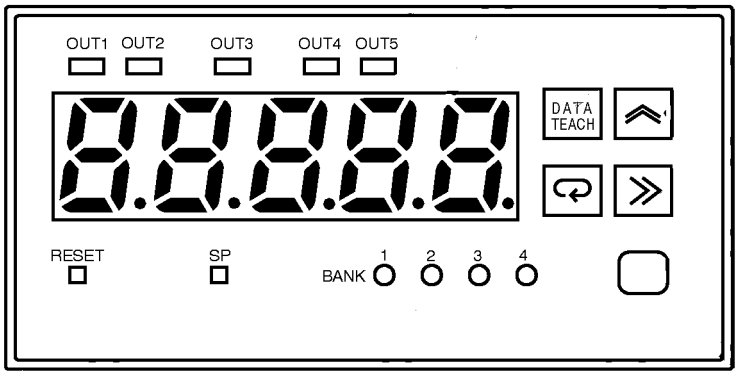
K3TC Intelligent Signal Processor

Operation Manual

Produced January 1997



Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to the product.

⚠ DANGER Indicates information that, if not heeded, is likely to result in loss of life or serious injury.

⚠ WARNING Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

⚠ Caution Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PC” means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of the K3TC Intelligent Signal Processor and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the K3TC.

Section 1 introduces the special functions of the K3TC and identifies its main components.

Section 2 describes the steps that must be performed before turning on the power, such as installation and wiring.

Section 3 explains the parameter settings and how to make these settings with key inputs.

Section 4 describes the operations that can be performed in run mode.

Section 5 describes the teaching function and test mode.

Section 6 explains how to use the outputs of the K3TC-□B1□A-B4 (BCD outputs).

Section 7 provides error processing and troubleshooting information.

The ***Appendices*** provide specifications, parameter setting tables, and information on applicable sensors.

⚠WARNING Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

SECTION 1
Introduction

This section introduces the special functions of the K3TC and identifies its main components. Refer to the later sections for details on the K3TC's menus and operation.

1-1 Features

The basic features of the K3TC Intelligent Signal Processor are outlined below. Refer to relevant sections of this manual for details.

Operating Mode

The K3TC features three operating modes: RUN mode, setting mode, and test mode. The RUN mode is used during normal operation, the setting mode is used to make the initial parameter settings, and the test mode inputs can be simulated and the actual outputs activated.

Input and Output Modes

The K3TC is equipped with two input modes, for individual inputs and phase-difference inputs, and two output modes, ALL-H mode and ALL-L mode.

Prescale Function

The parameter allows a pulse to be displayed as a value other than 1, for the purpose of measuring relevant engineering units such as length, etc. The prescale value is set in the form of $X \times 10^{Y}$ with X and Y being programmable values. The following equation shows the relationship between the count value, input count value, and prescale value.

Count value = input count value × prescale value

Example

If there are 100 counts/unit, the prescale value should be set to 0.01.
(Count value = 100 × 0.01 = 1)

Bank Selection

With the K3TC, the set value and prescale value can be altered without key operation via the selection of an another bank when making a level change. The K3TC has four banks; each bank can output HH, H, L, and LL set values.

Power Failure Memory

When enabled, this function retains the measured value during a power interruption.

Setting Levels

Settings are divided into three groups, called setting levels 1, 2, and 3, to simplify the setting procedure.

Sensor Type

The user can use this parameter to specify any of four types of sensors (non-contact/contact and NO/NC) to be connected to the inputs.

Teaching

The K3TC is provided with a teaching function that can set an actual input signal as a set value, X values for input prescaling, or linear output range.

Setting Auto-zero Time

The K3TC has a function to force the frequency to set to zero if no pulse is received for a certain period. The period during which no pulse is received before the K3TC sets the frequency to zero is called “auto-zero time.”

Display Refresh Period

If display data is updated in synchronization with the normal sampling period, the data may change too rapidly to be read. In this case, the speed at which the displayed data is updated can be slowed down. When a slow data display speed is selected, the sampling period for measurement is not changed. The comparative outputs or BCD outputs are updated in synchronization with the sampling period.

Setting Linear Output Range

The K3TC with Linear Output Board outputs a linear voltage or current in proportion to the changes in the measured value, i.e., the value to be displayed.

1-2 Overview

1-2-1 Display Font

The K3TC's display uses a seven segment font for characters a through z, as shown in the following tables. Numerals are displayed with standard seven-segment characters.

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
a	b	c	d	e	f	g	h	i	j	k	l	m
N	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**
n	o	p	q	r	s	t	u	U	w	Ʊ	y	=

1-2-2 Precautions

Observe the following precautions when using the K3TC.

- The power supply must reach the specified voltage within two seconds after being turned on.
- Separate the connector and terminal wiring for the K3TC from high-voltage and high-current lines to help prevent inductive noise. Do not run the wiring in parallel or in the same ducts as power lines. Use separate ducts and shielded lines to reduce noise.
- Separate the K3TC as far as possible from equipment that generate strong, high-frequency waves (e.g., high-frequency welders and sewing machines) or devices that generate surge. Such equipment will cause faulty operation if located too close to the K3TC.
- Attach surge absorbers, noise filters, etc., to any nearby equipment that generates noise (e.g., motors, transformers, solenoids, magnetic coils, or other devices with a high inductance content).
- When using noise filters, be sure the proper voltage and current are supplied to the K3TC and locate the filters as close as possible to the K3TC.
- Do not use the K3TC in the following locations.
  - Locations subject to condensation, frost, dust, or corrosive gases particularly sulfuric or ammonia gases).
  - Locations subject to excessive vibration or shock.
  - Locations subject to contact with water or oil.
  - Locations subject to rapid or extreme temperature changes.
  - Locations subject to heat from furnaces.
- Use the K3TC within the following ambient temperature and humidity ranges:
  Temperature : –10° to 55°C
  Humidity: 35% to 85%
  The above ambient temperature and humidity ranges apply to the K3TC itself and not to any panel or housing containing the K3TC. If the K3TC is located near a source of heat, the side surface nearest the source of heat must not exceed 55°C. Use a cooling fan or other method to maintain the temperature within the above range as required.
- Store the K3TC within the following ambient temperature and humidity ranges:
  Temperature : –20° to 65°C
- Do not place excessively heavy objects on the K3TC during usage or storage. The K3TC could be distorted or otherwise damaged.
- Do not place the K3TC near radios, televisions or other wireless devices. These devices may interfere with proper communications.

1-3 Outline of Main Functions

1-3-1 Features

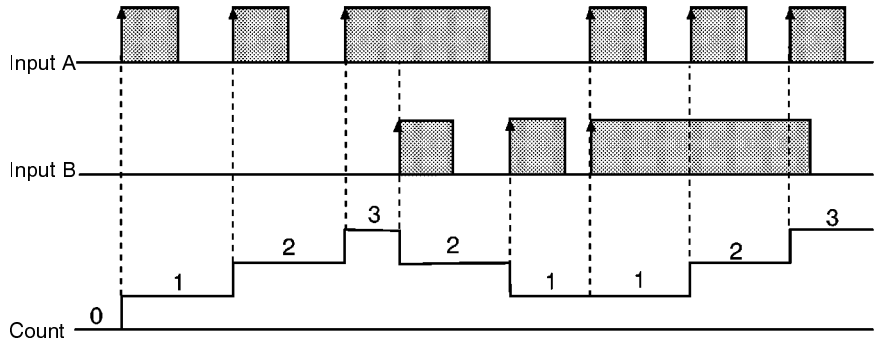
When used with an incremental Rotary Encoder, pulses can be incremented or decremented by changing the rotation direction to either forward or backward.

1-3-2 Counting Modes

The counting mode can be set to either individual input or phase-difference input. Pulses of up to 50 kHz can be input. The minimum pulse width is 9 μs for both the ON and OFF sides.

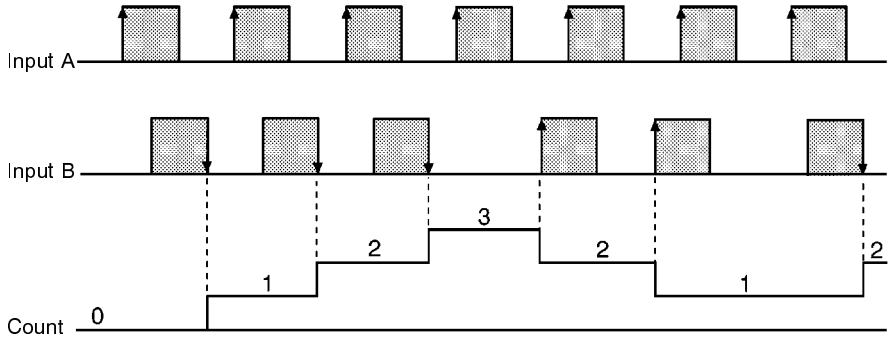
Individual Inputs

This input mode counts by using input A as the increment input and input B as the decrement input. The count is incremented at the rising edge of input A and decremented at the rising edge of input B. The count is left unchanged if the inputs are simultaneous.



Phase-difference Inputs

This input mode increments the count when input A precedes input B and decrements the count when input B precedes input A. The count is incremented at the rising edge of input B and decremented at the rising edge of input A.

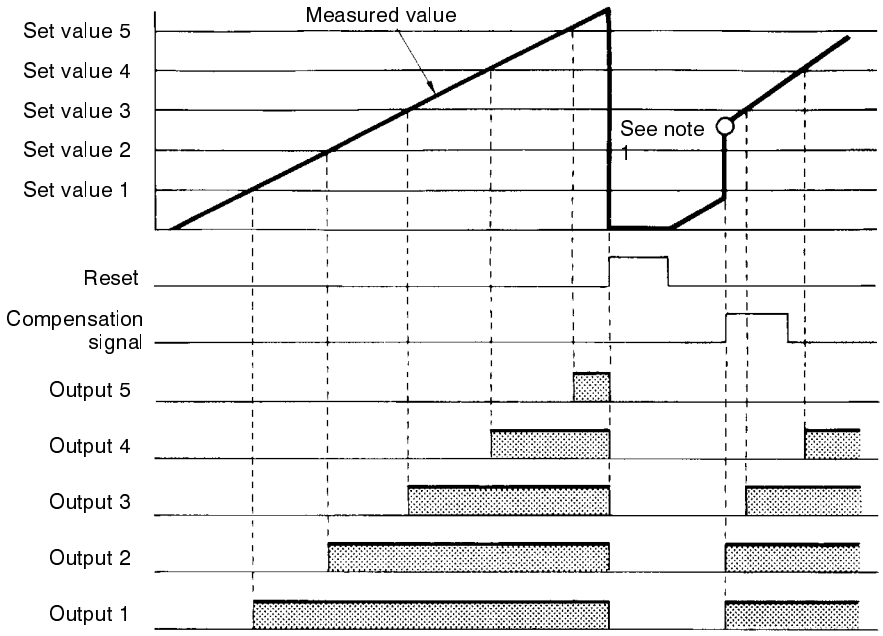


1-3-3 Output Modes (Relay Contact Output and Transistor Output)

The K3TC is equipped with two output modes, ALL-H mode and ALL-L mode. The measured value is compared to set values 1 through 5 and the corresponding output (1 through 5) is turned ON if the measured value is above (ALL-H mode) or below (ALL-L mode) the set value.

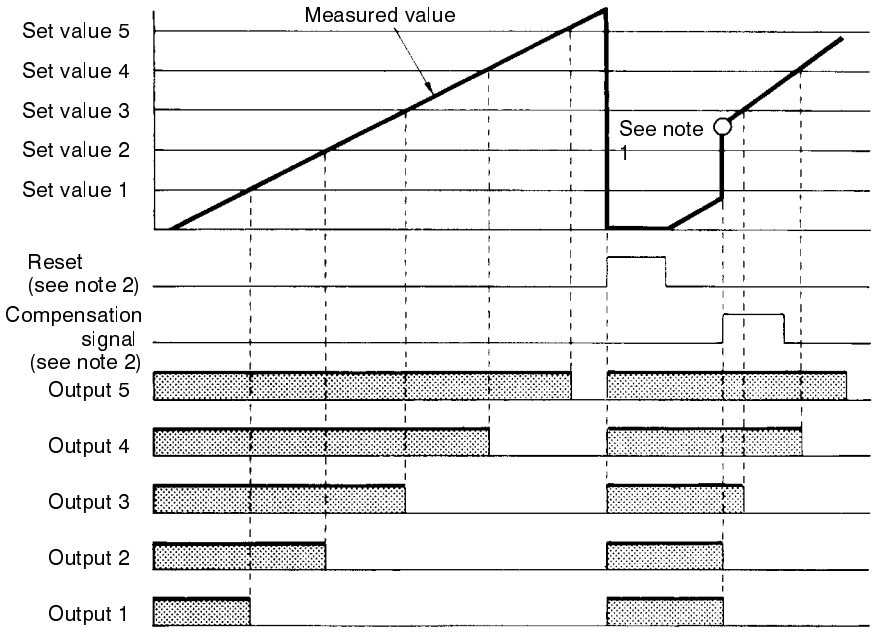
ALL-H Mode

If ALL-H output mode is selected, outputs 1 to 5 will be ON when the measured value exceeds set values 1 to 5.



ALL-L Mode

If ALL-L output mode is selected, outputs 1 to 5 will be ON when the measured value is less than set values 1 to 5.



Note 1. Set value 2 < compensation value < set value 3

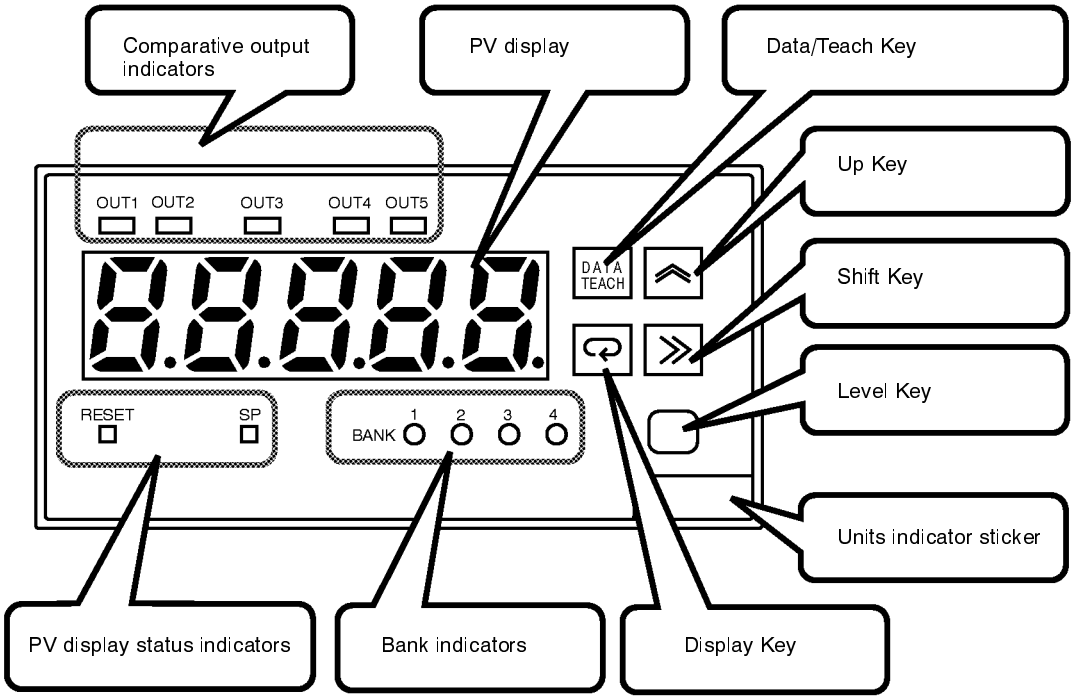
2. Reset and Compensation Signals:
   While the reset signal is ON, the counting value will return to zero.
   When the compensation signal is ON, the K3TC will be in counting operation starting with the preset compensation value. By selecting plus in compensation value parameter, the compensation value will be effective only for the adding operation.

