



# F130

LOADCELL INTERFACE  
FOR OMRON SYSMAC CJ1

OPERATION MANUAL

06APR2009REV.1.00

UNIPULSE

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# INTRODUCTION

Thank you very much for purchasing our Loadcell Interface F130.  
For good performance, and proper and safe use of the F130, be sure to read this operation manual and properly understand the contents of it before use. Also, carefully keep this operation manual so that it can be referred to at any time.

# SAFETY PRECAUTIONS

**For safety reasons, please read the following safety precautions thoroughly.**

Please assign only persons with electrical technical knowledge to set up, service or inspect F130. For the safe use of F130, safety precautions that should be complied with have been categorized and indicated as " WARNING" and " CAUTION" in this Operation Manual. The safety precautions mentioned in this Operation Manual are crucial for safety. Therefore, use F130 only after you have correctly understood the safety contents given.

 **WARNING**

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

 **CAUTION**

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



## WARNING

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

### Warning on design

- Before using the F130 as described below, be sure to consult with our sales personnel.
  - Use in environments not described in the operation manual.
  - Use in environments that greatly affects human life and assets, such as medical devices, transport equipment, recreational equipment, and safety devices.

### Warning on installation

- Do not modify the F130. Doing so may cause fire or electric shocks.
- Do not install in the following environments.
  - Places containing corrosive gas or flammable gas.
  - Where the product may be splashed with water, oil or chemicals.

### Warning on wiring

- Do not connect a commercial power source directly to the signal input/output terminals.
- Be sure to ground the protective ground terminal.
- Before performing the following, make sure that no power is applied.
  - Wiring/connection of cables to the terminal boards.
- For connection to the signal input/output terminals, check the signal names and pin assignment numbers, and then carry out wiring properly.
- Do not connect anything to unused terminal(s).
- Before applying power, carefully check the wiring, etc.

### Warning during startup and maintenance

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



## CAUTION

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

### Caution on installation

- Do not install in the following environments.
  - Where the temperature/humidity exceeds the range of the specifications.
  - Where the temperature changes severely or there is a danger of freezing or condensation.
  - Places exposed to direct sunlight.
  - Outdoors, or where the altitude exceeds 2000m.
  - Dusty places
  - Places containing large quantities of salt or iron powder.
  - Where the main body is directly affected by vibrations or shocks.
- Take adequate shielding measures when using at the following locations.
  - Near a power line.
  - Where a strong electric field or magnetic field is formed.
  - Where static electricity, relay noise or the like is generated.
- Install the F130 as far away as possible from devices that generate high frequency, high voltage, large current, surge, etc. Also, carry out wiring separately from their power lines. Do not carry out parallel wiring and common wiring.

### Caution on wiring

- For sensors and external outputs use shielded cables.

### Caution during startup and maintenance

- For turning on/off the power, be sure to keep intervals of 5 seconds or more.
- After power-on, be sure to warm up the F130 for 30 minutes or more before use.
- If the F130 is not used by the specified method, its protective performance may be impaired.
- Do not use it, broken down.
- Maintenance
  - When performing maintenance, disconnect the power.
  - Do not wipe with a wet rag, or with benzine, thinner, alcohol, etc. Doing so may cause discoloration or deformation of the F130. In the case of heavy contamination, wipe off the contamination with a cloth after dipping it into a diluted neutral detergent and wringing it well, and then wipe with a soft, dry cloth.

### Caution during transportation

- When the F130 is shipped, spacers made of corrugated cardboard are used as cushioning materials.  
Though it is factory-designed so that shocks can sufficiently be absorbed, breakage may result if shocks are applied when the spacers are reused for transportation. If you send the F130 to us for repair, etc., take adequate measures against shocks by using polyurethane materials, etc., separately.

### Caution during disposal

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

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# STATEMENT OF CONFORMATION TO EC DIRECTIVES

Unipulse F130 Loadcell Interface conforms to the EC Directives (based on Council of the European Communities, and is allowed to affix CE mark on it.

- \* EMC Directives      EN61131-2  

EN55016,	EN61000-4-2,	EN61000-4-3,
EN61000-4-4,	EN61000-4-5,	EN61000-4-6,
EN61000-4-8,	EN61000-4-11	

The following notice must be observed when you install F130 unit.

1. F130 is an electrical device that are incorporated in machines and manufacturing installations. F130 conforms to the related EMC standards so that the devices and machines into which F130 is built can more easily conform to EMC standards.  
The actual F130 has been checked for conformity to EMC standards.  
Whether these standards are satisfied for the actual system, however, must be checked by the customer.  
EMC-related performance will vary depending on the configuration, wiring, and other conditions of the machine or device in which the F130 is installed.  
The customer must, therefore, perform final checks to confirm that the overall machine or device conforms to EMC standards.
  
2. Use shielded cables for connection with load cell.

## RoHS-COMPLIANT PRODUCT

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

### What is RoHS?

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

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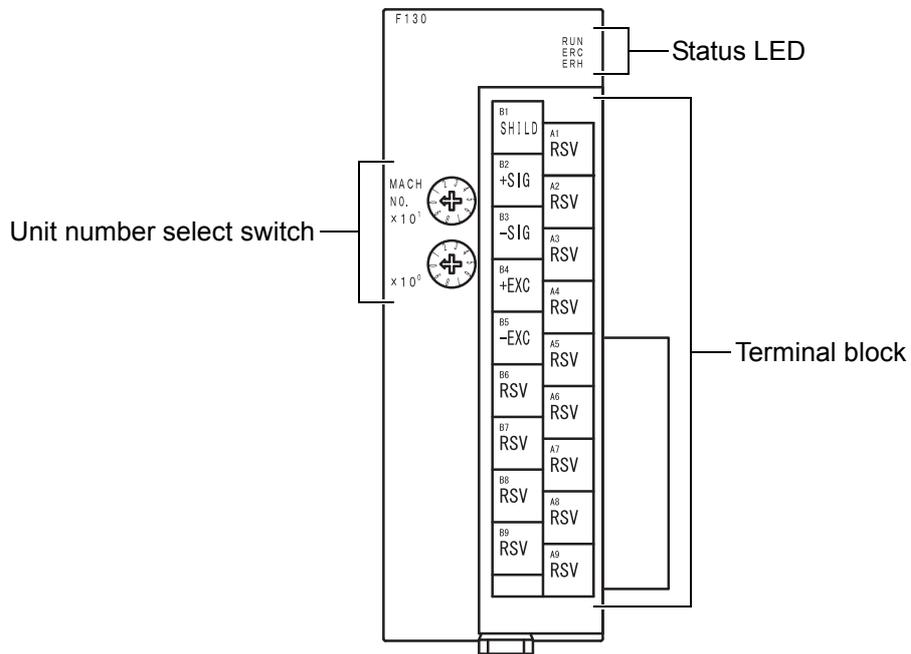
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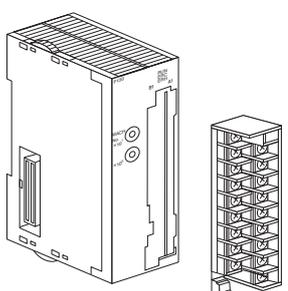
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# 1. APPEARANCE DESCRIPTION

## 1-1. Front Panel



**⚠ CAUTION**



Terminal block can be detached by pulling down the lever. Normally, the lever should be in upper position.

Always turn off the CJ1's voltage source before trying to attach/detach the terminal block.

## 1-2. Status LED

Status LEDs display the current operating status of the unit. The following table summaries their names and meanings.

LED	Name	State	Description
RUN (Green)	Operation status	LED ON	Normal operation
		LED OFF	Data exchange with CPU has been aborted
ERC (Red)	Error detected by the unit	LED ON	Error occurred in F130
		LED Blink	Error (calibration error / setting error) or overflow (A/D input range over / measurement value over) occurred in F130.
		LED OFF	Normal operation
ERH (Red)	CPU error	LED ON	Error occurred during data exchange with CPU
		LED OFF	Normal operation

### 1-3. Unit Number Select Switch

F130 acts as a Special I/O unit for Omron SYSMAC CJ1 series PLC. The data exchange between CPU unit and F130 are carried out by the high performance relay area of I/O and DM area.

Relay and DM number used by F130 can be selected by the unit number selection switch located on the front panel.



