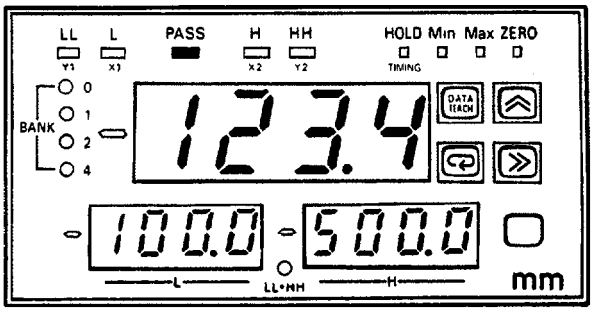
K3TS Intelligent Signal Processor

Operation Manual

Revised August 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 warnings in this manual. Always heed the information provided with them.

DANGER! Indicates information that, if not heeded, could result in loss of life or serious injury.

Caution Indicates information that, if not heeded, could result in minor injury or damage to the product.

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... Indicates lists of one sort or another, such as procedures, precautions, etc.

TABLE OF CONTENTS

About this Manual:

Section 1 introduces the basic features of the K3TS Intelligent Signal Processor.

Section 2 identifies all the major features of the front panel and gives a brief description of each function.

Section 3 identifies all the input and output features of the terminals and gives a brief description of each terminal.

Section 4 provides the dimensions and environmental conditions needed for mounting the K3TS Intelligent Signal Processor.

Section 5 briefly describes the sensors that can be connected to the K3TS Intelligent Signal Processor.

Section 6 gives comprehensive descriptions on setting the parameters and the operation of the K3TS Intelligent Signal Processor.

Section 7 describes the K3TS Unit's comparative output response (sampling) times under various settings and operating parameters.

Section 8 illustrates some application examples.

Section 9 provides a troubleshooting guide for possible errors during operation and the corrective actions to be taken.

Appendix A provides a list of standard models and options (special specifications).

Appendix B provides a list of sensor models.

Appendix C provides lists of specifications, ratings, and factory-set parameters.

SECTION 1
Features

This section deals with the basic features of the K3TS Intelligent Signal Processor. A brief description is given of each major feature.

The basic features of the K3TS Intelligent Signal Processor are outlined below. These features can be used according to the application. Applications include the measurement of height and quality of products and the discrimination of good and bad products, measurement of discs, measurement of plate thickness, checking height differences, and detection of the protruding portion of cylindrical objects. Refer to relevant sections of this manual for details.

Operating Parameters

The Intelligent Signal Processor features 3 operating parameters. Operating parameter 1 converts outputs into actual figures. With operating parameter 2, the K3TS detects only values fluctuating rapidly, dismissing slowly fluctuating ones such as values caused by the decentering of a sensing object or the sagging of a belt conveyor. Operating parameter 3 can be set to sampling hold, maximum hold, minimum hold, or peak-to-peak hold.

Prescale Value

For the K3TS to display operating parameter process values, the operating parameter must be multiplied by a factor input before the input pulses are measured. This factor is called the prescale value.

Forced Zero (Zero-shift)

By turning the ZERO input ON (by short-circuiting the ZERO input), the process value can be calibrated to zero. This calibration is maintained until the next time the ZERO input signal is turned ON.

Display Refresh Period

A display refresh period among 5 settings can be selected. The display refresh period can range between 0.1 to 4 s.

Set Values

Measured values are compared with the set values. There is no limitation on the relationships among HH, H, L, and LL. The decimal is displayed at the position set in the prescale parameter.

Bank Selection

With the Intelligent Signal Processor, the set value can be altered without key operation via the selection of an another bank when making a level change. The K3TS has 8 banks; each bank can output HH, H, L, and LL set values.

Hysteresis

The set value includes a hysteresis setting to prevent the comparative output status indicators from turning ON/OFF when it should not if the measured value fluctuates in the vicinity of the set value.

Protecting, Checking, and Changing Set Values

With the Set Value LED and Thumbwheel Switches Models, the set values can be checked, or changed in RUN mode. Protection of set values is not possible with the Thumbwheel Switches Models.

Linear Output Range

The Intelligent Signal Processor outputs a linear voltage or current in proportion to the changes in the measured value.

K Constant

The K constant is used in operating parameter 1 to convert the outputs of the displacement sensors into actual figures.

Process Values Averaging

The number of process values to be averaged can be selected.

TIMING-delay

With the TIMING-delay function, the time immediately after the TIMING input is turned ON until the start of pulse counting operation can be set within a range of 0.00 to 1.99 s.

OFF-delay

The OFF-delay can be set within a range of 0.00 to 1.99 s.

Maximum/Minimum Values The maximum and minimum of the values measured since power application or RESET signal input up to the present point are retained. When the RESET signal turns ON, both the maximum and minimum values are reset to the present value. Even though the maximum and minimum values are retained in memory, the comparative output and BCD output are output in accordance with changes in the measured value, regardless of the display or even if the RESET signal is OFF, except as controlled by the HOLD input (see next feature).

Hold Measured Value When the HOLD input is turned ON during RUN mode, measurement stops and the input measured just before the HOLD input turned ON is held. The displayed value, comparative output, BCD data, etc., are also held.

Test Mode This function is convenient for checking a system to which the Intelligent Signal Processor is connected, especially when some inputs cannot be operated. The Intelligent Signal Processor simulates an input, changing the display and output conditions.

Teaching Function This function allows the measured values, comparative outputs, and linear output range to be set as set values while actual measurement is being carried out. This function is useful for setting parameters while checking the operating status of the Intelligent Signal Processor.

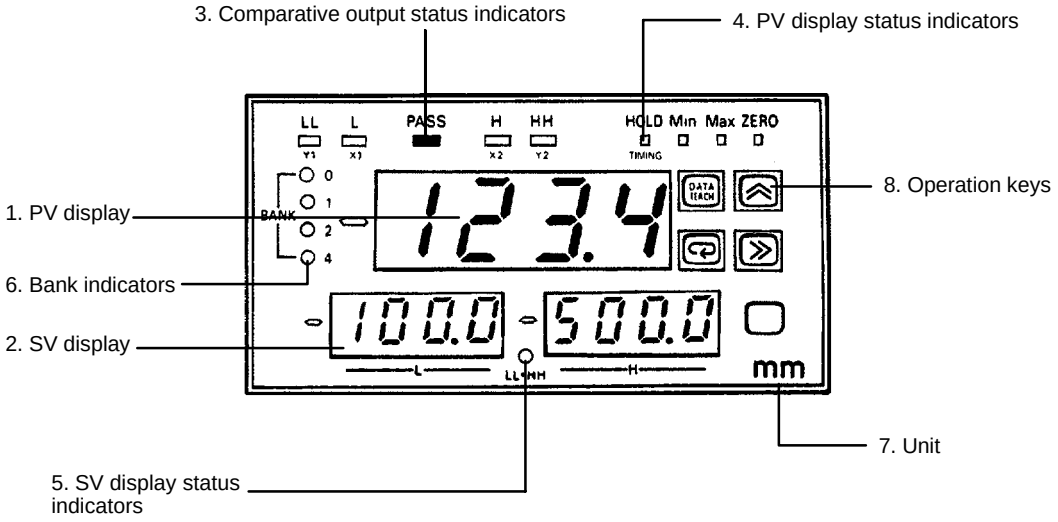
Input Range Input ranges of 4 to 20 mA, 1 to 5 V, or ±9.999 VDC can be selected.

SECTION 2
Front Panel: Nomenclature and Functions

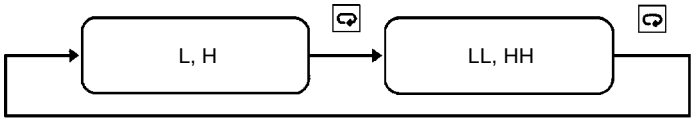
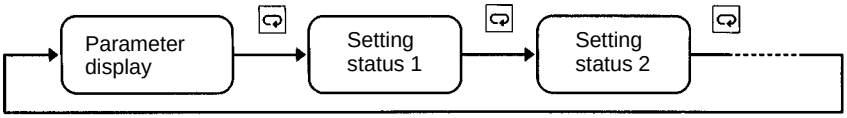
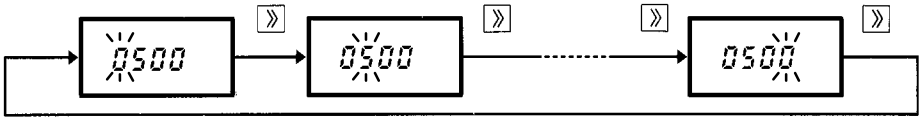
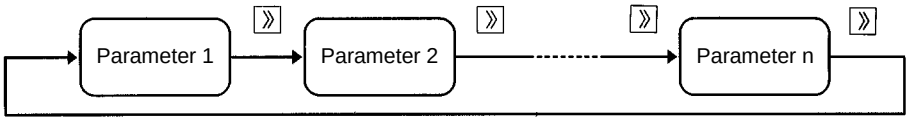
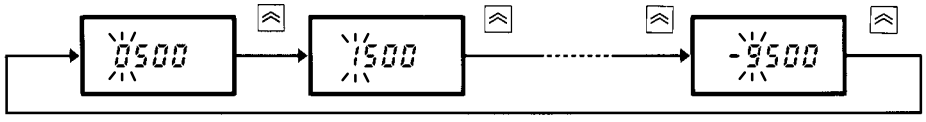
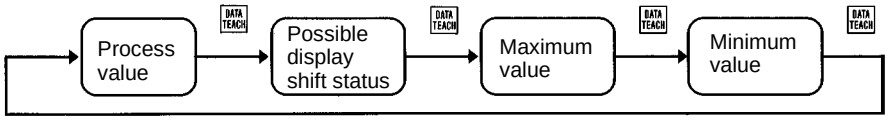
This section gives a general description of the Intelligent Signal Processor's front panel.

2-1 K3TS-SD□□B-□□ (with Set Value LED Display)

The following diagram identifies the major features found on the K3TS with Set Value LED Display front panel. The table gives a brief description of the function of each front panel feature.

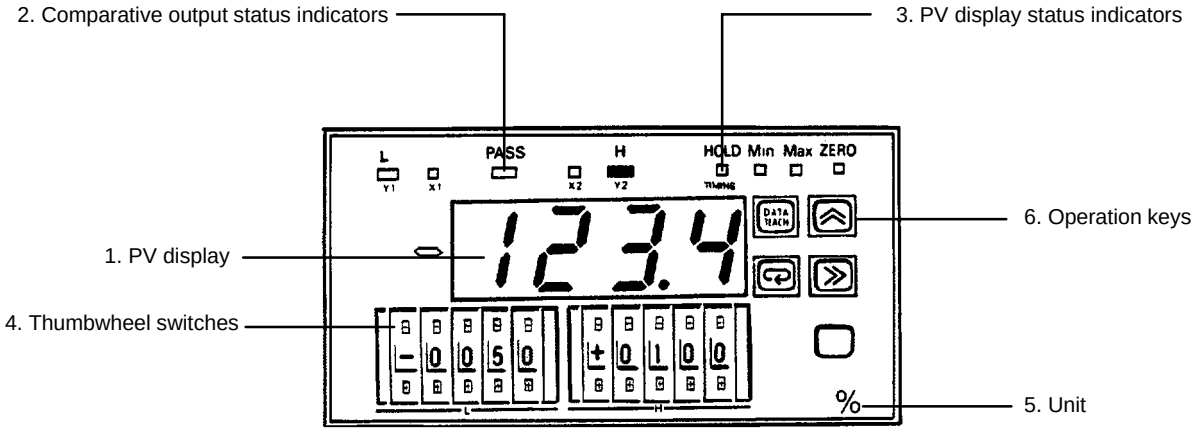


No.	Name		Functions
1	PV (process value) display		Displays the process, maximum, and minimum values. Displays characters indicating the set mode and set values. Displays an error message when an error occurs.
2	SV (set value) display		Displays the set value of a comparative output. In setting mode, displays the set parameter.
3	Comparative output status indicators	HH	Is lit when HH comparative output status is ON. HH comparative output status turns ON when the measured value exceeds the HH set value.
		H	Is lit when H comparative output status is ON. H comparative output status turns ON when the measured value exceeds the H set value.
		L	Is lit when L comparative output status is ON. L comparative output status turns ON when the measured value falls below the L set value.
		LL	Is lit when LL comparative output status is ON. LL comparative output status turns ON when the measured value falls below the LL set value.
		PASS	Is lit when PASS comparative output status is ON. PASS comparative output status turns ON when all HH, H, L, and LL comparative output status are OFF.
4	PV display status indicators	HOLD	Is lit when HOLD input is ON. By turning ON the HOLD terminal on the rear panel, the hold function can be effected.
		TIMING	Is lit when the TIMING input is ON. By turning ON the TIMING terminal on the rear panel, the TIMING hold function can be effected.
		Min	Indicates that the value displayed on the PV display is the minimum value. To display the minimum value, use the DATA TEACH Key.
		Max	Indicates that the value displayed on the PV display is the maximum value. To display the maximum value, use the DATA TEACH Key.
		ZERO	Is lit when ZERO shift status is ON. By turning ON the ZERO terminal on the rear panel, the ZERO shift function can be effected.The ZERO indicator is lit when the display value is shifted if the model has a display shift function.
5	SV display status indicators		Indicates whether the displayed set value on the SV display is HH and LL or H and L. The SV display is lit when the set values are HH and LL and not lit when the set values are H and L.

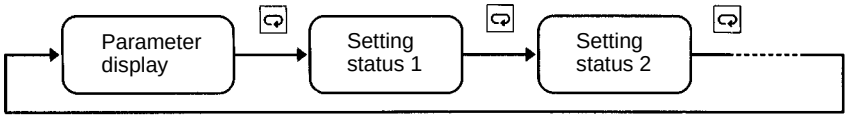
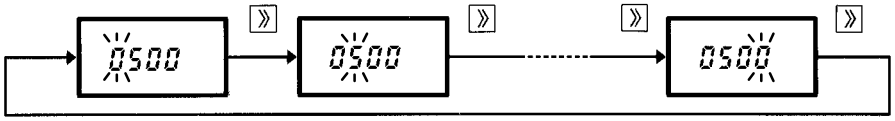
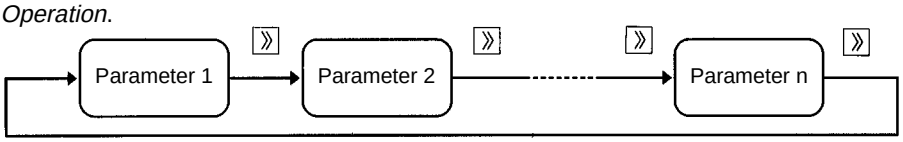
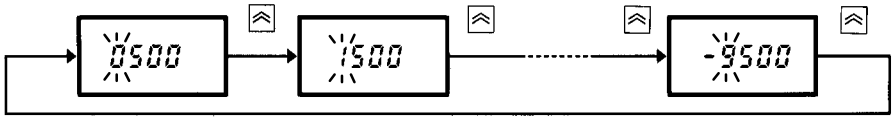
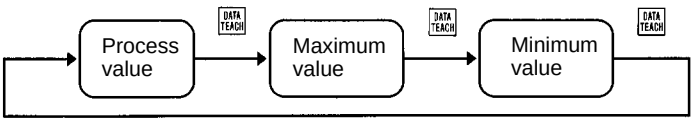
No.	Name		Functions
6	Bank indicators		To alter the set value without key operation, select another bank when making a level change. The K3TS has eight banks; each bank can output HH, H, L, and LL set values. The selected bank is displayed in the binary system.
7	Unit		Attach the appropriate label (use the labels supplied as accessories).
8	Operation Keys	□ Level Key	Selects the setting mode, in which the setting levels can be changed. For details on the setting levels, refer to *6-1 Before Setting the Parameters*.
		Display Key	Displays a set value on the SV display.  In the setting mode, after a parameter is selected with the Shift Key, the selected setting is enabled or disabled or the set value is written to memory with this key. 
		Shift Key	Shifts the digit where the set value is to be changed.  Selects a parameter at each setting level.  For details on the setting parameter, refer to *Section 6 Parameter Setting and Operation*.
		Up Key	Increases the value of the current digit in the set value by one. 
		DATA TEACH Key	Selects the process value, possible display shift status (*1), maximum value (*2), or minimum value (*2). *1: Available only if the model incorporates a shift function. *2: Available only when operating parameter 3 is in the normal setting.  In the setting mode, effects the teaching function. With this function, the comparison value, scaling value, and linear output range are set by means of actual input. For details on the teaching function, refer to *6-3-2 Special Functions*.

2-2 K3TS-SD1□D-□□ (with Thumbwheel Switches)

The following diagram identifies the major features found on the K3TS with Thumbwheel Switches front panel. The table gives a brief description of the function of each front panel feature.



No.	Name		Functions
1	PV (process value) display		Displays the process, maximum, and minimum values. Displays characters indicating the set mode and set values. Displays an error message when an error occurs.
2	Comparative output status indicators	H	Is lit when H comparative output status is ON. H comparative output status turns ON when the measured value exceeds the H set value.
		L	Is lit when L comparative output status is ON. L comparative output status turns ON when the measured value falls below the L set value.
		PASS	Is lit when PASS comparative output status is ON. PASS comparative output status turns ON when all HH, H, L, and LL comparative output status are OFF.
3	PV display status indicators	HOLD	Is lit when HOLD input is ON. By turning ON the HOLD terminal on the rear panel, the hold function can be effected.
		TIMING	Is lit when the TIMING input is ON. By turning ON the TIMING terminal on the rear panel, the TIMING hold function can be effected.
		Min	Indicates that the value displayed on the PV display is the minimum value. To display the minimum value, use the DATA TEACH Key.
		Max	Indicates that the value displayed on the PV display is the maximum value. To display the maximum value, use the DATA TEACH Key.
		ZERO	Is lit when ZERO shift status is ON. By turning ON the ZERO terminal on the rear panel, the ZERO shift function can be effected.
4	Thumbwheel switches		Set H and L set values. The set values can be changed at any time regardless of the RUN or setting mode.
5	Unit		Attach the appropriate label (use the labels supplied as accessories).

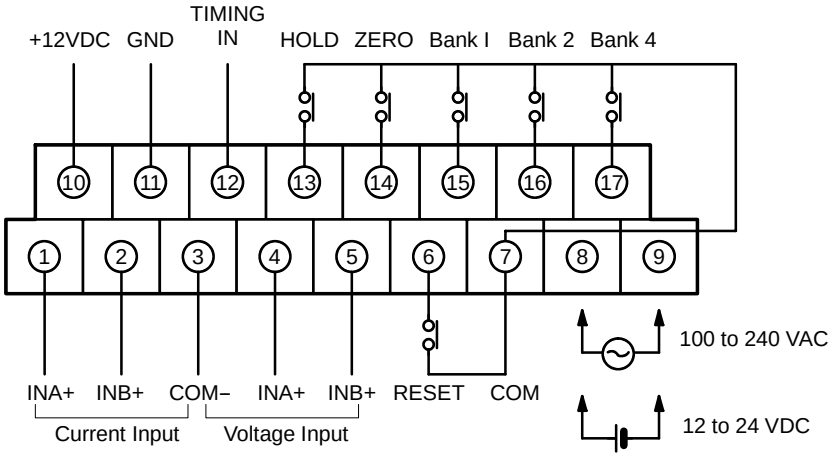
No.	Name		Functions
6	Operation Keys	□ Level Key	Selects the setting mode, in which the set levels can be changed. For details on the set levels, refer to *6-1 Before Setting the Parameters*.
		Display Key	This key has no function in RUN mode. In the setting mode, after a parameter is selected with the Shift Key, the selected setting is enabled or disabled or the set value is written to memory with this key. 
		Shift Key	Shifts the digit where the set value is to be changed.  Selects a parameter at each setting level. For details on the setting parameter, refer to *Section 6 Parameter Setting and Operation*. 
		Up Key	Increases the value of the current digit in the set value by one. 
		DATA TEACH Key	Displays the process, maximum, or minimum value. (Operating parameter 3: Only in the normal setting.)  In the setting mode, effects the teaching function. With this function, the set values, prescale values and linear output range are set by means of actual input. For details on the teaching function, refer to *6-3-2 Special Functions*.

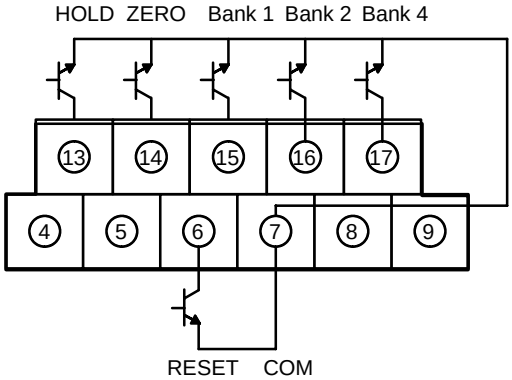
SECTION 3
Terminals: Nomenclature and Functions

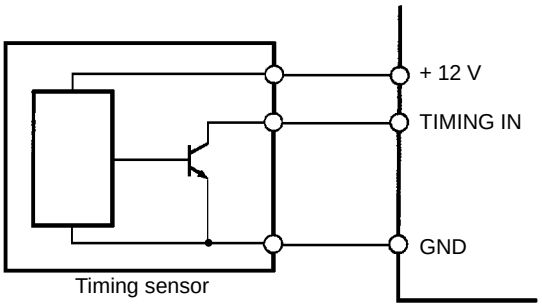
This section gives a general description of the K3TS Intelligent Signal Processor's terminals.

3-1 Inputs

The K3TS Intelligent Signal Processor's terminal inputs are described in the following diagram and table. The table identifies each terminal and briefly describes its input function.