BCD Outputs Refer to *2-4-4* and *Section 6 BCD Outputs*.

Linear Outputs Refer to *2-4-3 Linear Outputs*.

Communications Outputs (RS-232C/RS-422/RS-485) Refer to the *K3TC/K3TH/K3TR/K3TX Communication Output-type Intelligent Signal Processor Operation Manual*.

1-4 Front of the Processor: Nomenclature and Functions



PV Display In RUN mode, the PV display indicates the measured value unless the “SP” indicator is lit. When the “SP” indicator is lit in RUN mode, the PV display indicates the comparative set values.

In setting mode, the PV display indicates the setting item or set value. If the set value is being displayed, the digit being changed will be flashing.

When an error has occurred, the PV display indicates the error message.

Comparative Output Indicators These indicators are lit when the corresponding output (1 through 5) is ON. By means of a setting level 3 output parameter setting, it can be selected whether outputs are to be executed when the measured value exceeds the set value or when it is less than the set value.

PV Display Status Indicators The “RESET” indicator is lit when the reset signal is ON.
The “SP” indicator is lit when the PV display shows the comparative set value.

Bank Indicators The bank indicators, which show which bank number (1 through 4) has been selected, will be lit in the following situations:

(1) When there is an Output Board mounted.

(2) When the setting level 1 prescale bank parameter is set to ON.

(3) When the external control input bank signal is ON.

Units Indicator Sticker

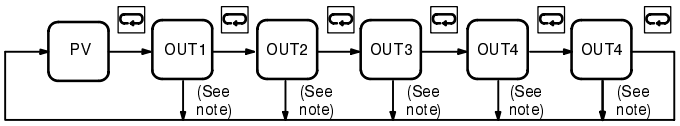
Select the appropriate units sticker from the provided stickers and attach it in the area provided.

Level Key

Press and hold the Level Key to go into the setting mode, and change the setting level within the setting mode. Refer to *1-6 Operating Modes* for more details.

Display Key

Press the Display Key to display the set value on the PV display. This function is provided only for the K3TC with Comparative Output Board.

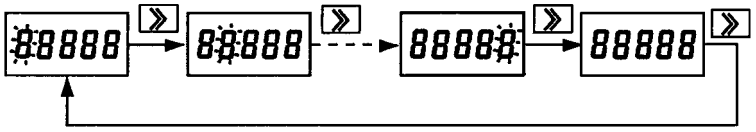


Note If a key is not pressed for 5 s, the process value will automatically return.

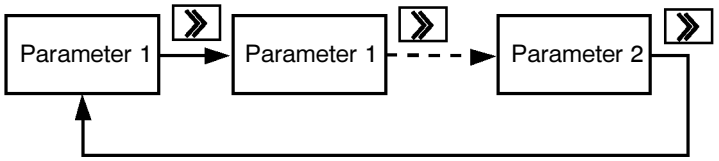
In the setting mode, this key is used to enable setting or to write set values into memory after selecting the parameter with the Shift Key.

Shift Key

Used to shift the digit being set.



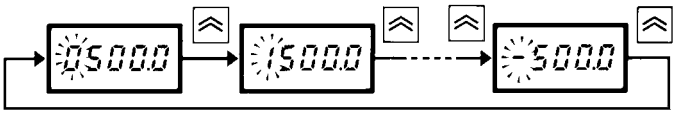
Within the setting level, the Shift Key can be used to select parameters.



For details on setting parameters, refer to *Section 3 Initial Settings*.

Up Key

The Up Key increments the current digit in the set value by one.



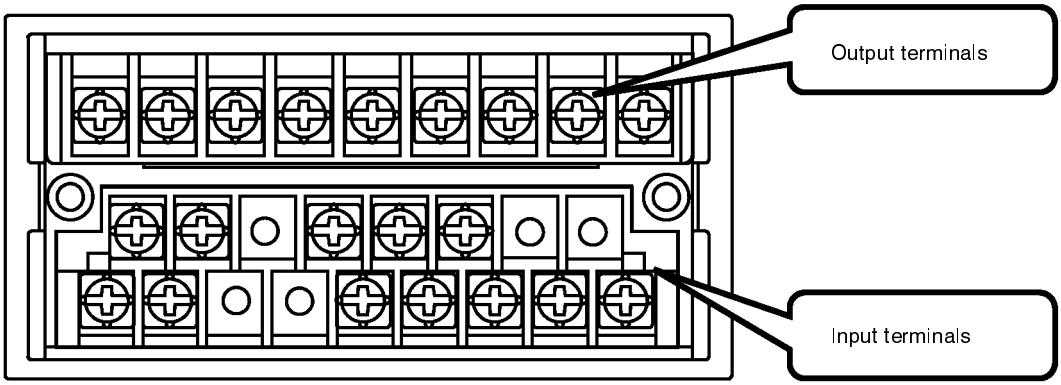
Data/Teach Key

In the setting mode, the prescale values, set values, and linear output range can be taught through actual inputs. For details regarding teaching, refer to *5-1 Teaching*.

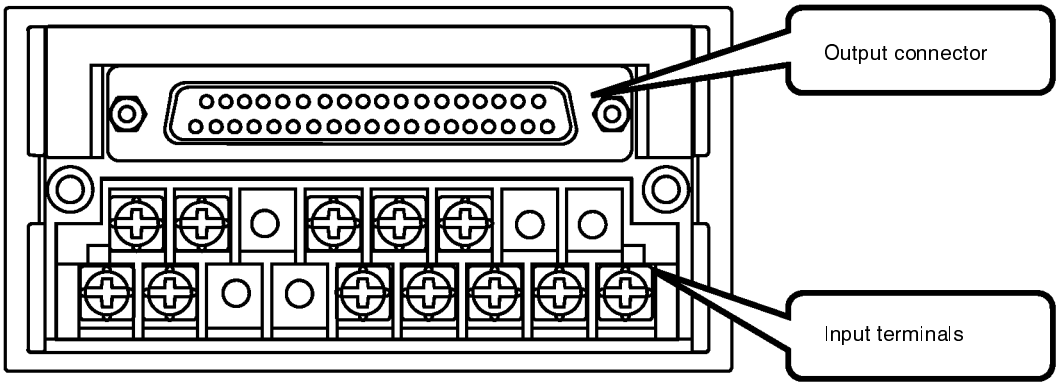
1-5 Rear of the Meter

The input terminals are the same for all models, but the outputs differ depending on the Output Board selected. Refer to 2-2 *Connecting Inputs* for details on the input terminals and 2-4 *Connecting Outputs* for details on the output terminals. Refer to *Section 6 BCD Outputs* for details on outputs from the K3TC with BCD Output Board.

K3TC with Relay Contact or RS-485 + 5 Transistor Output Board (K3TC-□□1□A-C□, K3TC-□□1□A-T□, K3TC-□□1□A-L□)

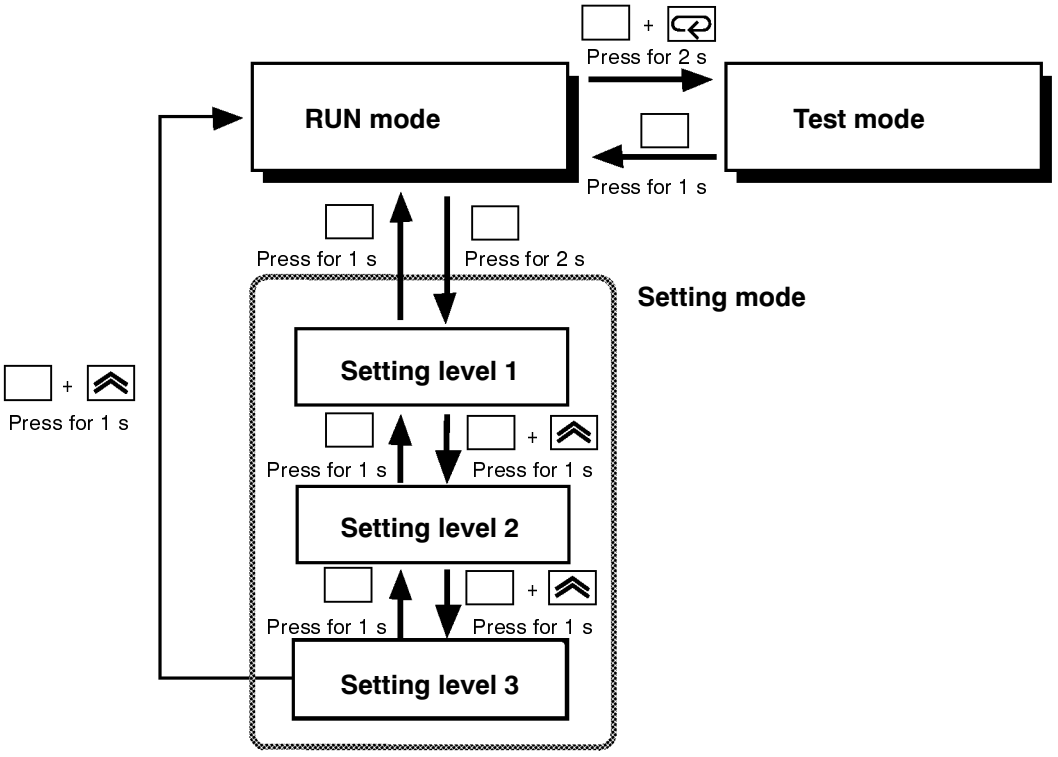


K3TC with BCD + 5 Transistor Output Board (K3TC-□□1□A-B4)



1-6 Operating Modes

The K3TC has three operating modes: RUN mode, setting mode, and test mode. The following diagram shows how to switch from one mode to another and how to change from one level to another under the setting mode.



RUN mode

The RUN mode is the default and automatically appears when the Unit is powered up. Measured values are ordinarily displayed, but set values can be displayed by pressing the Display Key. Set values can be changed as long as the setting level 1 protect function parameter is not ON.

Refer to *Section 4 RUN mode Operations* for details on operations in RUN mode.

Setting Mode

The setting mode is used to make the initial parameter settings with key operations or the teaching function. There are three setting levels, 1 through 3.

Refer to *Section 3 Initial Settings* for details on setting parameters with key operations. Refer to *5-1 Teaching Function* for details on setting parameters with the teaching function.

Test Mode

The test mode produces dummy inputs internally to test the display and output operations. Refer to *5-2 Test Mode* for details on test mode operations.

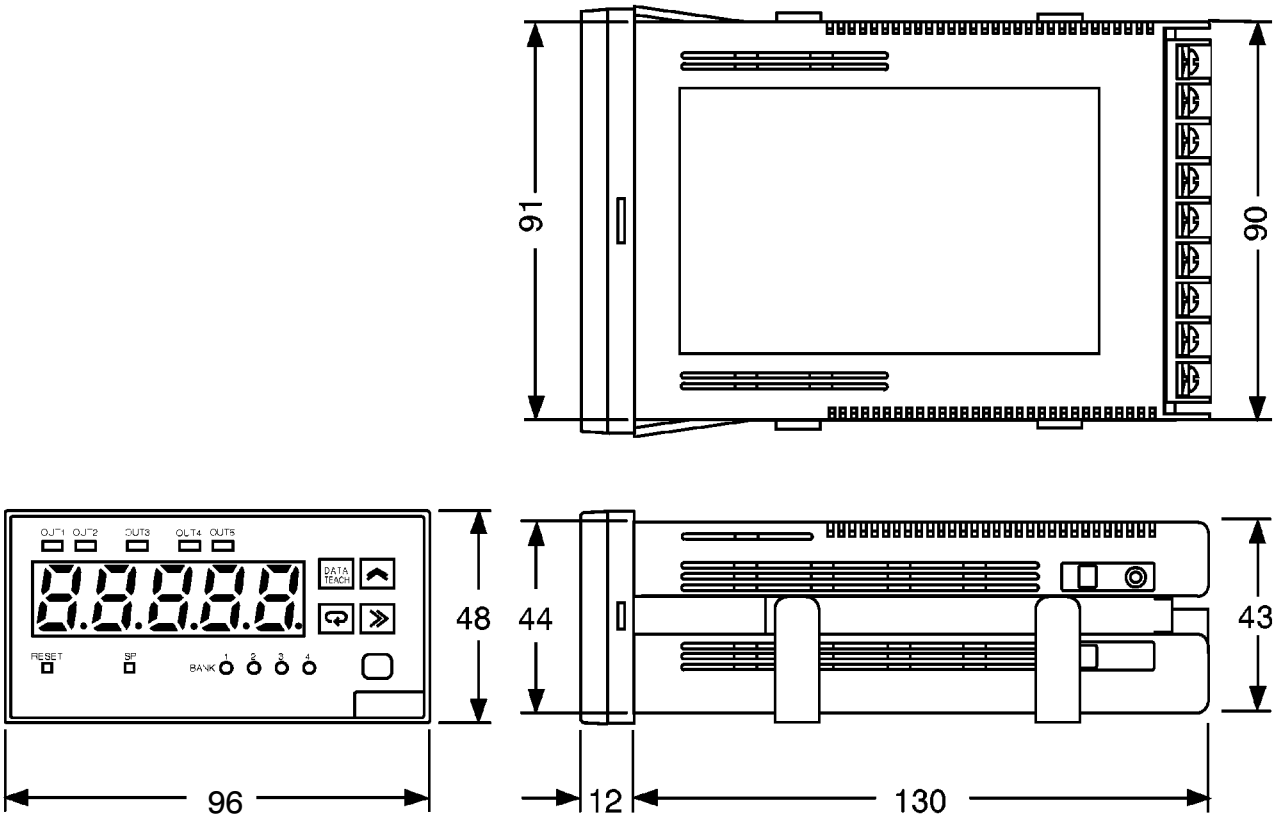
SECTION 2
Installation and Wiring

This section describes the steps that must be performed before turning on the power.

2-1 Installation

2-1-1 Dimensions

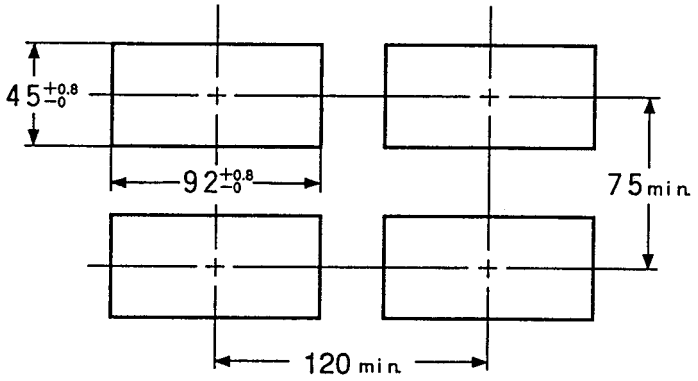
The following diagram shows the external dimensions of the K3TC. All dimensions are in mm.