Switch No.	Unit No.	Channel number allocated to the I/O unit relay area	DM number allocated to the I/O unit DM area
0	0	2000 to 2009CH	D20000 to 20099
1	1	2010 to 2019CH	D20100 to 20199
2	2	2020 to 2029CH	D20200 to 20299
3	3	2030 to 2039CH	D20300 to 20399
4	4	2040 to 2049CH	D20400 to 20499
5	5	2050 to 2059CH	D20500 to 20599
6	6	2060 to 2069CH	D20600 to 20699
7	7	2070 to 2079CH	D20700 to 20799
8	8	2080 to 2089CH	D20800 to 20899
9	9	2090 to 2099CH	D20900 to 20999
10	10	2100 to 2109CH	D21000 to 21099
⋮	⋮	⋮	⋮
n	n	2000+n × 10 to 2000+n × 10+9CH	D20000+n × 100 to D20000+n × 100+99
⋮	⋮	⋮	⋮
95	95	2950 to 2959CH	D29500 to 29599

Unit number must be unique: duplicate use of the same number for multiple of I/O units will cause operation error “Error: Duplicate use of unit No.” (“Duplicate use of unit No.” in programming console), disabling normal operation (A40113 turns ON).

## 2. CONNECTION METHOD

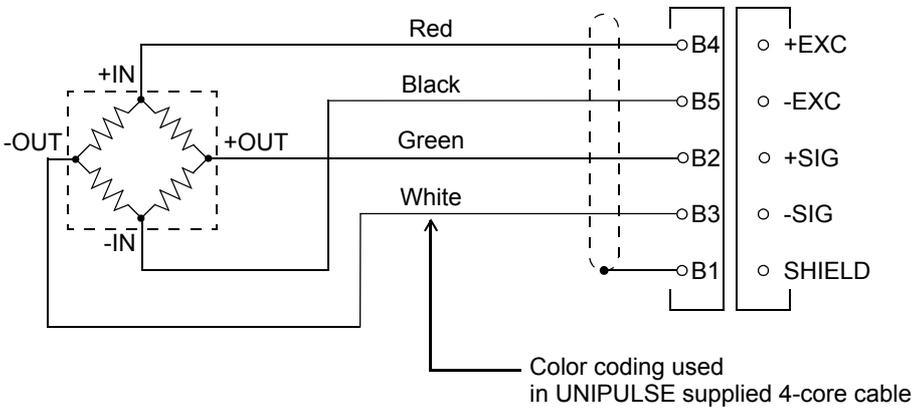
### 2-1. F130 Terminal Block Layout

SHIELD	B1	A1	RSV
+SIG	B2	A2	RSV
-SIG	B3	A3	RSV
+EXC	B4	A4	RSV
-EXC	B5	A5	RSV
RSV	B6	A6	RSV
RSV	B7	A7	RSV
RSV	B8	A8	RSV
RSV	B9	A9	RSV

### 2-2. Sensor Connection

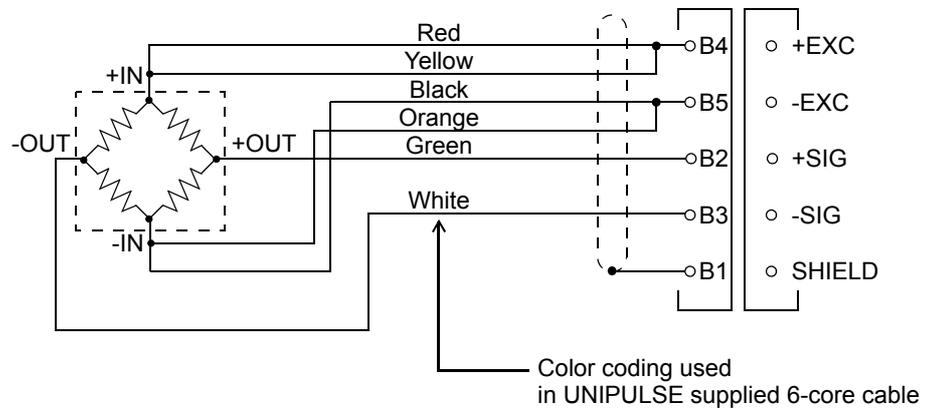
#### 2-2-1. 4-wire Connection

F130 input uses an accurate 4-wire sensor connection. Use shielded 4-core cable for this connection and route it apart from noisy lines (power and digital devices) and AC power lines.



### 2-2-2. 6-wire Connection

For connecting a 6-wire strain gauge type sensor, connect +EXC and +S, and -EXC and -S, respectively, on the terminal block as shown below.



### ⚠ CAUTION

The strain gauge type sensor excitation voltage of the F130 is 2.5V or 10V (selectable by setting). Set within the maximum excitation voltage of the strain gauge type sensor you use, and then make connection. Use exceeding the maximum excitation voltage may cause abnormal heating and damage.

### 2-2-3. Sensor Cable Coloration

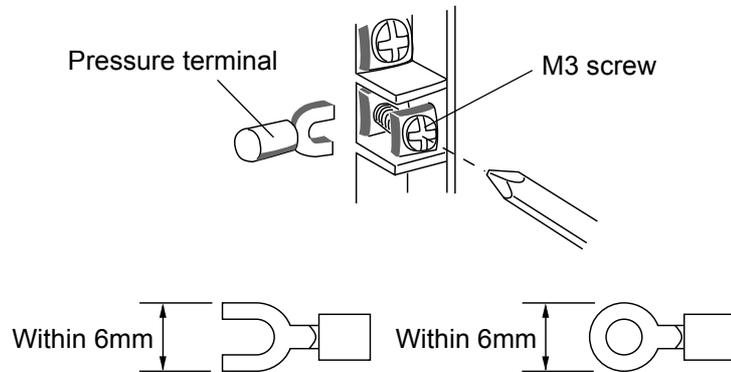
Sensor cable coloration differs with manufacturers.

See the sensor operation manual (or test report), and check the signal names and coloration for proper connection.

## 2-3. Connections to Terminal Block

Use pressure terminals to connect cables to the terminal. Tighten the pressure terminal securely to the terminal block using a M3 screw. Correct tightening torque is 0.5Nm.

The width of the pressure terminal should be 6mm or less (see the figure below).



### ⚠ CAUTION

A1 to A9 and B6 to B9 are unnecessary in this specification, please do not connect input and output signal lines to them.

Do not apply the voltage from the outside, or do not short-circuit with parts.

It may cause malfunction of F130 and external equipment.

### 3. DATA EXCHANGE WITH CPU

The F130 exchanges data with CPU using the following devices: High performance I/O unit relay area (measurement value and hold value) and high performance I/O unit DM area (Initial setting data).

#### Measurement value • Hold value

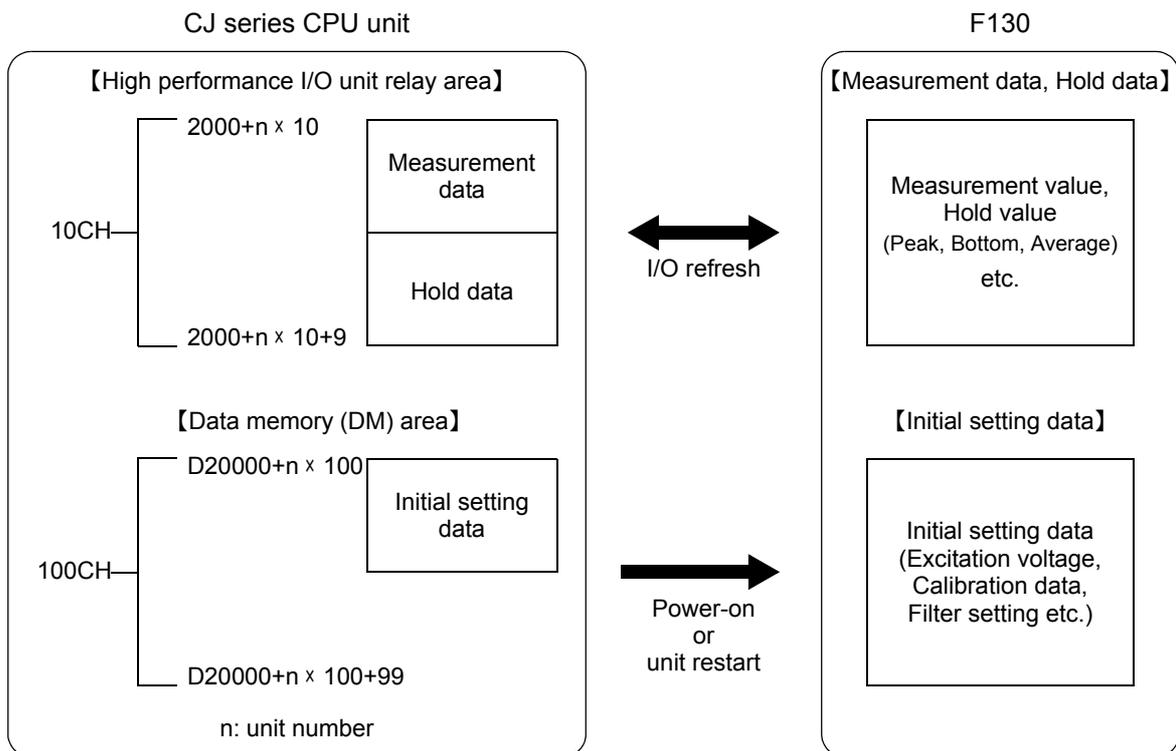
Analog signal from the strain gauge type sensor is converted into digital data.

