is read.

[Request]

Function	02
Start address (HI)	00
Start address (LO)	00
Number of inputs (HI)	00
Number of inputs (LO)	08

[Response]

Function	02
Data bytes	01
Hold to OK output	20

Note that the relative address is 0x00 when reading the hold value.

The F325 setting for this example is as follows.

Hold	OFF (0)
Stable	OFF (0)
Near zero output	OFF (0)
Overload (LOAD, OFL, Alarm)	OFF (0)
Zero tracking	OFF (0)
HI output	ON (1)
LO output	OFF (0)
OK output	OFF (0)

The LSB of the first data is the status of the initial address. 00100000 (0x20) represented in binary digits.

* Status can also be read by function code 04 (0x04) Read Input Registers. With function code 04, status is read along with the indicated value.

03 (0x03) Read Holding Registers

The contents of slave holding registers are read.

Broadcast cannot be specified.

The start address of the holding register and the number of registers are specified.

Slave devices transmit data by converting the contents of each register to 2 bytes.

[Request]

Function	1 byte	0x03
Start address	2 byte	0x0000 to 0xFFFF
Number of registers	2 byte	1 to 125 (0x7D)

[Response]

Function	1 byte	0x03
Data bytes	1 byte	2×N *
Register value	N x 2 bytes	

*: N = Number of registers

[Error response]

Error code	1 byte	0x83 (function +0x80)
Exception code	1 byte	01 or 02 or 03

e.g.) Contents from HI limit (address 40001) to LO limit (address 40002) are read.

[Request]

Function	03
Start address (HI)	00
Start address (LO)	00
Number of registers (HI)	00
Number of registers (LO)	02

[Response]

03
04
00
64
00
32

Note that the relative address is 0x00 when reading the HI limit value.

The F325 setting for this example is as follows.

HI limit	100 (0x0064)
LO limit	50 (0x0032)

04 (0x04) Read Input Registers

The contents of slave input registers are read.

Broadcast cannot be specified.

The start address of the input register and the number of registers are specified.

Slave devices transmit data by converting the contents of each register to 2 bytes.

[Request]

Function	1 byte	0x04
Start address	2 bytes	0x0000 to 0xFFFF
Number of registers	2 byte	1 to 125 (0x7D)

[Response]

Function	1 byte	0x04
Data bytes	1 byte	2×N *
Register value	N x 2 bytes	

^{*:} N = Number of registers

[Error response]

Error code	1 byte	0x84 (function +0x80)
Exception code	1 byte	01 or 02 or 03

e.g.) Contents of linked indicated value (address 30003) are read.

[Request]

Function	04
Start address (HI)	00
Start address (LO)	02
Number of registers (HI)	00
Number of registers (LO)	01

[Response]

04
02
03
E8

Note that the relative address is 0x02 when reading the linked indicated value.

The indicated value of the F325 for this example is as follows.

Linked indicated value: 1000 (0x03E8)

05 (0x05) Write Single Coil

The ON or OFF of slave coils is changed.

When broadcast (0) is specified, coils of all slave devices with the same address are rewritten.

The coil address and output value for request are specified.

0xFF and 0x00 are 0x00 at ON, and 0x00 is OFF.

Data other than the above are not modified as improper data.

[Request]	Function	1 byte	0x05
	Start address	2 byte	0x0000 to 0xFFFF
	Output data	2 byte	0x0000 or 0xFF00
[Response]	Function	1 byte	0x05
	Start address	2 byte	0x0000 to 0xFFFF
	Output data	2 byte	0x0000 or 0xFF00
[Error response]	Error code	1 byte	0x85 (function +0x80)

e.g.) Hold ON (address 00001) is changed to ON.

		_		
Function	05	[Response]	Function	05
Start address (HI)	00		Start address (HI)	00
Start address (LO)	00		Start address (LO)	00
Hold ON (HI)	FF		Hold ON (HI)	FF
Hold ON (LO)	00		Hold ON (LO)	00

1 byte

01 or 02 or 03

Note that the relative address is 0x00 when writing in hold ON.

Exception code

The response of normal write in is the same as request.

06 (0x06) Write Single Register

[Request]

The values of slave holding registers are changed (rewritten).

When broadcast (0) is specified, holding registers of all slave devices with the same address are rewritten.

The holding register address and the changed data for request are specified.

[Request]	Function	1 byte	0x06
	Start address	2 byte	0x0000 to 0xFFFF
	Output data	2 byte	
[Response]	Function	1 byte	0x06
	Start address	2 byte	0x0000 to 0xFFFF
	Output data	2 byte	
[Error response]	Error code	1 byte	0x86 (function +0x80)
	Exception code	1 byte	01 or 02 or 03

^{*} Consider the read/write of coil to be completed by the normal responses.

e.g.) The value of the moving average filter (address 40007) is changed to 20 (0x0014).

[Request]

Function	06
Start address (HI)	00
Start address (LO)	06
Moving average filter (HI)	00
Moving average filter (LO)	14

[Response]

Function	06
Start address (HI)	00
Start address (LO)	06
Moving average filter (HI)	00
Moving average filter (LO)	14

Note that the relative address is 0x06 when writing in the moving average filter.

The response of normal write in is the same as Request.

15 (0x0F) Write Multiple Coils

For slave coils, data of the specified number of coils is changed from a specified address.

When broadcast (0) is specified, coils of all slave devices with the same address are rewritten.

The coil address and new number of bytes for request are specified.

[Request]

Function	1 byte	0x0F
Start address	2 byte	0x0000 to 0xFFFF
Number of coils	2 byte	0x0001 to 0x07B0
Number of bytes	1 byte	N *
Changed data	N x 2 bytes	

^{*:} N = Number of coils/8, N = N+1 in case division is not possible.

[Response]

Function	1 byte	0x0F
Start address	2 byte	0x0000 to 0xFFFF
Number of coils	2 byte	0x0001 to 0x07B0

[Error response]

Error code	1 byte	0x8F (function +0x80)
Exception code	1 byte	01 or 02 or 03

e.g.) ON/OFF of digital zero reset (address 00004) from hold ON (address 00001) is switched.

[Request]

Function	0F
Start address (HI)	00
Start address (LO)	00
Number of coils (HI)	00
Number of coils (LO)	04
Data bytes	01
(Hold ON to	05
digital zero reset)	03

[Response]

Function	0F
Start address (HI)	00
Start address (LO)	00
Number of coils (HI)	00
Number of coils (LO)	04

Note that the relative address is 0x00 when writing in hold ON.

The example shows how ON (1) and OFF (0) of the F325 is rewritten.

Unused bits are filled with 0.

Coil	80000	00007	00006	00005	Digital zero reset	Digital zero	Hold OFF	Hold ON
Bit	0	0	0	0	0	1	0	1
		•	•	Oxi	05		•	

- * Consider the read/write of coil to be completed by the normal responses.
- * Do not execute commands in the address combinations below.

When executed, commands will be carried out one by one, but may not operate properly.

- Addresses 00001 and 00002
- Addresses 00003 and 00004
- Addresses 00005 and 00006
- Addresses 00007 and 00008
- Addresses 00009 and 00010
- Addresses 00011 to 00013

16 (0x10) Write Multiple Registers

For slave holding registers, data of the specified numbers is changed from a specified address.

When broadcast (0) is specified, holding registers of all slave devices with the same address are rewritten.

The register address, number of registers and data for request are specified.

Slave devices transmit data by converting the contents of each register to 2 bytes.

[Request]

Function	1 byte	0x10
Start address	2 byte	0x0000 to 0xFFFF
Number of registers	2 byte	0x0001 to 0x0078 (120)
Number of bytes	1 byte	2×N *
Changed data	N x 2 bytes	

*: N = Number of registers

[Response]

Function	1 byte	0x10
Start address	2 byte	0x0000 to 0xFFFF
Number of registers	2 byte	0x0001 to 0x007B (123)

[Error response]

Error code	1 byte	0x90 (function +0x80)
Exception code	1 byte	01 or 02 or 03

- e.g.) The moving average filter (address 40007) is changed to 20 (0x0014), and the analog filter is changed to 30 Hz (*).
 - * To set the analog filter of the F325, select from 7: 30 kHz, 6: 10 kHz, 5: 3 kHz, 4: 1 kHz, 3: 300 Hz, 2: 100 Hz, 1: 30 Hz, 0: 10 Hz. Write in "1" because the example is 30 Hz.

[Request]

Function	10
Start address (HI)	00
Start address (LO)	06
Register (HI)	00
Register (LO)	02
Data bytes	04
Moving average filter (HI)	00
Moving average filter (LO)	14
Analog filter (HI)	00
Analog filter (LO)	01

[Response]

Function	10
Start address (HI)	00
Start address (LO)	06
Register (HI)	00
Register (LO)	02
register (LO)	02

Note that the relative address is 0x06 when writing in the moving average filter.

11 (0x0B) Get Comm Event Counter

Every time a request is processed by the slave device, 1 is added to the event counter.

The counter does not increase when there is a frame error or when other counters are being read.

The master device reads this counter before and after a request to judge whether it has been processed or not.

The status is generally 0x0000 when the slave device is not busy.

[Request]

Function	1 byte	0x0B
	_	
Function.	1.1. 4.	0.00

[Response]

Function	1 byte	0x0B
Status	2 byte	0x0000
Event counter	2 byte	0x0000 to 0xFFFF

[Error response]

Error code	1 byte	0x8B (function +0x80)
Exception code	1 byte	01

e.g.) Event counters are read.

[Request]

Function 0B [Response]

Function	0B
Status (HI)	00
Status (LO)	00
Event counter (HI)	01
Event counter (LO)	08

The example shows that the slave device is not busy (0x0000) and that it has processed a total of 264 (0x0108) commands.

12 (0x0C) Get Comm Event Log

This function is used for reading the event status from slave devices.

The contents of the status and the event counter are the same as status 11 (Get Comm Event Counter). Message count is the same as sub-function 11 (Return Bus Message Count) of status 08. The event log retains 64 bytes worth of messages communicated by the slave device.

The newest event is always the 0th byte, and old events are discarded when it exceeds 64. The detailed contents of the events will be defined later on.

[Red	uest

[Response]

Function	1 byte	0x0C
Function	1 byte	0x0C
Byte count	1 byte	N *
Status	2 byte	0x0000
Event counter	2 byte	0x0000 to 0xFFFF
Message count	2 byte	0x0000 to 0xFFFF
Event counter	N hyte	0 to 64 (number of events)

*: N = Number of events + (3 x 2)

[Error response]

Error code	1 byte	0x8C (function +0x80)
Exception code	1 byte	01

e.g.) The event status is read.

[Request] F

Function 0C

[Response]

Function	0C
Byte count	08
Status (HI)	00
Status (LO)	00
Event counter (HI)	01
Event counter (LO)	08
Message count (HI)	01
Message count (LO)	21
Event 0	C0
Event 1	00

The example shows 264 times for the event counter (0x0108), 289 times for the message counter (0x0121), and not busy (0x0000). The newest event is 11000000 (0xC0) and bit 6 is 1, which means that the broadcast was received. The previous event is 00, indicating that the slave device received a request for Communications Restart.

Event log / Event details

Events are categorized into four types.