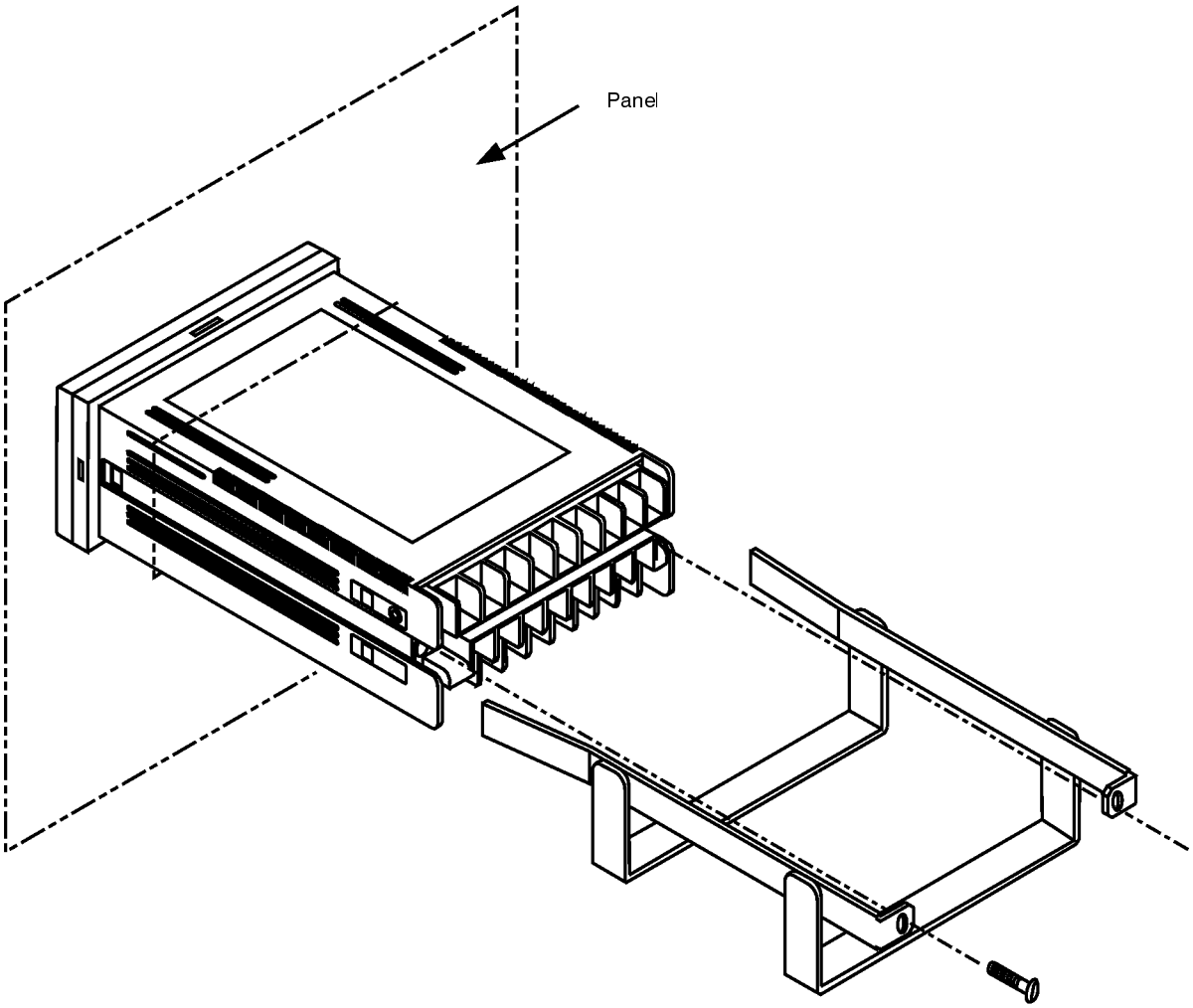
2-1-2 Installation Panel Measurements

The following diagram shows the measurements that should be used when preparing an installation panel. The installation panel can be from 1.0 to 3.2 mm thick.

Do not install a Unit right next to, above, or below another. Be sure to provide the minimum spacing shown below.



2-1-3 Installation Procedure



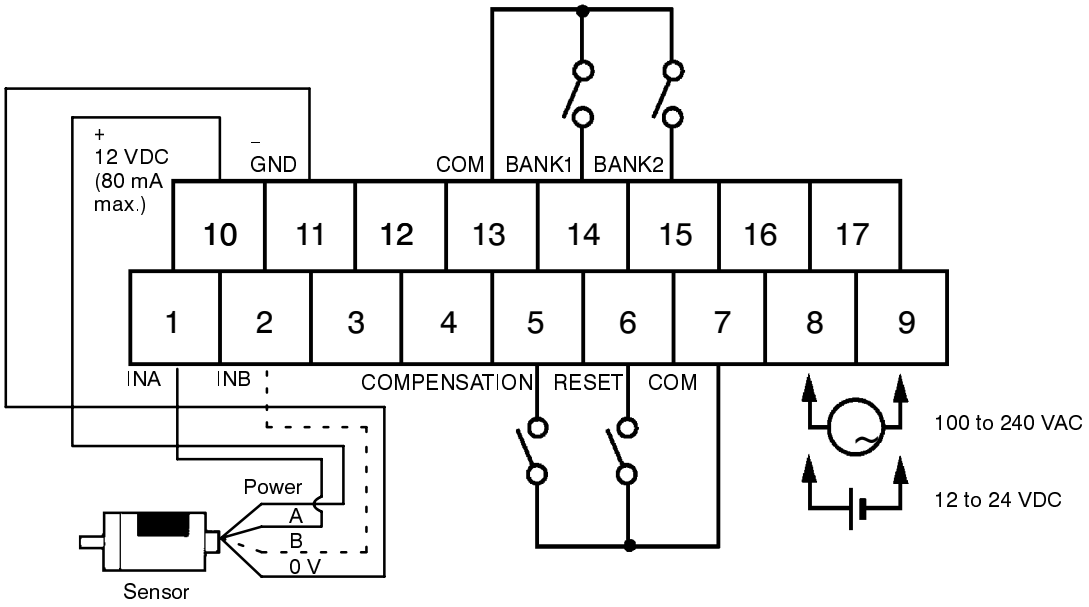
Use the following procedure when installing a K3TC.

1, 2, 3...

1. Insert the Unit into the hole in the panel.
2. Slide the mounting bracket along the guide rail on the K3TC from the back of the Unit until it contacts the installation panel.
3. Tighten the mounting bracket screws to about 0.49 N • m (5 kgf • cm).

2-2 Connecting Inputs

2-2-1 Input Terminal Allocation



Note Terminal numbers 7 and 13 are connected internally.

2-2-2 Wiring Precautions

Be sure to wire the signal lines and power lines separately to prevent noise in the signal lines.

Use crimp connectors to connect wires to the terminal block.

Tighten the terminal screws to about 0.78 N-m (8 kgf-cm).

Refer to page 3 for other precautions.

2-2-3 Wiring

Power Supply

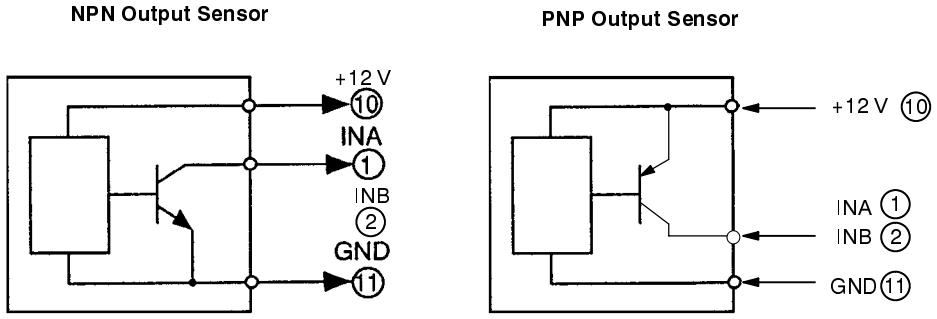
Input a power supply voltage of 100 to 240 VAC or 12 to 24 VDC to terminals 8 and 9.

Sensor Inputs

Connect the pulse input from Sensor A to terminal 1 and connect the pulse input from Sensor B to terminal 2.

Terminals 10 and 11 are the power supply terminals (12 VDC, 80 mA) for Sensors A and B. Do not use these terminals for any other purpose. Also, do not use terminal 10 when the sensor is a contact input or a separate sensor power supply is provided.

The sensor's connection conditions are shown below:



Residual voltage when ON:	3 V max.
Leakage current when OFF:	1.5 mA max.
Max. load current:	Must have switching capacity of 20 mA or higher.
Min. load current:	Must be able to reliably switch a load current of 5 mA or lower.

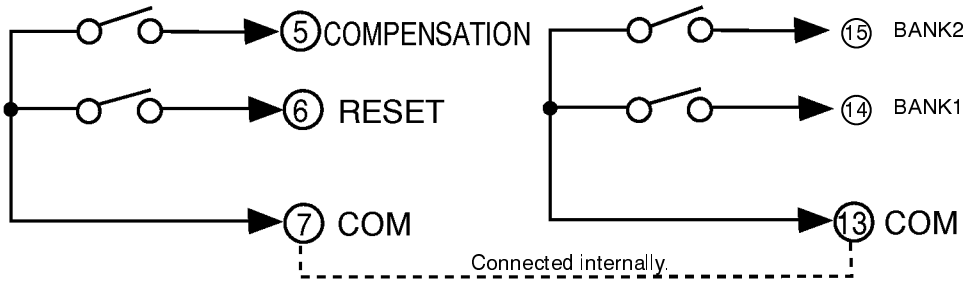
Devices such as photoelectric switches, proximity switches, rotary encoders, and relays can be used as sensors.

Input by No-voltage Contact
If a Unit with NPN input is used, connect INA(1)/INB(2) to GND(11). If a unit with PNP input is used, connect INA(1)/INB(2) to +12V(10).

2-wire Sensors
If a Unit with NPN input is used, +12V(10) is not used. If a unit with PNP input is used, GND(11) is not used.

External Signal Inputs (Compensation Signal, Reset Signal, and Bank Selector Inputs)

Connect the external signal inputs to terminals 5, 6, 7, 13, 14, and 15, as shown in the following diagram.



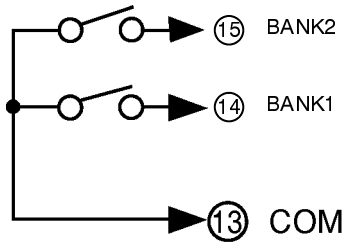
Connect the compensation signal (COMPENSATION) to terminal 5.
Connect the reset signal (RESET) to terminal 6.
Connect the bank selector inputs (BANK1 and BANK2) to terminals 14 and 15.

The input specifications are as follows:

Residual voltage when ON:	3 V max. (open-collector input)
Leakage current when OFF:	1.5 mA max. (open-collector input)
Max. load current:	20 mA or higher
Min. load current:	5 mA or lower

2-3 Using External Input Signals

2-3-1 Bank Selector Signals

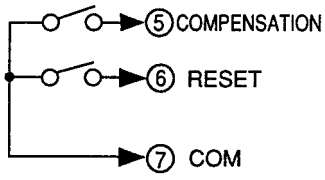


- The BANK1 and BANK2 signals determine which bank's set value, prescale value, and decimal point setting are used during operation, as shown in the following table.

Bank number	Control input	
	BANK1	BANK2
1	OFF	OFF
2	ON	OFF
3	OFF	ON
4	ON	ON

- One of the BANK indicators (1 through 4) on the front of the Unit will be lit to show which bank is currently selected.
- Bank switching minimum signal width: 100 ms

2-3-2 Reset/Compensation Signals

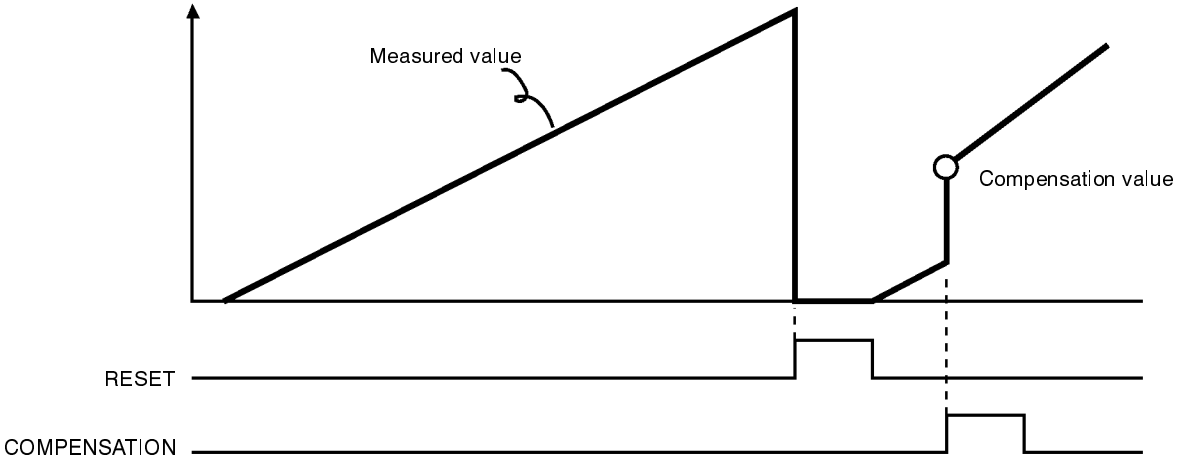


- Resets the present value to zero.
- No counting inputs are accepted when a REST input is ON.
- RESET is lit when a reset input is ON.

Note External reset minimum signal width: 16 ms

- Resets the present counting value to the compensation value at the rising edge of a compensation input. In the compensation value setting parameter, it is possible to set to “Effective during incrementing and decrementing a count” or to “Effective only during incrementing a count.”

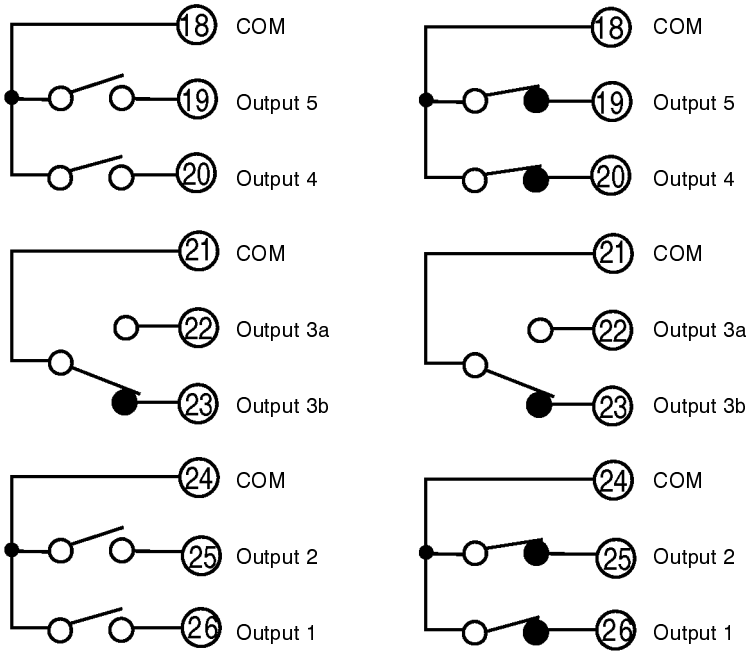
Note External compensation input minimum signal width: 16 ms



2-4 Connecting Outputs

2-4-1 Relay Contact Outputs

Relay contact outputs can be used with the K3TC-□□1□A-C□. The following diagram shows the usage of each terminal.



Unit with 5 Relay Contact Output Board (K3TC-□□1□A-C2)

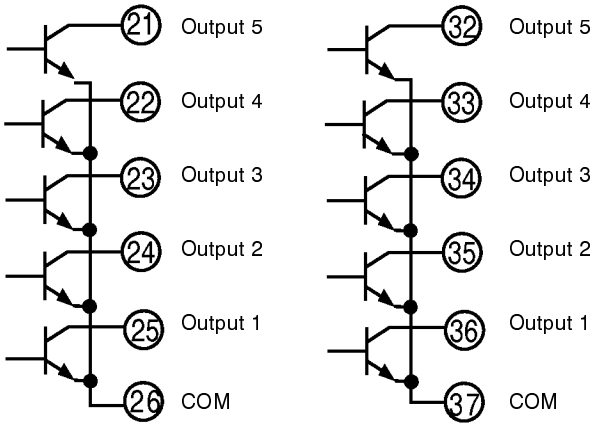
Unit with 5 Relay Contact Output Board (K3TC-□□1□A-C5)

The contact output conditions are as follows:

250 VAC, 5 A (resistive load)	250 VAC, 1.5 A (inductive load)
30 VDC, 5 A (resistive load)	30 VDC, 1.5 A (inductive load)

2-4-2 Transistor Outputs

Transistor outputs can be used with the K3TC-□□1□A-T□, K3TC-□□1□A-B4, and K3TC-□□1□A-L□. The following diagram shows the usage of each terminal.