No.	Name	Function
1 to 5	Inputs	Accepts analog input from the sensor. **Input range** / **Connection terminal** (**Input A** / **Input B**): 4 to 20 mA DC: 1 and 3 / 2 and 3 1 to 5 VDC: 4 and 3 / 5 and 3 ±9.999 VDC: 4 and 3 / 5 and 3 Use INA if only a single input line is used (if Fun1 is R). Refer to *Section 5 Connectable Sensors* for available sensors.
6	RESET	With the RESET signal to this terminal, the present maximum, minimum, and average process values are cleared, and the K3TS is reset. RESET status continues while the RESET signal is ON.
7	COM	These are common input terminals for RESET, HOLD, ZERO, and Banks 1 through 4. Connect non-voltage contact inputs to these terminals. To connect transistor inputs, use the open collector configuration shown below. 
8, 9	Power	Supplies power to these terminals. Be sure to supply 100 to 240 VAC for AC-operated models, and 12 to 24 VDC for DC-operated models.
10, 11	Timing sensor power supply	80 mA, 12 VDC. Use an external power supply if the capacity of the sensor power supply is insufficient.

<table>
<tr><th>No.</th><th>Name</th><th>Function</th></tr>
<tr><td>12</td><td>TIMING input</td><td>The TIMING input must be supplied from an open collector.
 

A photoelectric sensor or a proximity sensor can be used as a timing sensor.</td></tr>
<tr><td>13</td><td>HOLD</td><td>With normal setting on operating parameter 3: When the HOLD signal to this terminal is turned ON, measurement is stopped and the value input immediately before the HOLD signal is retained. The relevant displayed value, comparative outputs, and BCD data are also retained. While the HOLD signal is ON, the hold operation continues. The effect of the HOLD operating parameter is canceled when the HOLD signal is turned OFF.

When operating parameter 3 is in the state of Sampling hold, Maximum hold, Minimum hold, and Peak-to-peak hold, the HOLD signal is disregarded.</td></tr>
<tr><td>14</td><td>ZERO</td><td>When the ZERO input to this terminal is turned ON, the input value is calibrated to zero. Turn OFF the current zero input signal to receive the next zero input signal on this terminal.</td></tr>
<tr><td>15
to
17</td><td>Bank selection</td><td>Select the bank for set values.

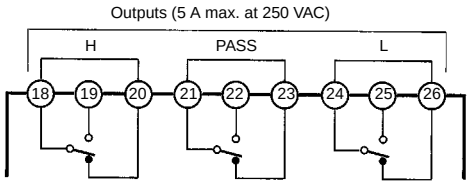
<table>
<tr><th>Bank no.</th><th>Bank 1</th><th>Bank 2</th><th>Bank 4</th></tr>
<tr><td>0</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>1</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>2</td><td>OFF</td><td>ON</td><td>OFF</td></tr>
<tr><td>3</td><td>ON</td><td>ON</td><td>OFF</td></tr>
<tr><td>4</td><td>OFF</td><td>OFF</td><td>ON</td></tr>
<tr><td>5</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>6</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>7</td><td>ON</td><td>ON</td><td>ON</td></tr>
</table>

The bank input is not available for the Thumbwheel Switches Models.</td></tr>
</table>

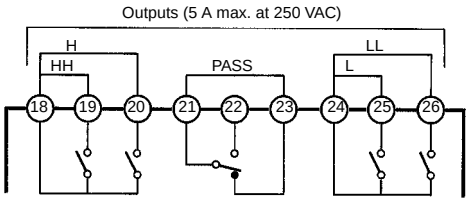
3-2 Outputs

Depending upon the requirements of the output device, the K3TS Intelligent Signal Processor can use one of the following outputs.

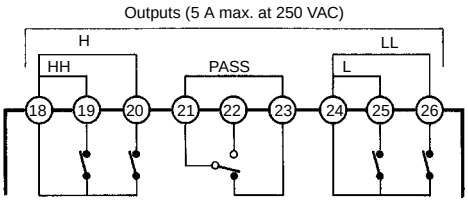
K31-C1: Relay (3 Outputs)



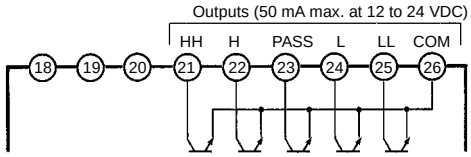
K31-C2: Relay (5 Outputs)



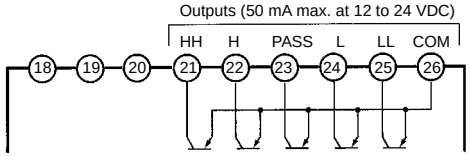
K31-C5: Relay (5 Outputs)



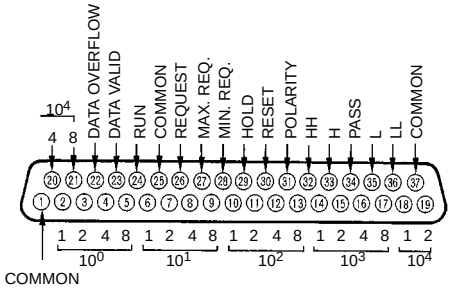
K31-T1: Transistor (NPN Open Collector)



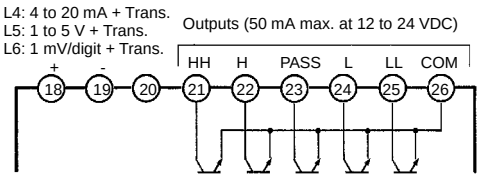
K31-T2: Transistor (PNP Open Collector)



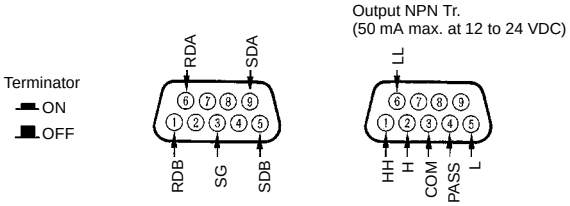
K31-B4: BCD + Transistor* (NPN Open Collector)



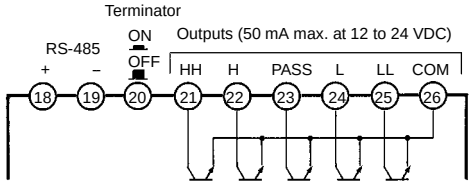
K31-L4, L5, L6: Linear + Transistor*



K31-S6: RS-422 + Transistor*



K31-S5: RS-485 + Transistor*



D-sub 37P Connectors for BCD output (enclosed)
Plug: XM2A-3701
Hood: XM2S-3711

D-sub 9P Connectors for RS-422 output (order separately)
Plug: XM2A-0901 or XM4A-0921
Hood: XM2S-0911

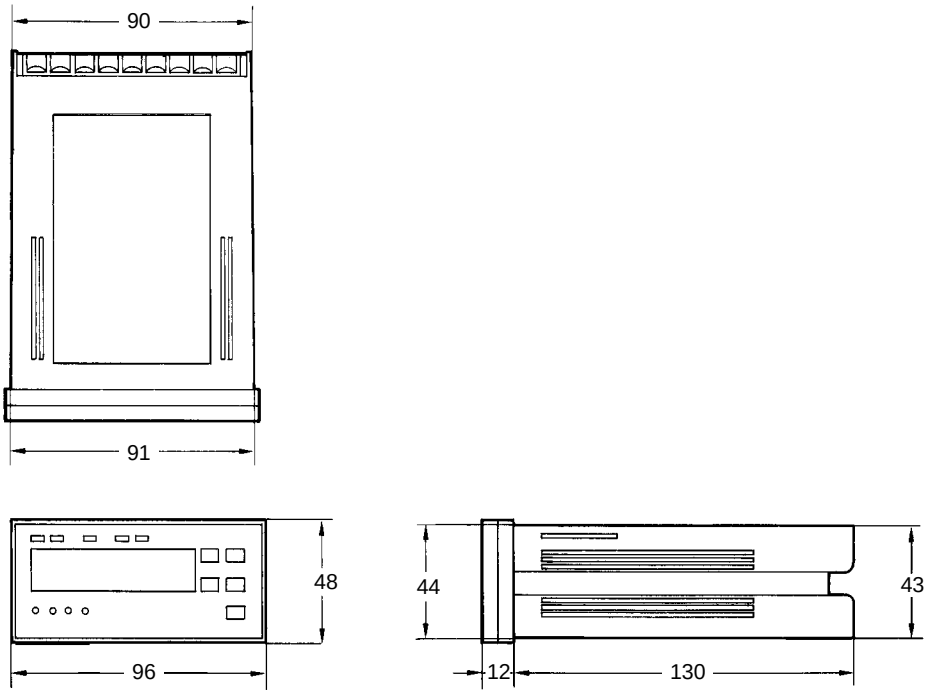
* Only with model with special specifications.

SECTION 4
Mounting

This section provides the dimensions and instructions required for mounting the K3TS Intelligent Signal Processor. Mounting conditions for the Unit are also given.

4-1 Dimensions

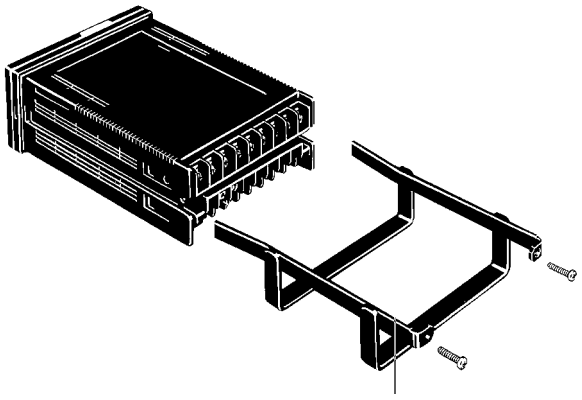
All dimensions are in millimeters.



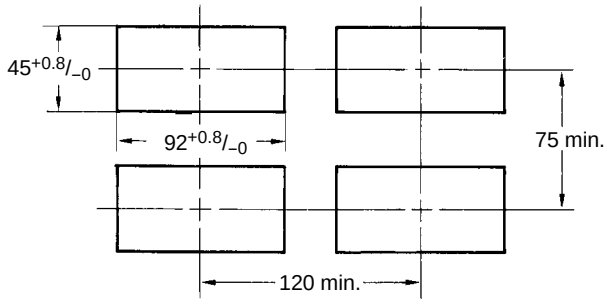
4-2 Panel Mounting

The mounting dimensions of the Intelligent Signal Processor conform to DIN 43700. Recommended panel thickness is 1 to 3.2 mm. Attach the mounting brackets supplied as accessories to the Intelligent Signal Processor from behind and tighten the mounting screws of the brackets to a torque of 5 kgf $ cm (0.49 N $ m).

Whenever possible, keep the Intelligent Signal Processor horizontal. Do not install the Intelligent Signal Processor where it will be exposed to corrosive gases (especially sulfurized gas and ammonia gas). Do not install the Intelligent Signal Processor where it will be subject to vibration, shock, dust, or high humidity. The ambient temperature of the installation site must be within −10° to 55°C.



Panel Cutout



All dimensions are in millimeters.

Note: Attach mounting bracket before wiring the terminals. When removing the Intelligent Signal Processor, first disconnect the wiring, then remove the mounting bracket.

SECTION 5
Connectable Sensors

This section gives a brief description on the sensors that can be connected to the K3TS Intelligent Signal Processor.

5-1 Linear Sensors

The K3TS incorporates a current input terminal and a voltage input terminal, thus corresponding to a wide variety of linear sensors.

Terminal	Linear sensor output
Current input	4 to 20 mA DC
Voltage input	1 to 5 VDC
	±9.999 VDC

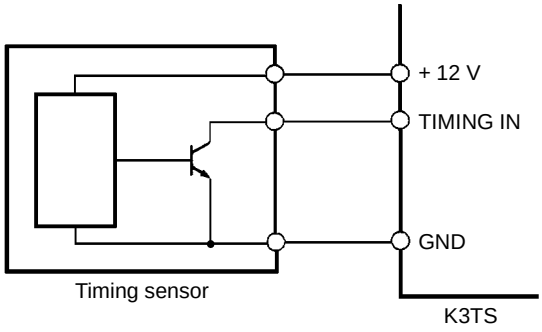
Displacement sensors, pressure sensors, and flow sensors with an output range of ±9.999 VDC can be used as linear sensors.

5-2 Timing Sensors

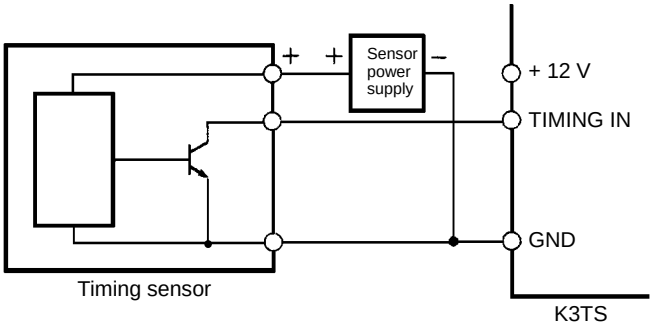
Photoelectric sensors and proximity sensors with the following specifications can be used:

Residual voltage when sensor is on	3 V max.
Current leakage when sensor is off	1.5 mA max.
Load current	For smooth switching operation, switching capacity should be at least 20 mA with a load current of no more than 5 mA.

The TIMING input must be via an open collector.



– Without external power supply –

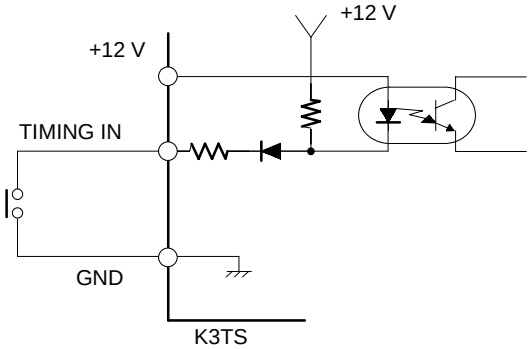


– With external power supply –

Short-circuit the TIMING and GND terminals for contact input operation.

Note Use an external power supply with a supply voltage of 12 to 24 VDC if the operating voltage of the sensor is other than 12 VDC or if the total power consumption exceeds 80 mA.

Short-circuit the TIMING IN and GND terminals for contact input operation.



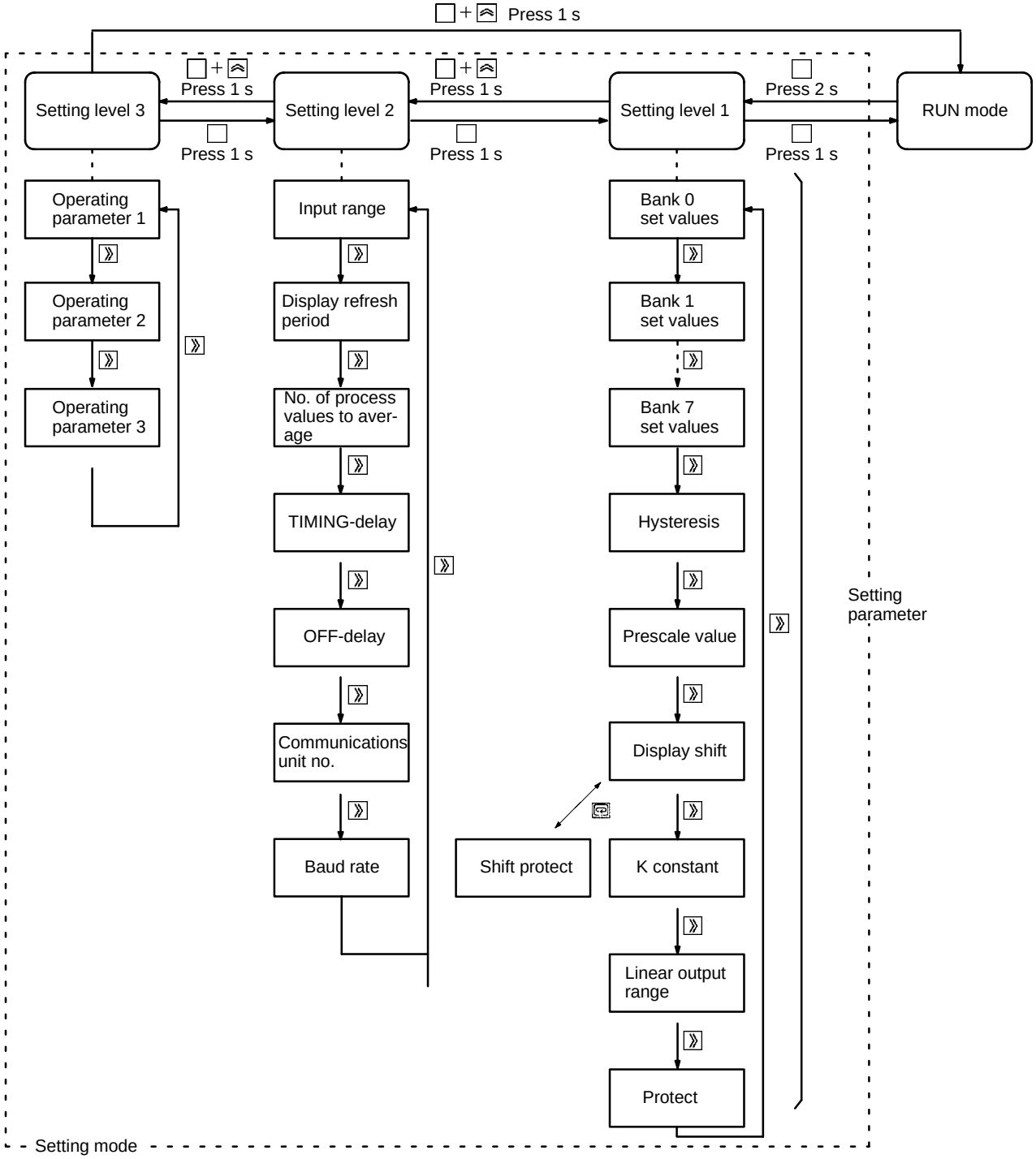
SECTION 6
Parameter Setting and Operation

This section provides instructions for the operation of the K3TS Intelligent Signal Processor. Each operational procedure is described with the aid of tables and diagrams.

6-1 Before Setting the Parameters

6-1-1 Level of Setting Mode and Parameters

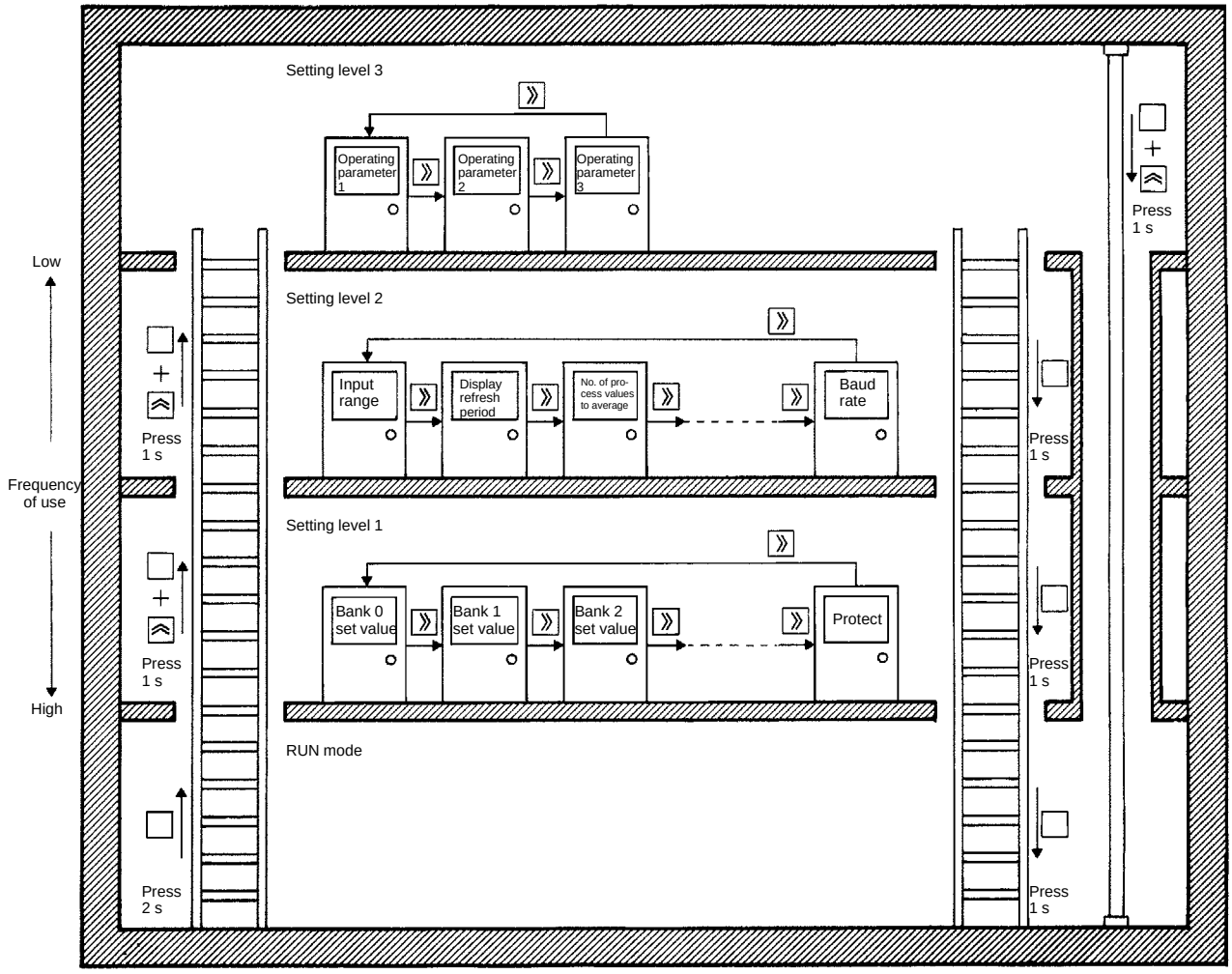
The Intelligent Signal Processor is used mainly in two modes: the RUN mode and the setting mode. In these two modes, the various parameters of the Intelligent Signal Processor can be set. The setting mode has three levels, in each of which one or more parameters can be used. To set the parameters, therefore, first select the setting mode, then select the level and parameter required, from which the necessary parameters can be set. The following diagram illustrates how this is done.