Receive event (when bit 7 is 1)

Bit

- 0 Unused
- Communication error
- 2 Unused
- 3 Unused
- 4 Character overrun
- 5 Listen Only Mode (0 for the F325)
- 6 Receive broadcast
- 1

Bit

- 0 Transmit exception code 1 to 3
- Transmit exception code 4
- 2 0
- 3 0
- 4 Transmit (write in) time out
- 5 Listen Only Mode (0 for F325)
- 6 1
- 0

O Slave is in Listen Only Mode

04 is recorded for Listen Only Mode.

O Communication is initialized by Communication Restart

This event is recorded when communication restarts.

Event is 00.

If the slave device is in Continue on Error mode, the event is written in the existing log. For Stop on Error mode, all log is cleared and 00 is written in event 0.

(The F325 is fixed to Stop on Error mode.)

17 (0x11) Report Slave ID

The slave device returns the current status and the operation mode.

The contents of response differ according to the product.

[Request]

Function 1 byte 0x11

[Response]

Function	1 byte	0x11
Number of bytes	1 byte	
Slave ID *	1 byte	
RUN Indicator	1 byte	0x00: Overload or calibration error 0xFF: Normal
Additional information	2 byte	Version

^{*:} The slave ID differs from the Address.

[Error response]

Error code	1 byte	0x91 (function +0x80)
Exception code	1 byte	01

e.g.) The slave ID is read.

[Request] Function	11
--------------------	----

[Response]

Function	11
Number of bytes	5
Slave ID	
RUN Indicator	00
Additional information	*

08 (0x08) Diagnostic code (diagnostics)

The communication status between the master and slaves can be checked by requesting a diagnosis. Contents of check differ by the sub-functions added to the end of general functions.

The slave device responds by returning the received request frame except when there is an error. Also, all counter for diagnosis is reset when the power is turned ON.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	
Data	N x 2 bytes	

[Response]

Function	1 byte	0x08
Sub-function	2 byte	
Data	N x 2 bytes	

[Error response]

Error code	1 byte	0x88 (function +0x80)
Exception code	1 byte	01 or 03

^{*:} Version information is represented in 2 bytes. Version 1.23 when 0x01, 0x17.

Sub-function code list

Code	Function name	Command
00 (0x0000)	Return Query Data	Request echo
01 (0x0001)	Restart Communications Option	Initialize communication port
02 (0x0002)	Return Diagnostic Register	Request echo
03 (0x0003)	Change ASCII Input Delimiter	_
04 (0x0004)	Force Listen Only Mode	Receive-only mode
05 to 09	Unused	
10 (0x000A)	Clear Counters and Diagnostic Register	Clear counters and registers
11 (0x000B)	Return Bus Message Count	Read message count
12 (0x000C)	Return Bus Communication Error Count	Read CRC error count
13 (0x000D)	Return Bus Exception Error Count	Read exception error count
14 (0x000E)	Return Slave Message Count	Read slave receive count
15 (0x000F)	Return Slave No Response Count	Read no-response count
16 (0x0010)	Return Slave NAK Count	_
17 (0x0011)	Return Slave Busy Count	Read busy count
18 (0x0012)	Return Bus Character Overrun Count	Read character overrun error counter
20 (0x0014)	Clear Overrun Counter and Flag	Clear character overrun error counter

- * Codes 03, 05 to 09, and 16 are not available for the F325.
- * For code 04, the receive only mode will be applied, but the counters and the event log will be updated (always 0x04 when code 04).

00 (0x0000) Return Query Data

The request frame is returned.

[Request

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x00
Data	N x 2 bytes	Arbitrary 16-bit data

[Response]

Request echo

01 (0x0001) Restart Communication Option

Communication ports are initialized. The communication event counters are cleared.

Response is given before the initializing operation.

This is processed in Listen Only Mode, but no response is given.

[Req	uest]
------	-------

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x01
Data	2 byte	

* Event log is cleared when data is 0xFF, 0x00. Event log is saved when 0x00, 0x00.

[Response]

Request echo

02 (0x0002) Return Diagnostic Register (not available for the F325)

The request frame is returned as is.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x02
Data	N x 2 bytes	Arbitrary 16-bit data

[Response]

Request echo

04 (0x0004) Force Listen Only Mode

The slave device is turned to receive only mode.

The slave device will ignore all messages, not operate or respond, but will process the counters and the event log.

However, the slave device responds to sub-function 1, which will initialize and restart communication as well as release the receive only mode.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x04
Data	2 byte	0x00, 0x00

[Response]

None

10 (0x000A) Clear Counters and Diagnostic Register

All counter and diagnosis registers are cleared.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0A
Data	2 byte	0x00, 0x00

[Response]

Request echo

11 (0x000B) Return Bus Message Count

The total numbers of frames detected by a slave device are read.

These are counted when the slave ID matches or when a message is simultaneously transmitted to all devices.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0B
Data	2 byte	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0B
Data	2 byte	Message count

12 (0x000C) Return Bus Communication Error Count

The total numbers of CRC errors detected by a slave device are read.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0C
Data	2 byte	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0C
Data	2 byte	CRC error count

13 (0x000D) Return Bus Exception Error Count

The total numbers of exception errors transmitted by a slave device are read.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0D
Data	2 byte	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0D
Data	2 byte	Exception response count

14 (0x000E) Return Slave Message Count

The total numbers of frames that match the slave address are read.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0E
Data	2 byte	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0E
Data	2 byte	Actual address message count

15 (0x000F) Return Slave No Response Count

The number of times not responded to frames that match the slave address is read.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0F
Data	2 byte	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x0F
Data	2 byte	No-response count

17 (0x0011) Return Slave Busy Count (no count-up for the F325)

Slave busy counts issued by a slave device are returned.

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Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x11
Data	2 byte	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x11
Data	2 byte	Busy

18 (0x0012) Return Bus Character Overrun Count (no count-up for the F325)

The number of times character overrun errors of the frame that matched the slave address is read.

[Request]	
-----------	--

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x12
Data	2 byte	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x12
Data	2 byte	Character, Overrun, Count

20 (0x0014) Clear Overrun Counter and Flag

The overrun counter, and drops the error flag are cleared.

[Request]

Function	1 byte	0x08
Sub-function	2 byte	0x00, 0x14
Data	N x 2 bytes	0x00, 0x00

[Response]

Request echo

■ Regarding error response

The slave device returns an error response without executing the command when a request from the master contains a failure. 0x80 is added to the requested function code.

Exception code is judged after the received frame.

The priority of the exception code judgment is $1 \rightarrow 3 \rightarrow 2$.

Exception code No.	
1	Function code error
2	Address out of range error
3	Data value error

Exception code = 01

A function code that does not exist has been specified.

Confirm the function code.

Exception code = 02

An address that cannot be used has been specified.

- Confirm the start address or the start address + (the number of coils, statuses or registers). (Function code 1 to 6, 15 and 16)

Exception code = 03

Specified data is out of range.

- Confirm that the number of coils, statuses or registers are within readable range. (Function code 1 to 4)
- Confirm that the output value is 0x0000 or 0xFF00. (Function code 5)
- Confirm that the output value is from 0x0000 to 0xFFFF, or that they are not specified within start address 54. (Function code 6)
- Confirm that the number of coils or registers are within the range. (Function code 15 and 16)
- Confirm that the number of bytes can be obtained from the number of coils or registers. (Function code 15 and 16)
- Confirm that every byte of the transmitted format is correct. (Function code 1 to 6, 8, 15 and 16)



Key points —

The slave device ignores requests from the master device and will not respond in the following cases.

- When the specified slave address No. and the actual address do not match.
- When the error-check code does not match.
- When communication errors such as parity errors are detected.
- When the spacing of the frame configuration data 1.5 characters or more.
- When the slave address No. is set as 0.

■Data address

Type of data	Address	Data name	Setting value LOCK	Calibration LOCK	Data format
	00001	Hold ON			
	00002	Hold OFF			
	00003	Digital zero			
	00004	Digital zero reset			
	00005	Hold reset			
Coil	00006	Survival verification request ON			В1
0XXXX	00007	Survival verification request OFF			DI
	00008	I/O output check			
	00009	BCD output check			
	00010	Zero calibration		0	
	00011	Actual load calibration		0	
	00012	Equivalent input calibration		0	
	10001	Hold	/		
	10002	Stable	1 /	/	
	10003	Near zero output	1 /	/ /	
	10004	Overload (LOAD, OFL, warning)	1 /	/	
	10005	Zero tracking] /		В1
	10006	HI output	1 /		DI
	10007	LO output] /		
Input status	10008	OK output] /		
1XXXX	10009	HH output	1 /		
	10010	LL output] /		
	10011] /		
	10012	Backup (not allocated)			
	10013				
	10014	Set value LOCK	1/		
	10015	Calibration LOCK	1/	/	B1
	10016	Survival verification response	7	V	
	30001	Decimal place	/		0, 1, 2, 3
	30002	0 fixed (reserved for units)	7	/	0 fixed
	30003	Linked indicated value *1	1 /	/ /	I16
	30004	Backup (not allocated)] /	/	
	30005	Non-linked indicated value *1, 3		/	I16
	30006] /		
	\sim	Backup (not allocated)			
	30010				
Input register	30011	Status 1			
3XXXX	30012	Status 2			I16
	30013	Status 3	/	/	
	30014		/	/	
	30015	Backup (not allocated)	/	/	
	30016] /	/	
	30017	Linked indicated value (HI)] /	/	
	30018	Linked indicated value (LO)] /	/	I32
	30019	Non-linked indicated value (HI) *3	」 /	[/	1,7,2
	30020	Non-linked indicated value (LO) *3	Y	V	

Type of data	Address	Data name	Setting value LOCK	Calibration LOCK	Data format	
	40001	HI limit *2	0			
	40002	LO limit *2	0			
	40003	HI/LO limit comparison mode	0			
	40004	Hysteresis	0			
	40005	Digital offset	0			
	40006	Near zero *2	0			
	40007	Moving average filter	0			
	40008	Analog filter	0			
	40009	Motion detect (time)	0			
	40010	Motion detect (range)	0			
	40011	Zero tracking (time)	0			
	40012	Zero tracking (range)	0		I16	
	40013	Hold mode	0			
	40014	ZERO key valid/invalid				
	40015	HOLD key valid/invalid				
	40016	Min. scale division		0		
	40017	Display frequency		0		
	40018	Decimal place		0		
	40019	Excitation voltage		0		
	40020	BCD data update rate	0			
	40021	D/A zero setting *2	0			
	40022	D/A full scale setting *2	0			
	40023	D/A output mode	0			
	40024	B/11 output mode				
Holding register	~	Backup (not allocated)				
4XXXX	40030	Backup (not anocated)				
	40031	Rated output		0		
	40032	Set value LOCK		0		
	40033	Calibration LOCK				
	40034	Output selection	0			
	40035	Sampling rate	0			
	40036	Digital low-pass filter				
	40037		0			
	40038	Hold fix section	0		I16	
	40039	Hold detection wait			110	
	40040	Renewal timing of hold value	0			
	40041	RS-232C communication type	0			
	40041	BCD output mode				
	40042	BCD B9 output selection	0			
	40043	Automatic printing	0			
			0			
	40045	Hold value printing	0			
	40046	Dooleyn (not all a sate A)				
	40050	Backup (not allocated)				
	40050	III limit (III)				
	40051	HI limit (HI)	0			
	40052	HI limit (LO)	0			
	40053	LO limit (HI)	0		I32	
	40054	LO limit (LO)	0			
	40055	Near zero (HI)	0			
	40056	Near zero (LO)	0			

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Type of data	Address	Data name	Setting value LOCK	Calibration LOCK	Data format
	40057	HH limit (HI)	0		
	40058	HH limit (LO)	0		
	40059	LL limit (HI)	0		
	40060	LL limit (LO)	0		
	40061	D/A zero setting (HI)	0		
	40062	D/A zero setting (LO)	0		
Holding register 4XXXX	40063	D/A full scale setting (HI)	0		
	40064	D/A full scale setting (LO)	0		132
	40065	Alarm HI limit (HI)	0		132
	40066	Alarm HI limit (LO)	0		
	40067	Alarm LO limit (HI)	0		
	40068	Alarm LO limit (LO)	0		
	40069	RS-232C I/F setting (HI)	0		
	40070	RS-232C I/F setting (LO)	0		
	40071	Capacity (HI)		0	
	40072	Capacity (LO)		0	

B1: 1 bit, I16: 16-bit integer, I32: 32-bit integer

*1, 2: Except for special cases, allocate the 32-bit after address No. 11 (*1) and 31 (*2) because the corresponding numerical values may not fit in 16-bit.