Unit with Transistor Output Board (K3TC-□□1□A-T□)
Unit with 4 to 20 mA or 1 to 5 V + Transistor Output Board (K3TC-□□1□A-L□)

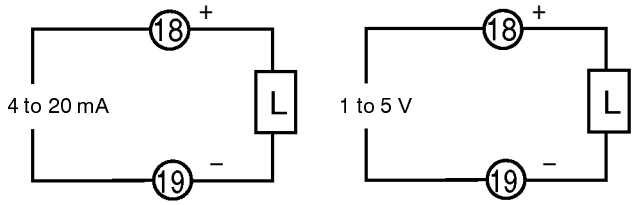
Unit with BCD + 5 Transistor Output Board (K3TC-□□1□A-B4)

The transistor output conditions are as follows:

Max. rated voltage:	24 VDC
Load current:	50 mA
Leakage current when OFF:	100 μA max.

2-4-3 Linear Outputs

Linear outputs can be used with the K3TC-□□1□A-L□. The following diagram shows the usage of each terminal.



Unit with 4 to 20 mA + 5 Transistor Output Board (K3TC-□□1□A-L4)

Unit with 1 to 5 V + 5 Transistor Output Board (K3TC-□□1□A-L5)

The linear output conditions are as follows:

Range	Allowable load resistance	Resolution	Output error
4 to 20 mA	600 Ω max.	4096	±0.5% full scale
1 to 5 V	500 Ω min.	4096	±0.5% full scale

2-4-4 BCD Outputs

BCD outputs can be used with the K3TC-□□1□A-B4. Refer to *Section 6 BCD Outputs* for details on terminal allocation and the interface.

2-4-5 Communications Outputs

RS-232C, RS-485, and RS-422 can be used with the K3TC-□□1□A-S1, K3TC-□□1□A-S5, and K3TC-□□1□A-S6 respectively. For details regarding communications specifications, refer to the *K3TC/K3TH/K3TR/K3TX Communication Output-type Intelligent Signal Processor Operation Manual*.

SECTION 3
Initial Settings

This section explains how to make settings with key inputs. Be sure to read this section before using the Unit for the first time.

3-1 Overview

3-1-1 Heading Symbols

FUNCTION

The following symbols are used for headings in this section.

This symbol precedes an explanation of the parameter's meaning and function.

SETTING

This symbol precedes a description of the settings, setting range, and default value.

PROCEDURE

This symbol precedes an explanation of procedures for parameters that specify operations.

REFERENCE

This symbol precedes a listing of references and related parameters.

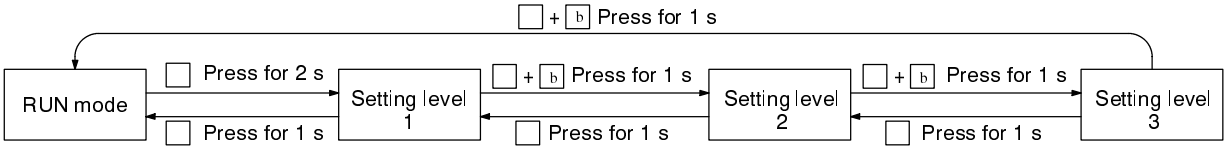
MODELS

This symbol precedes a listing of the models in which this parameter can be used.

3-1-2 Setting Procedure

The Intelligent Signal Processor has three indication levels 1 to 3, in which only specific parameters may be set. The RUN mode is the default and automatically appears when the Unit is powered up. To move to Level 1, it is necessary to press the Level Key for 2 seconds. Once level 1 is reached, it is possible to move forward to the next level by simultaneously pressing the Level and Up Key for 1 second, or move back to the RUN mode by pressing the Level Key for 1 second.

The parameters that are accessible on any individual Unit will vary depending on the Output Board installed. (refer to *Appendix B Parameter Settings Tables*)



During operation, if you are unsure of the present status (such as the level or parameter with which the setting has been made), press the Level Key for one second to go one level lower. Be sure to write the set value again on that level.

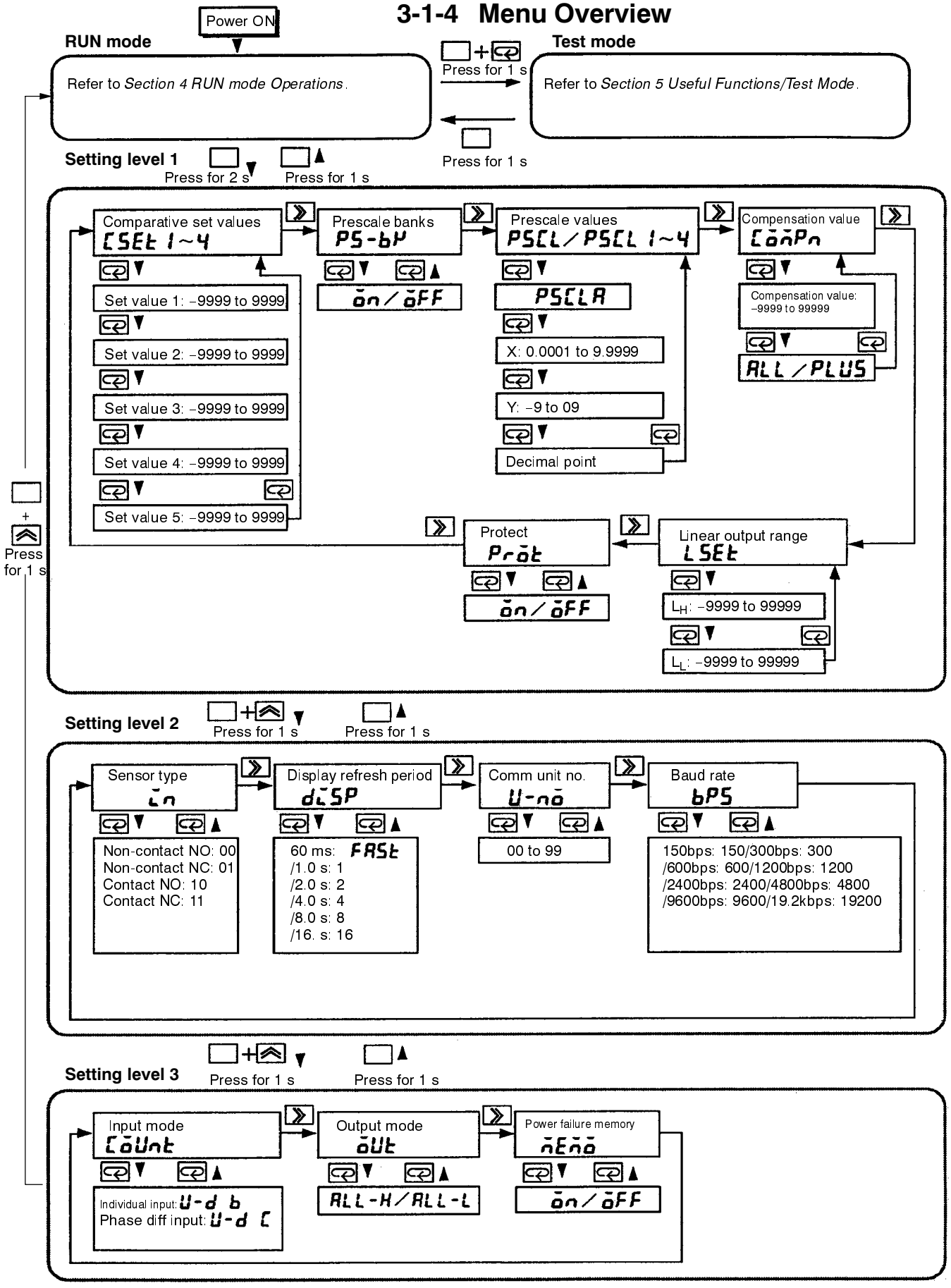
Normal Processor operation is stopped when setting mode is entered.

The setting examples assume the settings are in their factory-set default values. (The initial values are listed in *Appendix B Parameter Settings Tables*.)

3-1-3 List of Available Parameters

Level	Parameter	Display	Output Boards					
			None	C2/5,T1/2	B4	L4/5	S1	S5/6
1	Bank 1 set values	cset1	---	Yes	Yes	Yes	---	Yes
	Bank 2 set values	cset2	---	Yes	Yes	Yes	---	Yes
	Bank 3 set values	cset3	---	Yes	Yes	Yes	---	Yes
	Bank 4 set values	cset4	---	Yes	Yes	Yes	---	Yes
	Prescale bank	pr-bk	Yes	Yes	Yes	Yes	Yes	Yes
	Prescale value	pscl	Yes	Yes	Yes	Yes	Yes	Yes
	Bank 1 prescale value	pscl1	Yes	Yes	Yes	Yes	Yes	Yes
	Bank 2 prescale value	pscl2	Yes	Yes	Yes	Yes	Yes	Yes
	Bank 3 prescale value	pscl3	Yes	Yes	Yes	Yes	Yes	Yes
	Bank 4 prescale value	pscl4	Yes	Yes	Yes	Yes	Yes	Yes
	Compensation value	compn	Yes	Yes	Yes	Yes	Yes	Yes
	Linear output range	lset	---	---	---	Yes	---	---
	Set value protect	prot	---	Yes	Yes	Yes	---	Yes
2	Sensor type	in	Yes	Yes	Yes	Yes	Yes	Yes
	Display refresh period	disp	Yes	Yes	Yes	Yes	Yes	Yes
	Communications unit no.	u-no	---	---	---	---	Yes	Yes
	Baud rate	bps	---	---	---	---	Yes	Yes
3	Input mode	count	Yes	Yes	Yes	Yes	Yes	Yes
	Output mode	out	---	Yes	Yes	Yes	---	Yes
	Power failure memory	memo	Yes	Yes	Yes	Yes	Yes	Yes

3-1-4 Menu Overview



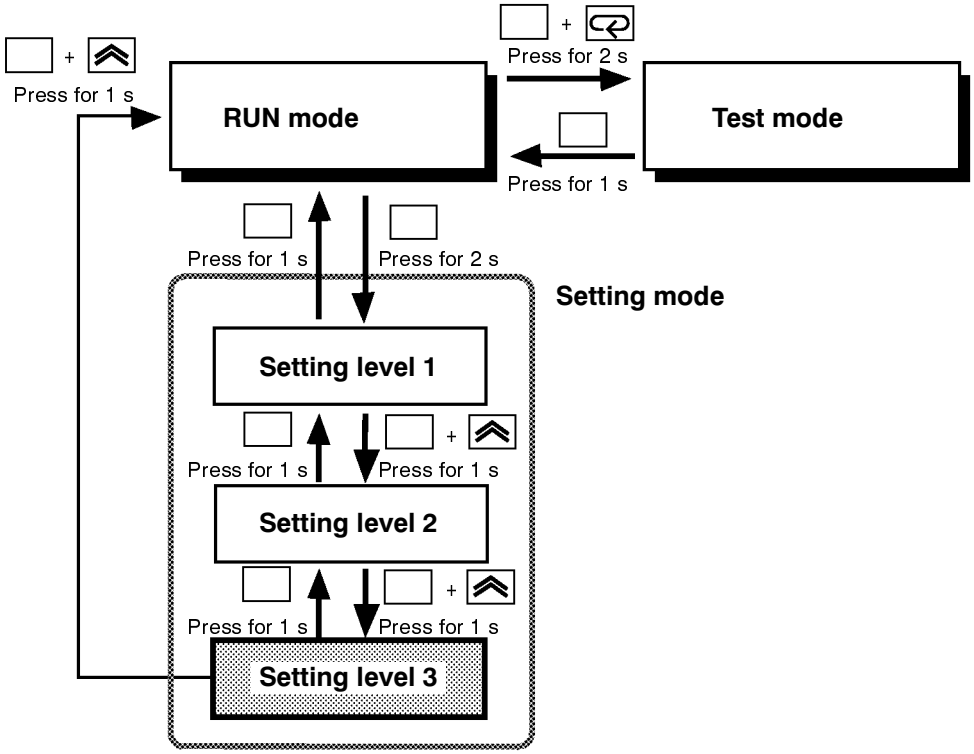
3-2 Setting Level 3

In level 3, parameters such as input mode, output mode, power failure memory can be set.

When this level is entered, count will appear on the present value screen. The Shift Key is used to move from one parameter to the next. When the desired parameter appears on the PV display, depress the Display Key to select that parameter for programming.

The current value of the parameter will then be displayed on the PV display. The Shift and Up Keys are used for changing the setting.

It is necessary to press the Display Key again in order to make the change effective and exit that particular parameter.



INPUT MODE

FUNCTION

- When this setting is changed, all other settings are returned to their initial values.
- Select either individual inputs or phase difference inputs.

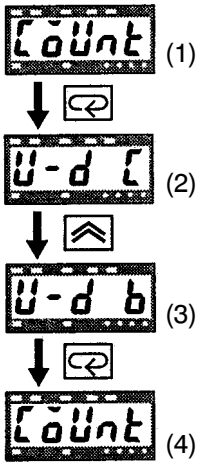
SETTING

Setting	Default
u-d b: Individual inputs u-d c: Phase difference inputs	u-d c

REFERENCE

- Refer to *1-3-1 Input Modes (Counting Modes)* for details on these input modes.

SETTING EXAMPLE



Setting u-d b: Individual Inputs

1, 2, 3...

1. Move to setting level 3. The count: input mode setting will be displayed.
2. Press the Display Key, and the default setting of u-d c: phase difference inputs will be displayed.
3. Use the Up Key to select u-d b: individual inputs. In order to cancel a settings change in progress, press the Level Key for more than one second to move to setting level 2.
4. Press the Display Key to enter the settings and return to the count: input mode setting.

OUTPUT MODE

FUNCTION

- Specifies the output mode for outputs 1 through 5.
- If the ALL-H output mode is selected, outputs 1 to 5 will be ON when the measured value exceeds set values 1 to 5.
- If the ALL-L output mode is selected, outputs 1 to 5 will be ON when the measured value is less than set values 1 to 5.

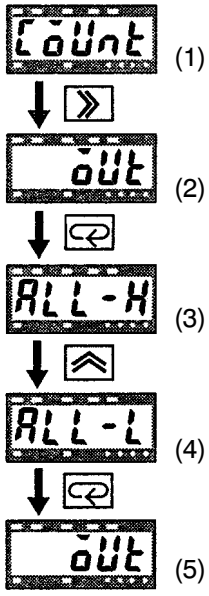
SETTING

Setting		Default
all-h:	Outputs 1 to 5 ON when the PV ≥ SV 1 to 5.	all-h
all-l:	Outputs 1 to 5 ON when the PV ≤ SV 1 to 5.	

REFERENCE

- Refer to *1-3-3 Output Modes* for details on these output modes.

SETTING EXAMPLE



Setting all-l

1, 2, 3...

1. Move to setting level 3. The count: input mode setting will be displayed.
2. Press the Shift Key to display the out: output mode setting.
3. Press the Display Key, and the default setting of all-h will be displayed.
4. Use the Up Key to select all-l. In order to cancel a settings change in progress, press the Level Key for more than one second to move to setting level 2.
5. Press the Display Key to enter the settings and return to the out: output mode setting.

POWER FAILURE MEMORY

FUNCTION

SETTING

- The count value will be stored in memory when the power is interrupted if this parameter is set to ON.

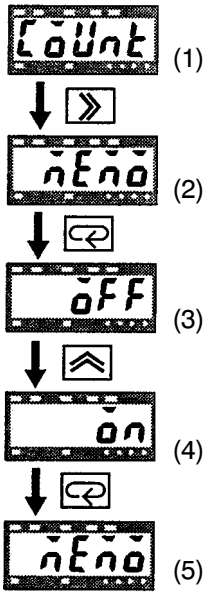
Setting		Default
on:	Stored	off
off:	Not stored	

SETTING EXAMPLE

Setting on.

1, 2, 3...

1. Move to setting level 3. The count: input mode setting will be displayed.
2. Press the Shift Key several times to display the memo: power failure memory setting.
3. Press the Display Key, and the default setting of off will be displayed.
4. Use the Up Key to select on. In order to cancel a settings change in progress, press the Level Key for more than one second to move to setting level 2.
5. Press the Display Key to enter the settings and return to the memo: power failure memory setting.