When setting mode is selected, measurement is stopped. Some parameters may not be displayed (i.e., cannot be selected or set), depending on the operating parameter selected and whether the Model is a Display Model or Output Model. For details, refer to the list of valid parameters by operating parameter see *6-1-3 List of Parameters for Each Model*.

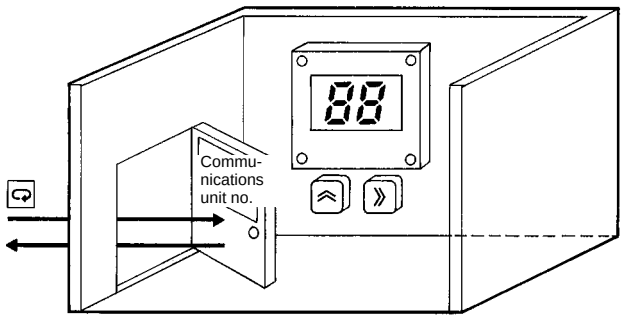
During operation, if you are unsure of the present status (such as the level or parameter with which the setting has been made), press the Level Key for one second to go one level lower. Be sure to write the set value again on that level. The following list and accompanying diagrams describe how to set levels in step-by-step fashion.

Setting Level Diagram



Setting Procedure

1. Press the Level Key or Level and Up Keys to go to the desired level.
2. Use the Shift Key to find the desired parameter.
3. Press the Display Key to access the parameter.
4. Use the Up or Shift Keys to input the desired value.
5. Leave the level you are in with the Display Key.
6. Return to the beginning with the Level Key or the Level and Up Keys.



6-1-2 Parameter Setting Procedure

First, set operating parameters on setting level 3. Then set an input range on setting level 2. Some parameters will not be displayed when the parameter is changed for another one during operation. When a new input range is selected during operation, all parameters on setting levels 1 and 2 are reset to initial values.

The setting procedure is as follows:

1, 2, 3...

1. Operating parameter 1 (setting level 3)
2. Operating parameter 2 (setting level 3)
3. Operating parameter 3 (setting level 3)
4. Input range (setting level 2)
5. Other parameters

Parameters other than the operating parameters and the input range can be set in any order.

6-1-3 List of Parameters for Each Model

The following tables indicate which parameters are available for each Model.

Set Value LED Display Models: K3TS-SD□□B-□□

Level	Parameter		Display	Output			
				C2/5,T1/2	B4	L4/5/6	S5/6
1	Bank 0 set values		CSt0	Yes	Yes	Yes	Yes
	Bank 1 set values		CSt1	Yes	Yes	Yes	Yes
	Bank 2 set values		CSt2	Yes	Yes	Yes	Yes
	Bank 3 set values		CSt3	Yes	Yes	Yes	Yes
	Bank 4 set values		CSt4	Yes	Yes	Yes	Yes
	Bank 5 set values		CSt5	Yes	Yes	Yes	Yes
	Bank 6 set values		CSt6	Yes	Yes	Yes	Yes
	Bank 7 set values		CSt7	Yes	Yes	Yes	Yes
	Hysteresis		HYS	Yes	Yes	Yes	Yes
	Prescale value		SCAL	Yes	Yes	Yes	Yes
	Display shift	Shift value	InDS	Yes	---	---	---
		Shift protect	PrDS	Yes	---	---	---
	K constant		KSEt	Yes	Yes	Yes	Yes
	Linear output range		LSEt	---	---	Yes	---
	Set value protect		Prot	Yes	Yes	Yes	Yes
2	Input range		In	Yes	Yes	Yes	Yes
	Display refresh period		dISP	Yes	Yes	Yes	Yes
	Process values averaging		AvE	Yes	Yes	Yes	Yes
	TIMING-delay		tOd	Yes	Yes	Yes	Yes
	OFF-delay		oFOd	Yes	Yes	Yes	Yes
	Communications unit no.		UOno	---	---	---	Yes
	Baud rate		bPS	---	---	---	Yes
3	Operating parameter 1		Fun1	Yes	Yes	Yes	Yes
	Operating parameter 2		Fun2	Yes	Yes	Yes	Yes
	Operating parameter 3		Fun3	Yes	Yes	Yes	Yes

Thumbwheel Switches Models: K3TS-SD1□D-□□

Level	Parameter		Display	Output	
				C1,T1/2	B4
1	Bank 0 set values		CSt0	---	---
	Bank 1 set values		CSt1	---	---
	Bank 2 set values		CSt2	---	---
	Bank 3 set values		CSt3	---	---
	Bank 4 set values		CSt4	---	---
	Bank 5 set values		CSt5	---	---
	Bank 6 set values		CSt6	---	---
	Bank 7 set values		CSt7	---	---
	Hysteresis		HYS	Yes	Yes
	Prescale value		SCAL	Yes	Yes
	Display shift	Shift value	∴nDS	---	---
		Shift protect	PrDS	---	---
	K constant		MSEt	Yes	Yes
	Linear output range		LSEt	---	---
	Set value protect		Prōt	---	---
2	Input range		∴n	Yes	Yes
	Display refresh period		dCSP	Yes	Yes
	Process values averaging		AvE	Yes	Yes
	TIMING-delay		tDd	Yes	Yes
	OFF-delay		ōFDd	Yes	Yes
	Communications unit no.		UDnō	---	---
	Baud rate		bPS	---	---
3	Operating parameter 1		Fun1	Yes	Yes
	Operating parameter 2		Fun2	Yes	Yes
	Operating parameter 3		Fun3	Yes	Yes

List of Valid Parameters by Operating Parameter

The following parameters are not available with all Models. For further information, refer to *6-1-3 List of Parameters for Each Model.*

If *FUn3* is set to *noRn*:

Level	Parameter		Display	*FUn1*					
				A	*Ab*	*AUb*	*PUAb*	*Pb1A*	*b1A*
1	Set values		*CSt0* to *7*	Yes	Yes	Yes	Yes	Yes	Yes
	Hysteresis		*HYS*	Yes	Yes	Yes	Yes	Yes	Yes
	Prescale value		*SCAL*	Yes	Yes	Yes	Yes	Yes	Yes
	Display shift	Shift value	*InUS*	Yes	Yes	Yes	Yes	Yes	Yes
		Shift protect	*PrUS*	Yes	Yes	Yes	Yes	Yes	Yes
	K constant		*PSEt*	---	---	---	Yes	---	---
	Linear output range		*LSEt*	Yes	Yes	Yes	Yes	Yes	Yes
	Set value protect		*Prot*	Yes	Yes	Yes	Yes	Yes	Yes
2	Input range		*In*	Yes	Yes	Yes	Yes	Yes	Yes
	Display refresh period		*dISP*	Yes	Yes	Yes	Yes	Yes	Yes
	Process values averaging		*AUE*	Yes	Yes	Yes	Yes	Yes	Yes
	TIMING-delay		*tUd*	---	---	---	---	---	---
	OFF-delay		*oFUd*	Yes	Yes	Yes	Yes	Yes	Yes
	Communications unit no.		*UUno*	Yes	Yes	Yes	Yes	Yes	Yes
	Baud rate		*bPS*	Yes	Yes	Yes	Yes	Yes	Yes
3	Operating parameter 2		*FUn2*	Yes	Yes	Yes	Yes	Yes	Yes

If *FUn3* is set to *SUH*, *PUH*, *bUH*, *PPUH*:

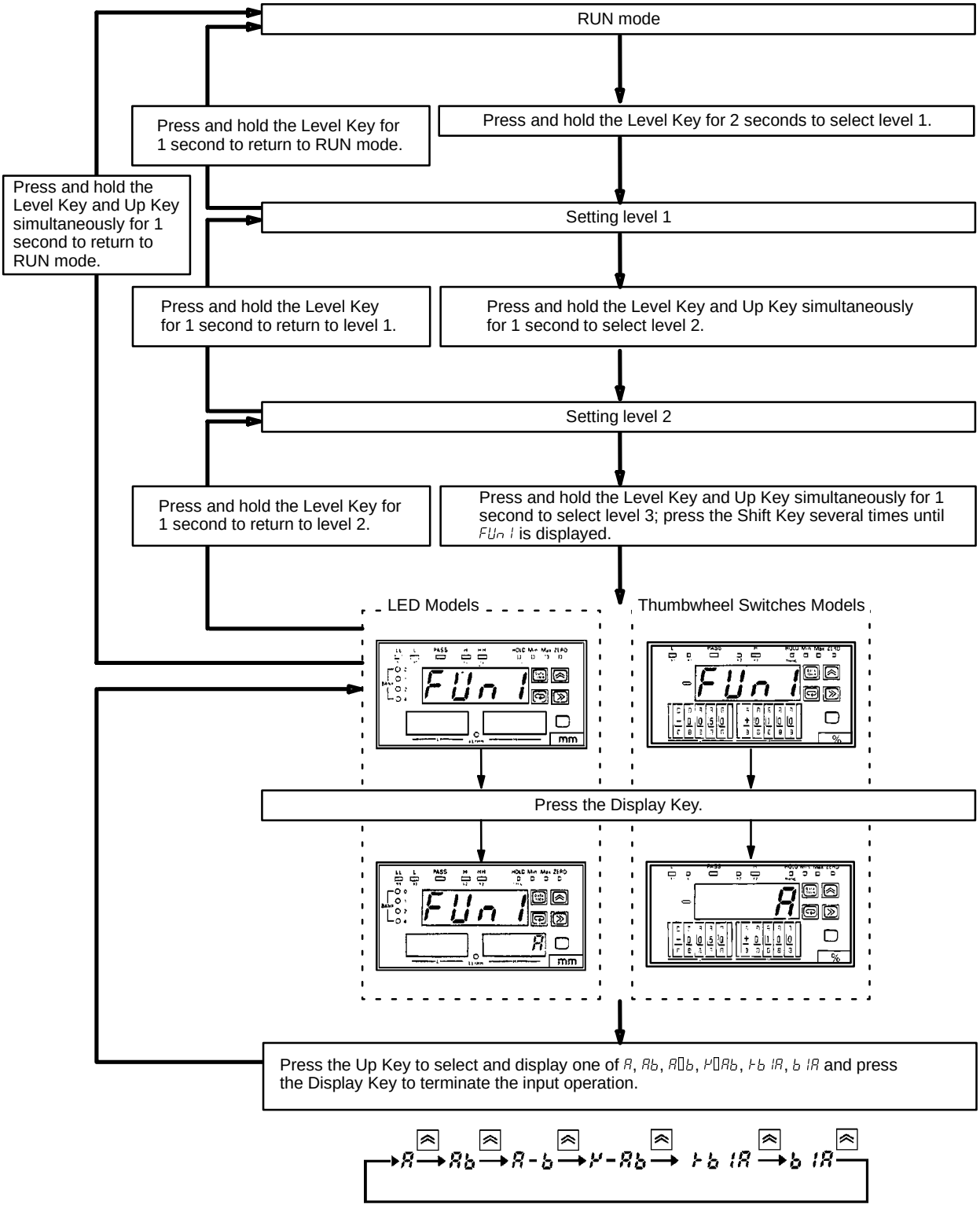
Level	Parameter		Display	*FUn1*					
				A	*Ab*	*AUb*	*PUAb*	*Pb1A*	*b1A*
1	Set values		*CSt0* to *7*	Yes	Yes	Yes	Yes	Yes	Yes
	Hysteresis		*HYS*	---	---	---	---	---	---
	Prescale value		*SCAL*	Yes	Yes	Yes	Yes	Yes	Yes
	Display shift	Shift value	*InUS*	Yes	Yes	Yes	Yes	Yes	Yes
		Shift protect	*PrUS*	Yes	Yes	Yes	Yes	Yes	Yes
	K constant		*PSEt*	---	---	---	Yes	---	---
	Linear output range		*LSEt*	Yes	Yes	Yes	Yes	Yes	Yes
	Set value protect		*Prot*	Yes	Yes	Yes	Yes	Yes	Yes
2	Input range		*In*	Yes	Yes	Yes	Yes	Yes	Yes
	Display refresh period		*dISP*	---	---	---	---	---	---
	Process values averaging		*AUE*	Yes	Yes	Yes	Yes	Yes	Yes
	TIMING-delay		*tUd*	Yes	Yes	Yes	Yes	Yes	Yes
	OFF-delay		*oFUd*	---	---	---	---	---	---
	Communications unit no.		*UUno*	Yes	Yes	Yes	Yes	Yes	Yes
	Baud rate		*bPS*	Yes	Yes	Yes	Yes	Yes	Yes
3	Operating parameter 2		*FUn2*	Yes	Yes	Yes	Yes	Yes	Yes

6-2 Parameter Setting

6-2-1 Operating Parameter 1 (2-Input)

Operating parameter 1 can convert outputs into actual figures. Set operating parameter 1 according to the following instructions outlined in the table and the flow diagram:

Setting	
A	A
A + B	Ab
A − B	A□b
K − (A + B)	K□Ab
(1 − B/A) x 100	1b iA
B/A x 100	b iA



If (1 − B/A) x 100 or B/A x 100 is selected in the 2-input operation mode, there is no difference in scaling operation between input A and input B and the decimal point will be always between the two rightmost digits and two leftmost digits. Therefore, the operation result will be displayed in a range between −99.99 and 99.99.

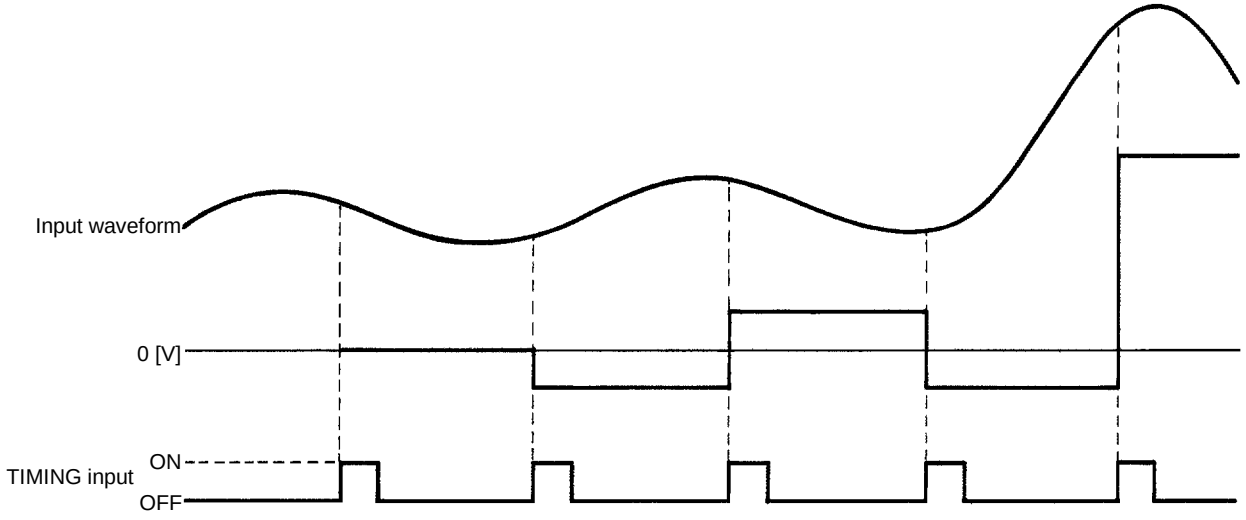
6-2-2 Operating Parameter 2 (Previous Average Value Comparison)

When the K3TS is set to $\bar{a}n$ in operating parameter 2, the K3TS detects only values fluctuating rapidly, dismissing slowly fluctuating ones such as values caused by the decentering of a sensing object or the sagging of a belt conveyor.

Concept of Previous Average Value Comparison

Number of measuring operations	Input value	Displayed value	Compared with present value
1	V_1	$V_1 - V_1 = 0$	$C_1 = V_1$
2	V_2	$V_2 - C_1$	$C_2 = 1/2(C_1 + V_2) = 1/2(V_1 + V_2)$
3	V_3	$V_3 - C_2$	$C_3 = 1/2(C_2 + V_3) = 1/4(V_1 + V_2) + 1/2V_3$
4	V_4	$V_4 - C_3$	$C_4 = 1/2(C_3 + V_4) = 1/8(V_1 + V_2) + 1/4V_3 + 1/2V_4$
n	V_n	$V_n - C_{n-1}$	$1/2^{n-1}(V_1 + V_2) + 1/2^{n-2} + ... + 1/2V_n$

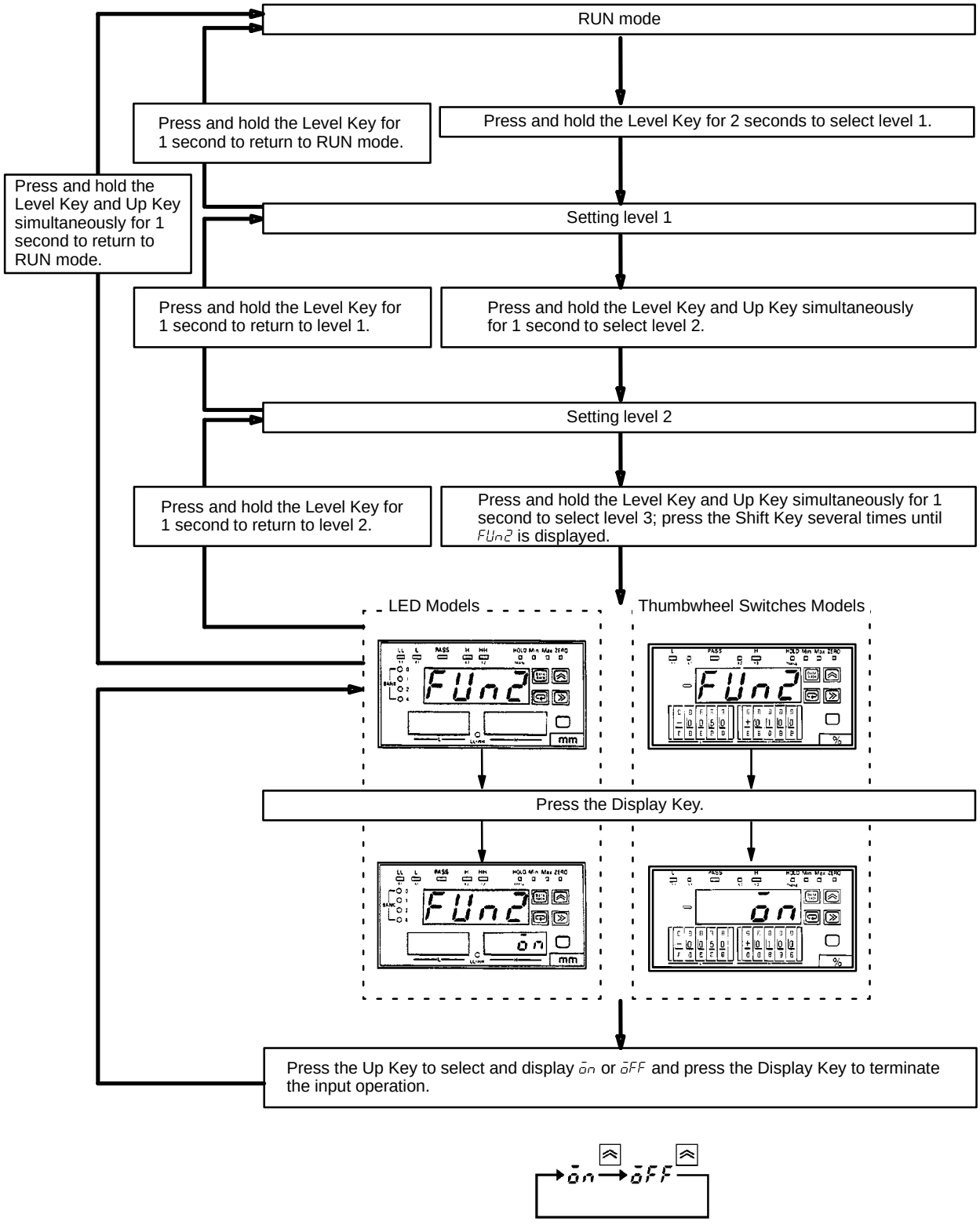
Example of Previous Average Value Comparison when selecting Sampling hold



Number of measuring operations	Input value	Displayed value	Compared with present value
1	4.0	4.0 − 4.0 = 0	4.0
2	3.0	3.0 − 4.0 = −1.0	1/2(4.0 + 3.0) = 3.5
3	4.5	4.5 − 3.5 = 1.0	1/2(3.5 + 4.5) = 4.0
4	3.0	3.0 − 4.0 = −1.0	1/2(4.0 + 3.0) = 3.5
5	8.5	8.5 − 3.5 = 5.0	1/2(3.5 + 8.5) = 6.0

Set operating parameter 2 according to the following instructions outlined in the table and the flow diagram:

Average comparison	ON	on
	OFF	oFF



6-2-3 Operating Parameter 3

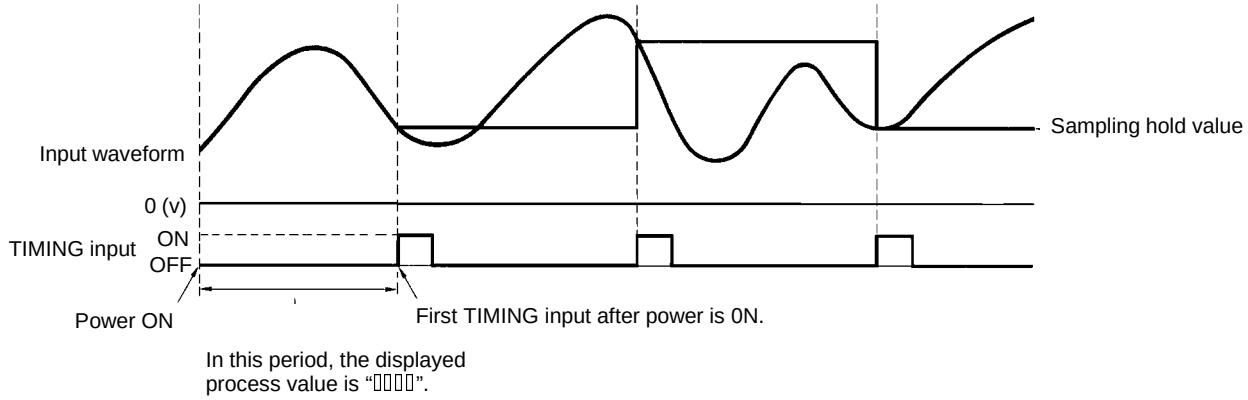
Holding Data (TIMING Input)

Normal

When the K3TS is set to nörn on operating parameter 3, the TIMING input is not effective, and the K3TS continues data sampling.