When values do not fit in 16-bit:

Numerical value > 32767 = 32767

Numerical value < -19999 = -19999

*3: When analog peak hold (peak hold selection = 1: analog, and hold mode = 1: peak hold) is used, the 5 digits will be the same as the linked indicated values.



Key points

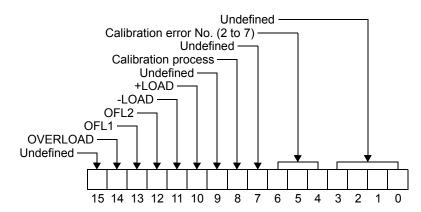
The address No. used in messages are relative addresses.

Relative addresses are obtained using the formula below.

Relative address = Last 4 digits of the address No. -1

For example, 0014 (0x0E) when 40015 is specified for the holding register.

* Status 1 (abnormal condition)



12

- OFL1, FL2, -LOAD, +LOAD, OVERLOAD:

"1" is indicated every time an error occurs.

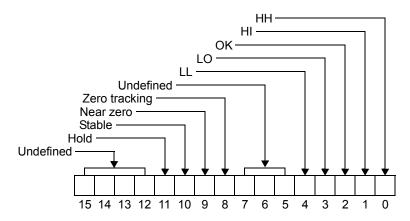
"1" is indicated when calibrating. - Calibration process:

- Calibration error: The error No. of the calibration error is indicated.

"0" is indicated when there is no calibration error.

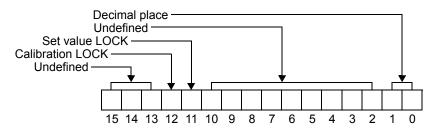
	Bit No.		
Calibration error	6	5	4
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

* Status 2 (measuring)



"1" is indicated when a status is ON.

* Status 3 (measuring)



· Decimal point: The decimal place is indicated.

Decimal place	Bit No.		
Decimal place	1	0	
None	0	0	
0.0	0	1	
0.00	1	0	
0.000	1	1	

12

nterface

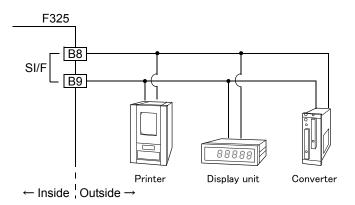
12-2.SI/F (RS-485 or SI/Specified at the time of order: SIF)

This is a two-wire serial interface for connecting printers, external display units and so on made by UNIPULSE.

B8 B9
SI/F

■Connection of SI/F

Up to three external devices can be connected with no polarity. Use two-core parallel cables, captire cables (electric wires with thick coating for construction) and so on for wires. When two-core parallel cables and captire cables are used, transmission distance is approx. 30m. When two-core shield twisted pair wires are used, transmission distance is approx. 300m. Do not parallel AC lines and high-pressure lines. This causes malfunction.



■ Regarding indicated values transmitted by SI/F

GROSS area

Values linked with indicated values are output.

NET area

Current values (sensor input values) that are not linked with indicated values are output (excluding analog peak holds *).

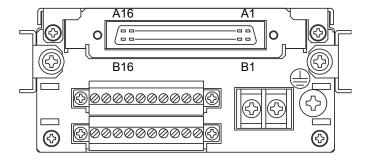
- * Values linked with indicated values are displayed when analog peak hold (peak hold selection = 1: analog, hold mode = 1: peak hold) is applied.
- * Select GROSS on the connecting device to display values linked with indicated values.
- * Select NET on the connecting device to display current values (sensor input values) that are not linked with the indicated values.

13Options

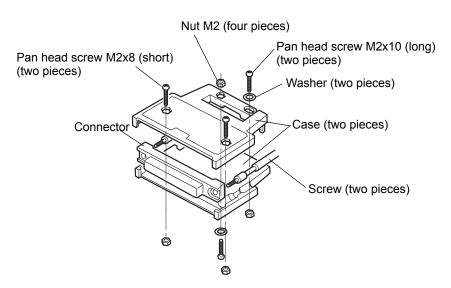
The following explains options such as BCD output, D/A converter, and RS-232C.

13-1.BCD data output

BCD data output is an interface to retrieve the indicated values of the F325 as BCD code data. This interface is convenient for processing such as controls, totals, and records by connecting the F325 to a computer, process controller, PLC, etc.



Connector assembly method



- 1. Fit a connector and screws (two pieces) into a groove of a case (one side).
- 2. Put the other case onto the above and fit the two cases together.
- **3.** Tighten pan head screws M2x8 (two pieces). Tighten the pan head screws M2x10 (two pieces). Be careful that washers are inserted into pan head screws M2x10.

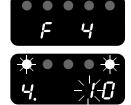
■Setting values related to BCD data input

- ■BCD data update rate
 - ■BCD data update rate setting method
 - 1. Select setting mode 4.



2. Select "BCD data update rate".

Press the CAL key four times.



Set the BCD data update rate using the GAIN Keys, and confirm it

with the HOLD key.

* Settable HI limit is up to the value set for a sample rate.

3. Press the FNC key to return to the indicated value display.

BCD data update rate

_					
10:	3000	times/sec.	STROBE range	e 0.167	msec
9:	1000	times/sec.	"	0.5	msec
8:	500	times/sec.	<i>II</i>	1	msec
7:	300	times/sec.	<i>II</i>	1.67	msec
6:	100	times/sec.	<i>II</i>	5	msec
5:	50	times/sec.	<i>II</i>	10	msec
4:	30	times/sec.	<i>''</i>	16.7	msec
3:	10	times/sec.	"	50	msec
2:	5	times/sec.	<i>''</i>	100	msec
1:	3	times/sec.	"	167	msec
_0:	1	time/sec.	"	500	msec

Key points

Normally, data is updated linking with the number of A/D convert times (3000 times/sec.). Slow the data update rate if the data cannot be read at 3000 times/sec due to low processing capability of equipment receiving BCD.

■BCD output mode

- ■BCD output mode setting method
 - Select setting mode 6.

2. Set "BCD output mode".

Press the CAL key four times.

Set the BCD output mode using

the
$$\begin{pmatrix} A \\ GAIN \end{pmatrix}$$
 $\begin{pmatrix} V \\ CAL \end{pmatrix}$ keys, and confirm it with the $\begin{pmatrix} A \\ HOLD \end{pmatrix}$ key.



BCD output mode -

- 1: Not linked with indicated value
 0: Linked with indicated value
- **3.** Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

Not linked with indicated value

Output is scaled and linked with sensor input.

Output corresponds to changes in sensor input signals even if indicated values are held.

* When analog peak hold (peak hold selection = 1: analog, and hold mode = 1: peak hold) is used, the 5 digits will be the same as the linked indicated values.

Linked with indicated value

Output is linked with indicated values.

Hold value is output even if sensor input signals change in case that indicated values are held.

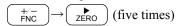
■BCD B9 output selection

B9 terminal functions are changed.

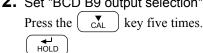
Use the terminal at "0: 80000 (default value)" except when using near zero in particular.

■BCD B9 output selection setting method

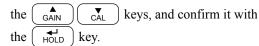
1. Select setting mode 6.



2. Set "BCD B9 output selection".



Set the BCD B9 output selection using





BCD B9 output selection

1: NZ 0: 80000

3. Press the +/-FNC key to return to the indicated value display.

■Sink type (BCO option)

Output

Output signal: Indicated value data (five-digit), 80000/near zero*, minus, OVER, stable,

STROBE

* Switch with setting value of BCD B9 output selection.

Output logic: Positive/negative logic selection

Output format: Sink type

Output transistor shall be ON when signal is ON.

When connecting input units such as PLC, connect a plus common type.

Rated voltage: 30V Rated current: 50mA

Insulation method: Photo-coupler insulation

Input

Input signal: BCD data hold, logic selection

Input format: No-voltage contact input (self-powered)

Relays, switches, and transistors can be connected.

Signals are input by making short-circuit and open-circuit between input

terminals and a common terminal.

If connecting transistors, connect an NPN output type (sink type)

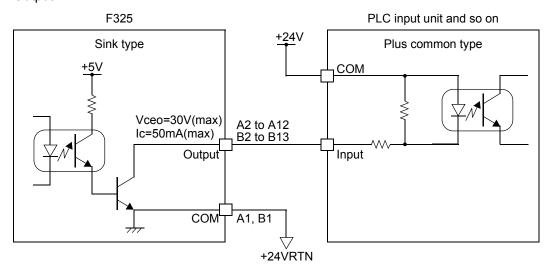
Current at the time of short circuit:

Approx. 6mA

Insulation method: Photo-coupler insulation

■Equivalent circuit

Output



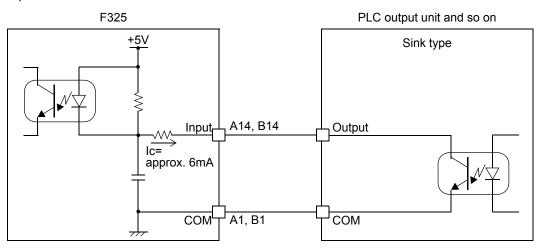
Internal transistor condition

Output	pin	level
--------------------------	-----	-------

Output data	Negative	Positive		Output data	Negative
0	OFF	ON		0	Н
1	ON	OFF		1	L
		In acco	ordance w	ith logic selection	on (B14pin)

Output data	Negative	Positive
0	Н	L
1	L	Н

Input



Open-circuit	OFF
Short-circuit	ON

Caution

- Do not apply voltage into the signal input circuit from outside.
- An external element must be an element in which Ic=10mA or more can be applied.
- An external element leak must be 30µA or below.

■Connector pin assignment

No.		Signal	No.		Signal
A1	*	COM	B1	*	COM
A2	Out	1	B2	Out	1000
A3	Out	2	В3	Out	2000
A4	Out	4	B4	Out	4000
A5	Out	8	В5	Out	8000
A6	Out	10	В6	Out	10000
A7	Out	20	В7	Out	20000
A8	Out	40	В8	Out	40000
A9	Out	80	В9	Out	80000/NZ
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 selection
A15		N.C.	B15		N.C.
A16		N.C.	B16		N.C.

Compatible connector:

FCN-361J032-AU (manufactured by FUJITSU COMPONENT or equivalent)

Connector cover: FCN-360C032-B (manufactured by FUJITSU COMPONENT or equivalent)

Near zero

Near zero condition is output.