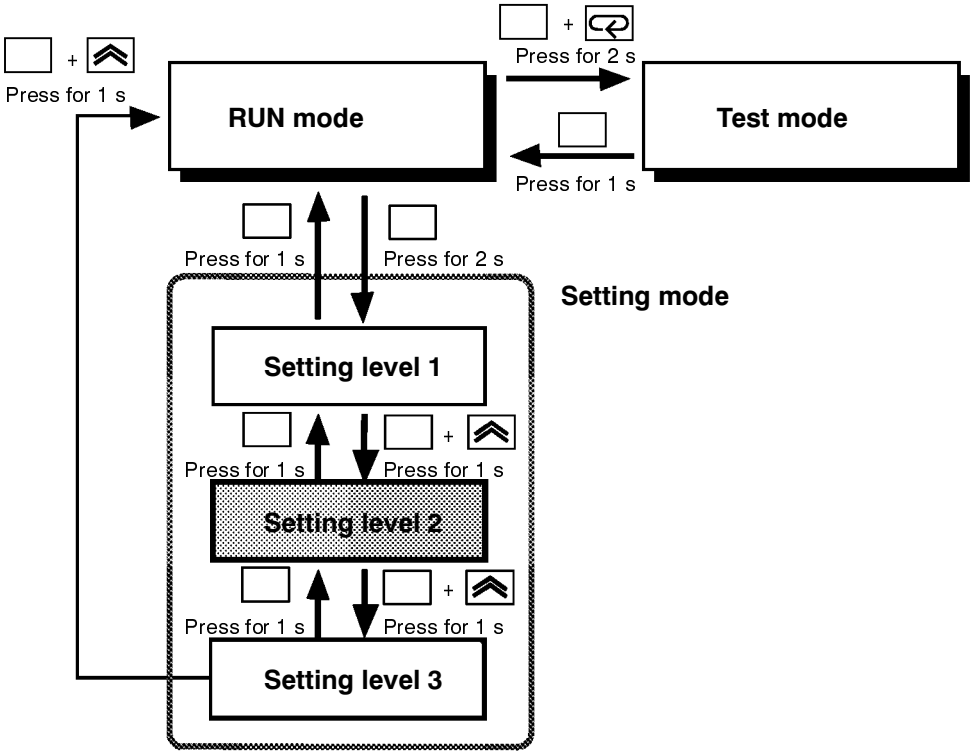
3-3 Setting Level 2

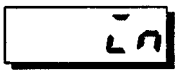
In level 2, parameters such as sensor type, display refresh period, and baud rate can be set.

When this level is entered, in: sensor setting will appear on the present value screen. The Shift Key is used to move from one parameter to the next. When the desired parameter appears on the PV display, press the Display Key to select that parameter for programming.

The current value of the parameter will then be displayed on the PV display. The Shift and Up Keys are used for changing the setting.

It is necessary to press the Display Key again in order to make the change effective and exit that particular parameter.





SENSOR TYPE

FUNCTION

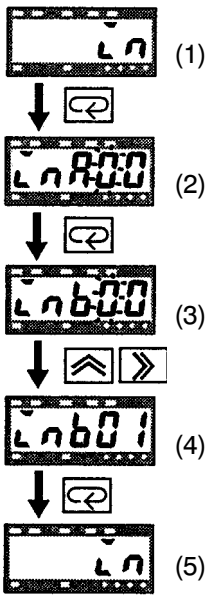
- Specifies the type of sensors connected to Inputs A and B.
- The sensor type parameter can specify the four kinds of sensors possible with these two characteristics: non-contact/contact and NO/NC. (NO: normally open; NC: normally closed.)

SETTING

Setting		Default
00:	Non-contact, NO	00
01:	Non-contact, NC	
10:	Contact, NO	
11:	Contact, NC	

SETTING EXAMPLE

In this example, Input A is set to non-contact, NO: 00 (the default setting) and Input B is set to non-contact, NC: 01.



1, 2, 3...

1. Move to setting level 2. The in: sensor setting will be displayed.
2. Press the Display Key, and ina00 (Input A sensor type = 00) will be displayed. The second digit from the right of 00 will be flashing.
3. In this example, 00 is the desired setting so select by pressing the Display Key. The display will show inb00 (Input B sensor type = 00) and the second digit from the right of 00 will be flashing.
4. Use the Up and Shift Keys to change the setting to 01.
5. Press the Display Key to enter "01" and return to the in: sensor setting.

DISPLAY REFRESH PERIOD

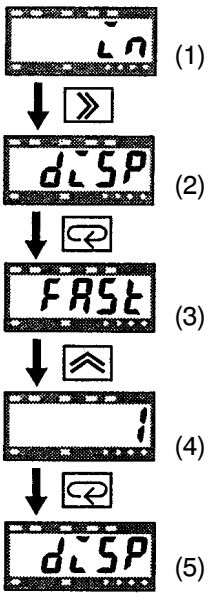
FUNCTION

- Specifies the interval between measurement value display refreshes. If the display flickers and is difficult to read, it can be made easier to read by slowing down the speed at which it is refreshed.

SETTING

Setting		Default
fast:	Approx. 60 ms	fast
1:	1 s	
2:	2 s	
4:	4 s	
8:	8 s	
16:	16 s	

SETTING EXAMPLE

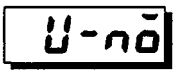


In this example, the display is set for refreshing every 1 s.

1, 2, 3...

1. Move to setting level 2. The in: sensor setting will be displayed.
2. Press the Shift Key to display the disp: display refresh period setting.
3. Press the Display Key, and fast: 60 ms will be displayed.
4. Press the Up Key to change the setting to 1.
5. Press the Display Key to enter "1" and return to the disp: display refresh period setting.

Even when a slow data display speed is selected, the measurement sampling period does not change. Comparative outputs or BCD outputs are changed in synchronization with the sampling cycle.



COMMUNICATIONS UNIT NO. (K3TC-NB1□A-S□ Only)

BAUD RATE (K3TC-NB1□A-S□ Only)

FUNCTION

- The communications unit No. parameter assigns a unit number to each Processor to allow the host device to distinguish between them when communicating.
- The speed for serial communications with the host device can be set with the baud rate parameter.
- When more than one Unit is connected to the host computer, set a unique communications unit no. for each Unit and enter each number individually.
- Set the baud rate to the same baud rate as the host computer.

SETTING

Communications unit No. setting	Default
00 to 99	00

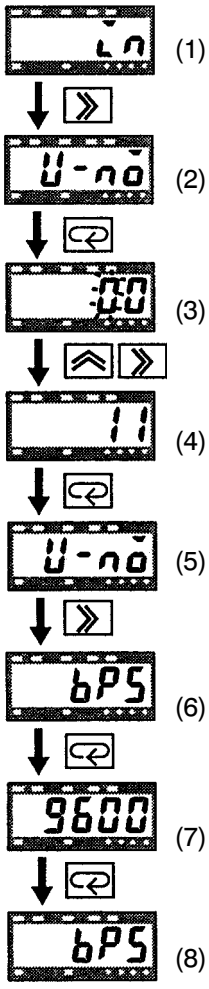
Baud rate setting	Default
150: 150 bps, 300: 300 bps, 600: 600 bps, 1200: 1,200 bps, 2400: 2,400 bps, 4800: 4,800 bps, 9600: 9,600 bps, 19200: 19,200 bps	9600

SETTING EXAMPLE

In this example, the unit number is set to 11 and the baud rate is set to 9,600 bps.

1, 2, 3...

1. Move to setting level 2. The in: sensor setting will be displayed.
2. Press the Shift Key several times to display the u-no: communications unit no. setting.
3. Press the Display Key and display the default setting of 00. The second digit from the right will flash.
4. Use the Up and Shift Keys to change the setting to 11.
5. Press the Display Key to enter the new setting and return to the u-no: communications unit no. display.
6. Press the Shift Key to switch to the bps: baud rate setting display.
7. Press the Display Key and display the default setting of 9600.
8. Press the Display Key to return to the bps: baud rate setting display.



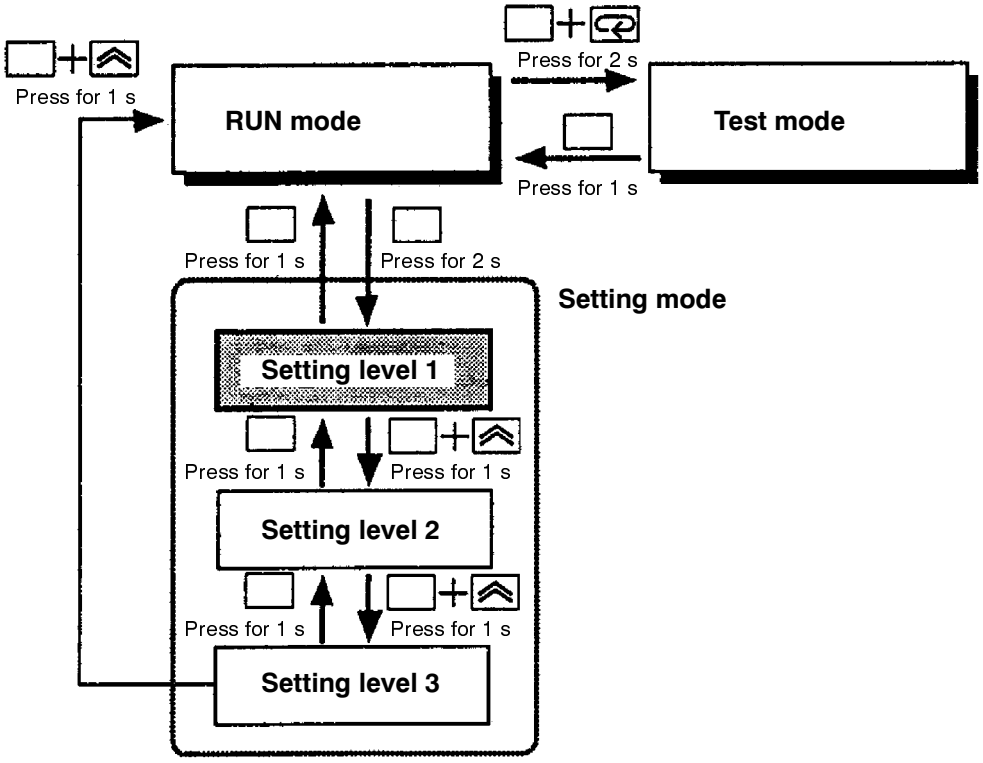
3-4 Setting Level 1

In level 1, parameters such as bank comparative set values, prescale value bank, prescale values, compensation, linear output range, and protect function can be set.

When this level is entered, cset1: Bank 1 comparative set value setting count will appear on the present value screen. The Shift Key is used to move from one parameter to the next. When the desired parameter appears on the PV display, press the Display Key to select that parameter for programming.

The current value of the parameter will then be displayed on the PV display. The Shift and Up Keys are used for changing the setting.

It is necessary to press the Display Key again in order to make the change effective and exit that particular parameter.



BANK 1 COMPARATIVE SET VALUE

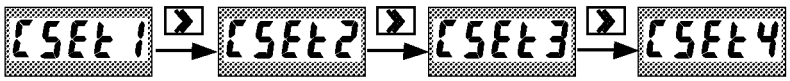
BANK 2 COMPARATIVE SET VALUE

BANK 3 COMPARATIVE SET VALUE

BANK 4 COMPARATIVE SET VALUE

FUNCTION

- One bank out of banks 1 to 4 can be selected by external signal inputs.
- Sets set values OUT 1 to 5 for each bank. The settings can be made by key input or by using the comparative value teaching function which can enter actual inputs as set values.
- Press the Shift Key to move to the desired bank to be set and the Display Key to scroll through the settings in that bank, as shown in the following diagram.



SETTING

Setting range	Default
Set values OUT 1: -9999 to 99999 Set values OUT 2: -9999 to 99999 Set values OUT 3: -9999 to 99999 Set values OUT 4: -9999 to 99999 Set values OUT 5: -9999 to 99999	00000

REFERENCE

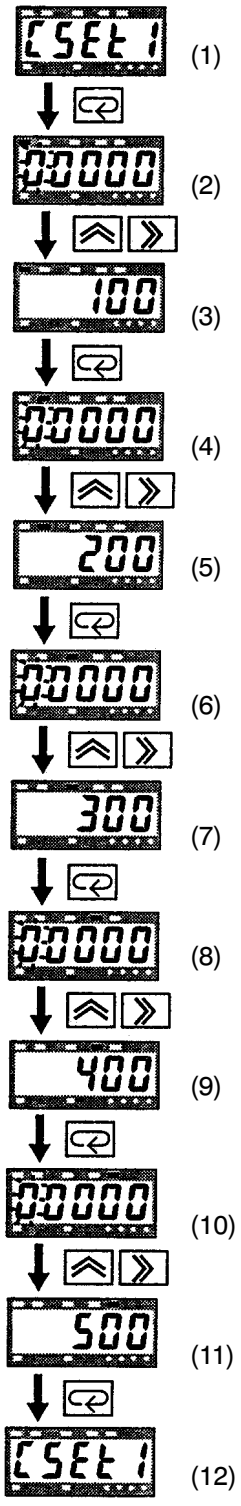
- Related Information:

  Refer to page 44 for more details on the comparative set values. Refer to *5-1 Teaching* for more details on the teaching function.
- Related Settings:

  Refer to page 34 for details on setting prescale values. Refer to page 16 for details on external signal inputs and page 47 for details on prescale banks.

SETTING EXAMPLE

In this example, comparative set values (OUT 1 through 5) in bank 1 are set to 100, 200, 300, 400, and 500. Use the same procedure to set the set values in banks 2 through 4.



1, 2, 3...

1. Move to setting level 1. The cset1: bank 1 comparative set value setting will be displayed.
2. Press the Display Key to display comparative set value 1 (OUT1). The OUT1 indicator will light and the leftmost digit will flash.
3. Use the Up and Shift Keys to change the set value to 00100.
4. Press the Display Key to enter “00100” and display comparative set value 2 (OUT2). The OUT2 indicator will light and the leftmost digit will flash.
5. Use the Up and Shift Keys to change the set value to 00200.
6. Press the Display Key to enter “00200” and display comparative set value 3 (OUT3). The OUT3 indicator will light and the leftmost digit will flash.
7. Use the Up and Shift Keys to change the set value to 00300.
8. Press the Display Key to enter “00300” and display comparative set value 4 (OUT4). The OUT4 indicator will light and the leftmost digit will flash.
9. Use the Up and Shift Keys to change the set value to 00400.
10. Press the Display Key to enter “00400” and display comparative set value 5 (OUT5). The OUT5 indicator will light and the leftmost digit will flash.
11. Use the Up and Shift Keys to change the set value to 00500.
12. Press the Display Key to enter “00500” and return to the cset1: bank 1 comparative set value setting display. All input operations are completed.

PS-bY

PRESCALE VALUE BANK

FUNCTION

- Enables a maximum of four prescale bank functions. A prescale value can be set for each of prescale banks 1 through 4. The following table shows the correspondences between bank inputs and the comparative set values and prescale values when this parameter is ON.
- When this parameter is ON, their own prescale value and decimal point location setting can be set for each of prescale banks 1 through 4.
- When this parameter is OFF, banks 1 through 4 share a single prescale value and decimal point location setting.

Bank No.	Control inputs		Comparative set values	Prescale values
	Bank 1	Bank 2		
1	OFF	OFF	Bank 1 value cset1	Bank 1 value pscl1
2	ON	OFF	Bank 2 value cset2	Bank 2 value pscl2
3	OFF	ON	Bank 3 value cset3	Bank 3 value pscl3
4	ON	ON	Bank 4 value cset4	Bank 4 value pscl4

Prescale bank 1 corresponds to set value bank 1, prescale bank 2 corresponds to set value bank 2, etc.