Measurement • Hold data is allocated to one of the relay area of the CPU units' high performance I/O unit based upon the unit number. The data is exchanged regularly every time I/O refresh takes place.

#### Initial setting data

Parameter settings for using F130 as a Loadcell Interface.

A set of initial setting data for each F130 is allocated, based on its unit number, to a DM area for high performance I/O unit (inside CPU unit), and is written to this area when the unit is powered on, or a refresh cycle is started.



### 3-1. High Performance I/O Unit Restart Flag

When the user restart the unit after he has modified data memory or removed the cause of failure, the user have to either power up the CJ1 main unit again, or changing the high performance I/O unit restart flag in the following sequence: OFF → ON → OFF.

#### High performance I/O unit restart flag

Relay number	Function
A50200	0th unit restart flag
A50201	1th unit restart flag
⋮	⋮
A50215	15th unit restart flag
A50300	16th unit restart flag
⋮	⋮
A50715	95th unit restart flag

Restart each unit by switching  
OFF → ON → OFF

### 3-2. Relay Area

#### 3-2-1. Allocation of Measurement · Hold Data

##### OUT (CPU unit → F130)

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
n CH	Mode selection request ※	Factory-adjusted operation request				Equiv. input cal. request	Actual load cal. request	Zero cal. request	Survival conf. request					Hold value clear request	Hold request (section spec.)	Digital zero request

##### IN (F130 → CPU unit)

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
n+1 CH	Mode selection response	Factory-adjusted operation response		Setting error occurrence	Cal. error occurrence	Equiv. input cal. response	Actual load cal. in progress	Zero cal. in progress	Survival conf. response ((n) 07 is inverted.)	Normally ON (Normally 1)		Measurement value overflow	A/D input range over	Hold value clear response	Hold response	Digital zero response
n+2 CH	Measurement value (-32768 to +32767)															
n+3 CH	Data update counter (0 to 65535)															
n+4 CH	Peak hold value (-32768 to +32767) / In calibration mode: strain gauge type sensor rated output value															
n+5 CH	Bottom hold value (-32768 to +32767) / In calibration mode: strain gauge type sensor rated capacity value															
n+6 CH	Average value (-32768 to +32767) / In calibration mode: strain gauge type sensor output value at the Zero calibration point															
n+7 CH	Average count (0,1 to 30000) / In calibration mode: calibration error number															
n+8 CH	Unused															
n+9 CH	Unused															

n = 2000 + unit number × 10      \* (n) 08 to 10 are valid only in the calibration mode.

### 3-2-2. OUT (CPU Unit → F130)

#### Digital zero request

ON edge (0 → 1) zeros the indicated value.

#### Hold request (section specification)

While this bit is ON (1), each hold value is detected and updated according to hold conditions.

#### Hold value clear request

ON edge (0 → 1) clears the hold value. The output value becomes the indicated value of the signal-input time.

#### Survival confirmation request

By changing this bit, the data transfer state between the CPU unit and F130 can be confirmed.  
A response is made to the 7th bit of n+1 CH as this bit is inverted (0 ⇔ 1).

#### Zero calibration request

ON edge (0 → 1) initiates Zero calibration.  
However, this is valid only when the calibration mode is selected by Mode selection.

#### Actual load calibration request

ON edge (0 → 1) initiates Actual load calibration.  
However, this is valid only when the calibration mode is selected by Mode selection.

#### Equivalent input calibration request

ON edge (0 → 1) initiates Equivalent input calibration.  
However, this is valid only when the calibration mode is selected by Mode selection.

#### Factory-adjusted operation request

This bit is for factory-adjusted operation. Be sure to keep this OFF.  
If this bit is changed (OFF → ON), normal operation may not be performed, or data may not be recovered in some cases.

#### Mode selection

Select the operation mode of the F130.

Mode selection	Operation mode
OFF	Normal operation mode
ON	Calibration mode

### 3-2-3. IN (F130 → CPU Unit)

**Digital zero response**

Returns the state of the digital zero request bit.

**Hold response**

Returns the state of the hold request bit.

**Hold value clear response**

Returns the state of the hold value clear request bit.

**A/D input range over**

This bit becomes "1" when the input from the strain gauge type sensor is out of the input range of the A/D converter.

**Measurement value overflow**

This bit becomes "1" when the indicated value is smaller than -32768, or larger than +32767.

**Normally ON**

Always returns "1."

**Survival confirmation response**

Returns the state of the survival confirmation request (n) 07 as it is inverted.

**Zero calibration in progress**

This bit becomes "1" while Zero calibration is in progress.

**Actual load calibration in progress**

This bit becomes "1" while Actual load calibration is in progress.

**Equivalent input calibration response**

Returns the state of the Equivalent input calibration request bit.

**Calibration error occurrence**

This bit becomes "1" if Zero calibration, Actual load calibration, or Equivalent input calibration does not end properly with a calibration error.

**Setting error occurrence**

This bit becomes "1" when the initial set value assigned in the data memory area is out of the setting range.

**Factory-adjusted operation response**

Returns the state of the factory-adjusted operation request bit.

#### **Mode selection response**

Returns the state of the mode selection request bit.

#### **Set value (n+2)**

Returns the indicated value of A/D-converted measurement.

-32768 to +32767; two's-complement number.

#### **Data update counter (n+3)**

Returns a numerical value incremented by one each time the indicated value is updated (3000 times/sec.).

0 to 65535; straight binary.

#### **Peak hold value / strain gauge type sensor rated output value (n+4)**

- In normal operation mode

Returns the maximum measurement value in the section specified by the hold request bit.

When the hold request bit turns OFF, data update is stopped, and the maximum measurement value of that time is held.

By the hold value clear request bit, the maximum measurement value is cleared, and the real-time measurement value is returned.

-32768 to +32767; two's-complement number

- In calibration mode

When the calibration mode is established by the mode selection bit, the initially set value "strain gauge type sensor rated output value" of the time when the calibration was executed by each calibration request bit is read and returned.

However, when Span calibration is executed, the input value from the strain gauge type sensor is returned.

\* After power-on, "0" is returned until the calibration is executed.

#### **Bottom hold value / strain gauge type sensor rated capacity value (n+5)**

- In normal operation mode

Returns the minimum measurement value in the section specified by the hold request bit.

When the hold request bit turns OFF, data update is stopped, and the minimum measurement value of that time is held.

By the hold value clear request bit, the minimum measurement value is cleared, and the real-time measurement value is returned.

-32768 to +32767; two's-complement number

- In calibration mode

When the calibration mode is established by the mode selection bit, the initially set value "strain gauge type sensor rated capacity value" of the time when the calibration was executed by each calibration request bit is read and returned.

\* After power-on, "0" is returned until the calibration is executed.