* Only when BCD B9 output selection is set as "1: NZ".

MINUS (polarity)

The polarity of an indicated value being output as BCD data is output.

P.C

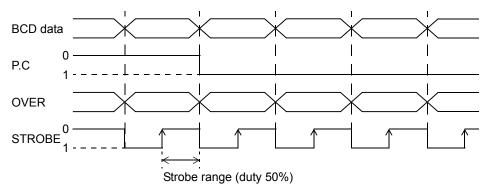
P.C is simultaneously output with BCD data at the time of stability.

OVER

OVER is output at the time of over scale (when -LOAD or LOAD, OFL1, OFL2)

STROBE

Strobe pulse is output linked with BCD data. Use a rising edge of pulse (1 -> 0) for reading data. BCD data update rate can be changed by setting.



BCD data hold - Level input

Update of BCD data output signals is stopped. (Indicated values are not held.)

STROBE output is also turned OFF.

Hold is performed at A14 pin.

Hold release when OFF and hold when ON.

ON
OFF Hold release Hold

Hold within 5mSec)

Logic selection - Level input -

Logic of output signals is selected. Selection is performed at B14 pin.

Negative logic when OFF, and positive logic when ON.

ON
OFF

Negative logic

Positive logic

Undefined section (within 5mSec)

■ Source type (BSC option)

Output

Output signal: Indicated value data (five-digit), 80000/near zero*, minus, OVER, stable,

STROBE

* Switch with setting value of BCD B9 output selection.

Output logic: Positive/negative logic selection

Output format: Source type

Output transistor shall be ON when the signal is ON.

When connecting input units such as PLC, connect a minus common type.

Rated voltage: 30V

Rated current: 20mA

Insulation method: Photo-coupler insulation

Input

Input signal: BCD data hold, logic selection

Input format: Minus common input

Use a PNP output type (source type) when connecting transistors.

ON voltage: 9V or higher

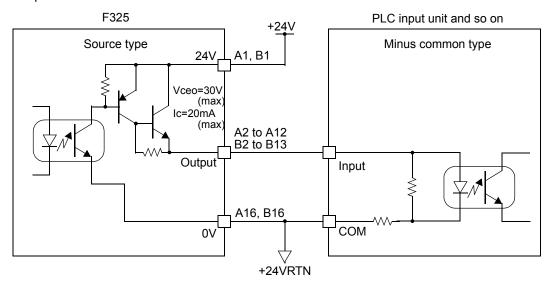
OFF voltage: 3V or less

At 24V load: Approx. 5mA

Insulation method: Photo-coupler insulation

■Equivalent circuit

Output



Internal transistor condition

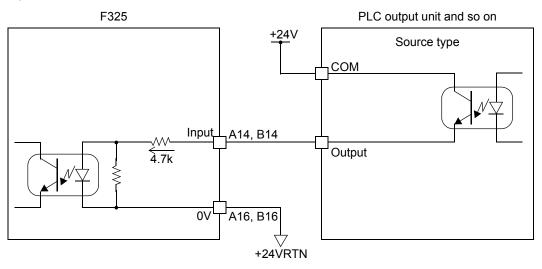
Output data Positive Negative 0 OFF ON 1 ON OFF

Output pin level

Output data	Positive	Negative
0	L	Н
1	Н	L

—— In accordance with logic selection (B14pin)

Input



9V or higher	ON
3V or less	OFF

- Do not apply voltage into the signal input circuit from outside.
- An external element must be an element in which Ic=10mA or more can be applied.
- An external element leak must be 30µA or below.

■Connector pin assignment

No.		Signal	No.		Signal
A1	In	+24V	В1	In	+24V
A2	Out	1	В2	Out	1000
A3	Out	2	В3	Out	2000
A4	Out	4	В4	Out	4000
A5	Out	8	В5	Out	8000
A6	Out	10	В6	Out	10000
A7	Out	20	В7	Out	20000
A8	Out	40	В8	Out	40000
A9	Out	80	В9	Out	80000/NZ
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 selection
A15		N.C.	B15		N.C.
A16	*	0V	B16	*	0V

Compatible connector:

FCN-361J032-AU (manufactured by FUJITSU COMPONENT or equivalent)

Connector cover: FCN-360C032-B (manufactured by FUJITSU COMPONENT or equivalent)

Near zero

Near zero condition is output.

* Only when BCD B9 output selection is set as "1: NZ".

MINUS (polarity)

The polarity of an indicated value being output as BCD data is output.

P.C

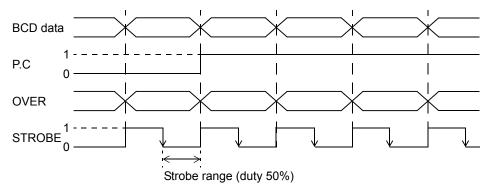
P.C is output simultaneously with BCD data at the time of stability.

OVER

OVER is output at the time of over scale (when -LOAD or LOAD, OFL1, OFL2)

STROBE

Strobe pulse is output linked with BCD data. Use a falling edge of pulse (1 -> 0) for reading data. BCD data update rate can be changed by setting.



BCD data hold - Level input

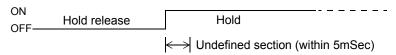
Update of BCD data output signals is stopped. (Indicated values are not held.)

STROBE output is also turned OFF.

Hold is performed at A14 pin.

Hold release when OFF (de-energized mode),

and hold when ON (energized mode).

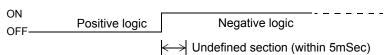


Logic selection - Level input -

Logic of output signals is selected. Selection is implemented at B14 pin.

Positive logic when OFF (de-energized mode),

and negative logic when ON (energized mode).



13-2.D/A converter

■ Voltage output (DAV option)

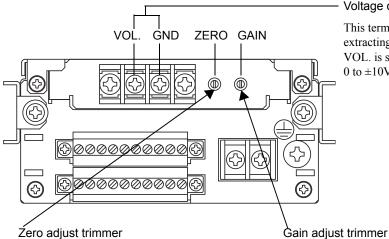
This converter is used for obtaining an analog output linked with indicated values of the F325.

The analog output range is voltage output -10 to +10V.

Analog output of 0V to ± 10 V can be obtained with respect to arbitrary digital values set by

D/A zero setting and D/A full scale setting functions.

Also, the output circuit and main unit circuit are isolated.



Voltage output terminal

This terminal is used for extracting voltage signals. VOL. is signal, and GND is ground. 0 to $\pm 10V$ can be obtained.

Zero adjust trimmer

This trimmer adjusts voltage output to zero when a value registered in D/A zero setting is displayed.

The zero adjust range is approx. -1.0 to +1.0V (at the time of zero output).

This trimmer adjusts voltage output to a display registered in D/A full scale setting. The gain adjust range is approx. 9.5 to 10.5V (at the time of full-scale output).

Voltage output: -10 to +10V (input resistance $2k\Omega$ or more)

D/A conversion rate: According to sampling rate

Resolution: 1/10000

-11.0 to +11.0V Over range:

Approx. -1.0 to +1.0V (at the time of zero output) Zero-adjust range:

Gain adjust range: Approx. 9.5 to 10.5V (at the time of full-scale output)

0.6mV/°C or less Zero drift:

Gain drift: 50ppm/°C or less

Non-linearity: 0.05%FS or less

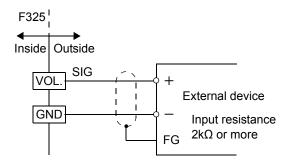
* Drift of analog input is not included

M3 screw type terminal block (two poles) Output connector:

> * Conforming crimping terminal 5.9mm or less 0.6N · m Tightening torque

Voltage output signals extraction method

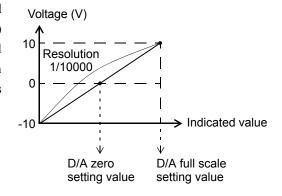
Connect an external device (input resistance $2k\Omega$ or more) to VOL. and GND of the F325 before using.



- D/A converter voltage output is optional.
- Do not apply voltage from outside. This will cause damage.
- Do not short-circuit voltage output. This may cause failure.
 Also, connecting capacity load may cause oscillation.

D/A zero/gain setting

D/A converter of the F325 sets an indicated value outputting 0V (D/A zero setting value) and an indicated value outputting 10V (D/A full scale setting value) respectively to obtain analog output. Input of each setting value is implemented in D/A zero full scale setting.

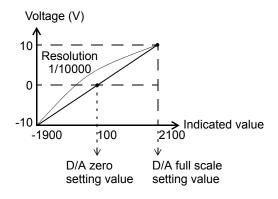


Setting sample

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

D/A zero setting 00100

D/A full scale setting 02100



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

D/A resolution

D/A converter resolution is 1/10000 to 0 to ± 10 V.

Minimum unit of voltage is

 $(+10-(-10V)) \times 1/10000 = 2mV.$

Minimum unit of indicated value is

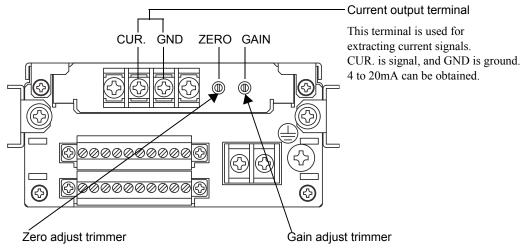
(D/A full scale setting value - D/A zero setting value) x 2 x 1/10000.

■Current output (DAI option)

This converter is used for obtaining an analog output linked with indicated values of the F325. The analog output range is current output 4 to 20mA.

Analog output of 4mA to 20mA can be obtained with respect to arbitrary digital values set by D/A zero setting and D/A full scale setting functions.

Also, the output circuit and main unit circuit are isolated.



This trimmer adjusts voltage output to zero when a value registered in D/A zero setting is displayed.

The zero adjust range is approx. 3.6 to 4.4mA (at the time of zero output).

This trimmer adjusts voltage output to a display registered in D/A full scale setting. The gain adjust range is approx. 19.6 to 20.4mA (at the time of full-scale output).

Current output: 4 to 20mA (input resistance 500Ω or less)

D/A conversion rate: According to sampling rate

Resolution: 1/10000

Over range: 3.2 to 20.8mA

Zero-adjust range: Approx. 3.6 to 4.4mA (at the time of zero output)

Gain adjust range Approx. 19.6 to 20.4mA (at the time of full-scale output)

Zero drift: $0.5\mu\text{A/°C}$ or less Gain drift: 50ppm/°C or less Non-linearity: 0.05%FS or less

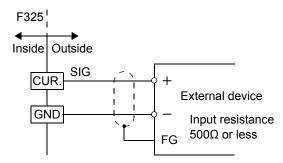
* Drift of analog input is not included

Output connector: M3 screw type terminal block

* Conforming crimping terminal 5.9mm or less Tightening torque 0.6N • m

Current output signals extraction method

Connect an external device (input resistance 500Ω or less) to CUR. and GND of the F325 before using.

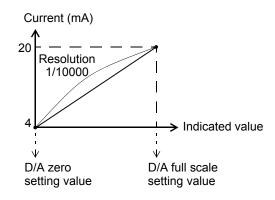


Caution

- D/A converter current output is optional.
- Do not apply voltage from outside. This will cause damage.
 Also, connecting capacity load may cause oscillation.