SETTING

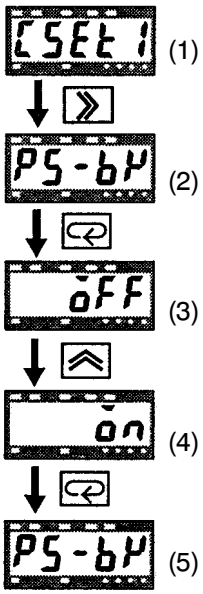
Setting		Default
on:	Prescale bank function enabled.	off
off:	Prescale bank function disabled.	

REFERENCE

- Related Settings:

  Refer to page 36 for details on setting the prescale values and the location of the decimal point. Refer to page 32 for details on banks 1 to 4 comparative set values.

SETTING EXAMPLE



In this example, the prescale bank function is enabled (i.e., set to ON).

1, 2, 3...

1. Move to setting level 1. The cset1: Bank 1 comparative set values setting will be displayed.
2. Press the Shift Key several times to display the ps-bk: prescale bank setting.
3. Press the Display Key, and the default setting off will be displayed.
4. Use the Up Key to select on.
5. Press the Display Key to enter the setting and return to the ps-bk: prescale bank setting display.

PRESCALE VALUE

BANK 1 PRESCALE VALUE

BANK 2 PRESCALE VALUE

BANK 3 PRESCALE VALUE

BANK 4 PRESCALE VALUE

FUNCTION

- This parameter allows a pulse to be displayed as a value other than 1, for the purpose of measuring relevant engineering units.
- The prescale values are set with a mantissa X and an exponent Y, i.e., $X \times 10^{Y}$. For example, a prescale value of 0.02 would be set with X=2 and Y=–2 (2×10^{-2}).
- When the prescale bank parameter has been set to off, the pscl setting will be displayed and a single prescale value and the decimal point location can be set.
- When the prescale bank parameter has been set to on, the pscl1 through pscl4 settings will be displayed and four kinds of prescale values and decimal point locations can be set for each bank.

- Use the Shift Key to change the location of the decimal point. The location is shifted right each time the Shift Key is pressed.

Prescale values can be set by key input or by using the comparative set value teaching function which can enter actual inputs as set values.

SETTING

	Prescale Value Settings	Default
X	0.0001 to 9.9999	1.0000
Y	-9 to 09	00

Decimal Point Settings	Default
00000 to 0000.0	00000

REFERENCE

- Related Information:

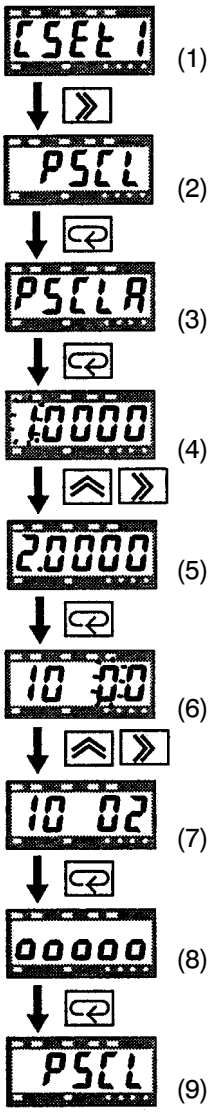
  Refer to *5-1 Teaching* for more details on the prescale values.

• Related Settings:

Refer to page 34 for details on setting the prescale bank parameter.
Refer to page 32 for details on setting the comparative set values for banks 1 through 4.

SETTING EXAMPLE

In this example, the prescale bank parameter has been set to off and the prescale value is set to 200.



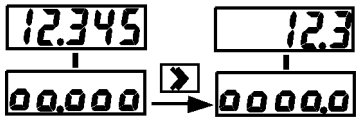
1, 2, 3...

1. Move to setting level 1. The cset1: bank 1 comparative set values setting will be displayed.
2. Press the Shift Key to display the pscl: prescale value setting.
3. Press the Display Key, and pscla will be displayed.
4. Press the Display Key again to display the mantissa, X. The leftmost digit will flash.
5. Use the Up and Shift Keys to change the mantissa to 2.0000.
6. Press the Display Key to enter that setting and to display the default value 00 for the exponent, Y. The second digit from the right will flash. That digit can only be set to 0 or – (minus).
7. Use the Up and Shift Keys to change the exponent to 02.
8. Press the Display Key, and the decimal point setting 00000 will be displayed.
9. Press the Display Key again to enter the prescale value and return to the pscl: prescale value setting display. This completes the input procedure.

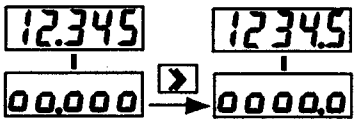
Note Use the same procedure to set prescale values 1 through 4 when the prescale bank parameter has been set to ON.

Effect of the Decimal Point Location Setting

The decimal point positions of measured values displayed in RUN mode are set by the prescale value setting parameter. In RUN mode, this setting expresses how many digits are displayed beyond the decimal point when displaying the measured value, maximum value, or minimum value.



In setting mode, this setting specifies the location of the decimal point when displaying the comparative set value or minimum/maximum values in the linear output range.



COMPENSATION VALUE

FUNCTION

- When the COMPENSATION input is ON, the display value is forcibly reset to the compensation value set by this parameter. The count begins again from the compensation value that is set.
- The conditions can be set for when the compensation function is to be enabled. The compensation function is always enabled (i.e., enabled during both incrementation and decrementation) when set to all; it is enabled only during incrementation when set to plus.

SETTING

Settings		Default
Compensation value	-9999 to 99999	00000
Condition setting	all: Incrementing and decrementing plus: Incrementing only	all

REFERENCE

- Related Information:

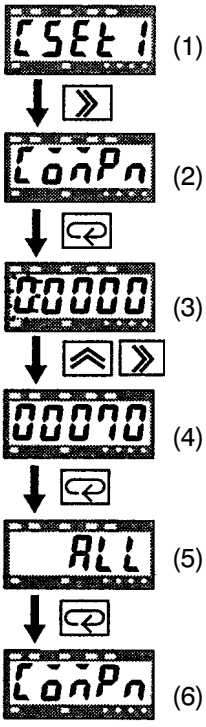
  Refer to *1-3-3 Output Modes* or *2-3-2 Reset/Compensation Signals* for an example showing usage of the compensation value. Refer to *2-3 Using External Input Signals* for instructions on using external input signals.

SETTING EXAMPLE

In this example, the compensation value is set to 70. The condition setting is set to ALL (incrementing and decrementing).

1, 2, 3...

1. Move to setting level 1. The cset1: bank 1 comparative set values setting will be displayed.
2. Press the Shift Key several times to display the compn: compensation value setting.
3. Press the Display Key, and the decimal point setting 00000 will be displayed. The leftmost digit will flash.
4. Use the Up and Shift Keys to change the setting to 70.
5. Press the Display Key to enter that setting, and default setting of ALL will be displayed.
6. Press the Display Key again to enter that setting and return to the compn: compensation value setting display. This completes the input procedure.

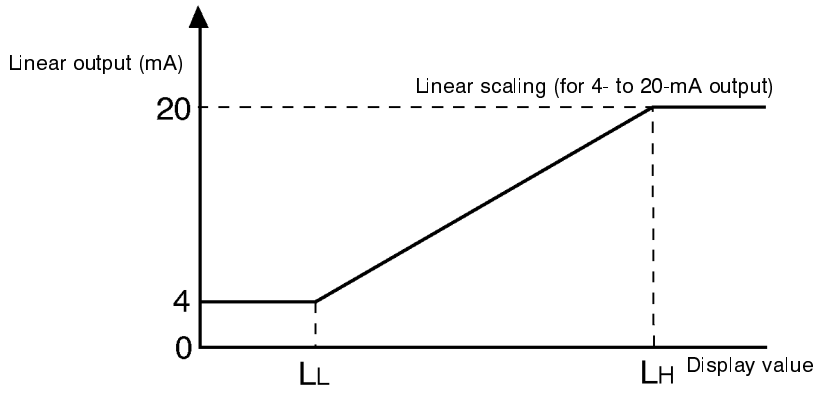


LSEt

LINEAR OUTPUT RANGE (K3TC-□B1□A-L□ Only)

FUNCTION

- Linear voltage or current is output in proportion to changes in the display value.
- These parameters set the linear output's maximum value (L_H) and minimum value (L_L).
- The relationship between the linear output and display value is as follows:



- Do not set L_L=L_H; otherwise, it is assumed that L_L + 1 digit = L_H.
- The location of the decimal point is determined by the decimal point location parameter in the prescale value setting, but the decimal point isn't shown when L_H and L_L are being set.

SETTING

Settings	Default
-9999 to 99999	L_H = 99999 L_L = -9999

REFERENCE

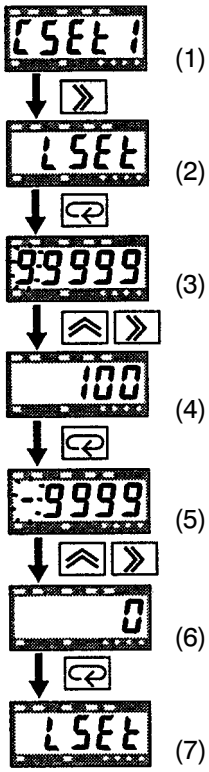
- Related Information:

  Refer to *5-1 Teaching* for details on the teaching function.
- Related Settings:

  Refer to page 34 for details on setting the prescale bank parameter.

SETTING EXAMPLE

The following example shows a case where the output value is set to 4 to 20 mA for the display value of 0 to 100. L_H (the display value corresponding to the maximum output) is set to 100 and L_L (the display value corresponding to the minimum output) is set to 0.



1, 2, 3...

1. Move to setting level 1. The cset1: bank 1 comparative set values setting will be displayed.
2. Press the Shift Key several times to display the lset: linear output range setting.
3. Press the Display Key, and the initial value of 99999 for L_H will be displayed. The leftmost digit will flash.
4. Use the Up and Shift Keys to change the setting to 100.
5. Press the Display Key to enter that setting, and the initial value of -9999 for L_L will be displayed. The leftmost digit will flash.
6. Use the Up and Shift Keys to change the setting to 0.
7. Press the Display Key to enter that setting and return to the lset: linear output range setting display. This completes the input procedure.

PROTECT FUNCTION

FUNCTION

- This parameter can be set so that comparative set values cannot be changed in RUN mode. This parameter must be set to OFF in order to change comparative set values in RUN mode.

SETTING

Settings		Default
on:	Alternation possible	off
off:	Alternation prohibited	

REFERENCE

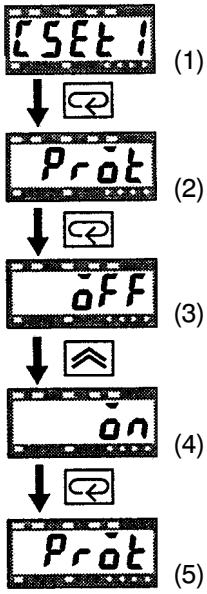
- Related Information:

  Refer *Checking Operation* in *Section 4* for details on changing comparative set values in RUN mode.

- Related Settings:

  Refer to page 32 for details on setting the comparative set values for banks 1 through 4.

SETTING EXAMPLE



In this example, the protect function is turned ON.

1, 2, 3...

1. Move to setting level 1. The cset1: bank 1 comparative set values setting will be displayed.
2. Press the Shift Key several times to display the prot: protect setting.
3. Press the Display Key, and the initial value of off will be displayed.
4. Use the Up Key to select on.
5. Press the Display Key to enter that setting and return to the prot: protect setting display. This completes the input procedure.

SECTION 4
RUN Mode Operations

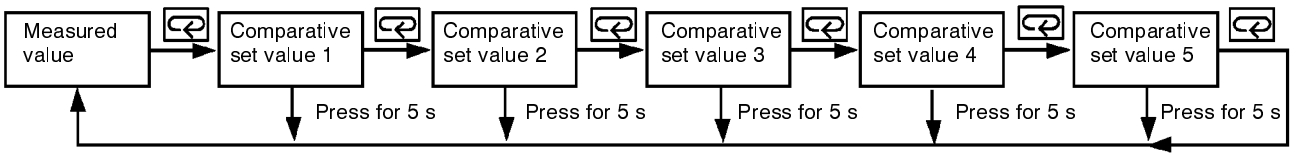
This section describes the operations that can be performed in RUN mode

Checking Operation

Comparative Set Values

Checking Comparative Set Values

- The measured value and the set values 1 through 5 can be monitored by pressing the Display Key in order, as shown in the following diagram. The SP indicator on the front of the Unit will be lit when comparative set values are being displayed.
- The display will automatically show the current measured value again if no key is pressed for five seconds when a comparative set value is displayed.

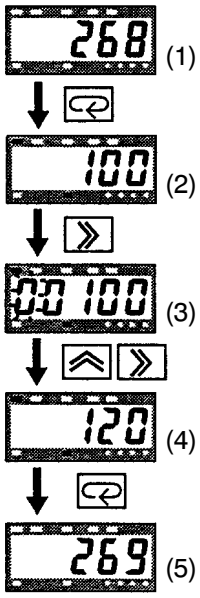


Changing Comparative Set Values

- Comparative set values can be changed in RUN mode if the protect function is set to OFF.
- When the comparative set value is displayed, the Shift or Up Key can be pressed to display all of the set value's digits and allow the set value to be changed. (When protect setting parameter is set to OFF.)
- Use the Shift and Up Keys to change the set value just as they are used in setting mode. Two seconds after the set value has been changed the display will show the comparative value and the new set value will be written to memory. At this point, press the Shift or Up Key to change the set value again.

SETTING EXAMPLE

In this example, comparative set value 1 is changed from 100 to 120 (with the protect setting parameter set to OFF).



1, 2, 3...

1. Make sure that the K3TC is set to the RUN mode.
2. Press the Display Key to display comparative set value 1 (100 in this case). The OUT1 and SP indicators will light.
3. Press the Shift Key to display all of the digits of set value 1 and allow it to be changed. The leftmost digit will flash.
4. Use the Up and Shift Keys to change the set value from 100 to 120.
5. Each time the Display Key is pressed, the display will show the next comparative set value (2 through 5) and the OUT2 through OUT5 and SP indicators will light. Then the display will revert to the current measured value and the SP indicator will turn off.

   If the Display Key is not pressed within 5 seconds, the display will show the measured value again.

SECTION 5
Useful Functions

This section describes the teaching function and test mode.

5-1 Teaching

Comparative set values, prescale values, and the linear output range can be set by an actual input signal. The comparative set values and prescale values are used as the values in the currently selected bank.

5-1-1 Comparative Set Values

- Instead of inputting the comparative set values manually with key inputs, pressing the DATA/TEACH Key will set that value so that it is equal to the current input signal.
- The teaching procedure is as follows:

1, 2, 3...

1. If the Data/Teach Key is pressed when setting the comparative set value, the measurement will begin and the comparative set value indicator will flash.
2. When the Data/Teach Key is pressed again the measured value will be input as the comparative set value and the comparative set value indicator will be lit. This completes setting the set value with the teaching function.

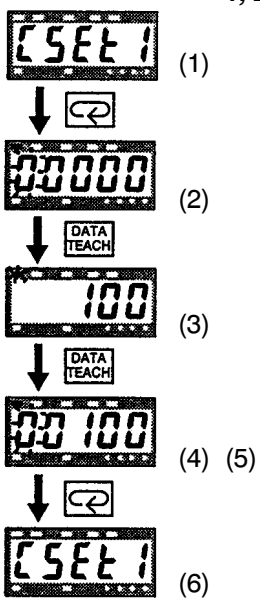
- When the teaching operation is completed, the Unit will return to the normal setting display, so the first digit will be flashing and the set value can be changed using the Up and Shift Keys. If the set value is acceptable, press the Display Key to accept the set value.

SETTING EXAMPLE

In this example, bank 1 set value is set using the teaching function.

1, 2, 3...

1. Select bank 1 set value setting.
2. Press the Display Key to display set value for OUT1. The OUT1 indicator will light.
3. If the Data/Teach Key is pressed at this point, measurement will begin, the measured value will be displayed, and the OUT1 indicator will flash.
4. When the Data/Teach Key is pressed again, measurement will stop and the prior measured value will be used for set value 1. The OUT1 indicator will return to its lit status.
5. Press the Display Key to return to the comparative set value 1 setting.
6. Press the Display Key several times to return to the cset1: comparative set value 1 setting. This completes the input procedure.