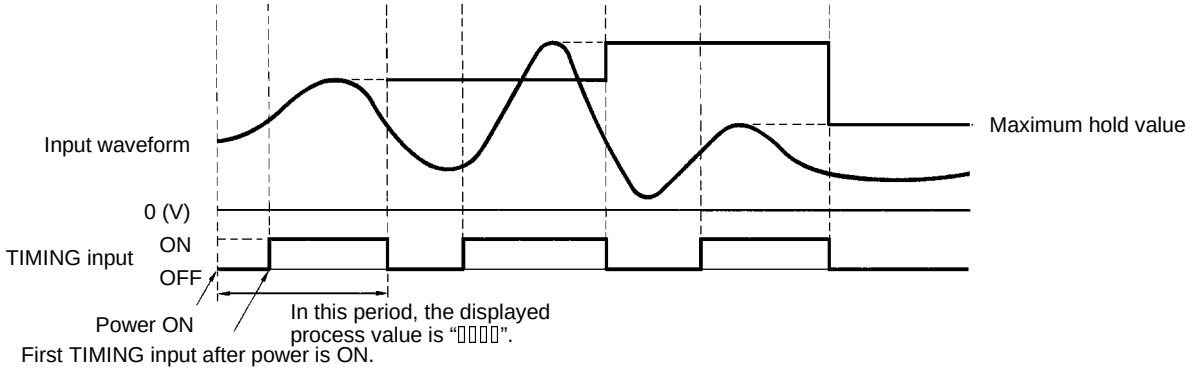
Sampling Hold

When the K3TS is set to S□H on operating parameter 3, the K3TS retrieves the data on the rising edge of the TIMING input and holds the data until the rising edge of the next TIMING input signal.



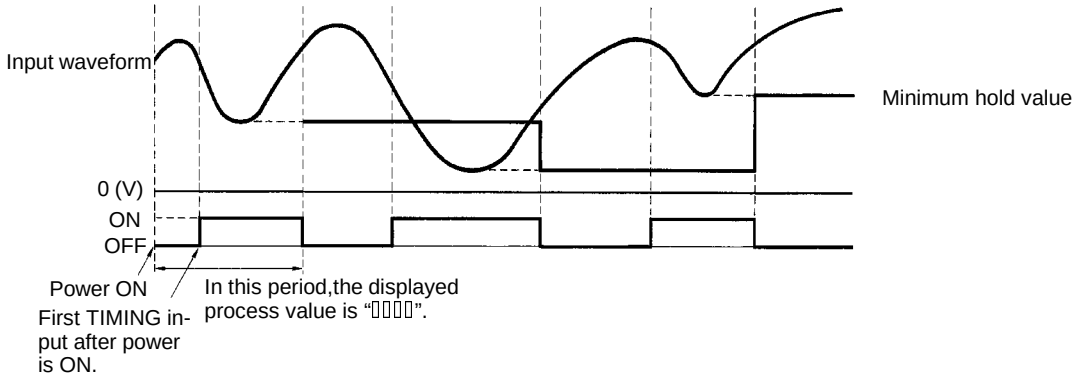
Maximum Hold

When the K3TS is set to P□H on operating parameter 3, the K3TS continues data sampling while the TIMING input is ON. When the TIMING input is OFF, the K3TS displays the maximum value of the data that has been sampled and holds the value until the next TIMING input signal is OFF.



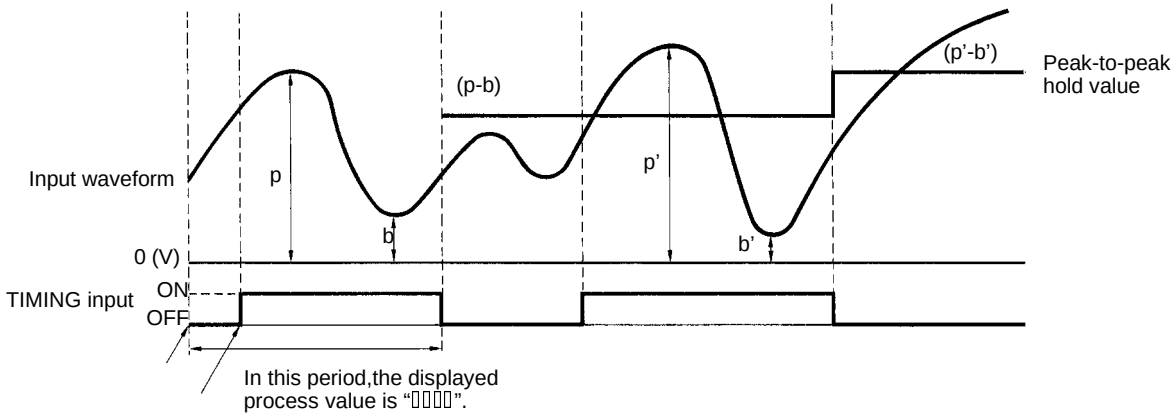
Minimum Hold

When the K3TS is set to bOH on operating parameter 3, the K3TS continues data sampling while the TIMING input is ON. When the TIMING input is OFF, the K3TS displays the minimum value of the data that has been sampled and holds the value until the next TIMING input signal is OFF.



Peak-to-Peak Hold

When the K3TS is set to PPOH on operating parameter 3, the K3TS continues data sampling while the TIMING input is ON. When the TIMING input is OFF, the K3TS displays the peak-to-peak value (the difference between the maximum value and the minimum value) of the data that has been sampled and holds the value until the next TIMING input signal is OFF.



To cancel hold status, the RESET input must be ON.

Set operating parameter 3 according to the following instructions outlined in the table and the flow diagram:

Settings	
Normal	norn
Sampling HOLD	S□H
Maximum HOLD	P□H
Minimum HOLD	b□H
Peak-to-peak HOLD	PP□H

RUN mode

Press and hold the Level Key for 1 second to return to RUN mode.

Press and hold the Level Key for 2 seconds to select level 1.

Press and hold the Level Key and Up Key simultaneously for 1 second to return to RUN mode.

Setting level 1

Press and hold the Level Key for 1 second to return to level 1.

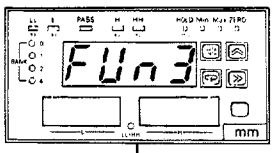
Press and hold the Level Key and Up Key simultaneously for 1 second to select level 2.

Setting level 2

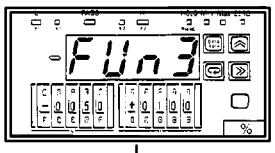
Press and hold the Level Key for 1 second to return to level 2.

Press and hold the Level Key and Up Key simultaneously for 1 second to select level 3; press the Shift Key several times until Fun3 is displayed.

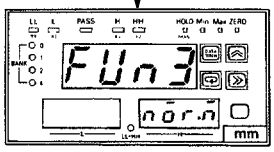
LED Models

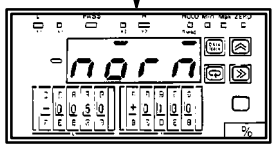


Thumbwheel Switches Models

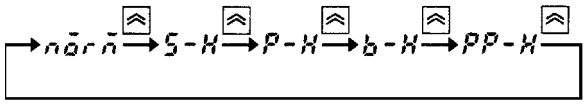


Press the Display Key.





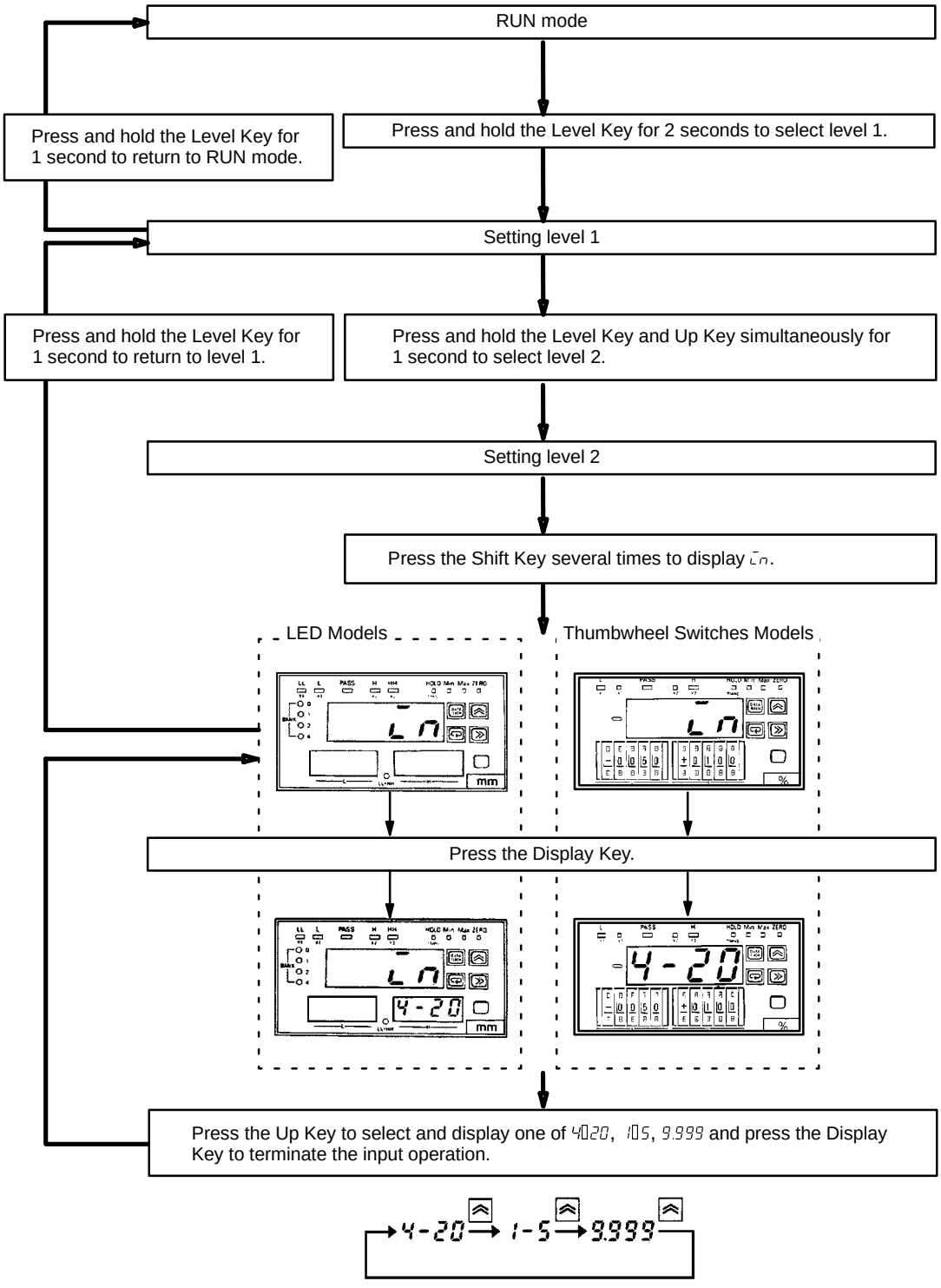
Press the Up Key to select and display one of norn, S□H, P□H, b□H, PP□H and press the Display Key to terminate the input operation.



6-2-4 Input Range

Set input range according to the following instructions outlined in the table and the flow diagram:

Setting	
4 to 20 mA	4020
1 to 5 V	105
±9.999 V	9.999



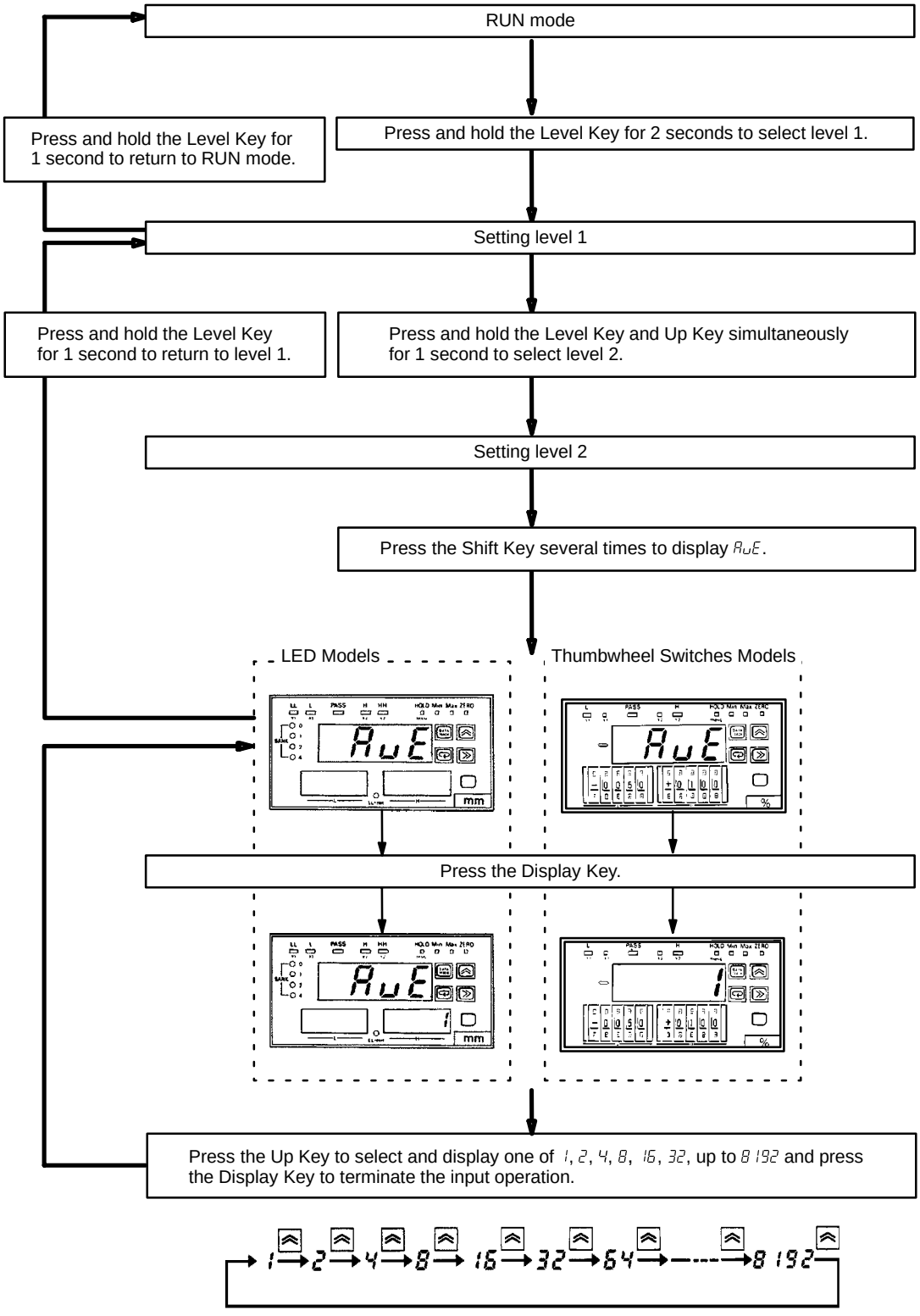
6-2-5 Number of Process Values to Average

Set the number of process values to average according to the following tables and flow diagram. The setting range available for averaging is shown below.

Setting period			
1	1	128	128
2	2	256	256
4	4	512	512
8	8	1024	1024
16	16	2048	2048
32	32	4096	4096
64	64	8192	8192

Given a setting, the time required for sampling is shown below.

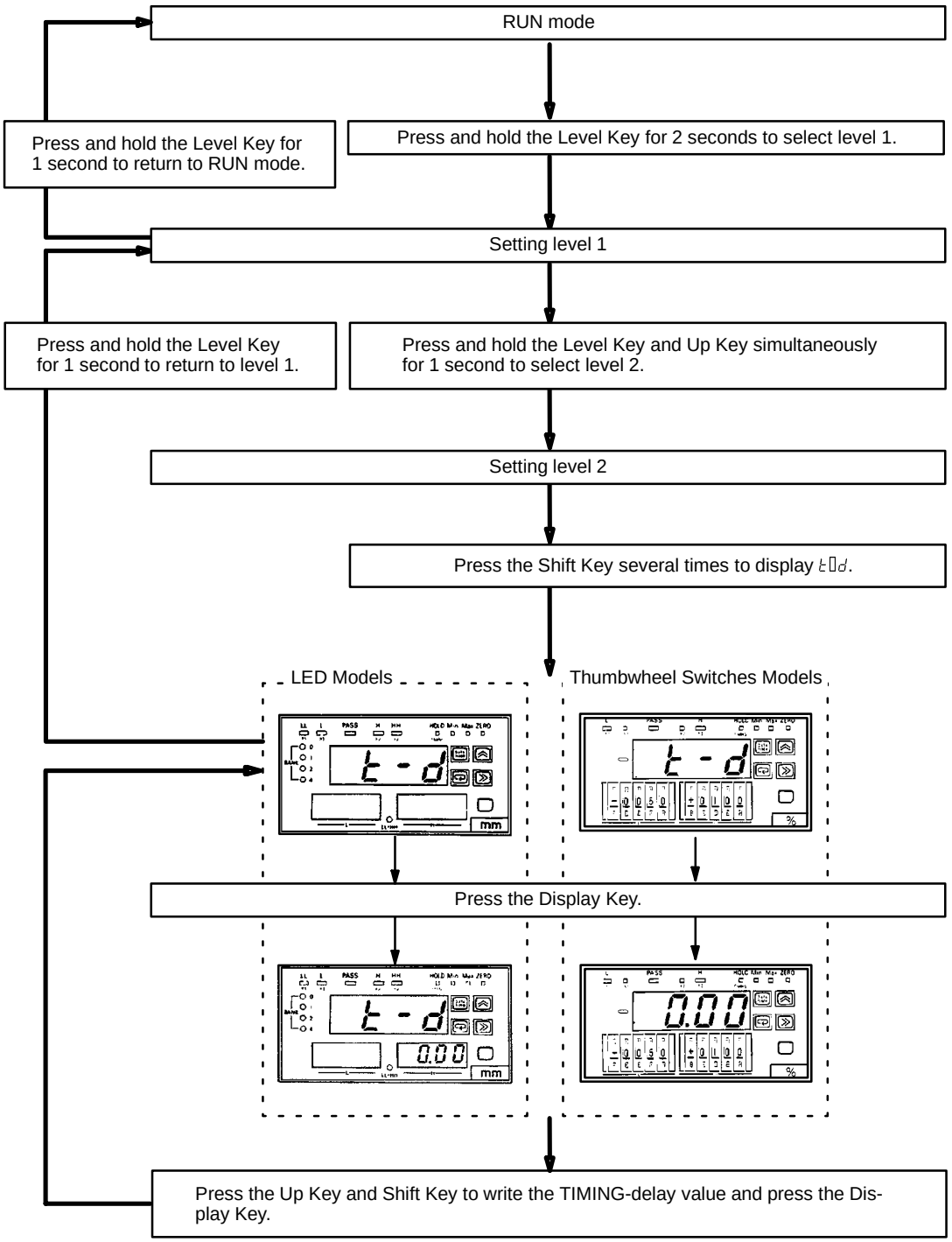
Sampling period			
1	3.1 ms	128	130 ms
2	4.2 ms	256	270 ms
4	6.2 ms	512	530 ms
8	10 ms	1024	1.1 s
16	19 ms	2048	2.1 s
32	35 ms	4096	4.2 s
64	68 ms	8192	8.4 s


RUN mode
Press and hold the Level Key for 1 second to return to RUN mode.
Press and hold the Level Key for 2 seconds to select level 1.
Setting level 1
Press and hold the Level Key for 1 second to return to level 1.
Press and hold the Level Key and Up Key simultaneously for 1 second to select level 2.
Setting level 2
Press the Shift Key several times to display AuE.
LED Models
Thumbwheel Switches Models
Press the Display Key.
Press the Up Key to select and display one of 1, 2, 4, 8, 16, 32, up to 8 192 and press the Display Key to terminate the input operation.
1 → 2 → 4 → 8 → 16 → 32 → 64 → ---- → 8 192

6-2-6 TIMING-delay

The TIMING-delay function is available only when the K3TS is set to S□H, P□H, b□H, or PP□H on operating parameter 3. With the TIMING-delay function, the time immediately after the TIMING input is turned ON until the start of pulse counting operation can be freely set within a range of 0.00 to 1.99 s. The following diagram illustrates the procedure for TIMING-delay time setting:

Setting range	0.00 to 1.99



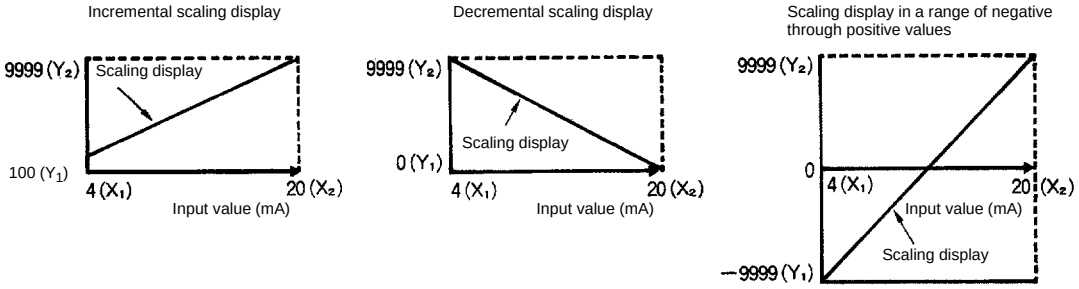
6-2-7 Parameters for Display

Prescaling

Set prescaling data to convert an input value into a desired displayed value. Prescaling data can be freely set within a range of −9999 to 9999.