D/A zero/gain setting

D/A converter of the F325 sets an indicated value outputting 4mA (D/A zero setting value) and an indicated value outputting 20mA (D/A full scale setting value) respectively to obtain analog output. Input of each setting value is performed in D/A zero/full scale setting.



zero ->

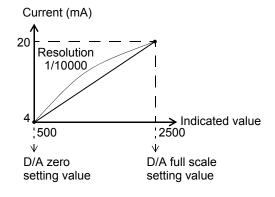
Full scale setting ->

Setting sample

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

D/A zero setting 00500

D/A full scale setting 02500



Indicated value	Current (mA)
480	3.84
500	4.00
1000	8.00
1500	12.00
2500	20.00
2520	20.16

120

D/A resolution

D/A converter resolution is 1/10000 to 4 to 20mA.

Minimum unit of current is

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

Minimum unit of indicated value is

(D/A full scale setting value - D/A zero setting value) x 1/10000.

■ Setting values related to D/A converter

■D/A zero/full scale

D/A zero/full scale of F325 is set.

- D/A zero/full scale setting method
 - **1.** Select setting mode 4.





2. Set "D/A zero setting".

key five times. Press the



Set the D/A zero setting using the GAIN CAL ▶ ZERO (shift) keys, and (numerical value input) and confirm it with the $\begin{pmatrix} \checkmark \\ HOLD \end{pmatrix}$ key.



(-19999 to 99999)

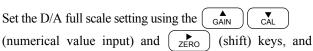
Press the +/- key to insert a minus sign.

3. Set "D/A full scale setting".

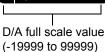
Press the $\begin{pmatrix} \mathbf{v} \\ \mathbf{cAL} \end{pmatrix}$ key once.

confirm it with the (HOLD) key.









Press the key to insert a minus sign. +/-FNC

4. Press the +∕-FNC key to return to the indicated value display.

Options

■D/A output mode

D/A output mode of the F325 is set.

■D/A output mode setting method

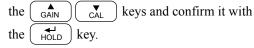
1. Select setting mode 4.



2. Set "D/A output mode".



Set the D/A output mode using







- 3: 20mA(10V) fixed output
- 2: 4mA(0V) fixed output

D/A output mode

- 1: Not linked with the indicated value
- 0: Linked with the indicated value
- **3.** Press the $\binom{+/-}{FNC}$ key to return to the indicated value display.

20mA(10V) fixed output

20mA is fixed and output when current output option was selected, and 10V is fixed and output when voltage output option was selected.

4mA(0V) fixed output

4mA is fixed and output when current output option was selected, and 0V is fixed and output when voltage output option was selected.

Not linked with the indicated value

Analog output is scaled and linked with sensor input.

Output corresponds to changes in sensor input signals even if the indicated values are held.

* When analog peak hold (peak hold selection = 1: analog, and hold mode = 1: peak hold) is used, the 5 digits will be the same as the linked indicated values.

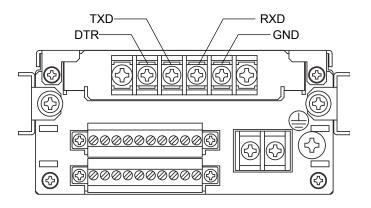
Linked with the indicated value

Analog output is linked with the indicated values.

Hold value is output even if sensor input signals change in case that indicated values are held.

13-3.RS-232C interface

RS-232C is an interface to read the indicated values and status of the F325 and to write the setting values into the F325. This interface is convenient for processing such as controls, totals, and records by connecting the F325 to a computer, PLC and so forth.



■Communication specifications

Specifications

Signal level: RS-232C compliant

Transmitting distance: Approx. 15m

Transmitting method: Asynchronous, full-duplex communication

Transmitting speed: Selectable from 1200, 2400, 4800, 9600, 19200, 38400 bps

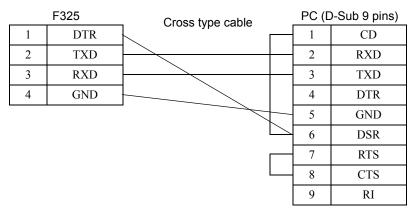
Bit configuration: Start bit 1bit

Length of character Selectable from 7 or 8 bit Stop bit Selectable from 1 or 2 bit

Parity bit Selectable from none, odd or even Terminator Selectable from CR, CR-LF

Code: ASCII

■Cables



This connection figure indicates a cable layout when a PC used is a DTE (Data Terminal Equipment). (Example) Use a straight type cable when a connecting counterpart is a DCE (Data Circuit-terminating Equipment) such as a modem.

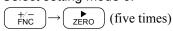
Create cables after double-checking connector shapes and signal wires (pin assignment) of devices to be used.

■ Setting values related to RS-232C

■RS-232C I/F setting

RS-232C I/F setting of the F325 is set.

- ■RS-232C I/F setting method
 - 1. Select setting mode 6.



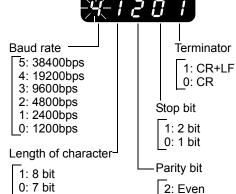
2. Select "RS-232C I/F setting".



Set the RS-232C I/F setting using (numerical value input) (shift) keys, and confirm it and with the HOLD key.

3. Press the $\begin{bmatrix} +/- \\ FNC \end{bmatrix}$ key to return to the indicated value display.





1: Odd 0: None

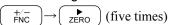


Initialize the RS-232C I/F setting of the connecting computer and PLC to the F325 setting.

■RS-232C communication type setting

RS-232C communication type of F325 is set.

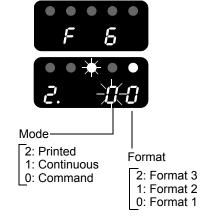
- ■RS-232C communication type setting method
 - 1. Select setting mode 6.



2. Select "RS-232C communication type".



Set the RS-232C communication type using (numerical value input) and CAL (shift) keys, and confirm it with the HOLD key.



3. Press the key to return to the indicated value display.

Communication type

- Mode = 0: Command

Communication is commanded from the host computer.

(Indicated value will not be automatically transmitted.)

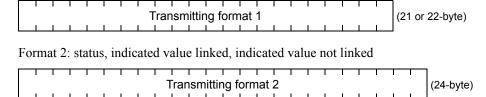
Terminators can be selected from CR or CR+LF.

- Mode = 1: Continuous

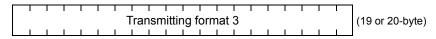
Message in UNI-Format is continuously transmitted.

R, W, and C commands are ignored.

Format 1: status, indicated value linked



Format 3: status, indicated value linked

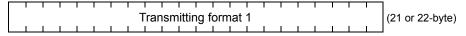


^{*} Outputs of HH limit and LL limit are excluded from Format 1.

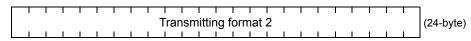
- Mode = 2: Printed

Message in the UNI-Format is transmitted when printing is performed.

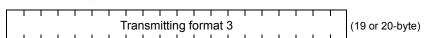
Format 1: status, indicated value linked



Format 2: status, indicated value linked, indicated value not linked



Format 3: status, indicated value linked



^{*} Outputs of HH limit and LL limit are excluded from Format 1.

Attention

Refer to P.132 "■ Continuous transmitting format" for transmitting specifications.

Key points

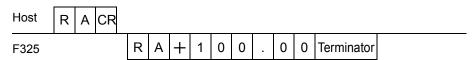
Continuous transmission timing

When Mode 1 or 2 is selected, the remote continuous transmissions are as follows according to the communication baud rate settings.

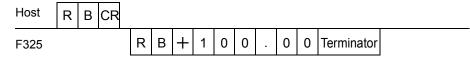
Communication baud rate	Remote continuous transmission
38400 bps	100 times/sec.
19200 bps	50 times/sec.
9600 bps	25 times/sec.
4800 bps	12 times/sec.
2400 bps	6 times/sec.
1200 bps	3 times/sec.

■ Communication format for commands

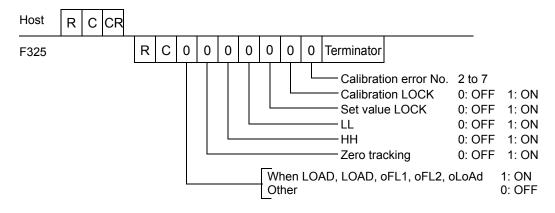
- Read linked indicated values (sign, 5-digit, decimal point)



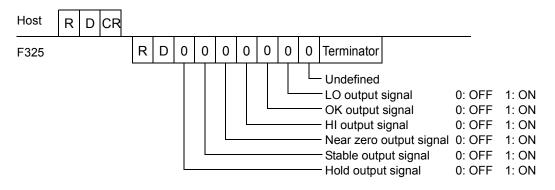
- Read non-linked indicated values (sign, 5-digit, decimal point)



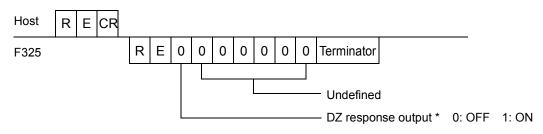
- Read status 1



- Read status 2

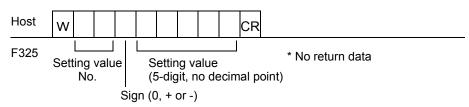


- Read status 3



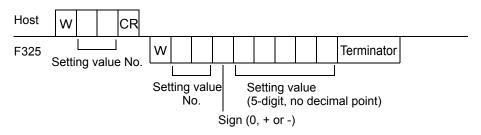
* When reading after digital zero is performed, it turns ON only once. It remains OFF until digital zero is performed again.

- Write setting values



* Refer to P.129 " Setting value communication format" for setting value No.

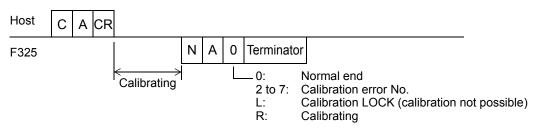
- Read setting value



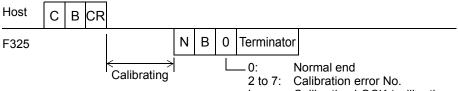
* Refer to P.129 "

Setting value communication format" for setting value No.

- Zero calibration

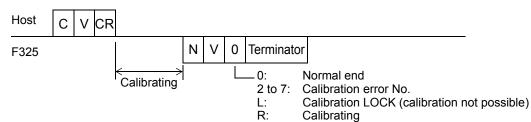


- Actual load calibration



L: Calibration LOCK (calibration not possible)
R: Calibrating

- Equivalent input calibration



Attention

Set the rated capacity value before sending a command for actual load calibration.

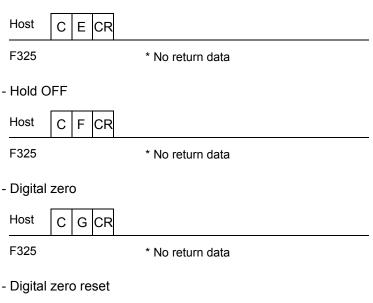
Set the rated output value and rated capacity value before sending a command for equivalent input calibration.

- Hold ON

Host

F325

H CR



* No return data

Options

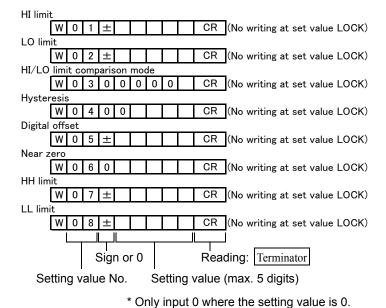
- Print c	Print command								
Host	С	I CR							
F325			* No return data						
A co	mmar	nd to pr	int on the printer via SIF.						
- Hold r	eset								
Host	С	J CR							
F325			* No return data						
- I/O ou	tput o	check							
Host	С	K CR							
F325			* No return data						
	-		is performed. 5.I/O output check" for check details.						
BCD output check									
Host	С	L CR							
F325			* No return data						

BCD output check is performed.