5-1-2 Prescale Values

- Instead of inputting the prescale value manually with key inputs, the teaching function can be used to set the prescale value to the current measured value. The user just presses the Data/Teach Key during measurement to read the measured value which is then converted to the prescale value.
- The prescale value is automatically calculated from the measured value read during teaching and the desired value input by the user (the desired value after prescale conversion); this prescale value is set in the X mantissa and Y exponent format. For example, when the measured value is 50, the prescale value that yields the desired value of 1 is calculated as follows:

$$\text{Prescale value} = \frac{\text{desired value}}{\text{measured value}} = \frac{1}{50} = 0.02$$

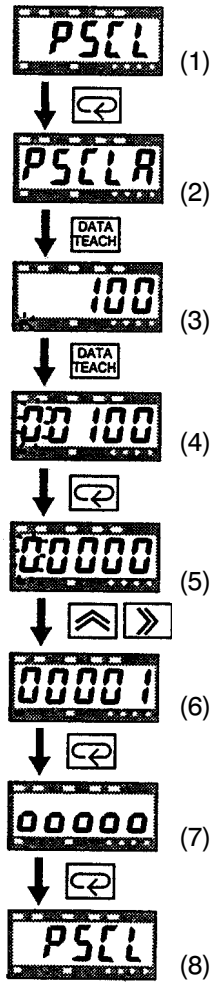
  In this case, the pscl: prescale value is set as X=2 and Y=–2 (2×10^{-2}).
- The teaching procedure is as follows:

1, 2, 3...

1. Measurement will begin if the Data/Teach Key is pressed at the pscla display.
2. When the Data/Teach Key is pressed again, measurement will stop and the prior measured value will be read as the reference value. If the measured value isn't acceptable, press the Data/Teach Key again to redo the measurement or use the Up and Shift Keys to change the value.
3. Press the Display Key to display 00000. Use the Up and Shift Keys to change the desired value as needed.
4. Press the Display Key again to set the prescale value automatically.

SETTING EXAMPLE

In this example, the teaching function is used to set a prescale value that converts the count value of 100 to the desired value of 1.



1, 2, 3...

1. Select the pscl: prescale value setting.
2. Press the Display Key to display pscla.
3. Measurement will begin if the Data/Teach Key is pressed.
4. When the Data/Teach Key is pressed again, measurement will stop and the prior measured value will be read.
5. Press the Display Key to display 00000.
6. Use the Up and Shift Keys to change the desired value to 00001.
7. Press the Display Key to verify that there is no decimal point.
8. Press the Display Key to enter the pscl: prescale value and return to the prescale value setting. This completes the input procedure.

5-1-3 Linear Output Range (K3TC-NB1□A-L□ Only)

- Instead of inputting the minimum (L_L) and maximum (L_H) values of the linear output range manually with key inputs, the teaching function can be used to set an actual measured value as a set value.
- The teaching procedure is as follows:

1, 2, 3...

1. Measurement will begin if the Data/Teach Key is pressed when setting the maximum or minimum value of the linear output range.
2. When the Data/Teach Key is pressed again, the prior measured value will be read as the linear output range's maximum or minimum value. This completes teaching operation.

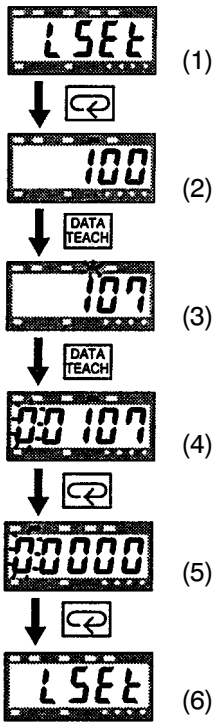
- When the teaching operation is completed, the Unit will return to the normal setting display, so the first digit will be flashing and the setting can be changed using the Up and Shift Keys. If the setting is acceptable, press the Display Key to accept it.

SETTING EXAMPLE

In this example, the teaching function is used to set the linear output range's maximum value.

1, 2, 3...

1. Select the lset: linear output range setting.
2. Press the Display Key to display the maximum value of the range. (The OUT4 indicator will light.)
3. Measurement will begin if the Data/Teach Key is pressed. (The OUT4 indicator will flash.)
4. When the Data/Teach Key is pressed again, measurement will stop and the prior measured value will be read as the maximum value of the range.
5. Press the Display Key to display the minimum value of the range. (The OUT2 indicator will light.)
6. Press the Display Key to return to the lset: linear output range setting. This completes the input procedure.

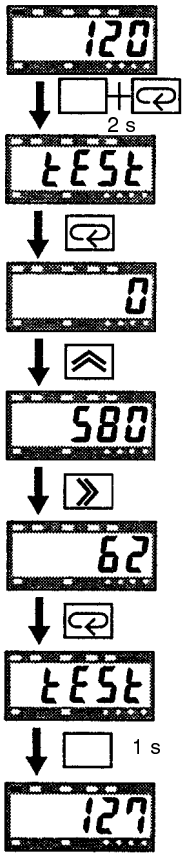


5-2 Test Mode

- By utilizing this function, inputs can be simulated and the actual comparative outputs activated.

Note During the test, an actual corresponding output signal is issued even if a simulated input signal is applied. If output devices are connected, make sure that no damage or problems will occur due to the output levels before proceeding with the test.

SETTING EXAMPLE



The test procedure is as follows. In this example, the out: output mode has been set to all-h.

1, 2, 3...

1. With the Unit in RUN mode, press the Level and Display Keys simultaneously for two seconds or more to move to test: test mode.
2. Press the Display Key to display the value of the simulated input (0).
3. Press the Up Key to increase the value of the simulated input. Output indicators OUT1 through OUT5 will light as the value of the simulated input exceeds comparative set values 1 through 5.
4. Press the Shift Key to decrease the value of the simulated input. Output indicators OUT1 through OUT5 will go off as the value of the simulated input falls below comparative set values 1 through 5.
5. After completing the test, press the Display Key to return to the test: test mode display.
6. Press the Level Key for one second to return to RUN mode.

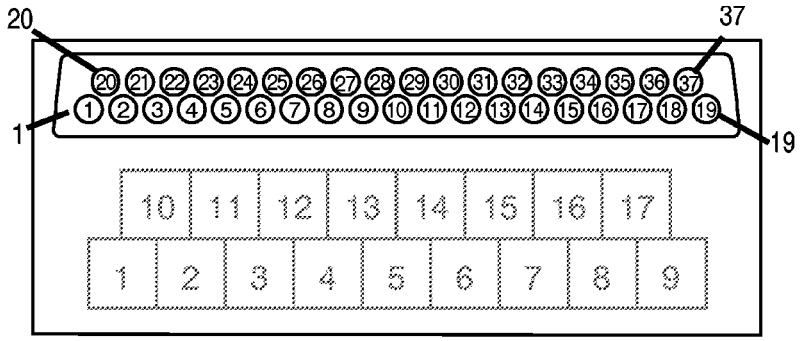
Note When changing the value of the simulated input, the display value will change consecutively while the Up or Shift Key is held down.

SECTION 6
BCD Outputs

This section explains how to use the outputs of the K3TC-□B1□A-B4 (BCD outputs).

6-1 Interface Specifications

Terminal Numbers



Pin	Signal name	I/O	Usage
1	COM	---	GND:VO (See note 1.)
2	RD1-1	Output	1: Read data 10^0 digit
3	RD1-2	Output	2: Read data 10^0 digit
4	RD1-4	Output	4: Read data 10^0 digit
5	RD1-8	Output	8: Read data 10^0 digit
6	RD2-1	Output	1: Read data 10^1 digit
7	RD2-2	Output	2: Read data 10^1 digit
8	RD2-4	Output	4: Read data 10^1 digit
9	RD2-8	Output	8: Read data 10^1 digit
10	RD3-1	Output	1: Read data 10^2 digit
11	RD3-2	Output	2: Read data 10^2 digit
12	RD3-4	Output	4: Read data 10^2 digit
13	RD3-8	Output	8: Read data 10^2 digit
14	RD4-1	Output	1: Read data 10^3 digit
15	RD4-2	Output	2: Read data 10^3 digit
16	RD4-4	Output	4: Read data 10^3 digit
17	RD4-8	Output	8: Read data 10^3 digit
18	RD5-1	Output	1: Read data 10^4 digit
19	RD5-2	Output	2: Read data 10^4 digit
20	RD5-4	Output	4: Read data 10^4 digit
21	RD5-8	Output	8: Read data 10^4 digit
22	OVER	Output	Data overflow
23	D - V	Output	Data valid signal
24	RUN	Output	Run signal
25	COM	---	GND:VO (See note 1.)
26	REQ	Input	Measurement value output request
27	NC	---	Not used.
28	NC	---	Not used.
29	COMPENSATION	Input	Compensation input
30	RESET	Input	Reset input
31	POL	Output	Data polarity signal
32	OUT5	Output	Output 5 (See note 2.)
33	OUT4	Output	Output 4 (See note 2.)
34	OUT3	Output	Output 3 (See note 2.)
35	OUT2	Output	Output 2 (See note 2.)
36	OUT1	Output	Output 1 (See note 2.)
37	COM	Output	GND:VO (See note 1.)

Note 1. Pins 1, 25, and 37 share the same common.

2. Refer to *2-3 Connecting Outputs* for details on outputs 1 through 5.

Applicable Connectors

• The accessory connector is made up of the following:

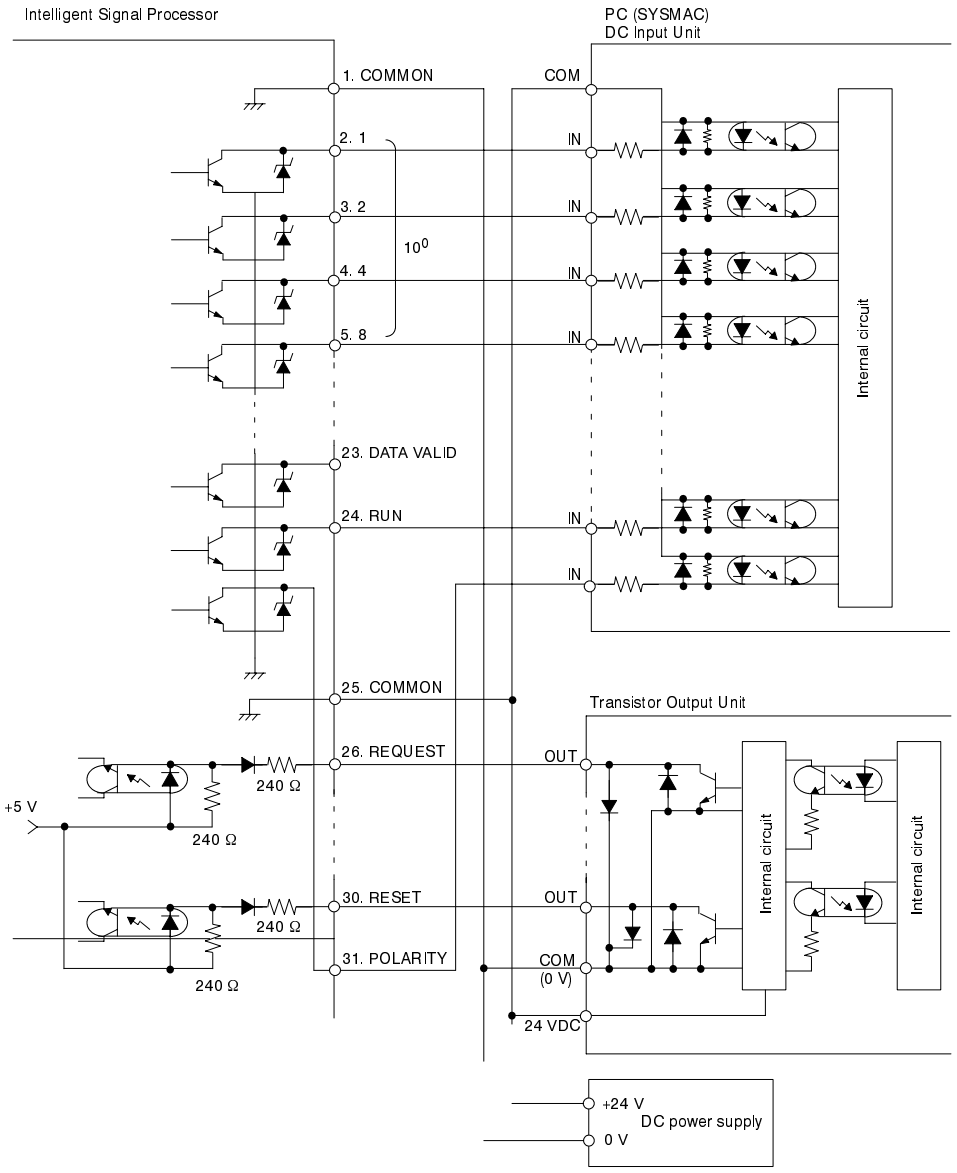
Plug: OMRON XM2A-3701 or equivalent
Hood: OMRON XM2S-3711 or equivalent

6-1-1 Connection Conditions

The I/O ratings are listed in the following table. Refer to *2-3 Connecting Outputs* for details on outputs 1 through 5.

I/O	Item	Rating
Inputs	Input current	10 mA
	Operating voltage	ON: 3 V min. OFF: 1.5 V max.
Outputs	Max. load voltage	24 VDC
	Max. load current	10 mA
	Leakage current	100 μA max.

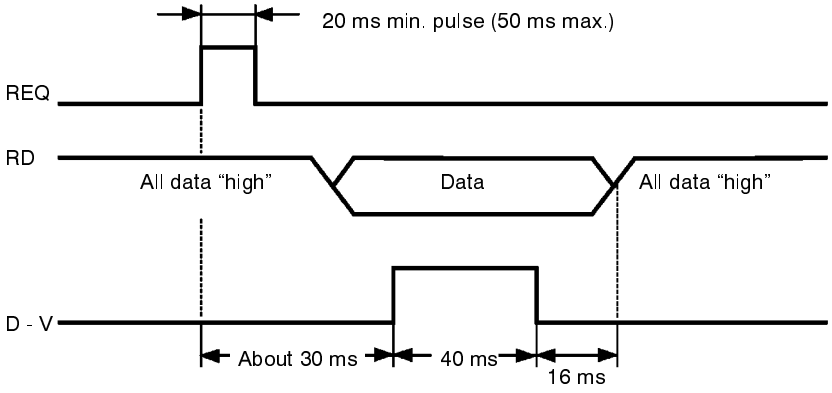
6-1-2 Example of Connection to PC



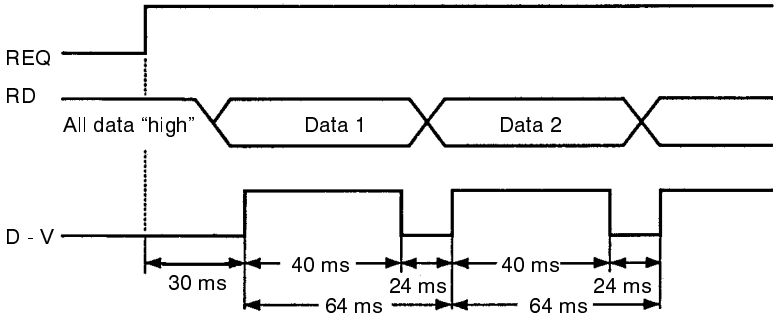
Note
1. RD2-1 through RD2-8, RD3-1 through RD3-8, RD4-1 through RD4-8, and RD5-1 through RD5-8 are connected in the same way as RD1-1 through RD1-8.
2. Connect the RUN and OVER signals when they are used as status information.
3. Connect the COMPENSATION signal when using the compensation function.

6-2 BCD Output Timing Charts

- The data shown in the timing charts is the measured value.
- When the K3TC receives the REQUEST signal from a PC or other device, it outputs the data along with the DATA VALID (D - V) signal.
- The following chart shows the timing of these signals.