$X_2 - Y_2$ and $X_1 - Y_1$ must be input (X: Input value, Y: Corresponding displayed value). When the 2-input operation mode is selected, the X and Y input values must be values resulting from 2-input operation. X_1 or Y_1 can be either larger or smaller than X_2 or Y_2. If $X_1 = X_2$, it is assumed that $X_2 = X_1 + 1$.

For example, in the case of adding A and B using two sensors, each of which has an output of 1 to 5 V, input value X should not be set from 2 to 10 V but from 2 to 5 V (0% to 50% input) for easier scaling. X_2 or X_1 cannot be be set if the total sum of X_2 and X_1 exceeds ±9.999V or 99.99 mA.



If (1 − B/A) x 100 and B/A x 100 are selected, there will be no difference in scaling between input A and input B, and the position of the decimal point will be fixed between the second and third digits (i.e., 00.00). Consequently, the result of operation will be displayed in a range of −99.99 to 99.99.

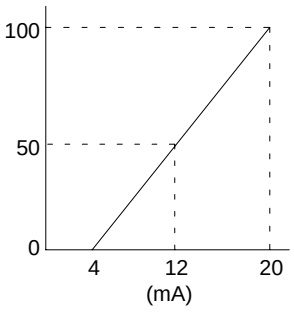
For the B/A of operating parameter 1, the operation of 1 − (B/A) is required. Scaling is possible.

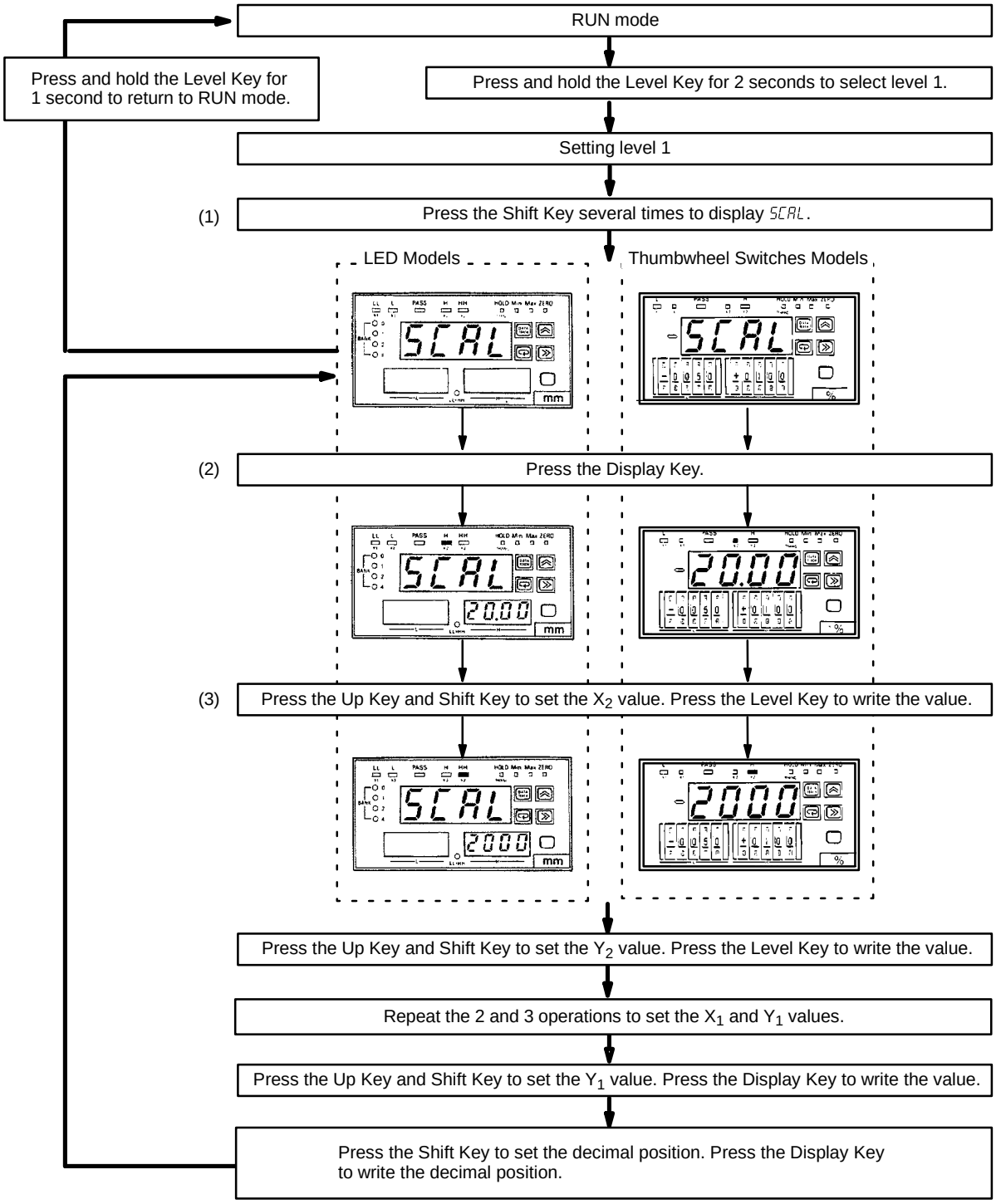
The operation for the scaling result of the actual input value is as follows.

Example in the case of 4- to 20-mA input:

INA = 20 mA, INB = 12 mA
Scaling: X_2 = 20 mA, Y_2 = 100, X_1 = 4 mA, and Y_1 = 0

Then INA = 100 and INB = 50
Therefore, B/A x 100 = 50/100 x 100 = 0.5 x 100 = 50%

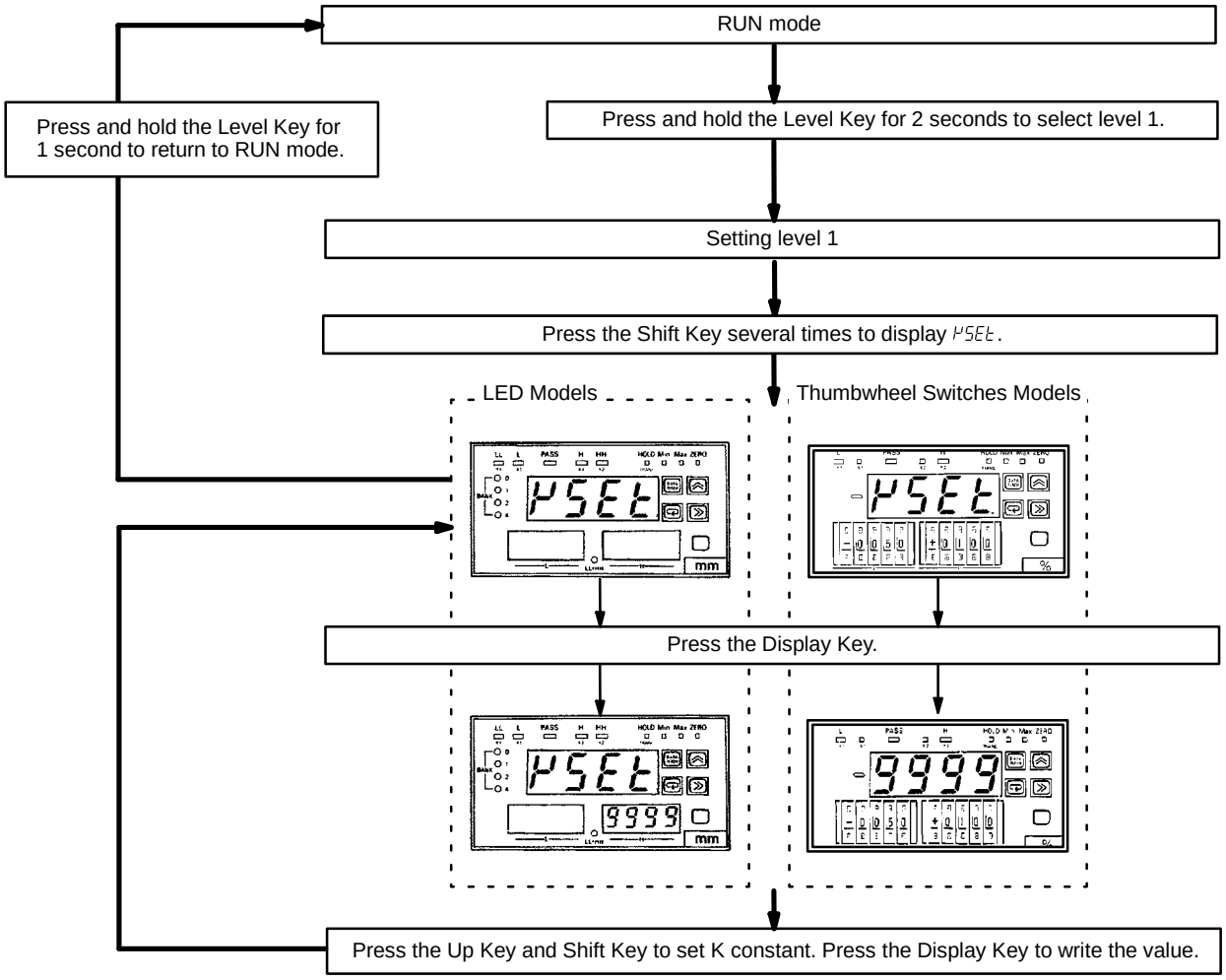



RUN mode
Press and hold the Level Key for 2 seconds to select level 1.
Setting level 1
(1) Press the Shift Key several times to display SCAL.
LED Models
Thumbwheel Switches Models
(2) Press the Display Key.
(3) Press the Up Key and Shift Key to set the X2 value. Press the Level Key to write the value.
Press the Up Key and Shift Key to set the Y2 value. Press the Level Key to write the value.
Repeat the 2 and 3 operations to set the X1 and Y1 values.
Press the Up Key and Shift Key to set the Y1 value. Press the Display Key to write the value.
Press the Shift Key to set the decimal position. Press the Display Key to write the decimal position.
Press and hold the Level Key for 1 second to return to RUN mode.

K Constant

The K constant is used to convert the outputs of the displacement sensors into actual figures. The setting of K constant is available only when the K3TS is set to *P□Ab* on operating parameter 1.

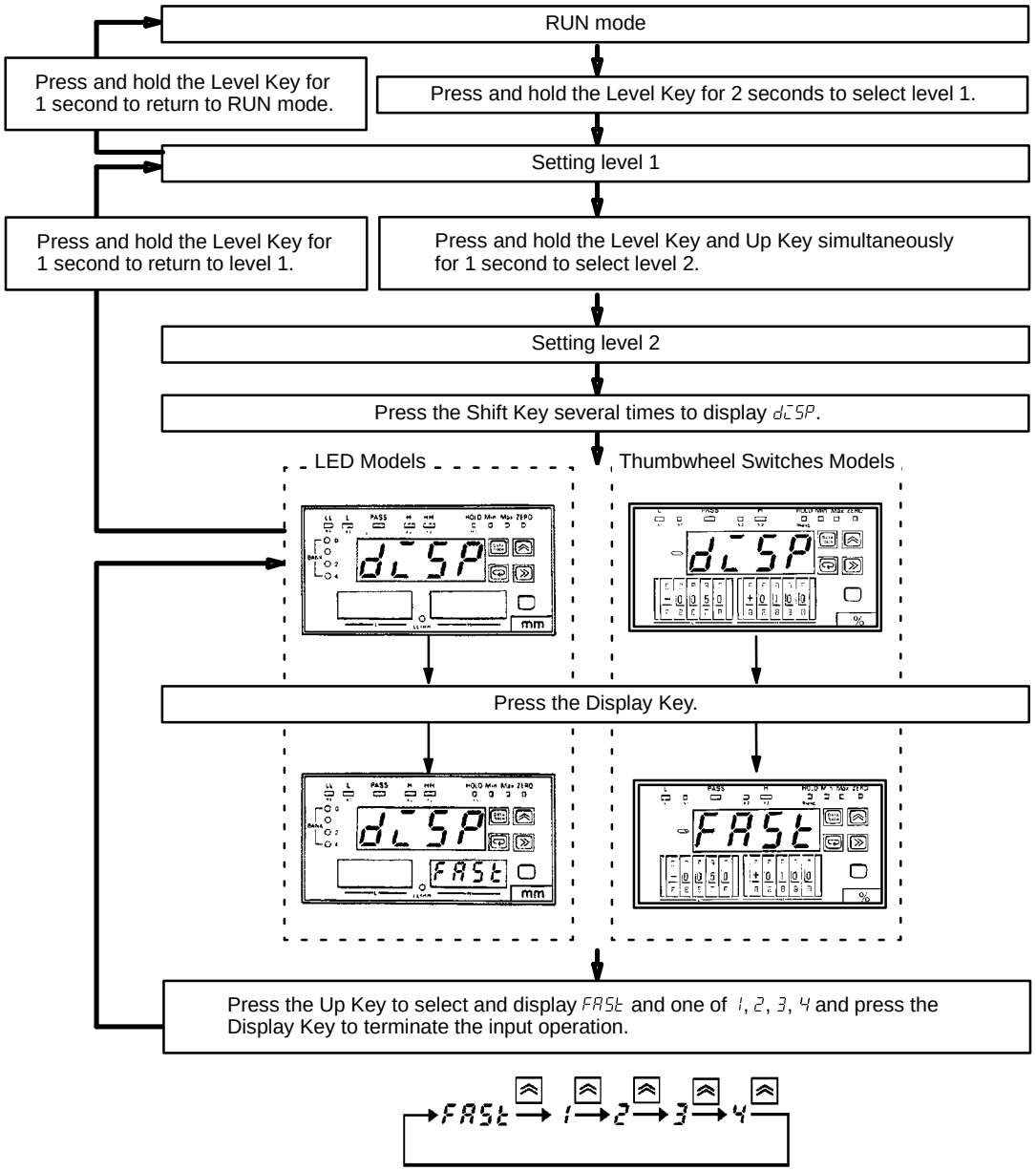
Setting range	*0000* to *9999*



Display Refresh Period

The alteration of the display refresh period does not change the sampling range. The comparative outputs and BCD data are updated in synchronization with the sampling range. The display refresh period parameter will not appear when the sampling hold, maximum hold, minimum hold, or peak-to-peak hold parameter is set on operating parameter 3.

Setting	
Refreshed every 0.1 s	FAST
Refreshed every 1.0 s	1
Refreshed every 2.0 s	2
Refreshed every 3.0 s	3
Refreshed every 4.0 s	4

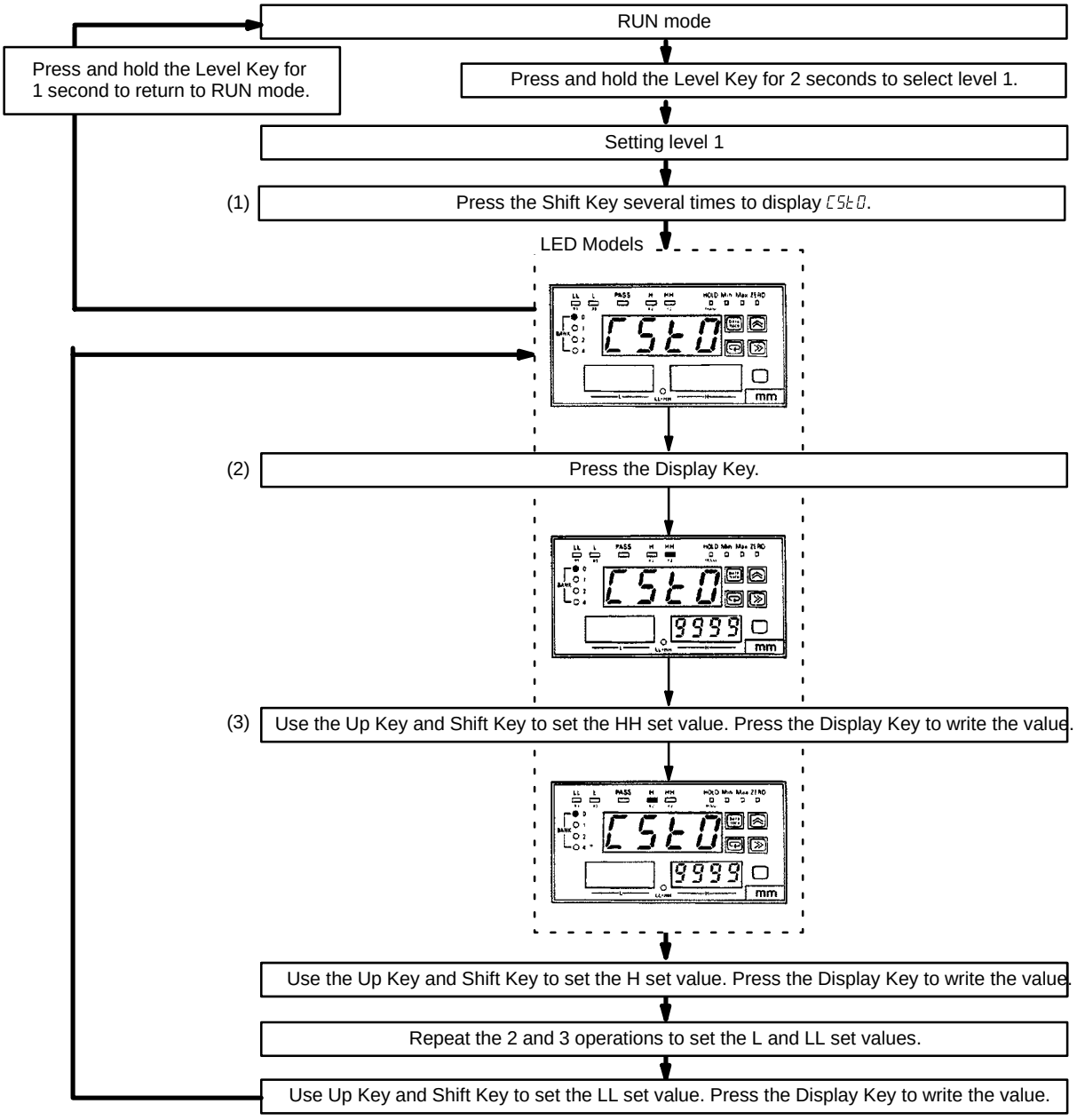


6-2-8 Parameters for Output

Set Values

To establish whether the measured values are within a given range or criteria, they are regularly compared with set values. In order to establish set values, follow the instructions outlined in the flow diagram (the example is for the setting of set values on Bank 0). Operate likewise for the setting of set values on Banks 1 to 7 after executing (1) to display CSt0 to 7. The decimal is displayed at the position set in the prescale parameter. Any one of HH, H, L, and LL can be larger or smaller than the others. No parameter settings for set values are available for the Thumbwheel Switches Models. Establish set values with the front panel's thumbwheel switches. The values are registered 1.5 s after the values have been set.

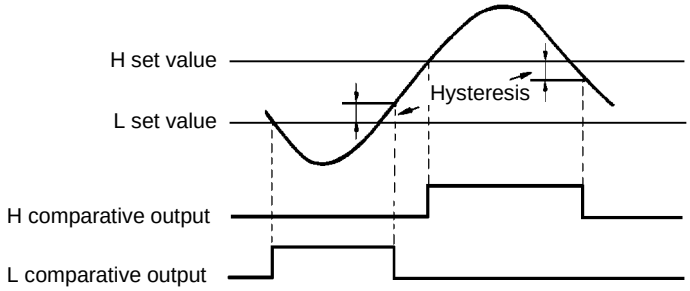
Setting range	-9999 to 9999

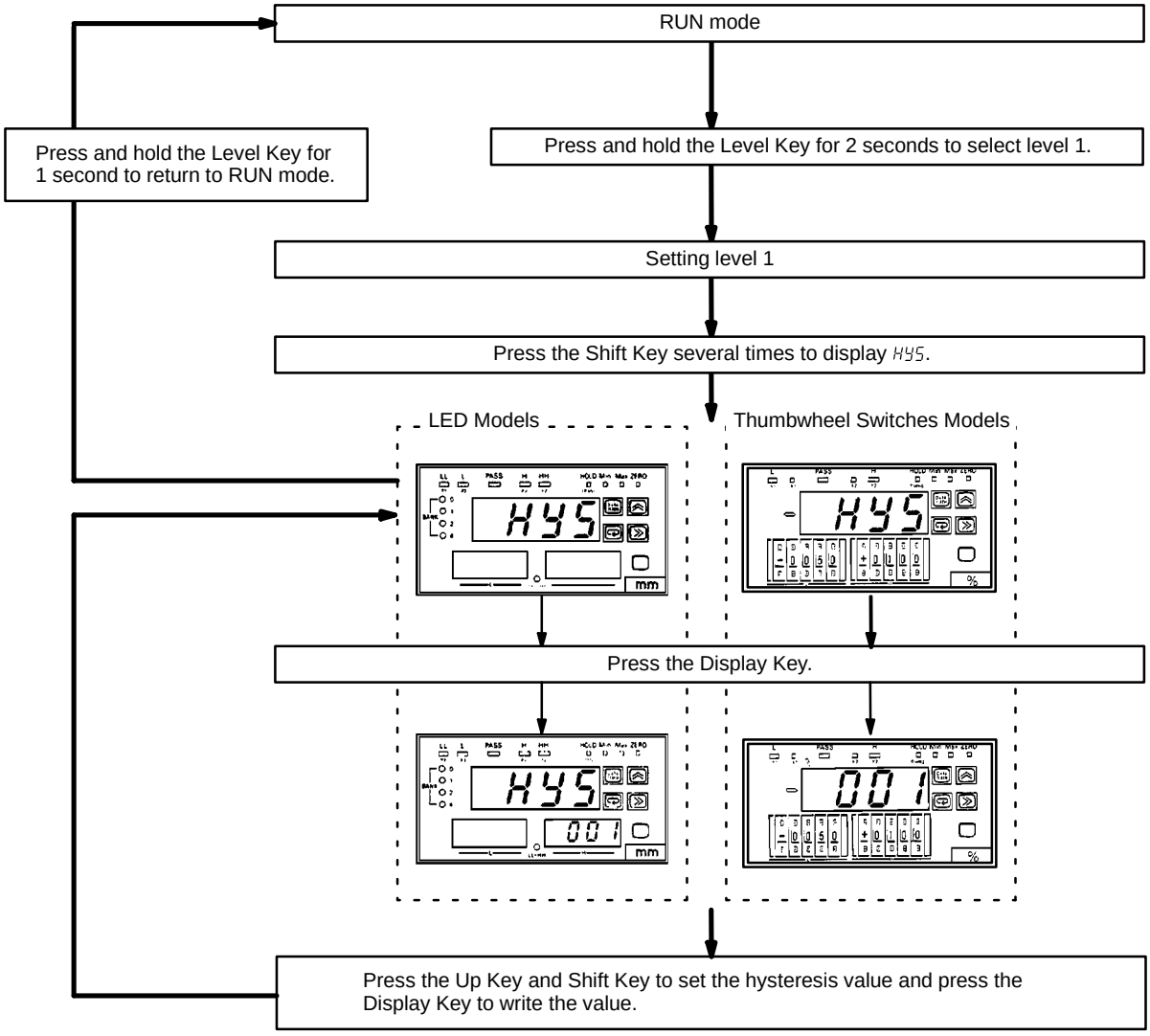


Hysteresis

The established set value includes a hysteresis to prevent the comparative output status from tuning ON/OFF when it should not if the process value (displayed value) fluctuates in the vicinity of the established set value.