**Average value / strain gauge type sensor output value at the Zero calibration point (n+6)**

- In normal operation mode
  - Returns the average measurement value in the section specified by the hold request bit.
  - When the hold request bit turns OFF, data update is stopped, and the average measurement value of that time is held.
  - By the hold value clear request bit, the average measurement value is cleared, and the real-time measurement value is returned.
  - 32768 to +32767; two's-complement number
  
- In calibration mode
  - When the calibration mode is established by the mode selection bit, the strain gauge type sensor input value of the time when the calibration was executed by the Zero calibration request bit is returned.
  - \* After power-on, "0" is returned until the Zero calibration is executed.

**Average count / calibration error number (n+7)**

- In normal operation mode
  - Returns the A/D conversion count in the section specified by the hold request bit as the number of data used for average calculation.
  - By the hold value clear request bit, the average count value is cleared, and "0" is returned.
  - 1 to 32767 ("0" when cleared); two's-complement number
  
- In calibration mode
  - When the calibration mode is established by the mode selection bit, the calibration error number of the time when the calibration was executed by each calibration request bit is returned.
  - \* After power-on, "0" is returned until the calibration is executed.

**3-2-4. Register Allocations for Initial Settings**

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
m	Excitation voltage selection (0:2.5V, 1:10V)															
m+1	Minimum scale division (1 to 100)															
m+2	Analog filter selection (0:3Hz, 1:10Hz, 2:30Hz, 3:100Hz, 4:300Hz, 5:1kHz)															
m+3	Digital filter count setting (1 to 512) * Digital filter: Moving-average															
m+4	Digital offset (-30000 to +30000)															
m+5	Sensor rated output value (50 to 3100) * Used for 0.050 to 3.100mV/V Equivalent input calibration.															
m+6	Sensor rated capacity value (1 to 32000) * Used for Actual load calibration or Equivalent input calibration.															
m+7	Unused															
m+8	Unused															
m+9	Unused															

\* m+10 ~ m+99: Unused

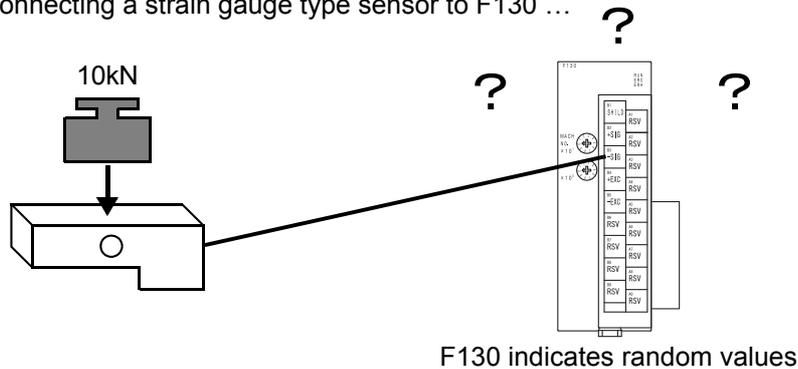
## 4. CALIBRATION METHOD

### 4-1. What is Calibration?

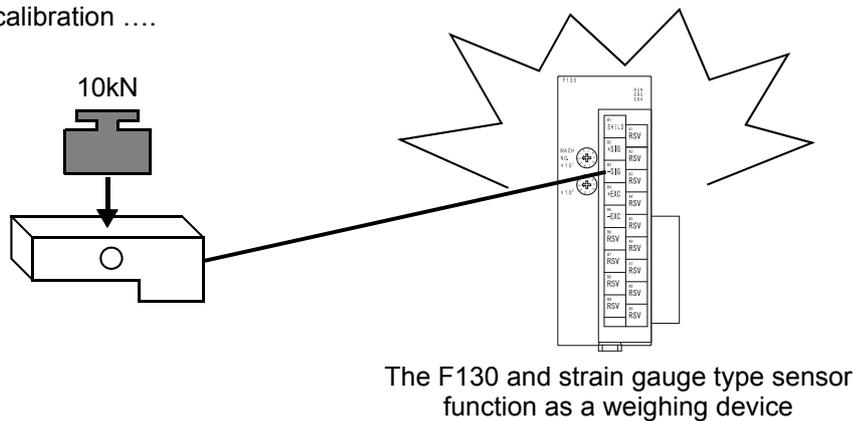
Calibration is performed for matching the F130 to a strain gauge type sensor.

That is, F130 must be properly adjusted to indicate 10.00kN when an actual load of 10kN is placed on the strain gauge type sensor.

Just connecting a strain gauge type sensor to F130 ...



After calibration ....



#### 4-1-1. About Calibration Methods

There are two methods of Span calibration: Actual load calibration and Equivalent input calibration.

##### Actual load calibration

By this method, calibration value is registered by the value of the actual load applied to the strain gauge type sensor.

Error-less accurate calibration can be performed.

##### Equivalent input calibration

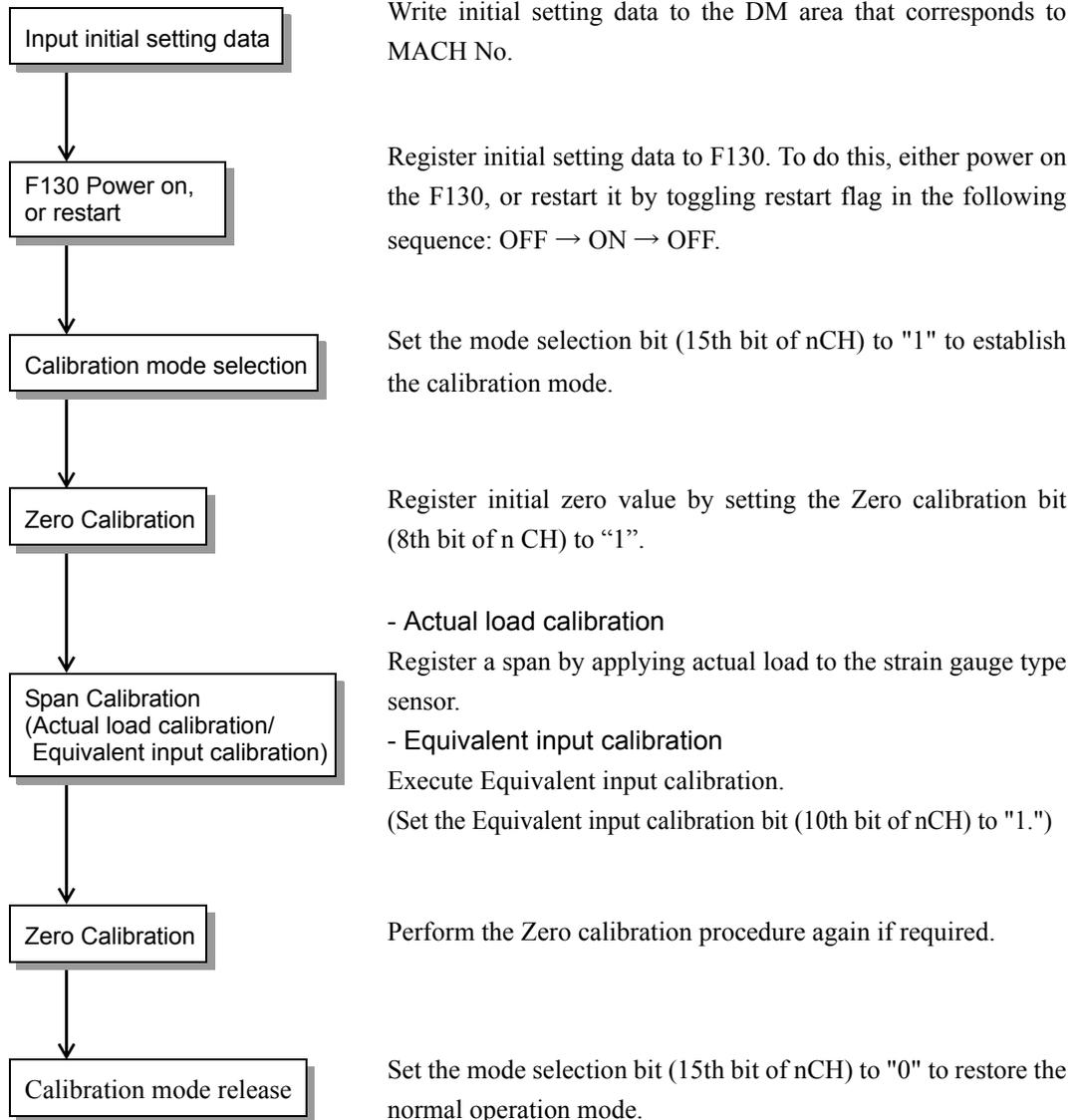
By this method, calibration value is registered from the rated output value (mV/V) and rated capacity value of the strain gauge type sensor. This calibration method using no load can simplify work.