- When outputting the data continuously, leave the REQUEST signal ON as shown in the following chart.



- Check the data polarity signal (POLARITY). The data is positive when the POLARITY signal is OFF, negative when it is ON.
- When the Unit is in test mode, test data will be output regardless of the status of the REQUEST signal.

Operating Conditions

The RUN signal will be ON when the Unit is in RUN mode or test mode unless the OVER signal is ON. The RUN signal will be OFF if the OVER signal is ON.

Don't input 2 or more signals simultaneously. All outputs will be OFF when 2 or more signals are input at the same time.

SECTION 7
Error Processing

This section provides information on correcting errors that prevent proper operation of the K3TC. Be sure to follow the troubleshooting procedures in the order in which they appear in this section.

7-1 Preliminary Checks

If a problem occurs with the K3TC, first check the items in the following list and correct any problems you find.

1, 2, 3...

1. **Power Supply**
   Check that the power supply is on and the voltage is within the specified operating range.
2. **Wiring**
   Check that the wiring is correct.
3. **Communications Conditions**
   If the Unit has a Communications Output Board (K3TC-□B1□A-S□), check that the unit number and transmission baud rate match the settings in the connected device.

If the problem isn't solved by correcting the items in the list above, continue with other troubleshooting steps such as checking error displays.

7-2 Using Error Displays

7-2-1 Error Displays

The error displays can be used to check what kind of error has occurred.

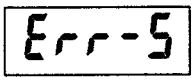
The output status will be as follows when an error code is being displayed:

- OUT 1 through 5 will all be OFF.
- Linear outputs will be at their minimum value.
- BCD outputs will all be OFF (high).
- If the Unit has a Communications Output Board, a "Unit error" response will be returned.

Memory Error

Condition
There is an error in internal memory operation.

Corrective Action
Turn the power off and then on again. If the error display hasn't changed, the Unit will have to be repaired.



Setting Error

Condition
There is an error in the parameter settings.

Corrective Action
Turn the power off and then on again. Press the Display Key if the error display hasn't changed. The settings will be initialized, so set all of the parameters again.

7-2-2 Flashing Displays

All of the digits in the display will flash if the displayed value (measured value, etc.) exceeds the capacity of the display. Check the prescale value and set it again so that the displayed value is within the display's capacity.

The output status will be as follows when the display is flashing:

- Outputs 1 through 5 will continue normal operation.
- Linear outputs will continue normal operation.
- BCD outputs will continue normal operation, but the OVER signal will be ON.

- If the Unit has a Communications Output Board, it will continue normal operation but the “OVER” response will be returned.

Appendix A
Specifications

Ratings

Supply voltage	100 to 240 VAC (50/60 Hz); 12 to 24 VDC		
Operating voltage range	85% to 110% of supply voltage		
Power consumption (see note)	15 VA max. (max. AC load with all indicators lit) 10 W max. (max. DC load with all indicators lit)		
Built-in sensor power supply	80 mA at 12 VDC±10%		
Insulation resistance	10 MΩ min. (at 500 VDC) between external terminal and case. Insulation provided between inputs, outputs, and power supply.		
Dielectric withstand voltage	2,000 VAC min. for 1 min between external terminal and case. Insulation provided between inputs, outputs, and power supply.		
Noise immunity	±1,500 V on power supply terminals in normal or common mode ±1 μs, 100 ns for square-wave noise with 1 ns		
Vibration resistance	Malfunction: 10 to 55 Hz, 0.5-mm for 10 min each in X, Y, and Z directions Destruction: 10 to 55 Hz, 0.75-mm for 2 hrs each in X, Y, and Z directions		
Shock resistance	Malfunction: 98 m/s^2 (10G) for 3 times each in X, Y, and Z directions Destruction: 294 m/s^2 (30G) for 3 times each in X, Y, and Z directions		
Ambient temperature	Operating: −10°C to 55°C (with no icing) Storage: −20°C to 65°C (with no icing)		
Ambient humidity	Operating: 35% to 85% (with no condensation)		
Ambient atmosphere	Must be free of corrosive gas		
EMC	Emission Enclosure:	EN55011 Group 1 class A	
	Emission AC Mains:	EN55011 Group 1 class A	
	Immunity ESD:	EN61000-4-2:	4 kV contact discharge (level 2) 8 kV air discharge (level 3)
	Immunity RF-interference:	ENV50140:	10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz)
	Immunity Conducted Disturbance:	ENV50141:	10 V (0.15 to 80 MHz) (level 3)
	Immunity Burst:	EN61000-4-4:	2 kV power-line (level 3) 2 kV I/O signal-line (level 4)
	Performance Criterion:	EMS:	0.1% rdg±30 digits display range
Approved standards	UL (File No. E4151), CSA (File No.LR67027); conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1)		
Weight	Approx. 450 g		

Note An Intelligent Signal Processor requires a control power supply current of approximately 1 A the moment the Intelligent Signal Processor is turned on. Do not forget to take this into consideration when using several Intelligent Signal Processors.

Input/Output Ratings

Relay Contact Output

(Incorporating a G6B Relay)

Item	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4, L/R = 7 ms)
Rated load	5 A at 250 VAC; 5 A at 30 VDC	1.5 A at 250 VAC, 1.5 A at 30 VDC
Rated carry current	5 A max. (at COM terminal)	
Max. contact voltage	380 VAC, 125 VDC	
Max. contact current	5 A max. (at COM terminal)	
Max. switching capacity	1,250 VA, 150 W	375 VA, 80 W
Min. permissible load	10 mA at 5 VDC	

Transistor Output

Rated load voltage	12 to 24 VDC $^{+10\%}/_{-15\%}$
Max. load current	50 mA
Leakage current	100 mA max.

BCD Output

I/O signal name		Item	Rating
Inputs	REQUEST, COMPENSATION, RESET	Input voltage	No-voltage contact input
		Input current	10 mA
		Operating voltage	ON: 1.5 V max. OFF: 3 V min.
Outputs	DATA, POLARITY, OVERFLOW, DATA VALID, RUN	Rated load voltage	12 to 24 VDC $^{+10\%}/_{-15\%}$
		Max. load current	10 mA
		Leakage current	100 mA max.

Note Logic method: negative logic

Linear Output

Item	4 to 20 mA	1 to 5 V
Resolution	4,096	
Output error	±0.5% FS	
Permissible load resistance	600 Ω max.	500 Ω min.

Communications

Item		RS-232C, RS-422	RS-485
Transmission method		4-wire, half-duplex	2-wire, half-duplex
Synchronization method		Start-stop synchronization	
Baud rate		150/300/600/1,200/2,400/4,800/9,600/19,200	
Transmission code		ASCII (7-bit)	
Communications	**Write to K3TC**	Set values, reset control	
	Read from K3TC	Set values, process value, model data, error code, etc.	

For details, refer to *K3TC/K3TH/K3TR/K3TX Communication Output-type Intelligent Signal Processor Operation Manual.*

Characteristics

Input signal	Non-voltage contact (30 Hz (cps) max., ON/OFF pulse width: 15ms min.) Open collector (50 kHz (kcps) max., ON/OFF pulse width: 9μs min.) (see note) Output delay time: 1 ms max. when NPN transistor output is ON **Connectable Sensors** ON residual voltage: 3 V max. OFF leakage current: 1.5 mA max. Load current: Must have switching capacity of 20 mA min. Must be able to dependably switch a load current of 5 mA max.
Input mode	Up/Down B (individual inputs), Up/Down C (phase difference inputs)
Output mode	ALL-H/ALL-L
Max. displayed digits	5 digits (–9999 to 99999)
Display	7-segment LED
Polarity display	"–" is displayed automatically with a negative input signal.
Zero display	Leading zeros are not displayed.
Prescale function	Programming via front-panel key inputs. (0.0001×10^{-9} to 9.9999×10^{9}, decimal: 10^{-1} to 10^{-4}) Can be set using prescale value teaching.
External control	RESET: 16 ms max. (external reset signal only) COMPENSATION: 16 ms max. (external compensation signal only) BANK 1, 2: 100 ms max. (bank switching time) Up to 4 set value or prescale value banks available
Other functions	Set value teaching Set value write-protection Linear output range teaching Variable linear output range
Output configuration	Relay contact output (5 outputs), transistor output (NPN and PNP open collector), parallel BCD (NPN open collector) + transistor output (NPN open collector), linear output (4 to 20 mA, 1 to 5 V) + transistor output (NPN open collector), communication functions (RS-232C), communication functions (RS-485, RS-422) + transistor output (NPN open collector)
Delay in comparative outputs	1 ms max. (at transistor output), 10 ms max. (at relay output)
Linear output response time	20 ms max.
Enclosure rating	Front panel: Refer to IEC standard IP50 Rear case: Refer to IEC standard IP20 Terminals: Refer to IEC standard IP00
Memory protection	Non-volatile memory (EEPROM)

Appendix B
Parameter Settings Tables

Setting Level 1

Setting name		Range	Units	Default value	Set value
cset1	Bank 1 comparative set values	OUT 1: –9999 to 99999	None	00000	
		OUT 2: –9999 to 99999	None	00000	
		OUT 3: –9999 to 99999	None	00000	
		OUT 4: –9999 to 99999	None	00000	
		OUT 5: –9999 to 99999	None	00000	
cset2	Bank 2 comparative set values	OUT 1: –9999 to 99999	None	00000	
		OUT 2: –9999 to 99999	None	00000	
		OUT 3: –9999 to 99999	None	00000	
		OUT 4: –9999 to 99999	None	00000	
		OUT 5: –9999 to 99999	None	00000	
cset3	Bank 3 comparative set values	OUT 1: –9999 to 99999	None	00000	
		OUT 2: –9999 to 99999	None	00000	
		OUT 3: –9999 to 99999	None	00000	
		OUT 4: –9999 to 99999	None	00000	
		OUT 5: –9999 to 99999	None	00000	
cset4	Bank 4 comparative set values	OUT 1: –9999 to 99999	None	00000	
		OUT 2: –9999 to 99999	None	00000	
		OUT 3: –9999 to 99999	None	00000	
		OUT 4: –9999 to 99999	None	00000	
		OUT 5: –9999 to 99999	None	00000	
ps-bk	Prescale bank	ON/OFF	None	OFF	
pscl	Prescale value	X: 0.0001 to 9.9999	None	1.0000	
(See note 1.)		Y: –9 to 09	None	00	
		Digits below decimal point: 0 to 4	None	0: 00000	
pscl1	Bank 1 prescale value	X: 0.0001 to 9.9999	None	1.0000	
(See note 2.)		Y: –9 to 09	None	00	
		Digits below decimal point: 0 to 4	None	0: 00000	
pscl2	Bank 2 prescale value	X: 0.0001 to 9.9999	None	1.0000	
(See note 2.)		Y: –9 to 09	None	00	
		Digits below decimal point: 0 to 4	None	0: 00000	
pscl3	Bank 3 prescale value	X: 0.0001 to 9.9999	None	1.0000	
(See note 2.)		Y: –9 to 09	None	00	
		Digits below decimal point: 0 to 4	None	0: 00000	
pscl4	Bank 4 prescale value	X: 0.0001 to 9.9999	None	1.0000	
(See note 2.)		Y: –9 to 09	None	00	
		Digits below decimal point: 0 to 4	None	0: 00000	
compn	Compensation value	Compensation: –9999 to 99999	None	1.0000	
		Condition setting: ALL/PLUS	None	ALL	
lset	Linear output range	L_H: –9999 to 99999	None	99999	
		L_L: –9999 to 99999	None	–9999	
prot	Protect function	ON/OFF	None	OFF	

Note 1. Valid when the prescale bank parameter is set to OFF.
2. Valid when the prescale bank parameter is set to ON.

Setting Level 2

Setting name		Range	Units	Default value	Set value
in	Sensor type	00 to 11 (binary)	None	00	
disp	Display refresh period	FAST, 1, 2, 4, 8, or 16	None	FAST	
u-no	Communications unit number	00 to 99	None	00	
bps	Baud rate	150/300/600/1,200/2,400/4,800/ 9,600/19,200	bps	9600	

Setting Level 3

Setting name		Range	Units	Default value	Set value
count	Input mode	U-d b or U-d C	None	U-d C	
out	Output mode	ALL-H or ALL-L	None	ALL-L	
memo	Power failure memory	ON/OFF	None	OFF	

Appendix C
Applicable Sensors

The following list provides some typical examples of connectable OMRON Sensors. For further details, please refer to the OMRON Sensor catalog.

Photoelectric Sensors

D: Directly connectable to up to two inputs.
S: Directly connectable to one input, but a separate power supply is necessary for two inputs.
C: Connectable, but a separate power supply is needed.
N: Not connectable.

Classification		Model	NPN inputs K3TC-NB1□□-□□	PNP inputs K3TC-PB1□□-□□
3-wire DC	NPN	E3X-A/F/VG/H	D	N
		E3S-A/B		
		E3S-CL		
		E3S-LS□C4		
		E3S-LS3C1D		
		E3S-GS/VS		
		E3S-R		
		E3HQ		
		E3HF/HS/HT/HC		
		E3V (see note)		
		E3S-C (see note)		
		E3R (see note)		
		E3L (see note)		
		E3S-X3 (see note)		
		E3X-NT	S	
		E3X-NV/NVG		
		E3C-GE4		
		E3C-WE4		
		E3C-WH4F		
		E3C-JC4P		
		E3S-5E4S-45		
		E3X-NM	N	
	PNP	E3X-A/F	N	D
		E3X-NM/NT		
		E3S-A/B		
		E3S-CL		
		E3S-LS5B4/LS20B4		
		E3S-C (see note)		
		E3V3 (see note)		

Note A separate power supply is required for two inputs depending on the model.

Proximity Sensors

D: Directly connectable to up to two inputs.
S: Directly connectable to one input, but a separate power supply is necessary for two inputs.
C: Connectable, but a separate power supply is needed.
N: Not connectable.

Classification		Model	NPN inputs K3TC-NB1□□-□□	PNP inputs K3TC-PB1□□-□□
3-wire DC	NPN	E2E-X□E(-P)	D	N
		E2E-□C		
		E2C-GE4		
		E2C-WH4A		
		E2C-JC4A	S	
		E2C-AM4A		
		E2EC	D	
		TL-G3D-3		
		TL-W5E		
		TL-W□MC		
		TL-N□E		
		E2K-F□C		
		E2K-X□E		
		E2EV		
	PNP	E2E-□B	N	D
		E2E-X□F		
		E2F-X□F		
		TL-W□F		
	Amplifier	E2C-GF4	D	D
		E2C-WH4A		
		E2C-AM4A	S	S
2-wire DC	NPN	E2E-XD	N	D
		E2EC-D		

Rotary Encoder (Incremental Type)

D: Directly connectable to up to two inputs.
S: Directly connectable to one input, but a separate power supply is necessary for two inputs.
C: Connectable, but a separate power supply is needed.
N: Not connectable.

Classification		Model	NPN inputs K3TC-NB1□□-□□	PNP inputs K3TC-PB1□□-□□
3-wire DC	NPN	E6H-CWZ1C	C	N
		E6H-CWZ1E		
		E6H-CWZ2C		
		E6A2-CS3C	D	
		E6A2-CW3C		
		E6A2-CWZ3C		
		E6A2-CS5C		
		E6A2-CW5C		
		E6A2-CS3E		
		E6A2-CW3E		
		E6A2-CWZ3E	S	
		E6B2-CWZ6C		
		E6B2-CWZ3E	C	
		E6C-CWZ5C	S	
		E6C-CWZ3E		
		E6D-CWZ2C	C	
		E6D-CWZ1E		

Index

A–B

C

D

I

K–O

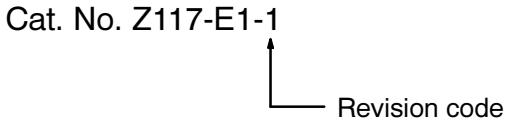
P

R–S

T–W

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	January 1997	Original production