Setting range	001 to 999



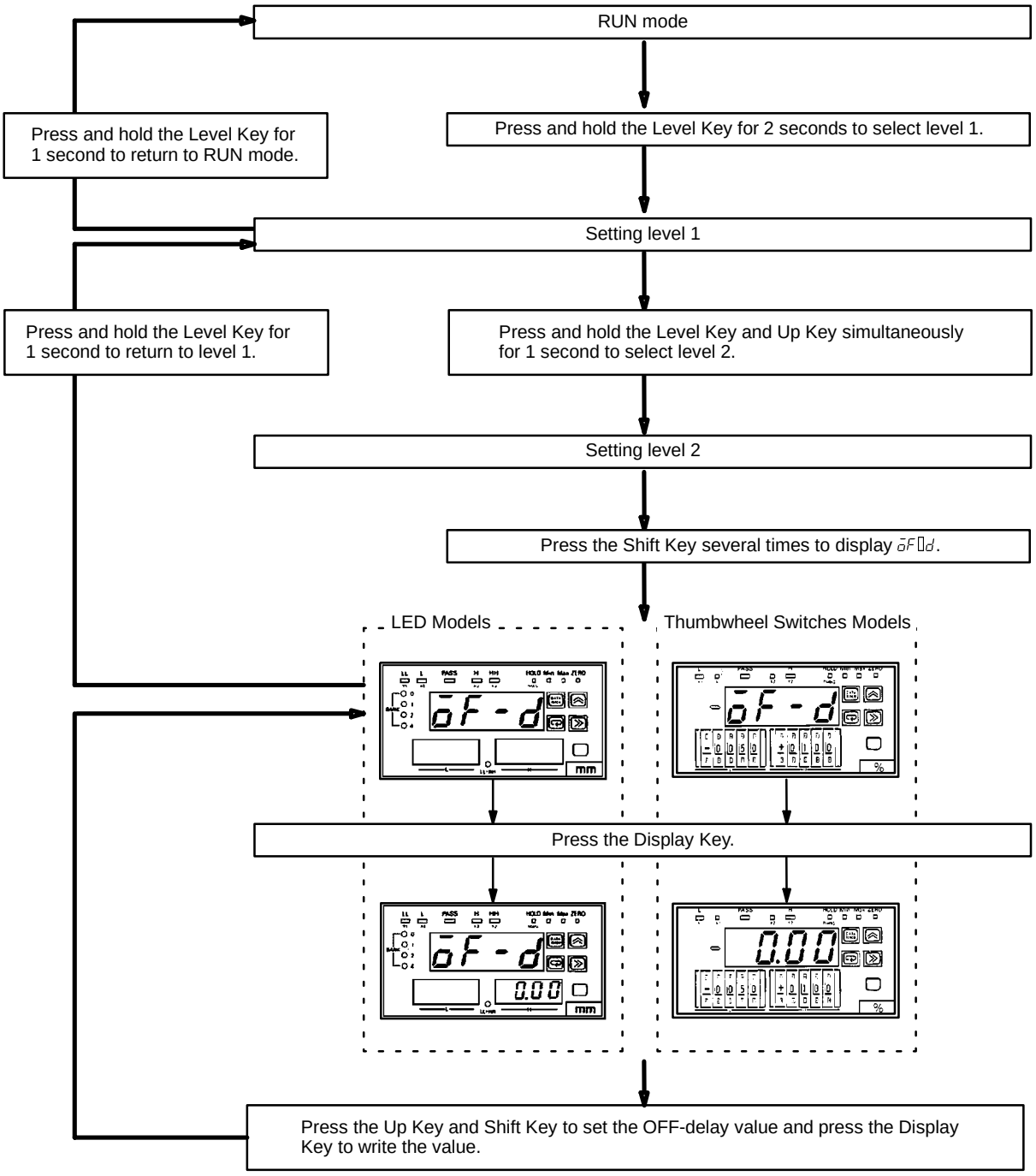


Logically, 0 cannot be set as a hysteresis value. If 0 is set, the K3TS takes the hysteresis value as 1. If sampling hold, maximum hold, minimum hold, peak-to-peak hold values are set on operating parameter 3 (on setting level 3), no hysteresis setting is available.

OFF-delay

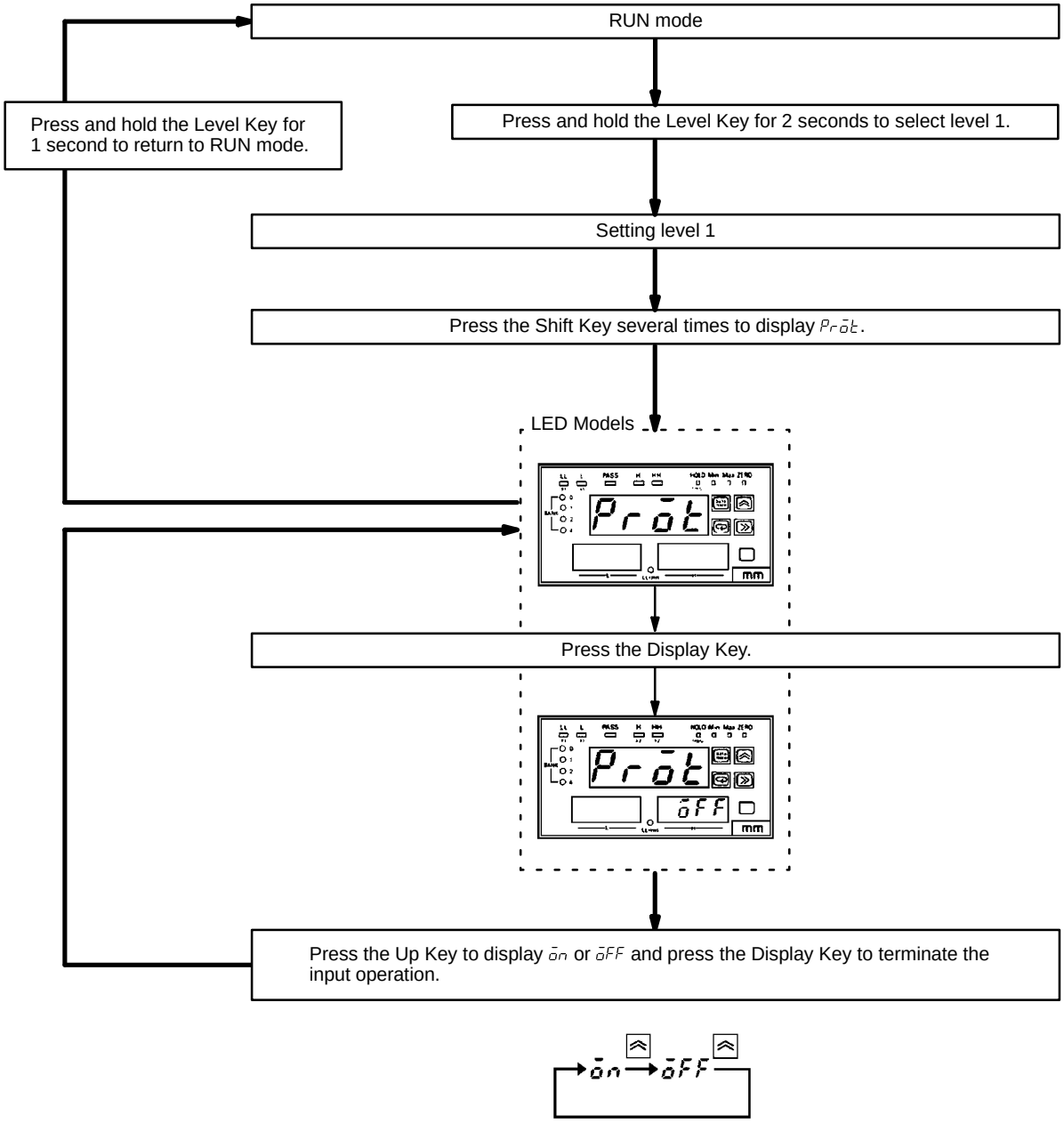
The OFF-delay function is available only when the K3TS is set to nörn on operating parameter 3. With the OFF-delay function, the comparative output OFF-delay time can be freely set within a range of 0.00 to 1.99 s. The following diagram illustrates the procedure for setting the OFF-delay time:

Setting range	0.00 to 1.99



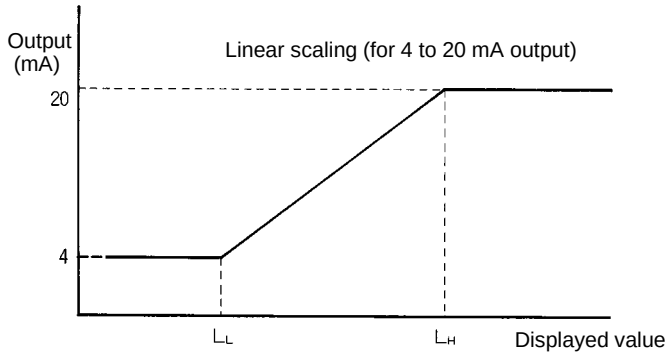
Protecting Set Values

With the Set Value LED Display Models, the set values can be changed in the RUN mode. However, this feature can be disabled to protect the set values. In order to protect them, follow the instructions outlined in the flow diagram. Protection of set values is not possible with the Thumbwheel Switches Models. Therefore no parameter settings for set value protection appears.



Linear Output Range

This setting is only for Models with 4 to 20 mA, 1 to 5 V linear output.



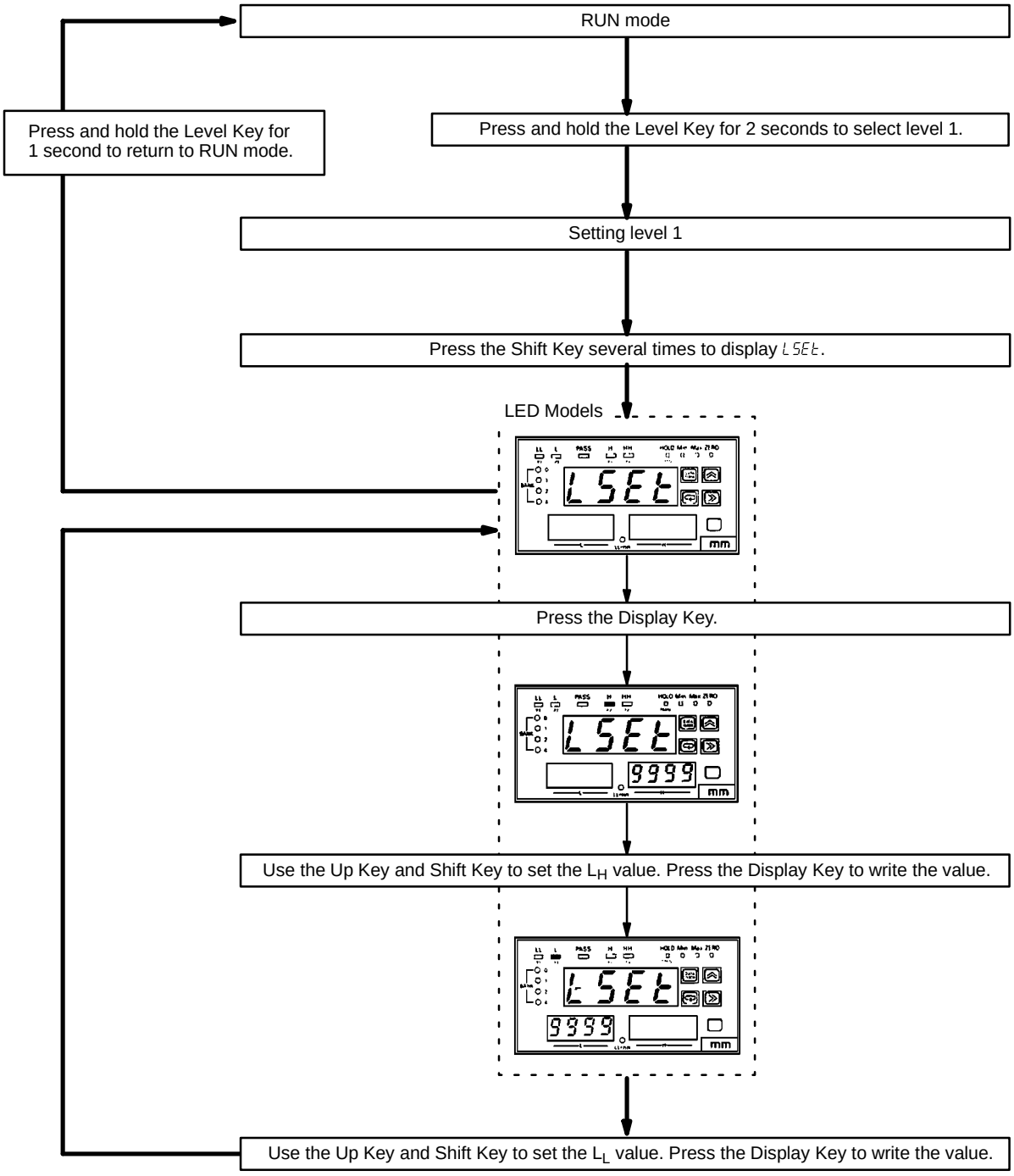
For operating parameters 1 through 3, the Intelligent Signal Processor outputs a linear voltage or current in proportion to the changes in the measured value. In the example above, a displayed value corresponding to the L_H maximum output value (20 mA or 5 V) and a displayed value corresponding to the L_L minimum output value (4 mA or 1 V) is set.

The decimal is displayed at the position set in the prescale parameter. Note that neither L_H nor L_L shift if the position of the decimal is changed after L_H and L_L have been set.

Do not set $L_L = L_H$; otherwise, it is assumed that L_L + 1 digit = L_H.

This function is not provided on the mV/digit Output Models on which regardless of the position of the decimal, 1 mVDC is output per digit displayed. (For example, if the displayed value is 150.0, the output is 1500 mV.) A linear output range cannot be set with Thumbwheel Switches Models.

In order to set the linear output range, follow the instructions outlined in the flow diagram and operate the Intelligent Signal Processor as follows:

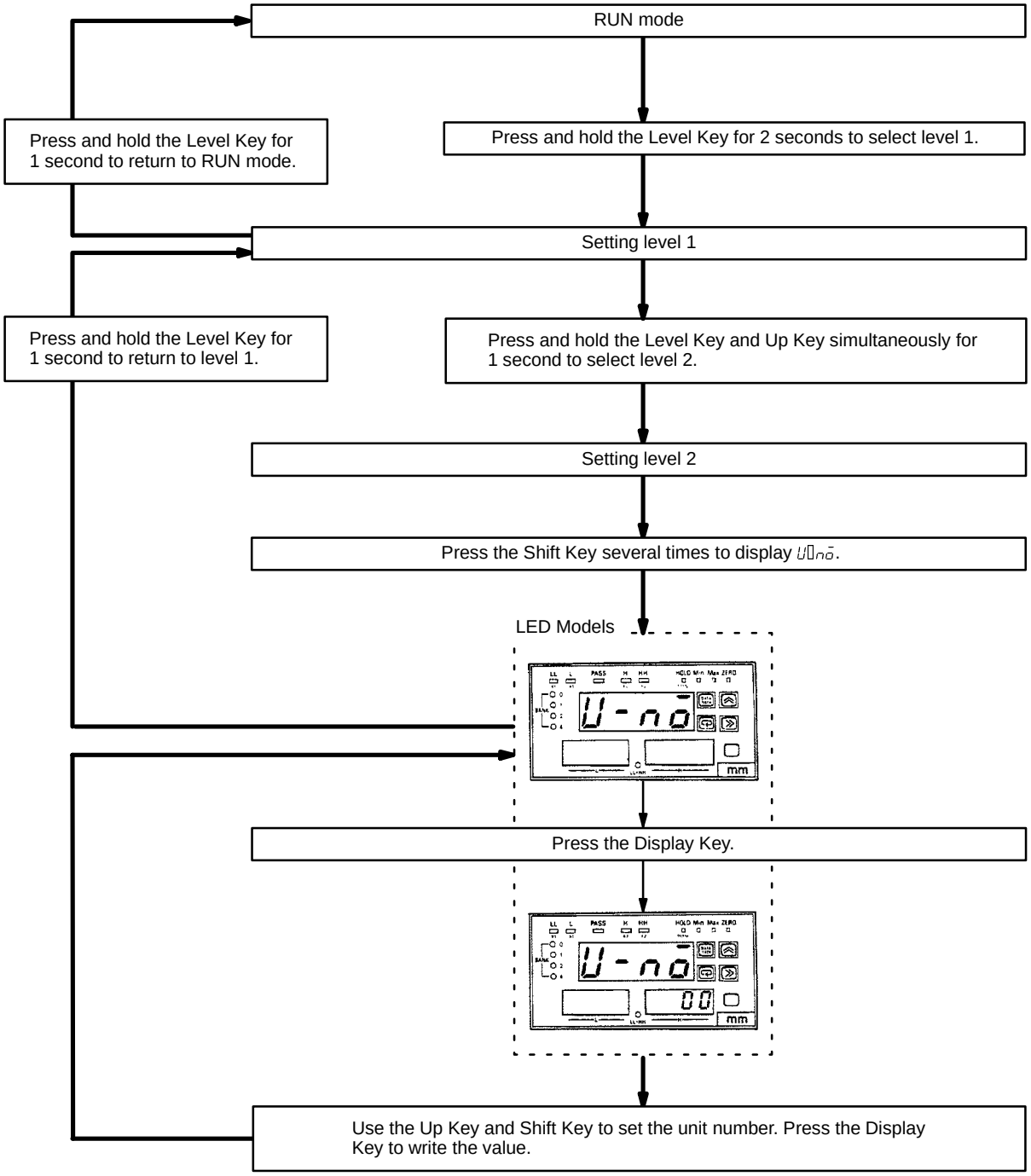

RUN mode
Press and hold the Level Key for 2 seconds to select level 1.
Setting level 1
Press the Shift Key several times to display LSET.
LED Models
Press the Display Key.
Use the Up Key and Shift Key to set the L_H value. Press the Display Key to write the value.
Use the Up Key and Shift Key to set the L_L value. Press the Display Key to write the value.
Press and hold the Level Key for 1 second to return to RUN mode.

Communications Unit Number

The communications unit number is an identification number by which the host computer to which the Intelligent Signal Processor is connected identifies the Intelligent Signal Processor. The Thumbwheel Switches Models are not provided with the communications output function; therefore, communications unit number setting is not required. For details, refer to the K3TS Communication Operation Manual.

In order to set the communications unit number, follow the instructions outlined on the flow diagram (after the table) and set within the following range:

Setting range	00 to 99

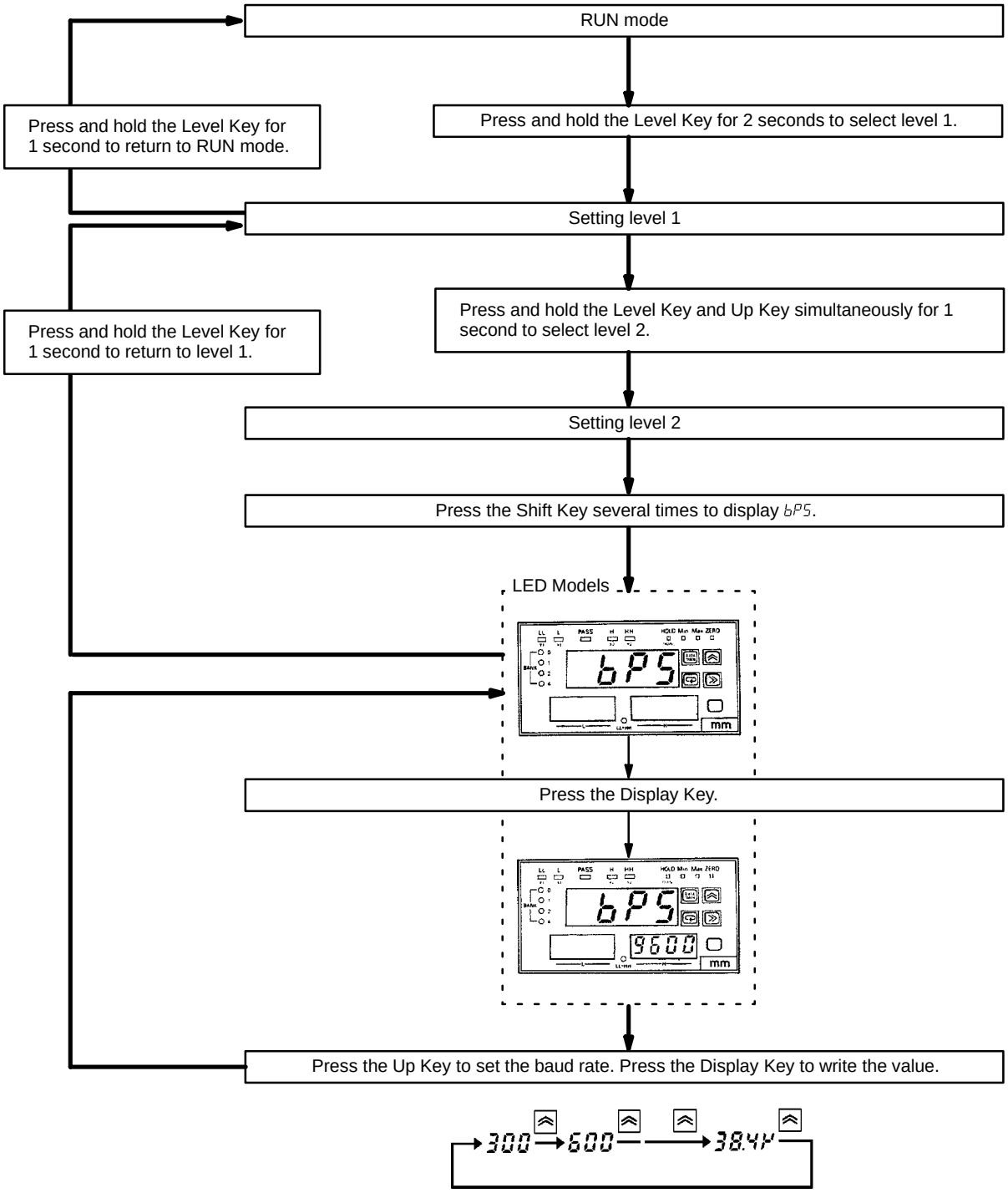


Baud Rate

The Thumbwheel Switches Models are not provided with a communications output function; therefore, setting of the baud rate is not required. For details, refer to the K3TS Communication Operation Manual.