Refer to P.71 "9-7.BCD output check" for check details.

■ Setting value communication format

Transmitted data when writing the setting value, return data when reading the setting value.



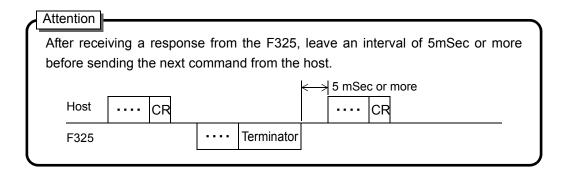
Moving average filter CR (No writing at set value LOCK) W 1 1 0 0 0 Analog filter W 2 0 0 0 0 0 CR (No writing at set value LOCK) Motion detect (time) W 1 3 0 0 0 0 CR (No writing at set value LOCK) Motion detect (range) W 1 4 0 0 0 0 CR (No writing at set value LOCK) Zero tracking (time) W 1 5 0 0 0 0 CR (No writing at set value LOCK) Zero tracking (range) W 1 6 0 0 0 0 CR (No writing at set value LOCK) Hold mode CR (No writing at set value LOCK) W 1 7 0 0 0 0 Automatic printing CR (No writing at set value LOCK) W 1 8 0 0 0 0 0 Hold value printing CR (No writing at set value LOCK) | W | 1 | 9 | 0 | 0 | 0 | 0 | 0 | Set value LOCK, calibration LOCK, ZERO key valid/invalid, HOLD key valid/invalid W 2 1 0 0 (1)(2)(3)(4) CR (1) Set value LOCK 1: ON 0: OFF (2) Calibration LOCK 1: ON 0: OFF (3) ZERO key valid/invalid 1: Invalid 0: Valid (4) HOLD key valid/invalid 1: Invalid 0: Valid Min. scale division W 2 2 0 0 0 CR (No writing at calibration LOCK) Display frequency W 2 3 0 0 0 0 0 CR (No writing at calibration LOCK) Excitation voltage CR (No writing at calibration LOCK) | W | 2 | 4 | 0 | 0 | 0 | 0 | 0 Decimal place W 2 5 0 0 0 0 0 CR (No writing at calibration LOCK) BCD data update rate W 3 1 0 0 CR (No writing at set value LOCK) RS-232 I/F setting W 3 2 0 (1) (2) (3) (4) (5) CR (Read only) 5:38400bps 4:19200bps 3:9600bps 2:4800bps 1:2400bps 0:1200bps (1) Baud rate (2) Length of character 1:8 bit 0:7 bit (3) Parity bit 2: Even 1: Odd 0: None (4) Stop bit 1:2 bit 0:1 bit 1:CR+LF 0:CR (5) Terminator D/A zero setting W 3 3 ± CR (No writing at set value LOCK) D/A full scale setting W 3 4 ± CR (No writing at set value LOCK) D/A output mode W 3 5 0 CR (No writing at set value LOCK) RS-485 I/F setting | W | 3 | 6 | 0 | (1) | (2) | (3) | (4) | (5) | CR | (No writing at set value LOCK) 5:38400bps 4:19200bps 3:9600bps 2:4800bps 1:2400bps 0:1200bps (1) Baud rate (2) Length of character 1:8 bit 0:7 bit (3) Parity bit 1: Odd 2: Even 0: None (4) Stop bit 1:2 bit 0:1 bit 1:CR+LF 0:CR (5) Terminator RS-485 ID | W | 3 | 7 | 0 | 0 | 0 | 0 CR (No writing at set value LOCK) RS-485 transmission delay time W 3 8 0 0 0 0 CR (No writing at set value LOCK) Reading: Terminator Sign or 0 Setting value No. Setting value (max. 5 digits)

* Only input 0 where the setting value is 0.

¹³⁰

Alarm HI limit
W 4 1 ± CR (No writing at set value LOCK)
Alarm LO limit
W 4 2 ± CR (No writing at set value LOCK)
Output selection
W 4 3 0 0 0 0 (1) (2) CR (No writing at set value LOCK)
(1) Output selection 1 (B5) 5: DZ response 4: NZ 3: Hold 2: RUN 1: Overload 0: HI
(2) Output selection 2 (B6) 5: DZ response 4: NZ 3: Hold 2: RUN 1: Overload 0: LL
Sampling rate
W 4 4 0 0 0 0 0 CR (No writing at set value LOCK)
Digital low-pass filter
W 4 5 0 0 0 0 CR (No writing at set value LOCK)
Peak hold selection
W 4 6 0 0 0 0 0 CR (No writing at set value LOCK)
Hold fix section
W 4 7 0 0 0 0 0 0 CR (No writing at set value LOCK)
Hold detection wait W 4 8 0 0 0 0 CR (No writing at set value LOCK)
Renewal timing of hold value
W 4 9 0 0 0 0 0 CR (No writing at set value LOCK)
[W] 4 3 0 0 0 0 0 0 Old (No writing at set value 2001)
RS-485 communication type
W 5 1 0 0 0 0 (1)(2) CR (No writing at set value LOCK)
(1) Mode 3: Modbus-RTU 2: Printed 1: Continuous 0: Command
(2) Format 1: Format 2 0: Format 1
RS-232C communication type
W 5 2 0 0 0 0 (1)(2) CR (Read only)
(1) Mode 2: Printed 1: Continuous 0: Command
(2) Format 2: Format3 1: Format2 0: Format1
BCD output mode
W 5 4 0 0 0 0 0 CR (No writing at set value LOCK)
BCD B9 output selection
W 5 5 0 0 0 0 0 CR (No writing at set value LOCK)
Actual load calibration (capacity)
W 7 1 0 CR (No writing at calibration value LOCK)
Equivalent input calibration (rated output)
W 7 2 0 0
Sign or 0 Booding: Terminator
Sign or 0 Reading: Terminator
Setting value No. Setting value (max. 5 digits)

* Only input 0 where the setting value is 0.

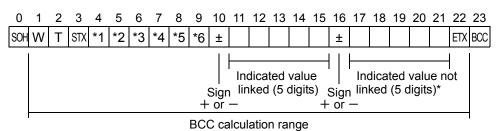


■ Continuous transmitting format

- Transmitting format 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
G	S	,	*1	,	*2	,	*3	,	*4	,	*5	,	±							Termi	inator		
Sign + or — Indicated value linked (5 digits + decimal point)									nt)														

- Transmitting format 2



Each ASCII code of SOH, STX, ETX

BCC calculation method

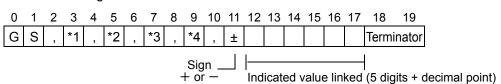
SOH: 01

For BCC,

STX: 02 ETX: 03 each code in the BCC calculation range is represented in hexadecimals and is XORed with all data.

*: When analog peak hold (peak hold selection = 1: analog, and hold mode = 1: peak hold) is used, the 5 digits are the same as the linked indicated values.

- Transmitting format 3



*1 O: Overload

(LOAD, OFL, OVERLOAD)

- S: Stable
- M: Unstable
- H: Hold

Priority: H > O > (S or M)

- *2 A: Zero tracking OFF
 - T: Zero tracking ON
- *3 H: HI limit ON
 - L: LO limit ON
 - G: HI limit and LO limit OFF
 - N: HI limit and LO limit ON
 - F: Compare OFF

Priority: N > (H or L) F > G

- 4 N: Near zero OFF
 - Z: Near zero ON
- *5 H: HH limit ON
 - L: LL limit ON
 - G: HH limit and LL limit OFF
 - N: HH limit and LL limit ON
 - F: Compare OFF

Priority: N > (H or L) F > G

- *6 Decimal place
 - 3: 0.000
 - 2: 00.00
 - 1: 000.0
 - 0: None

14 Error Message Display

■Over scale display

Display	Error details
-LoAd	A/D converter Negative over (-3.9mV/V or less between ±SIGs)
LoAd	A/D converter Positive over (+3.9mV/V or more between ±SIGs)
oF L I	Display over range When below -19999 (indicated value = -19999)
oF L Z	Display over range When over 99999 (indicated value = 99999)
oLoAd	OVERLOAD error When sensor input value exceeds alarm HI limit or alarm LO limit (However, overload and so on are not monitored against sensor input values when used in analog peak hold (peak hold selection = 1: analog, hold mode = 1: peak hold), but is monitored against the indicated values (hold values during hold).)

■Calibration error display

Display	Calibration error No.	Error details
cErr2	2	Zero calibration or span calibration cannot be performed because the electronic signal input on the positive side exceeds the input voltage range. Check for cable disconnection and mis-wiring.
cErr3	3	Zero calibration or span calibration cannot be performed because the electronic signal input on the negative side exceeds the input voltage range. Check for cable disconnection and mis-wiring.
cErrS	5	Sensor rated capacity value is set as "0". Reset to an appropriate value.
cErrb	6	The output of strain gauge type sensor has not reached the span adjustment range (approx. 0.05 mV/V). Check the load and confirm that the sensor has sufficient performance for adequate output. Then, perform span calibration again.
cErrl	7	The strain gauge type sensor is output to the negative side. Confirm that the + SIG and - SIG wires of the strain gauge type sensor are not reversely connected.

■Error message display

Display	Error message details
CAL2E	Zero calibration
CALSP	Actual load calibration, equivalent input calibration

15Specifications

15-1. Specifications

■Analog section

Sensor excitation voltage DC 10V or $2.5V \pm 10 \%$ (factory default value 2.5V)

Output current 30mA or less

Signal input range -3.0 to 3.0mV/V

Equivalent input calibration range

0.5 to 3.0mV/V

Equivalent input calibration error

0.1%/FS or less (at 0.5mV/V input)

Zero/gain adjustment Automatically adjusted by digital computation

Minimum input sensitivity 1μV/count (at excitation voltage 10V)

1/10000 is guaranteed for input of 1mV/V or more

 $0.02\%/FS \pm 1$ digit (at 3mV/V input) Accuracy Non-linearity:

> 0.5μV/°C RTI or less Zero drift: Gain drift: 25ppm/°C or less

A/D converter Sampling rate: 30, 300, 3000 times/sec. (setting selectable)

> Resolution: 24 bit (binary)

Analog filter First-order low-pass filter

fc = 10, 30, 100, 300, 1k, 3k, 10k, 30kHz (setting selectable)

Moving average filter Filter 1:

Second-Order Low-Pass Bessel Filter

Cut-off frequency can be set at 1/300 or more, 1/10 or less than

the sampling rate.

(It is also possible to select no filter.)

Sampling rate	Digital low-pass filter
3000 times/sec.	10 to 300Hz
300 times/sec.	1.0 to 30.0Hz
30 times/sec.	0.1 to 3.00Hz

Filter 2:

Moving average

Arbitrarily selectable from 1 to 999 times

Resolution 1/30000 (at 3.0mv/v input)

Monitor output Approx. 2V per load cell input 1mV/V

(load resistance $2k\Omega$ or more)

Hold function Sample, peak (selectable from analog peak (response 1kHz) or

digital peak)

■ Display section

Display unit

Numbers are displayed by a 7-segment green LED with a character

height of 15mm (5-digit)

Numerical value: 5 digits $\pm 8.8.8.8.8$

Indicated value: -19999 to 99999

Decimal point: Display point is selectable

(0.000, 00.00, 000.0, 0000)

Display items Status display: Red 3\(\phi\)LED HI, LO, PEAK, HOLD

Display frequency: Selectable from 3, 6, 13, 25 times/sec.