##### Attention

A data sheet is attached to a strain gauge type sensor at the time of purchase. For Equivalent input calibration, the "rated capacity value" and "rated output value" described on the data sheet are set to the F130: therefore, it should be carefully stored after calibration.

## 4-2. Actual Load Calibration and Equivalent Input Calibration Procedure

Steps required to perform Actual load calibration and Equivalent input calibration are as follows:



## 4-3. Preparation for Calibration

### 4-3-1. Setting Initial Data

Minimum data items required for performing proper calibration are: Excitation voltage, Minimum scale division, Sensor rated output value, and Sensor rated capacity value. Initial setting data are registered when F130 is powered on or it restarts.

#### Excitation voltage selection (m)

Select the bridge voltage supplied to the strain gauge type sensor.

The bridge voltage can be selected from 2.5V and 10V.

After this setting, be sure to perform calibration.

(Setting range 0: 2.5V, 1: 10V)

#### Attention

Since calibration value data are stored separately for excitation voltage 10V and 2.5V, it should always be determined before performing calibration operation, and it should not be changed after calibration.

If the maximum excitation voltage of the strain gauge type sensor is under 10V, be sure to select 2.5V.

#### Minimum scale division (m+1)

Set the increment of the indicated value.

(Setting range 1 to 100)

#### Sensor rated output value (m+5)

Set the rated output value of the strain gauge type sensor for Equivalent input calibration.

Since the set value is reflected when the calibration is executed (ON edge of the Equivalent input calibration request), set before execution.

(Setting range 50 to 3100 (0.050 to 3.100mV/V))

#### Sensor rated capacity value (m+6)

Set the indicated value corresponding to the actual load for Actual load calibration.

Set the rated output value of the strain gauge type sensor for Equivalent input calibration.

(Setting range 1 to 32000)

#### Attention

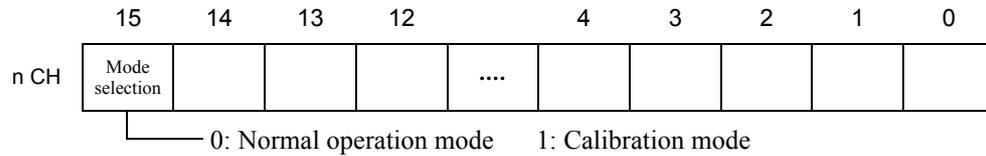
Set each set data properly within the setting range.

In the case of setting out of the setting range, normal operation may not be performed with measurement value and hold value.

\* If out of the setting range, "1" is returned to the 12th bit of (n+1)CH "setting error occurrence."

### 4-3-2. Calibration Mode Selection

On the F130, Zero calibration and Span calibration can be operated by selecting the calibration mode with the mode selection bit. Use the normal operation mode except during calibration.



### 4-4. Zero Calibration

Follow the steps below to define correct initial value:

1. Make sure that the strain gauge type sensor is free from unnecessary load, such as foreign object placed on the weighing plate, or contact with peripheral devices.
2. Make sure that the measurement value (n+2 CH) is stable without fluctuations.
3. Toggle the Zero calibration bit (8th bit of n CH) from 0 → 1.
4. F130 starts Zero calibration procedures when it acknowledges an ON edge (0 → 1) of the Zero calibration bit.
5. Zero calibration in progress bit (8th bit of n+1 CH) turns on “1”. Do not touch the sensing portion (sensor) while this bit in on.
6. Make sure measurement value (n+2 CH) shows “0”.
7. Toggle the Zero calibration bit (8th bit of n CH) back to “0”.

### 4-5. Actual Load Calibration

Apply an actual load to the strain gauge type sensor and register the span.

1. Apply an actual load to the strain gauge type sensor.
2. Make sure that the strain gauge type sensor is free from unnecessary load, such as foreign object placed on the weighing plate, or contact with peripheral devices.
3. Make sure that the measurement value (n+2 CH) is stable without fluctuations.
4. Toggle the Actual load calibration bit (9th bit of n CH) from 0 → 1.
5. F130 starts Actual load calibration procedures when it acknowledges an ON edge (0 → 1) of the Actual load calibration bit.
6. Actual load calibration in progress bit (9th bit of n+1 CH) turns on “1”. Do not touch the sensing portion (sensor) while this bit in on.
7. Make sure that the measurement value (n+2 CH) exactly coincides with the sensor rated capacity value (m+6).
8. Toggle the Actual load calibration bit (9th bit of n CH) back to “0”.

### 4-6. Equivalent Input Calibration

1. Toggle the Equivalent input calibration bit (10th bit of n CH) from 0 → 1.
2. F130 starts Equivalent input calibration procedures when it acknowledges an ON edge (0 → 1) of the Equivalent input calibration bit.
3. Toggle the Equivalent input calibration bit (10th bit of n CH) back to “0”.

### 4-7. Calibration Error

If calibration operation is performed without properly making strain gauge type sensor input or initial setting to the F130, a calibration error occurs. Check the calibration error number (n+7 CH), remove the cause, and then perform calibration operation again.

When the calibration error occurs, "1" is returned to the 11th bit of n+1 CH "setting error occurrence."

#### Calibration Error 2

This indicates a state in which Zero calibration cannot be performed because an electric signal exceeding the input voltage range is input on the positive side. Check the cable for breaks or wrong wiring.

#### Calibration Error 3

This indicates a state in which Zero calibration cannot be performed because an electric signal exceeding the input voltage range is input on the negative side. Check the cable for breaks or wrong wiring.

#### Calibration Error 5

Sensor rated capacity value is preset to “0”. Select a proper non-zero value.

#### Calibration Error 6

The output of the strain gauge type sensor is too small to perform calibration. Check to see if load is applied properly, or the strain gauge type sensor has such a capability that can make appropriate output, and then perform Span calibration again.

#### Calibration Error 8

Strain gauge type sensor output is outside the F130’s allowable sensor input range. Check if the sensor is properly loaded, and the its rated output falls within the F130’s sensor input range. Perform Span calibration again. Then, perform Span calibration again.

## 5. MEASUREMENT SETTINGS

### 5-1. Analog Filter Selection (m+2)

A low-pass filter is provided for filtering input signals from the strain gauge type sensor and canceling noise components.

The cut-off frequency can be selected from 3Hz, 10Hz, 30Hz, 100Hz, 300Hz, 1kHz.

With an increase in the cut-off frequency, the response becomes faster, but noise components may be indicated.

(Setting range 0: 3Hz, 1: 10Hz, 2: 30Hz, 3: 100Hz, 4: 300Hz, 5: 1kHz)

### 5-2. Digital Filter Count Setting (m+3)

This filter calculates moving average of A/D converter output to reduce indicated value fluctuation. Set by the sampling count of the past data to perform moving average process.

Larger averaging width will enhance indicated value stability, but reduce response performance.

Vice versa, shorter averaging width reduces indicated value stability, but enhance response velocity.

(Setting range 1 to 512)

### 5-3. Digital Offset (m+4)

This function always subtracts the digital offset set value from the indicated value.

This function is convenient when zero cannot be obtained with no load for some reason or for offsetting. When not using, set "00000".

(Setting range -30000 to +30000)

#### Attention

Set each set data properly within the setting range.

In the case of setting out of the setting range, normal operation may not be performed with measurement value and hold value.

\* If out of the setting range, "1" is returned to the 12th bit of n+1 CH "setting error occurrence."

## 6. MEASUREMENT · HOLD FUNCTIONS

### 6-1. Measurement Function

#### Measurement value and data update counter

The F130 performs A/D conversion at a rate of 3000 times/sec to calculate the measurement value. Each time the measurement value is updated, the data update counter is incremented by one. Since the measurement value and counter value are returned in pairs, how often you see the measurement data of the F130 can be known from the progression of the counter value.

Measurement value	Data update counter	Counter difference
9999	3245	—
10001	3248	3
10000	3251	3
↓		
9998	65535	—
10000	3	4
9999	6	3

← According to the difference from the previous counter value, you can see that the rate is once out of three times (1000 times/sec.).