In order to set the baud rate, follow the instructions outlined in the flow diagram (after the table) and set within the following range:

Display	Meaning
300	300 bps
600	600 bps
1200	1,200 bps
2400	2,400 bps
4800	4,800 bps
9600	9,600 bps
19.2K	19.2k bps
38.4K	38.4k bps


RUN mode
Press and hold the Level Key for 2 seconds to select level 1.
Press and hold the Level Key for 1 second to return to RUN mode.
Setting level 1
Press and hold the Level Key and Up Key simultaneously for 1 second to select level 2.
Press and hold the Level Key for 1 second to return to level 1.
Setting level 2
Press the Shift Key several times to display bPS.
LED Models
bPS
mm
Press the Display Key.
bPS
9600
mm
Press the Up Key to set the baud rate. Press the Display Key to write the value.
300
600
38.4K

6-3 Operations

In order to perform operations in RUN mode and other special functions, graphs and flow diagrams are given as explanations.

6-3-1 Operations in RUN Mode

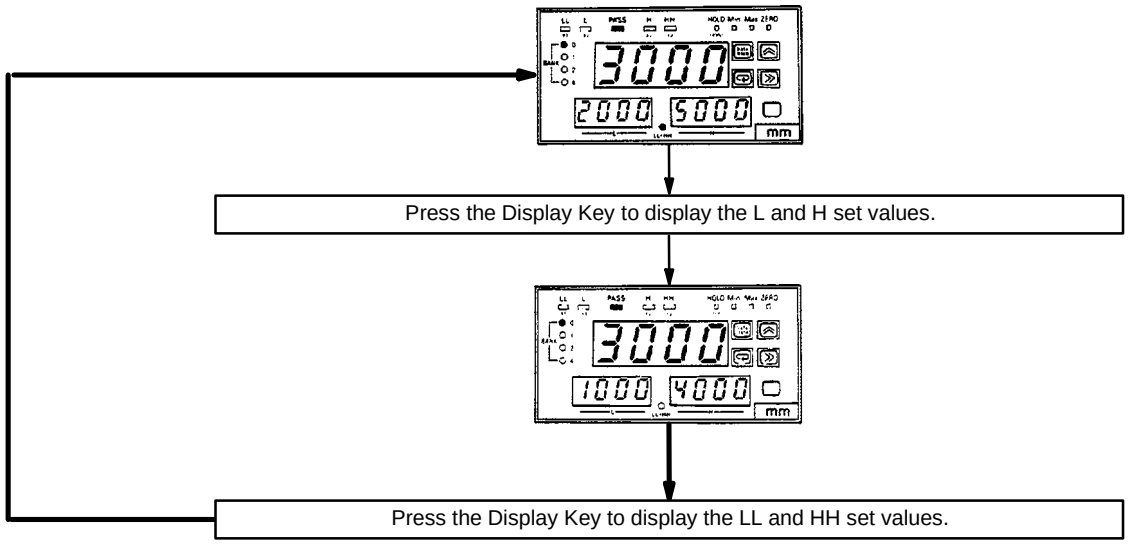
Checking Set Values

The Intelligent Signal Processor allows set values to be checked even in RUN mode. The set values of only the bank selected can be checked.

Set Value LED Display Models

LL and HH or L and H are always displayed on the SV display.

In order to check the set values on the LED Models, follow the instructions outlined in the flow diagram:



Thumbwheel Switches Models

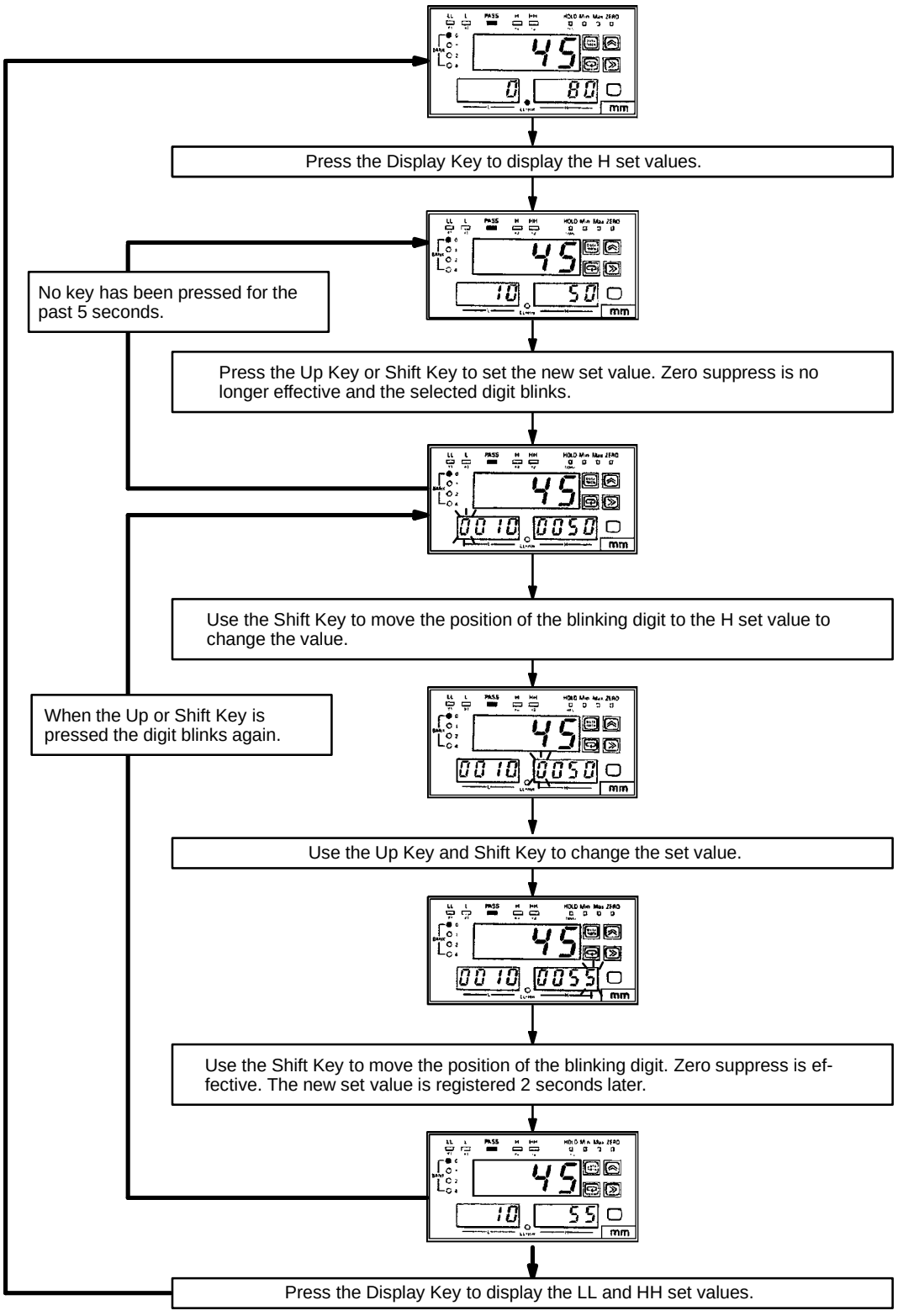
Thumbwheel Switches Models always display the set value of H and L.

Changing Set Values

Set values can be changed even in RUN mode. The values, however, cannot be changed when the protect input is ON.

Set Value LED Display Models

In order to change the set values on the Set Value LED Display Models, follow the instructions outlined on the flow diagram, which shows how to change set value H from 50.0 to 55.0:



Thumbwheel Switches Models

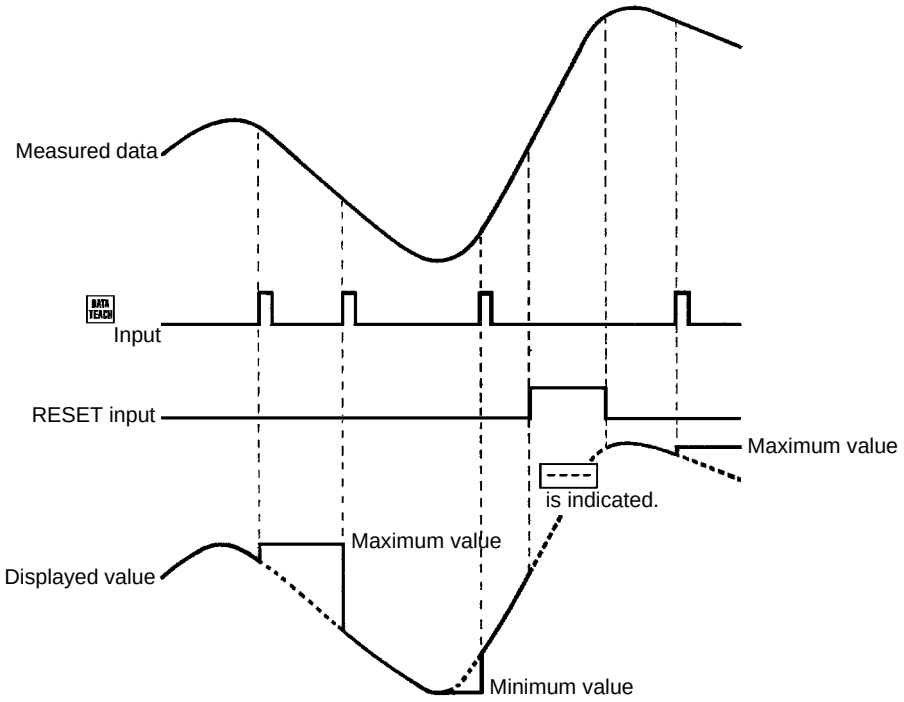
With the Thumbwheel Switches Models, set values can be changed at any time with the thumbwheel switches. The set values are registered 1.5 seconds after the values have been set with the thumbwheel switches and the Intelligent Signal Processor operates according to the new set values.

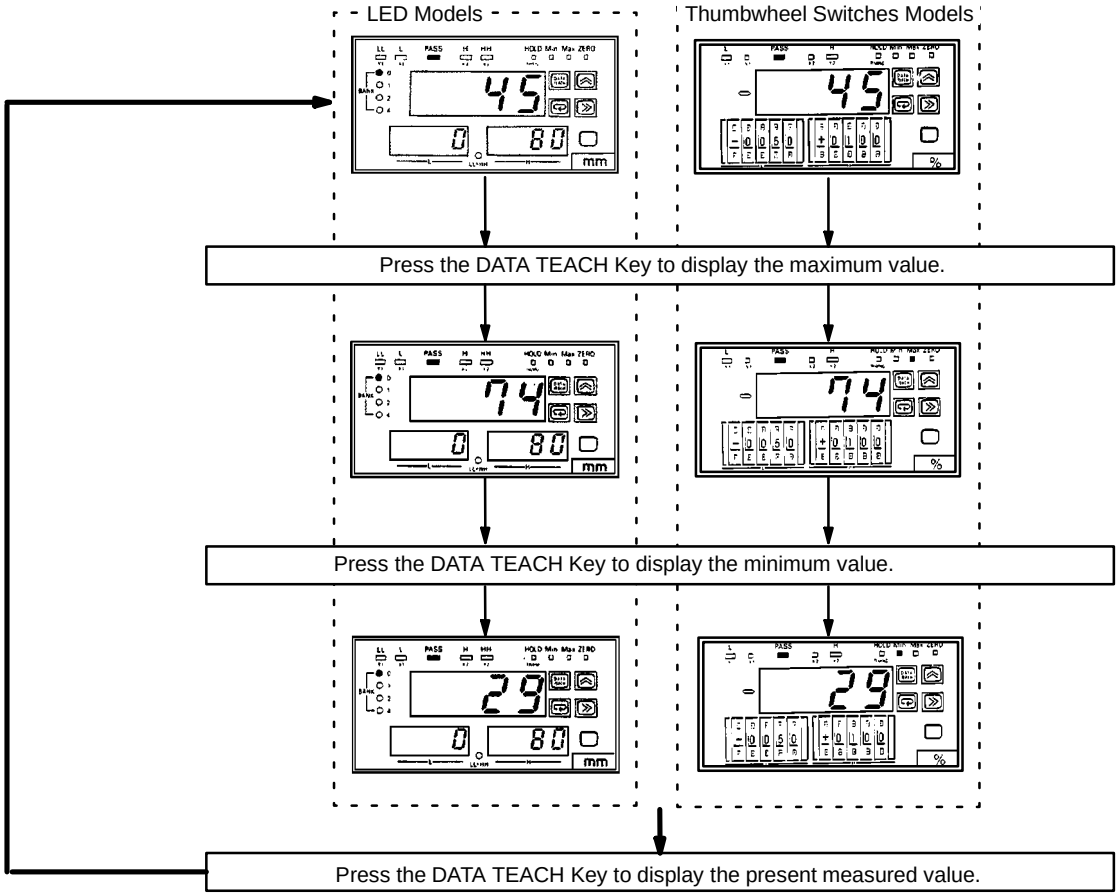
Retaining, Resetting Maximum/Minimum Values

The following is for when the K3TS is set to $\bar{n}\bar{o}\bar{r}\bar{n}$ on operating parameter 3.

Operate as shown below:

The maximum displayed (process) value and the minimum displayed (process) value recorded since power was applied or the RESET input turned ON are retained. Press DATA/TEACH once to display the maximum value on the PV display; press again to display the minimum value; and press again to display the process value. When the RESET input is turned ON, both the maximum and minimum values are cleared. While the RESET input is ON, "□□□□" is displayed.





While the K3TS is holding the maximum and minimum values, output data such as comparative outputs and BCD data are output according to the process value without being retained.

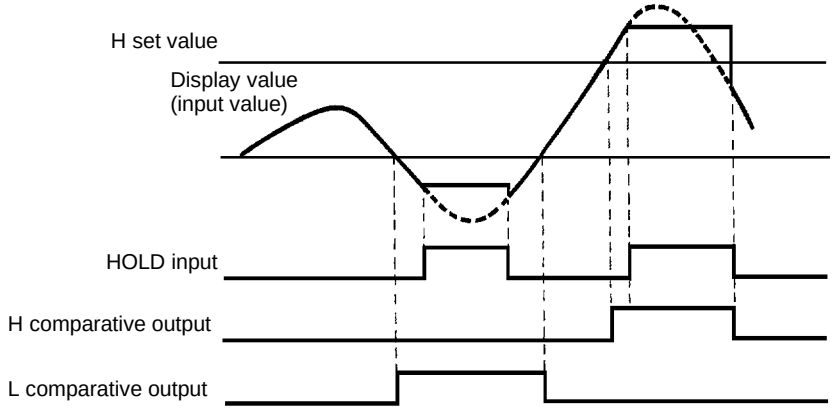
Both the maximum and minimum values re cleared, when the K3TS goes into the setting mode or when the power is switched off.

Hold Measured Value

The following is for when the K3TS is set to nor.

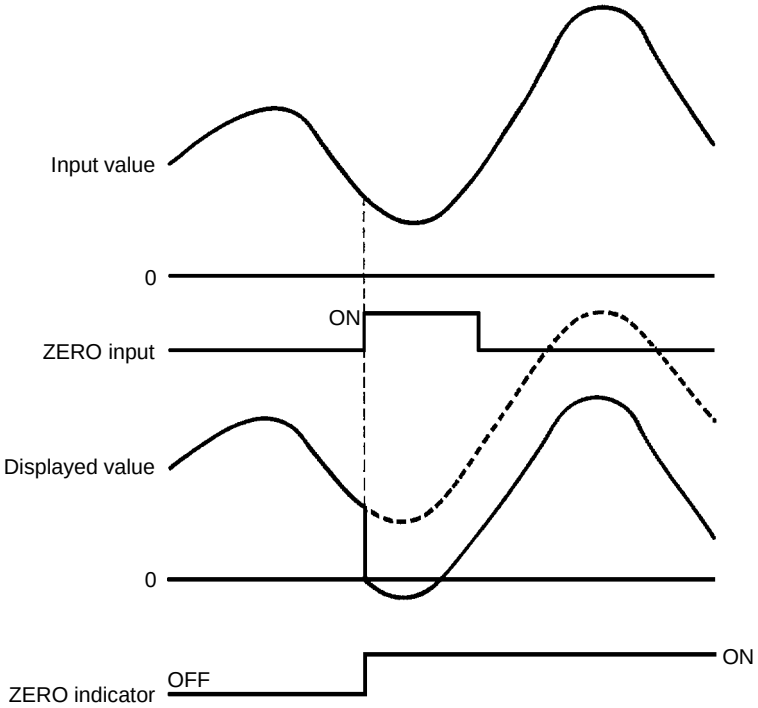
When the HOLD input is turned ON, measurement stops and the input value measured just before the HOLD input is turned ON is held. The displayed value, comparative outputs, and BCD data are also held while the HOLD input is ON. When the HOLD input is turned OFF, the held data is released.

If power is switched ON while the HOLD input is ON, the reset state is regarded as the input value. "□□□□" is displayed in this case. Make sure the HOLD input is OFF before applying power. The following graph illustrates the effect of this operation.



Forced Zero (Zero-shift)

With the ZERO input ON (by short-circuiting the ZERO input), the process value can be shifted to zero. This condition is held until the next ZERO input signal is turned ON.



The value is calibrated to zero at the rising edge of the ZERO input.

The ZERO indicator on the front panel is lit.

The K3TS retains the value calibrated to zero even if the K3TS is turned off.

To cancel zero-shift state, change the prescaling value (if the prescaling value should not be changed, go to the prescaling menu to reconfirm the X_2, Y_2, Y_1 values, and the position of the decimal point using the Display Key and then return to the RUN mode) or the input range. Check that the ZERO indicator is OFF when zero-shift state is canceled.

To input a ZERO input signal from a transistor such as a sensor, use an open collector configuration with a transistor that has a minimum collector current of 5 mA or less.

Difference between K3TS with Forced Zero RAM Specifications and Standard K3TS

The zero-shift value of the K3TS with forced zero RAM specifications will be lost when the K3TS is turned off.

Each time forced zero is turned ON on the standard K3TS, the shifted value will be written to the internal non-volatile memory (EEPROM). The data will not be lost even if the K3TS has a power failure. The EEPROM can be overwritten approximately 100,000 times. For applications in which the forced zero function is used more frequently, please use the K3TS-SD21B-□ with forced zero RAM.

Difference between K3TS with Display Shift Function and Standard K3TS

When the process value is shifted to zero on the K3TS with a display shift function, the calibrated value will be set in the display shift menu as the shift value. For example, if a process value of 100 is shifted to zero, -100 will be displayed as the shift value.

To cancel zero-shift state, change the input range or set the display shift value to 0000, at which time make sure that the ZERO indicator is lit.

Each time forced zero is turned ON on the standard K3TS, the shifted value will be written to the internal non-volatile memory (EEPROM). The data will not be lost even if the K3TS has a power failure. The EEPROM can be overwritten approximately 100,000 times. For applications in which the forced zero function is used more frequently, please use the K3TS-SD21B-□ with forced zero RAM.