■Setting section

Key switch FNC GAIN CAL ZERO HOLD (+/-) (\blacktriangle) (\blacktriangledown) (\blacktriangleright) (\checkmark) (5 keys)

Set items Calibration: Zero calibration/Span calibration (actual load calibration,

equivalent input calibration)

Setting mode 1 HI limit, LO limit, HI/LO limit comparison mode, hysteresis,

digital offset, near zero, HH limit, LL limit

Setting mode 2 Moving average filter, analog filter, 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, min. scale division, display frequency,

decimal place, excitation voltage

Setting mode 4 RS-485 I/F setting, 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

Setting mode 5 Alarm HI limit, alarm LO limit, output selection, sampling rate,

digital low-pass filter, peak hold selection, hold fix section,

hold detection wait, renewal timing of hold value

Setting mode 6 RS-485 communication type, RS-232C communication type,

RS232C I/F setting, BCD output mode, BCD B9 output selection,

automatic printing, hold value printing

Setting mode 7 I/O input check, I/O output check, BCD input check, BCD output check,

RS-232C check, RS-485 check, interface, option type, version

■External I/O signal

External input

No-voltage contact input or plus common/minus common DC-input (Selectable by specifying at time of order)

Number of circuits 3

Signals DZ, HOLD, H.RESET

<No-voltage contact input (NVI)>

Relays, switches, and transistors can be connected.

Signals are input by the short-circuit and open-circuit between input terminals and the common terminal.

Use a sink type when connecting transistors.

Internal power supply voltage DC12V

Short circuit flow Approx. 4mA

<DC-input (DCI)>

Relays, switches, and transistors can be connected.

Signals are input by applying voltage between the input terminals and the common terminal.

Use a sink type for plus common and a source type for minus common when connecting transistors.

Rated voltage DC27.6Vmax

ON condition DC9V or more (load current at DC24V = approx. 10mA)

OFF condition DC3V or less

External output

PhotoMOS relay output commonly for sink/source

Number of circuits 5

Signals HI, OK, LO, output selection 1, output selection 2

(Output selection can be selected by setting HH limit, LL limit,

overload, RUN, hold zero, near zero, and DZ response.)

Rated voltage DC30Vmax

Rated current 100mAmax

Operation time Approx. 1mSec.

■Interface

SI/F two-wire serial interface

Transmitting method Asynchronous

Transmitting speed 600bps

RS-485 Communication interface

Communication protocol Selectable from Modbus-RTU, UNI-Format

Signal level Based on RS-485 2-wire

Transmitting distance Approx. 1km

Transmitting method Asynchronous, half duplex

Transmitting speed Selectable from 1200, 2400, 4800, 9600, 19200, 38400 bps

Number of connectible units Maximum 32 (including 1 master unit)

Bit configuration Start bit 1bit

Character length Selectable from 7 or 8 bit

(8 bit for Modbus-RTU)

Stop bit Selectable from 1 or 2 bit

Parity bit Selectable from none, odd or even

Terminator Selectable from CR, CR-LF

Code Binary (for Modbus-RTU)

ASCII (for UNI-Format)

* SI/F and RS-485 cannot be simultaneously used (to be specified at the time of order).

RS-485 (standard: not specified)

SI/F (SIF: to be specified at the time of order)

Specifications

■Options

BCD parallel data output interface

Output can be selected from sink type (BCO) or source type (BSC) (to be specified at the time of order).

Output rate: Selectable from 1 time/sec., 3 times/sec., 5 times/sec., 10 times/sec., 30 times/sec.,

50 times/sec., 100 times/sec., 300 times/sec., 500 times/sec., 1000 times/sec.,

3000 times/sec.

However, the maximum number of times is the set sampling rate.

BCD data hold and positive logic / negative logic selection is possible.

<Sink type (BCO)>

- Output

Output format Sink type

The output transistor should be turned ON when the signal is ON.

When connecting input units such as PLC, connect a plus common type.

Rated voltage DC30Vmax
Rated current 50mAmax

- Input

Input format No-voltage contact input (built-in power supply voltage DC5V)

Relays, switches, and transistors can be connected.

Signals are input by the short-circuit and open-circuit between input

terminals and the common terminal.

Use a sink type when connecting transistors.

Short circuit flow Approx. 6mA

<Source type (BSC)>

- Output

Output format Source type

Output transistor should be turned ON when the signal is ON.

When connecting input units such as PLC, connect a minus common type.

Rated voltage DC30Vmax

Rated current 20mAmax

- Input

Input format Minus common input

Relays, switches, and transistors can be connected.

Signals are input by the short-circuit and open-circuit between input

terminals and the common terminal.

Use a source type when connecting transistors.

Rated voltage DC27.6Vmax

ON condition DC9V or more (load current at DC24V = approx. 5mA)

OFF condition DC3V or less

D/A converter

Selectable from voltage output (DAV) or current output (DAI) (to be specified at the time of order).

<Voltage output (DAV)>

Output range $-10 \text{ to } +10 \text{ (load resistance of } 2k\Omega \text{ or more)}$

D/A conversion rate According to sampling rate

Resolution 1/10000

Over range -11.0 to +11.0 V

Zero adjust range Approx. -1.0 to 1.0V (at zero output)

Gain adjust range Approx. 9.5 to 10.5V (at full-scale output)

Zero drift 0.6 mV/C or less Gain drift 50 ppm/C or less Non-linearity 0.05% FS or less

* Analog input drift is not included

Output connector M3 screw-type terminal block (two poles)

* Conforming crimping terminal 5.9mm or less
Tightening torque 0.6N • m

<Current output (DAI)>

Current output 4 to 20mA (load resistance 500Ω or less)

D/A conversion rate According to sampling rate

Resolution 1/10000

Over range 3.2 to 20.8mA

Zero adjust range Approx. 3.6 to 4.4mA (at zero output)

Gain adjust range Approx. 19.6 to 20.4mA (at full-scale output)

Zero drift $0.5\mu\text{A/°C}$ or less Gain drift 50ppm/°C or less Non-linearity 0.05%FS or less

* Drift of analog input is not included

Output connector M3 screw-type terminal block (two poles)

* Conforming crimping terminal 5.9mm or less
Tightening torque 0.6N • m

RS-232C communication interface

Signal level Based on RS-232C

Transmitting distance Roughly 15m

Transmitting method Asynchronous, full duplex

Transmitting speed Selectable from 1200, 2400, 4800, 9600, 19200, 38400 bps

Bit configuration Start bit 1bit

Character length Selectable from 7 or 8 bit Selectable from 1 or 2 bit

Parity bit Selectable from none, odd or even Terminator Selectable from CR, CR-LF

Code ASCII

■General performance

Power supply voltage AC spec.: AC100 to 240V (+10%, -15%)

[Free power supply 50/60Hz]

DC spec.: DC12 to 24V (±15%)

(DC power supply is selectable at the time of order.)

Power consumption AC spec.: 10W max

DC spec.: 10W max

Rush current AC spec.: 2A, 1msec: with AC100V average load

(reference value) (ordinary temperature, at cold-start time)

4A, 1msec: with AC200V average load (ordinary temperature, at cold-start time)

DC spec.: 2A, 20msec: with DC12V average load

(ordinary temperature, at cold-start time) 1A, 50msec: with DC24V average load (ordinary temperature, at cold-start time)

Operating conditions Temperature: Operating temperature -10 to 40°C

Storage temperature $-40 \text{ to } +80^{\circ}\text{C}$

Humidity: 85% RH or less (no condensation)

Dimensions $96 \text{ (W)} \times 48 \text{ (H)} \times 132.5 \text{ (D)} \text{ mm}$

(not including protruding sections)

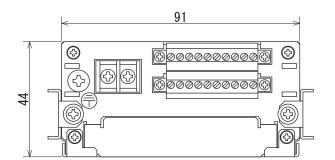
Panel cutout size $92 \times 45^{+1}_{-0}$ mm

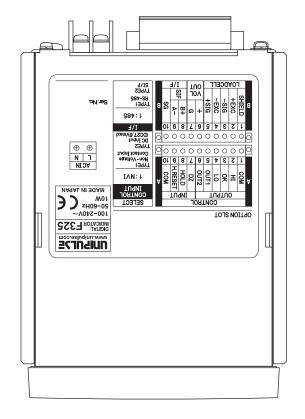
Weight Approx. 600g

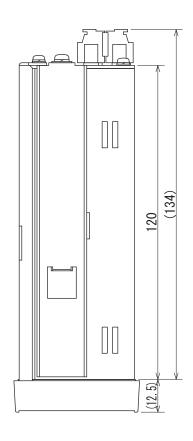
■Accessories

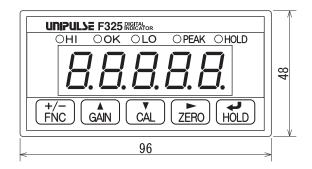
15-2. Dimensions

■Standard



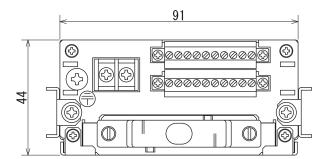




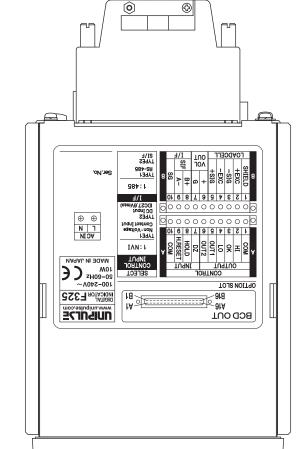


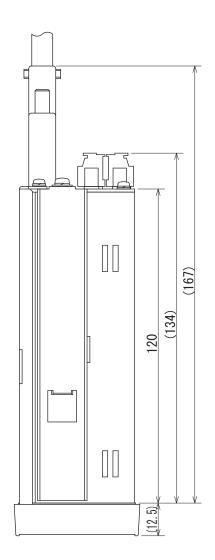
- * When SI/F is ordered, attach 2: SI/F on I/F
- * When DC-input type is ordered, attach (2: DCI) on CONTROL INPUT