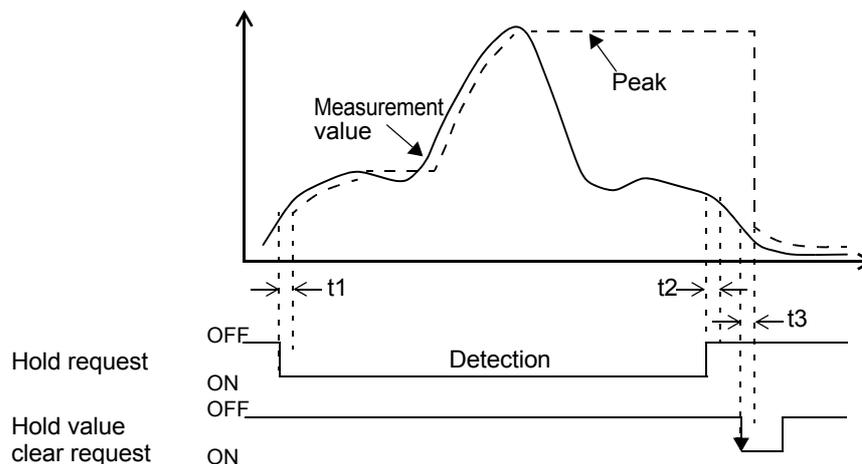
← Goes back to "0" after counting up to 65535.

### 6-2. Hold Functions

The F130 has three hold functions: peak hold, bottom hold, and average hold, and these hold functions operate simultaneously.

#### 6-2-1. Peak Hold

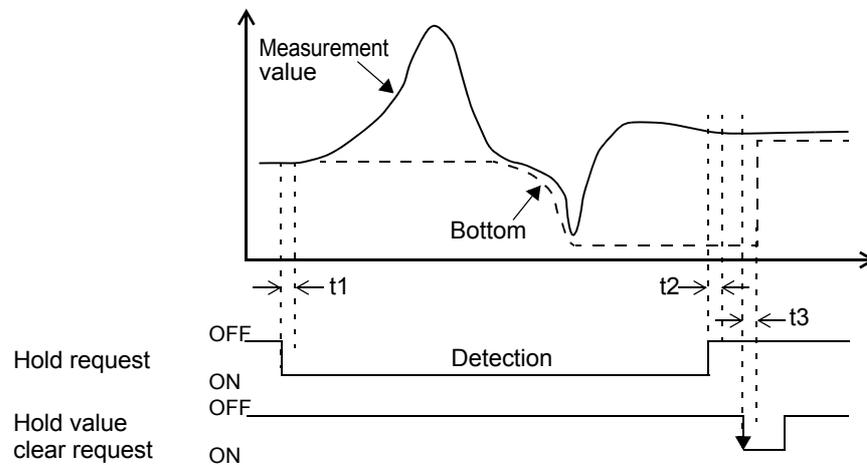
The maximum value (peak) in the positive direction of the specified section is held.



- t1: Delay time between the instant when the hold request turns ON and the instant when the measurement value hold detection is started
- t2: Delay time between the instant when the hold request turns OFF and the instant when the measurement value hold detection is stopped
- t3: Delay time between the instant when the hold clear request turns OFF and the instant when the hold value is released

### 6-2-2. Bottom Hold

The maximum value (bottom) in the negative direction of the specified section is held.



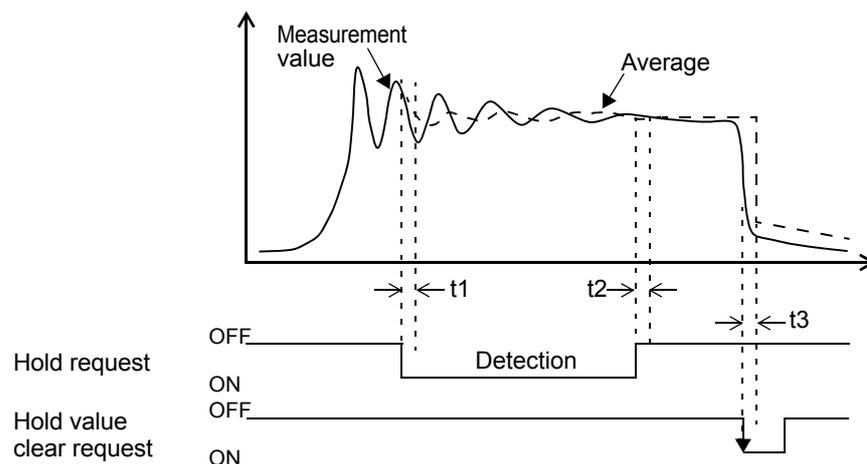
$t_1$ : Delay time between the instant when the hold request turns ON and the instant when the measurement value hold detection is started

$t_2$ : Delay time between the instant when the hold request turns OFF and the instant when the measurement value hold detection is stopped

$t_3$ : Delay time between the instant when the hold clear request turns OFF and the instant when the hold value is released

### 6-2-3. Average Hold

The average value of the specified section is held.



$t_1$ : Delay time between the instant when the hold request turns ON and the instant when the measurement value hold detection is started

$t_2$ : Delay time between the instant when the hold request turns OFF and the instant when the measurement value hold detection is stopped

$t_3$ : Delay time between the instant when the hold clear request turns OFF and the instant when the hold value is released



Point

< About average value measurement time >

What can be specified as a section for average value hold detection is up to 10 seconds (average count: 30000). Even if the hold request bit is ON exceeding that time, the average value in 10 seconds is held.