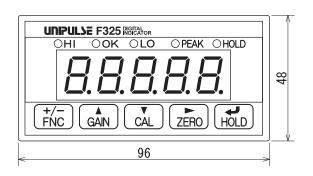
■When BCO/BSC option is selected

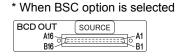




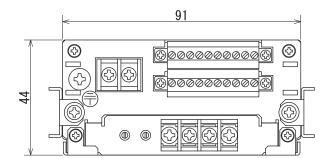


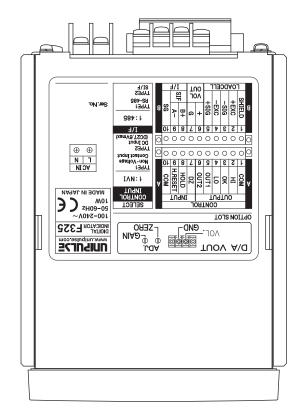


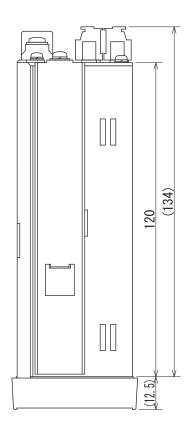


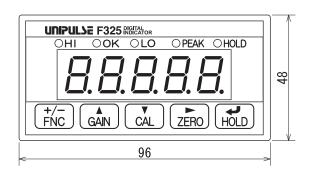


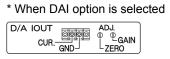
■When DAV / DAI option is selected



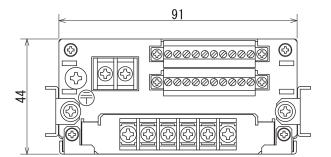




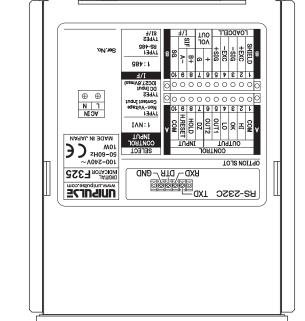


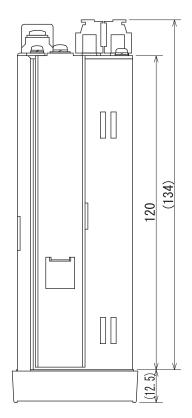


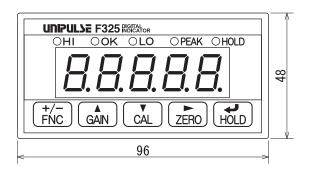
■When RS-232C option is selected



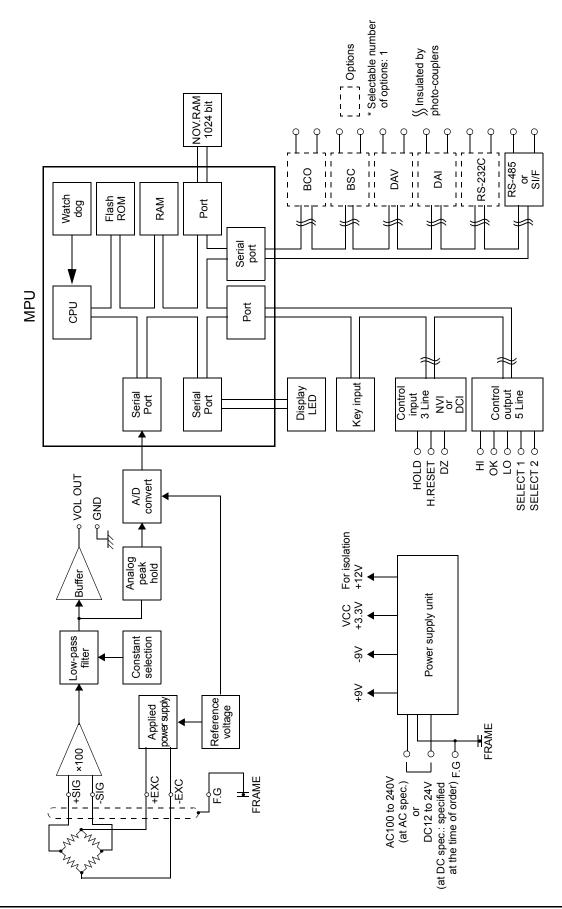








15-3.F325 block diagram



16Setting Values List

■ Setting mode 1

	Name Default value		Setting range	Set value LOCK	Calibration LOCK	Reference page
1	HI limit	075.00	-19999 to 99999 *1	0		P.45
2	LO limit	025.00	-19999 to 99999 *1	0		P.45
3	HI/LO limit comparison mode 0		4: Hold 3: MD+NZ 2: NZ 1: MD 0: ALL	0		P.47
4	Hysteresis 00.00		0000 to 9999 *1	0		P.48
5	Digital offset 000.00		-19999 to 19999 *1	0		P.43
6	Near zero 001.00		00000 to 99999 *1	0		P.51
7	HH limit 999.99		-19999 to 99999 *1	0		P.45
8	LL limit	-199.99	-19999 to 99999 *1	0		P.45

^{*1:} The decimal place is linked with the decimal place set in setting mode 3.

■ Setting mode 2

	Name	Default value	Setting range	Set value LOCK	Calibration LOCK	Reference page
1	Moving average filter	030	0 to 1 (OFF), 2 to 999 times	0		P.37
2	Analog filter	2	7: 30kHz 6: 10kHz 5: 3kHz 4: 1kHz 3: 300Hz 2: 100Hz 1: 30Hz 0: 10Hz	0		P.36
3	Motion detect (time)	1.5	5 0.0 to 9.9sec.			P.39
4	Motion detect (range)	05	05 00 to 99			P.39
5	Zero tracking (time)	0.0	0.0 0.0 to 9.9sec.			P.40
6	Zero tracking (range) 00 00 to 99		0		P.40	
7	Hold mode	0	1: Peak hold 0: Sample hold	0		P.52

■ Setting mode 3

	Name	Default value	Setting range		Set value LOCK	Calibration LOCK	Reference page
1	Set value LOCK	0	1: ON	0: OFF			P.66
2	Calibration LOCK	0	1: ON	0: OFF			P.35
3	ZERO key valid/invalid	0	1: Invalid 0: Valid				P.43
4	HOLD key valid/invalid	0	1: Invalid 0: Valid				P.62
5	Min. scale division	0.01	001 to 100 *1			0	P.32
6	Display frequency	3	3: 25 times/sec. 2: 13 times/sec. 1: 6 times/sec. 0: 3 times/sec.			0	P.36
7	Decimal place	2	3: 00 . 000 2: 000 . 00 1: 0000 . 0 0: 00000			0	P.32
8	Excitation voltage	0	1: 10V	0: 2.5V		0	P.31

^{*1:} The decimal place is linked with the decimal place set in setting mode 3.

■ Setting mode 4

		Name	Default value	Setting range	Set value LOCK	Calibration LOCK	Reference page
		Baud rate	4	5: 38400bps 4: 19200bps 3: 9600bps 2: 4800bps 1: 2400bps 0: 1200bps	0		
	RS-485	Length of character	1	1: 8bit 0: 7bit			
1	I/F setting	Parity bit	2	2: Even 1: Odd 0: None			P.78
		Stop bit	0	1: 2bit 0: 1bit			
		Terminator	1	1: CR+LF 0: CR			
2	RS-485 ID		01	01 to 32	0		P.78
3	RS-485 transmission delay time		00	00 to 99ms	0		P.87
4	BCD data update rate		10	10: 3000times/sec. 9: 1000times/sec. 8: 500times/sec. 6: 100times/sec. 5: 50times/sec. 4: 30times/sec. 3: 10times/sec. 2: 5times/sec. 1: 3times/sec. 0: 1time/sec. *2	0		P.109
5	D/A zero setti	ng	00.00	-19999 to 99999 *1	0		P.121
6	D/A full scale setting		100.00	-19999 to 99999 *1	0		P.121
7			0	3: 20mA (10V) fixed output 2: 4mA (0V) fixed output 1: Not linked with indicated value 0: Linked with indicated value	0		P.122
8	Password		0000	1239: Initialization			P.67

^{*1:} The decimal place is linked with the decimal place set in setting mode 3.

■ Setting mode 5

	Name Default value Setting range		Set value LOCK	Calibration LOCK	Reference page		
1	Alarm HI limit		999.99	-19999 to 99999 *1	0		P.50
2	Alarm LO limi	t	-199.99	-19999 to 99999 *1	0		P.50
3	Output	Output selection 1 (B5)	0	5: DZ response 4: NZ 3: Hold 2: RUN 1: Overload 0: HH	0		P.44
	selection	Output selection 2 (B6)	0	5: DZ response 4: NZ 3: Hold 2: RUN 1: Overload 0: LL	0		P.44
4	Sampling rate		2	2: 3000times/sec. 1: 300times/sec. 0: 30times/sec.	0		P.37
5	Digital low-pass filter		0	0 (OFF), 10 to 300 *3	0		P.38
6	Peak hold selection		0	1: Analog 0: Digital	0		P.59
7	Hold fix section		0	1: ON 0: OFF	0		P.60
8	Hold detection wait		0.00	0.00 to 1.00sec.	0		P.61
9	Hold value ren	ewal timing	0	1: Detection stop 0: Detection start	0		P.60

^{*1:} The decimal place is linked with the decimal place set in setting mode 3.

3000 times/sec.: 10 to 300Hz, 300 times/sec.: 1.0 to 30.0Hz, 30 times/sec.: 0.1 to 3.00Hz

^{*2:} The maximum number of times is the set sampling rate.

^{*3:} The setting range is as follows depending on the sampling rate.

■ Setting mode 6

	Na	Name		Setting range	Set value LOCK	Calibration LOCK	Reference page
1	RS-485 communication	Mode	0	3: Modbus-RTU 2: Printed 1: Continuous 0: Command	0		P.79
	type	Format	0	1: Format 2 0: Format 1			
2	RS-232C communication	Mode	0	2: Printed 1: Continuous 0: Command			P.124
	type	Format	0	2: Format 3 1: Format 2 0: Format 1			P.124
	RS-232C I/F setting	Baud rate	4	5: 38400bps 4: 19200bps 3: 9600bps 2: 4800bps 1: 2400bps 0: 1200bps			
		Length of character	1	1: 8bit 0: 7bit	0		D 124
3		Parity bit	2	2: Even 1: Odd 0: None			P.124
		Stop bit	0	1: 2bit 0: 1bit			
		Terminator	1	1: CR+LF 0: CR			
4	BCD output mod	CD output mode 0 1: Not linked with the indicated value 0: Linked with the indicated value		0		P.109	
5	BCD B9 output selection		0	1: NZ 0: 80000	0		P.110
6	Automatic printing 1		2: On+hold 1: ON 0: OFF	0		P.63	
7	Hold value print	ing	0	1: ON (print when released) 0: OFF	0		P.65

■ Setting mode 7

	Name	Default value	Setting range	Set value LOCK	Calibration LOCK	Reference page
1	I/O input check	_	_			P.70
2	I/O output check	_	_			P.70
3	BCD input check	_	_			P.70
4	BCD output check	_	_			P.71
5	RS-232C check	_	_			P.72
6	RS-485 check	_	_			P.72
7	Interface	_	SIF/485 (display only)			P.73
8	Option type	_	non/BCO/dAV/dAI/232/BSC (display only)			P.73
9	Version	_	1.00 to 9.99 (display only)			P.73



Key points -

Setting values can be rewritten to the factory default.

For initialization only, refer to P.67 "9-2.Password", and for initialization and selfcheck, refer to P.68 "9-3.Self-check/Initialization".

Unipulse Corporation

International Sales Department
9-11 Nihonbashi Hisamatsu-cho, Chuo-ku, Tokyo 103-0005
Tel: +81-3-3639-6120 Fax: +81-3-3639-6130

http://www.unipulse.com/en/

Head Office:	9-11 Nihonbashi Hisamatsu-cho, Chuo-ku, Tokyo 103-0005
Technical Center:	1-3 Sengendainishi, Koshigaya, Saitama 343-0041
Nagoya Sales Office:	CK16 Fushimi Bldg. 1-24-25 Sakae, Naka-ku, Nagoya 460-0008
Osaka Sales Office:	Sumitomo Seimei Shin Osaka Kita Bldg. 4-1-14 Miyahara, Yodogawa-ku, Osaka 532-0003
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