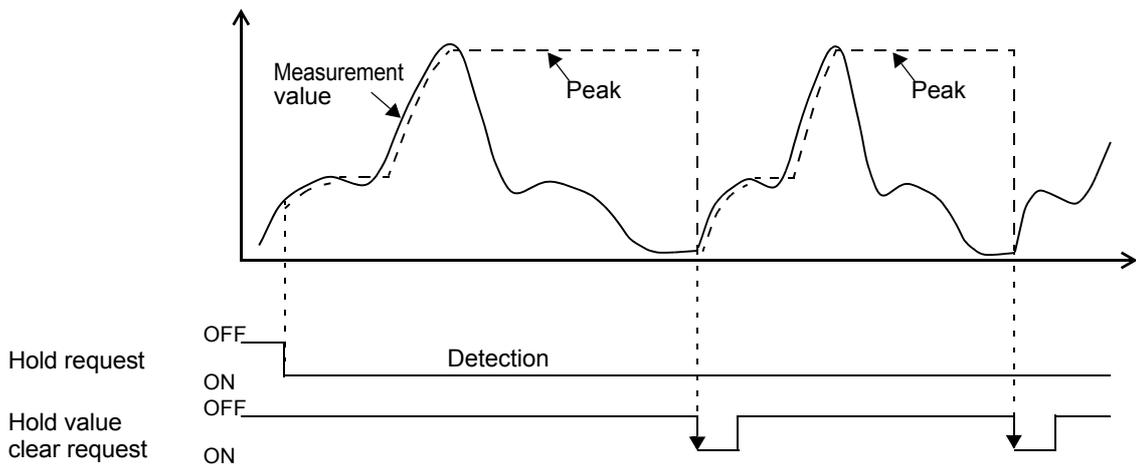
Attention

< About the request bit delay times (t1 to t3) >

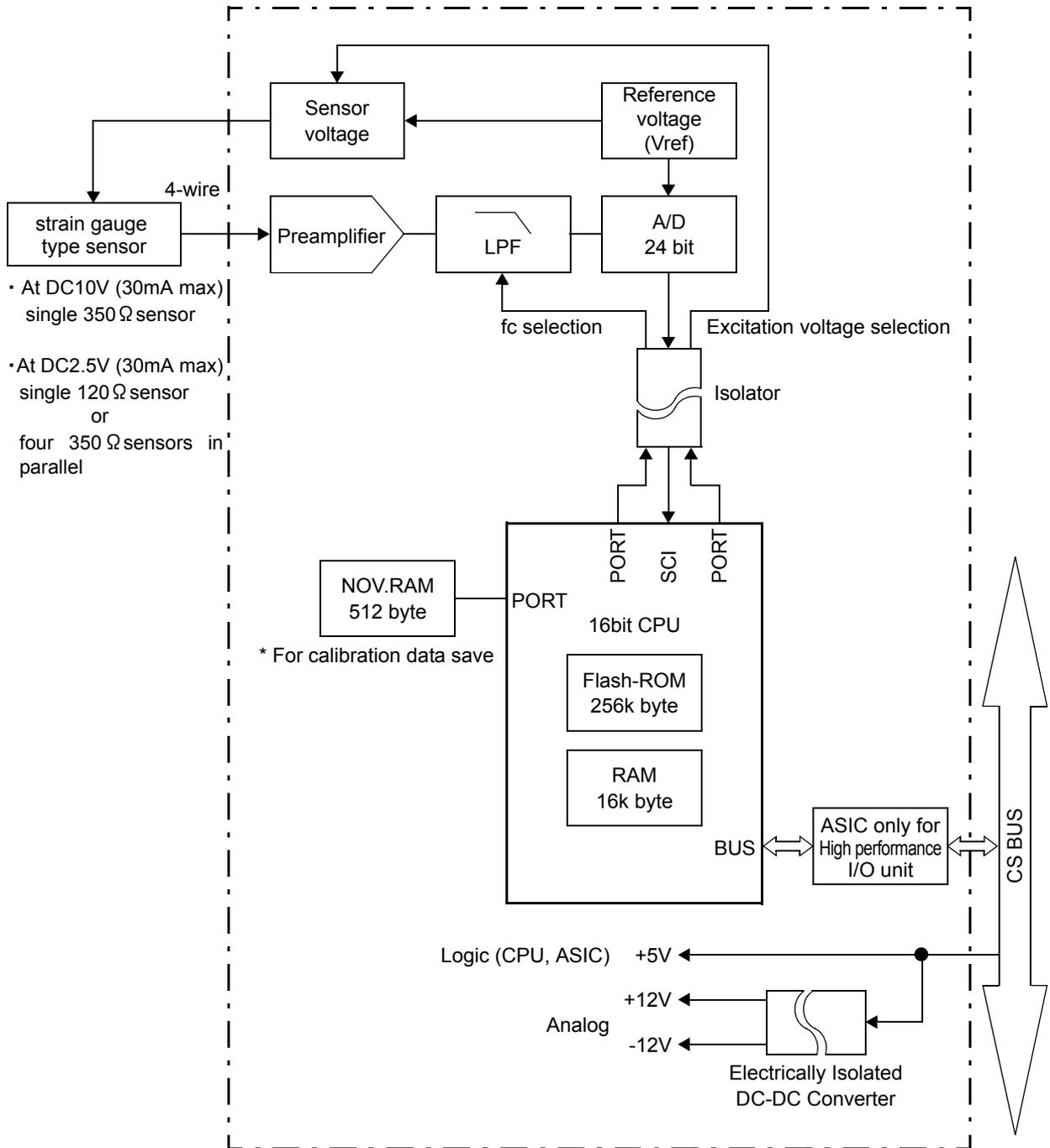
Since the delay times change depending on the system environment, sufficient evaluation should be performed before use in response to the actual status of use.

### 6-2-4. Application of the Hold Clear Function

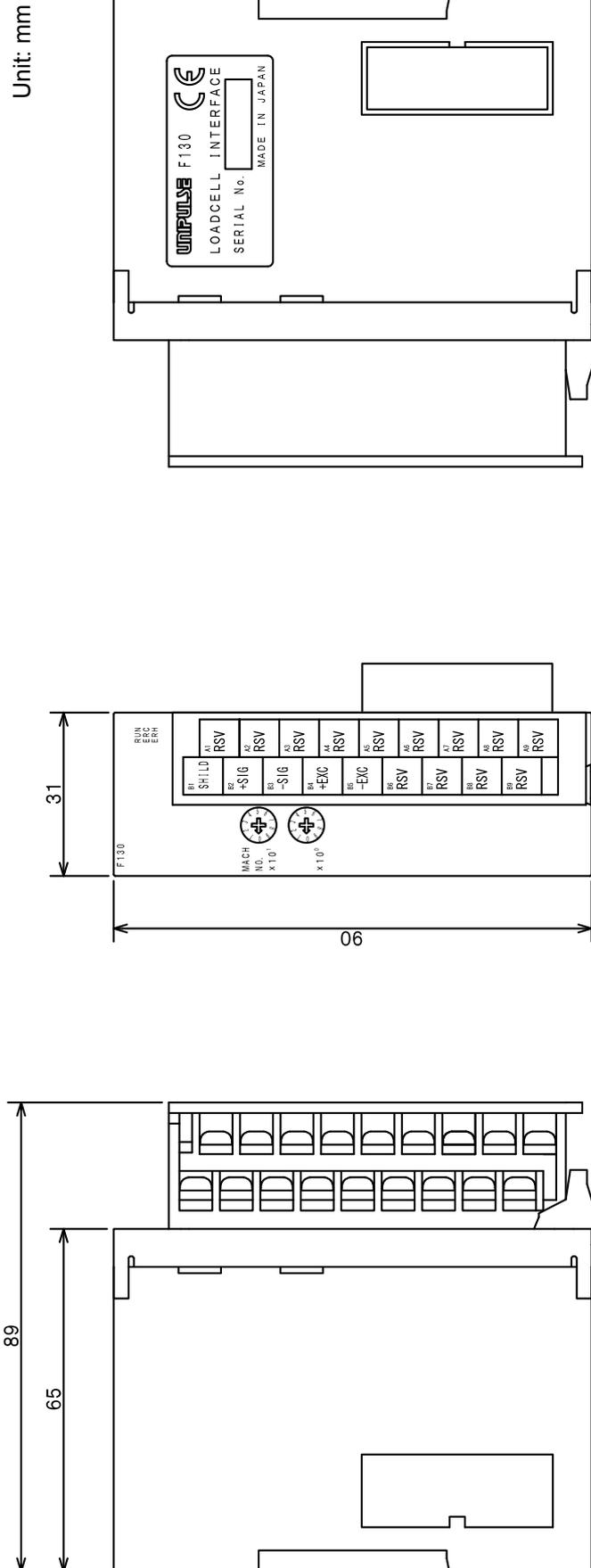
If the hold clear is turned ON when the hold request is ON (in the detection section), the previous hold value is once cleared, and then hold detection proceeds.



# 7. BLOCK DIAGRAM



# 8. DIMENSIONS

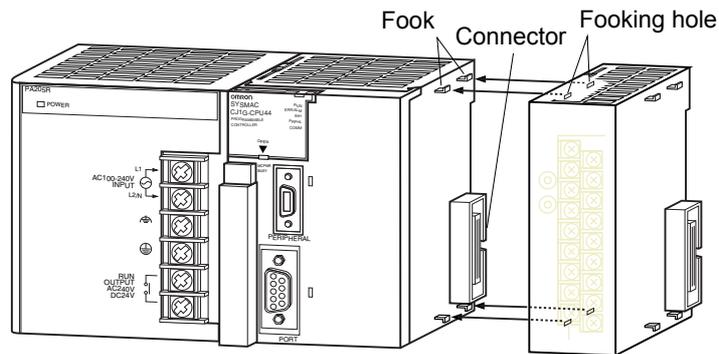


## 9. INSTALLATION

### 9-1. Connection with CJ1 Unit

Multiple of CJ1 units can be connected by simply engaging connectors and locking the slider. Add an end cover to the unit installed to the right most unit.

#### 1. Engage the connector properly to connect units.

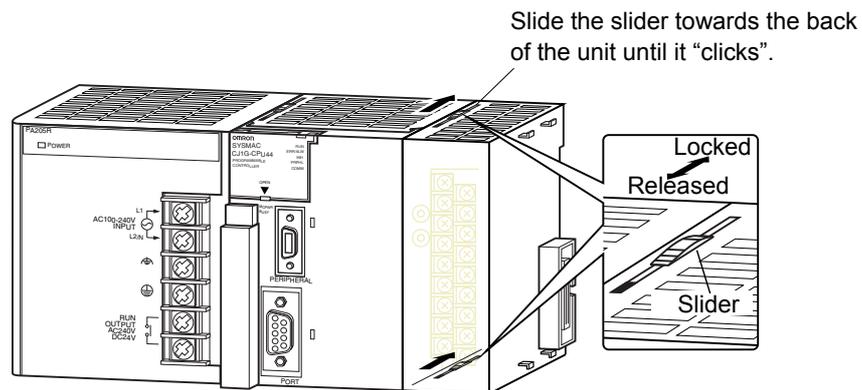


CJ series do not require base unit. Each unit can be connected to each other using the integrated side-mount connector.

### ⚠ CAUTION

- Never fail to turn off the system before starting system assembly.
- When replacing a unit, remove the assembled unit as a whole before replacing one of them.

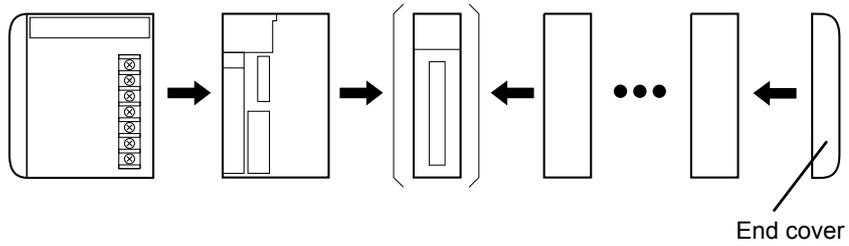
#### 2. Slide the two yellow sliders on the upper and lower end of the unit until they “clicks” to lock securely.



### ⚠ CAUTION

Lock the unit securely by moving the slider to its full stroke. Insufficient engagement can hinder the system from proper operation.

**3. Add an end cover to the right most unit.**



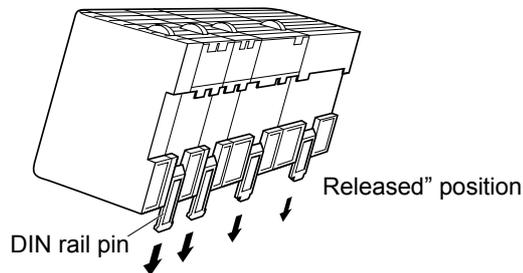
**⚠ CAUTION**

You must install an end cover to the right most units. Without it, CJ1's CPU unit issues "I/O bus error" (Operation Halt Error) and will not start operation (neithre "operation" nor "monitoring" mode).

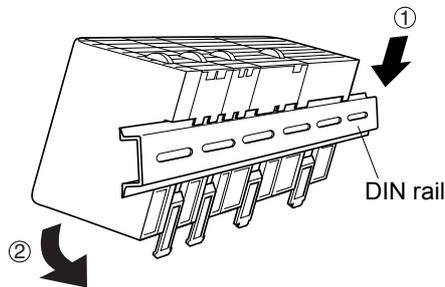
**9-2. DIN Rail Installation**

CJ series can only be mounted to DIN type rail. It can no be installed using screws.

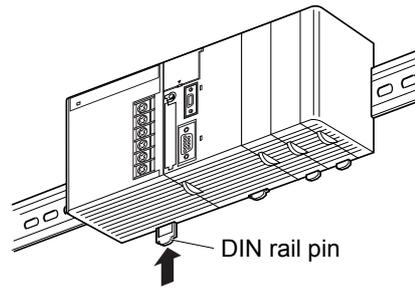
**1. Set the DIN rail pins on the rear of the unit to "Released" position.**



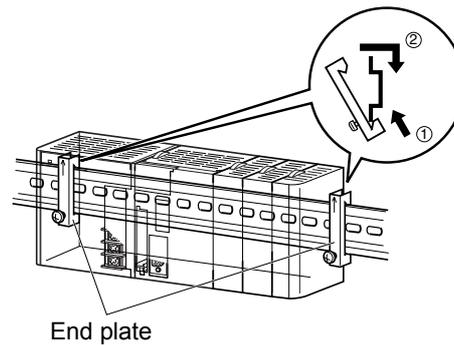
**2. Hook the CJ unit's upper protrusions on the DIN rail ( ① ), and engage the entire notch to the rail ( ② ).**



**3. Lock all the DIN rail pins by pushing upwards.**



**4. Secure the unit by installing a end plate.**



To fix CJ1 assembly securely, sandwich the assembly using a pair of endplates from both sides. Hook lower notch of the end plate to the lower plate of the rail ( ① ), and then engage the upper notch, then pull the end plate to lower direction ( ② ). Tighten the screw to fix them securely.

**Attention**

For details on the handling of CJ series units, see "OMRON CJ Series: CJ1/CJ1-H/ CJ1M CPU Unit User's Manual (Setup)" provided by OMRON.

## 10. CAUTION ABOUT POWER CONSUMPTION AND SYSTEM CONFIGURATION

Design your system with sufficient consideration given to power consumption so that the total power consumption of the F130 and units of the CJ series (CPU unit, Configuration units, etc.) does not exceed the maximum supply capability of the power supply unit.

F130 power consumption: 0.46 [A]

The number of connectable units is up to 10 units per CPU rack\* according to the specifications of the CJ series. (It can be expanded to 40 units depending on the CPU unit.)

\* The CJ-series CPU rack consists of a CPU unit, power supply unit, configuration units (Basic I/O units, Special I/O units(F130 included), and CPU bus units), and an end cover.

### Attention

For the system configuration of the CJ series and the power consumption of each unit, see "OMRON CJ series: CJ1/CJ1-H/CJ1M CPU Unit User's Manual (Setup)," etc.

# 11. SPECIFICATIONS

## 11-1. Analog Section

Number of sensor connection ch	1ch
Sensor connection terminal	Detachable terminal block
Sensor connection method	4-wire input (+SIG, -SIG, +EXC, -EXC, SHIELD)
Sensor excitation voltage	DC10V $\pm$ 5%, source current max. 30mA (single 350 $\Omega$ sensor) or DC2.5V $\pm$ 5%, source current max. 30mA (single 120 $\Omega$ sensor or four 350 $\Omega$ sensors in parallel)
Signal input range	-3.0 to +3.0mV/V
Aururacy	Non-linearity: Within 0.02%FS (at a 3.0mV/V input) Zero drift: Within 0.5 $\mu$ V/ $^{\circ}$ C RTI Gain drift: Within 25ppm/ $^{\circ}$ C
Analog filter	Low-pass filter (-6dB/oct) Cut off frequency: Selectable from 3, 10, 30, 100, 300, 1k Hz
A/D converter	Rate: 3000 times/sec. Resolution: 24bit binary (Effective resolution: approx. 16 to 18 bits) * When the effective resolution is 16 bits, the solution results in counting approx. 30000 with respect to 3.0mV/V. However, the bit stability depends on the averaging filter setting.

## 11-2. Display

Status LED	RUN (Green): Operation status (Turns on when Normal operation)
	ERC (Red): Error detected by the unit (Turns on when an alarm occurs or blinks when an error occurs in the F130.)
	ERH (Red): CPU error (Turns on when an alarm occurs in data exchange with the CPU unit.)

### 11-3. Setting

High performance I/O unit No.	Decimal 2-digit rotary switch (unit No. 0 to 95)
Calibration value • set value setting method	Made from the CPU unit via the data memory (DM) area defined for the F130.
Calibration value	Stored in NOV RAM (non-volatile RAM)
Set value	Measurement starts with the set values (DM area) written from the CPU unit after power-on. (Not stored on the F130 side)

### 11-4. Terminal Block Layout

Detachable terminal block (M3 screw)

SHIELD	B1	A1	RSV
+SIG	B2	A2	RSV
-SIG	B3	A3	RSV
+EXC	B4	A4	RSV
-EXC	B5	A5	RSV
RSV	B6	A6	RSV
RSV	B7	A7	RSV
RSV	B8	A8	RSV
RSV	B9	A9	RSV

\* Never connect anything to the RSV terminals.

### 11-5. General Specifications

Internal consumption current	DC5V, Approx. 0.46A (At excitation voltage DC10V, single 350Ω sensor)
Operating conditions	Operation temperature: 0 °C to +55 °C Accuracy compensation applicable temperature: 0 °C to +40 °C Storage temperature: -20 °C to +75 °C Humidity: 90%RH or less (non-condensing)
Dimensions	31(W) × 90(H) × 65(D) mm (protrusions excluded)
Weight	Approx. 160g