6-3-2 Special Functions

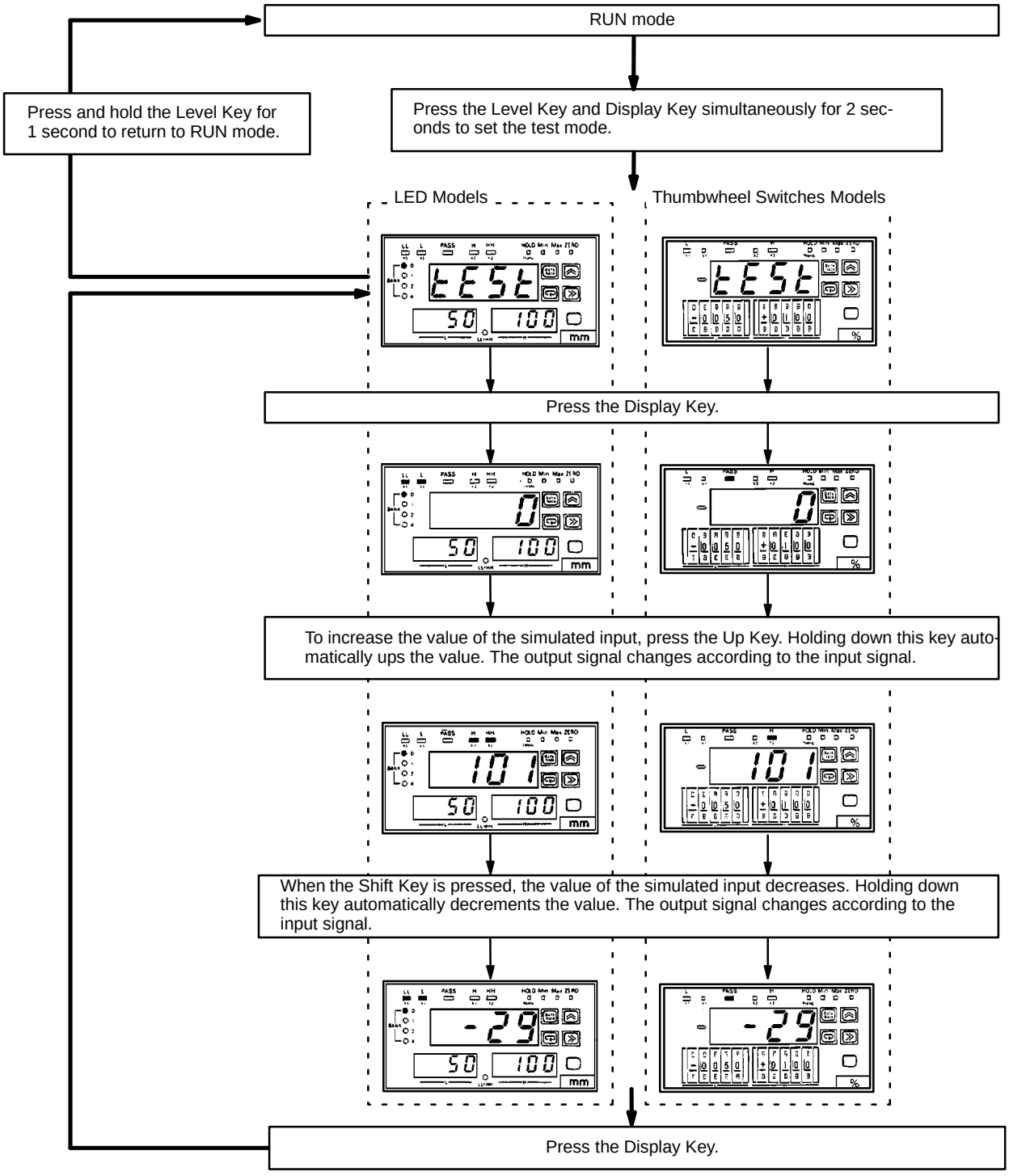
The K3TS Intelligent Signal Processor is provided with two special functions: test mode and teaching function.

1. Test function: This function is convenient for checking a system to which the Intelligent Signal Processor is connected, especially when some inputs cannot be operated. The Intelligent Signal Processor simulates the input, changing the display and output conditions.
2. Teaching function: This function allows the measured values to be retrieved and set as comparative outputs and as a linear output range while actual measurement is being carried out. This function is useful for setting parameters while checking the operating status of the Intelligent Signal Processor.

Test Function

The Intelligent Signal Processor is provided with a test function in which simulated signals can be input. When a simulated input signal is applied, an actual corresponding output signal is issued. Confirm the status of the equipment connected to the output side of the Intelligent Signal Processor.

In order to perform this operation, follow the instructions outlined in the flow diagram:



Teaching Function

Set Values

The teaching function of the K3TS can be set only when nbrn is set using operating parameter 3.

The Intelligent Signal Processor is provided with a teaching function that can set an actual measured value as a set value. The Thumbwheel Switches Models are not provided with this function.

In order to perform this operation, follow the instructions outlined in the flow diagram, which shows how to change set value HH on Bank 0 from 100 to 102:

100 –> TEACH –> 102

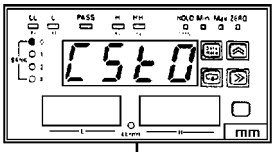
RUN mode

Press and hold the Level Key for 2 seconds to select level 1.

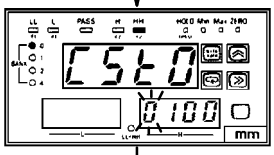
Setting level 1

Press the Shift Key several times until CSt0 is displayed.

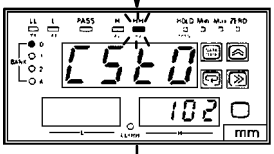
LED Models



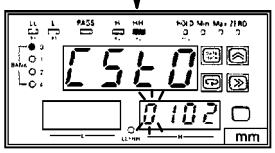
(1) Press the Display Key.



(2) Press the DATA TEACH Key. The present measured value will be displayed. (The HH indicator blinks. Zero suppress is displayed.



(3) Press the DATA TEACH Key again. Measurement is halted and the value displaced immediately before the key was pressed is displayed.



Press the Display Key. This completes input of HH.

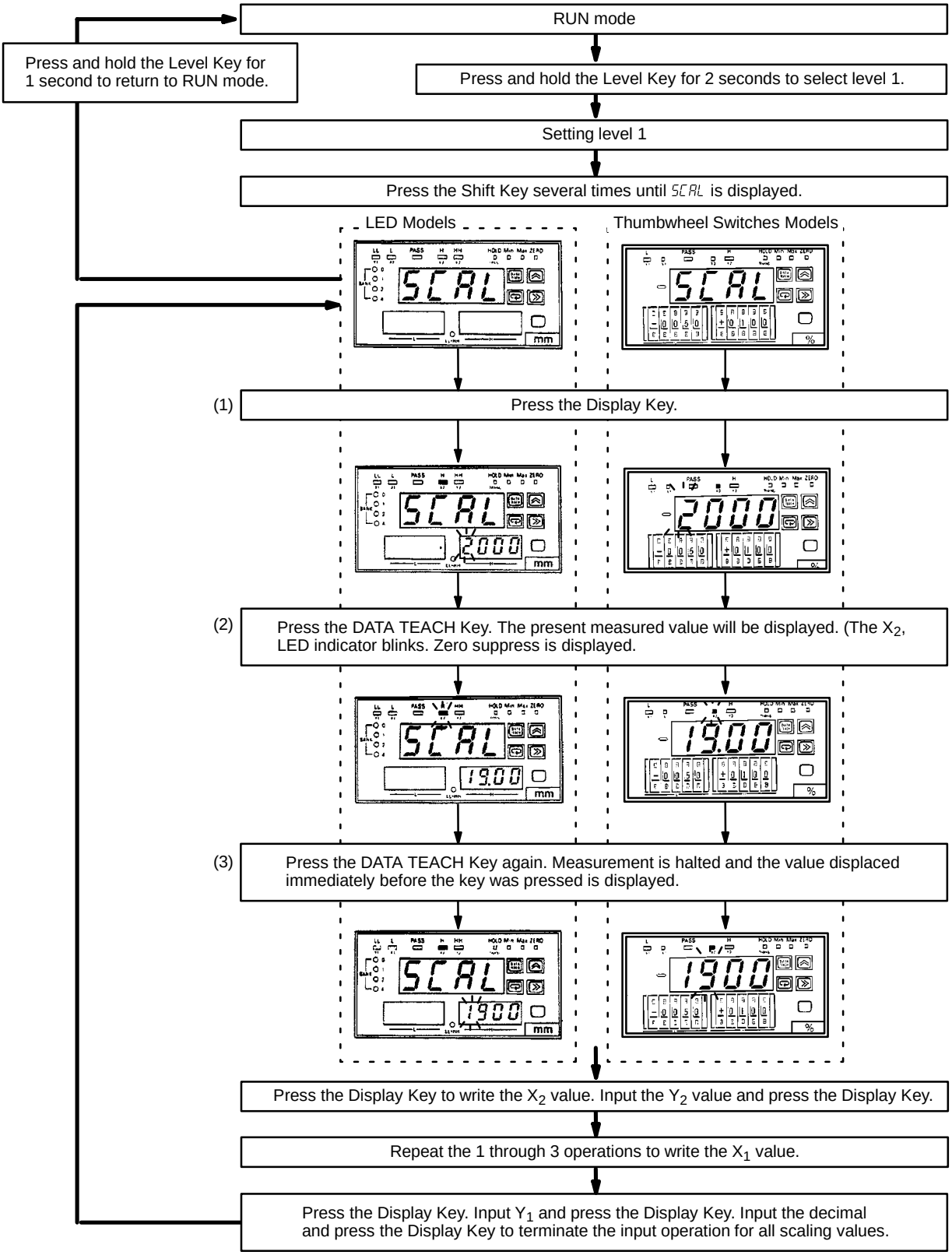
Repeat the 1 through 3 to set the value of H, L, and LL.

Press the Display Key. This completes input of all set values.

Press and hold the Level Key for 1 second to return to RUN mode.

Prescaling Value

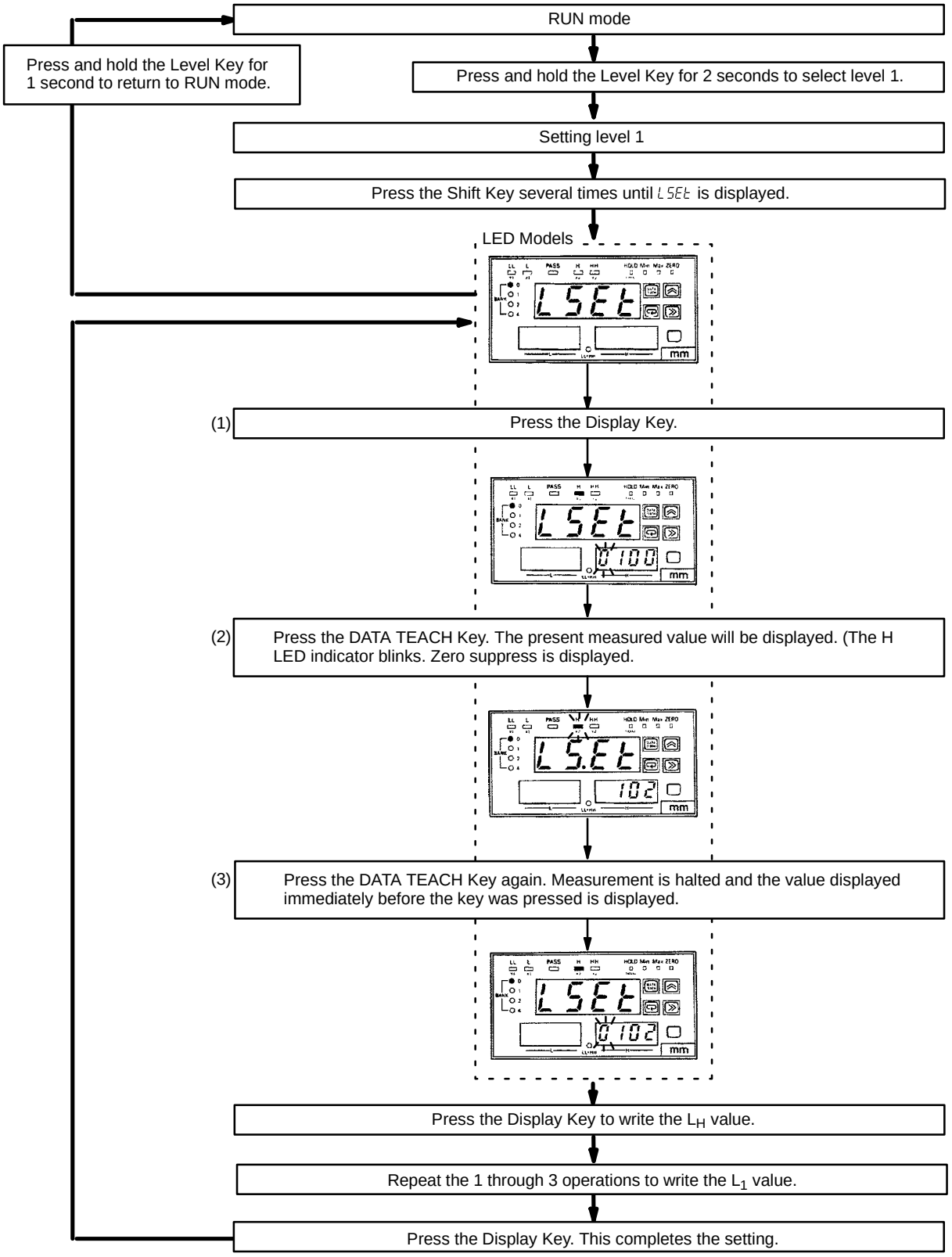
The teaching function of the K3TS can be set only when nörn is set using operating parameter 3. With the teaching function, a prescaling value can be set as a set value. In order to perform this operation, follow the instructions outlined in the flow diagram which show how to change set value X_2 from 20.00 to 19.00.



Linear Output Range

With the teaching function, it is possible to retrieve the actual measured values and set them as a linear output range. The Thumbwheel Switches Models do not incorporate a teaching function.

In order to perform this operation, follow the instructions outlined in the flow diagram which show how to change set value L_H from 100 to 102.

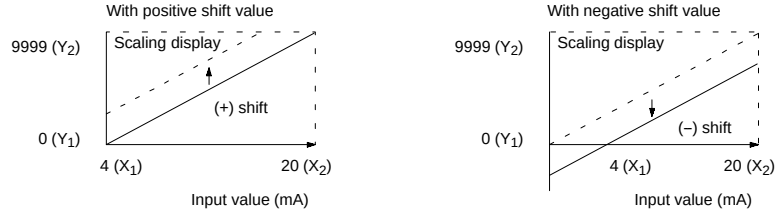


6-4 Display Shift Function Setting Menu

Display Shift Setting

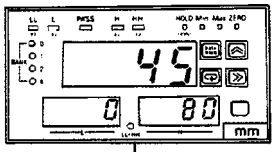
The display shift function calibrates the displayed value and shifts the displayed value to any value between –9999 and 9999 for all control operations. If the input value changes, the calibrated value will follow the change by retaining the shift value.

Shift value setting range	-9999 to 9999

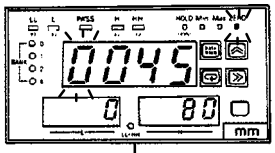


The process value can be shifted in the RUN mode if the shift protect is not turned ON. Refer to the following example to shift the process value.

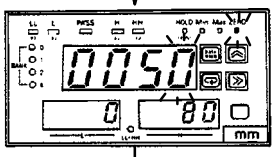
In this example, the displayed value is changed from 45 to 50.



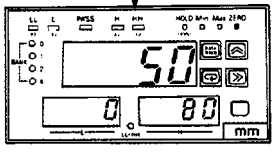
Press the DATA TEACH Key so that display shift will be possible, at which time, the ZERO indicator flashes, the PV display will have no zero suppress, and the digits will flash.



Change the process value with the UP and Shift Keys so that the difference between the process value and the calibrated value will be set as the shift value.



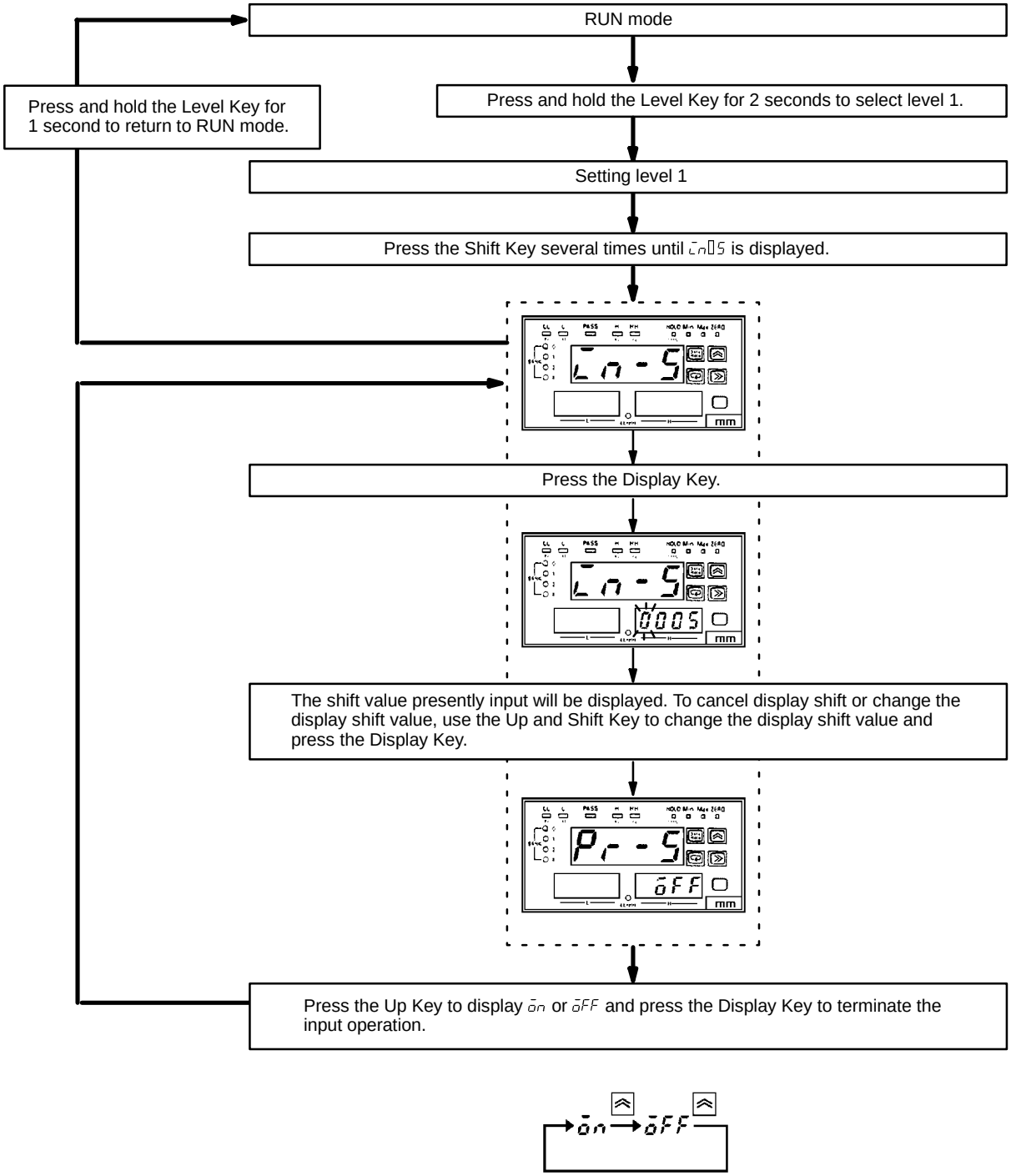
Press the Display Key to complete the display shift operation, at which time the ZERO indicator will be lit.



Note The K3TS with a thumbwheel switch does not incorporate a display shift function or shift protect function.

Shift Protect Setting

It is possible to change the shift value of the K3TS in the RUN mode if the K3TS incorporates a display shift function. It is, however, possible to prohibit shift value change with the shift protect function of the K3TS.



Note The K3TS with a thumbwheel switch does not incorporate a display shift function or shift protect function.

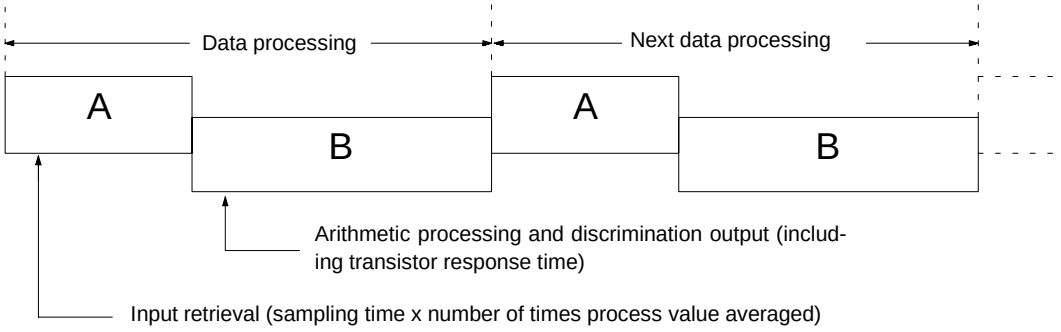
SECTION 7
Comparative Output Response Time

This section describes the K3TS Unit's comparative output response (sampling) times under various settings and operating parameters.

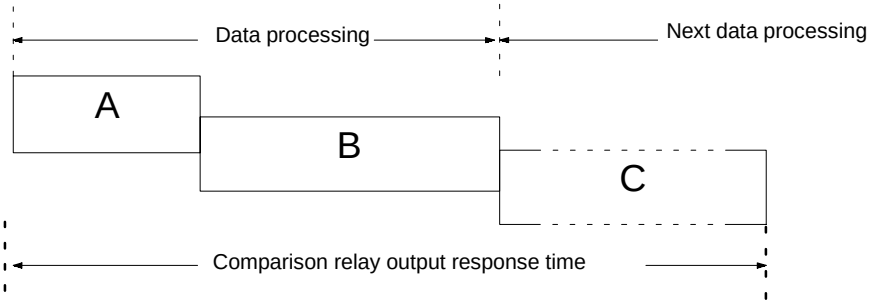
7-1 Sampling and Delay in Comparative Outputs

The sampling time or comparative output response time varies with the setting of the number of process values to be averaged or the operating parameters (2-input or holding data).

The K3TS repeats operation A (input retrieval operation) and B (arithmetic processing and discrimination output operation) as shown in the figure below. While operation B is executed, the comparative output transistor operates.



If the comparative output is a relay output, the response time (C in the figure) of the relay is added to the comparative output response time.



The data processing time and comparative output response time vary with the setting condition of each operating parameter as follows below. They do not vary in operating parameter 2 (average value comparison).

Differences in Data Processing Time in Operating Parameter 1 (2-input)

*n: number of process values to be averaged.

Operating parameter 1 (2-input)	A (input retrieval)	B (arithmetic processing and determination)	C (relay response time)
A only	1.04 x n * (ms)	2.08 ms	10 ms
A + B, A – B, K – (A + B)	2.08 x n* (ms)	4.16 ms	10 ms
B/A x 100, (1 – B/A x 100)	2.08 x n* (ms)	5.20 ms	10 ms

Differences in Delay in Comparative Outputs in Operating Parameter 3 (Holding Data)

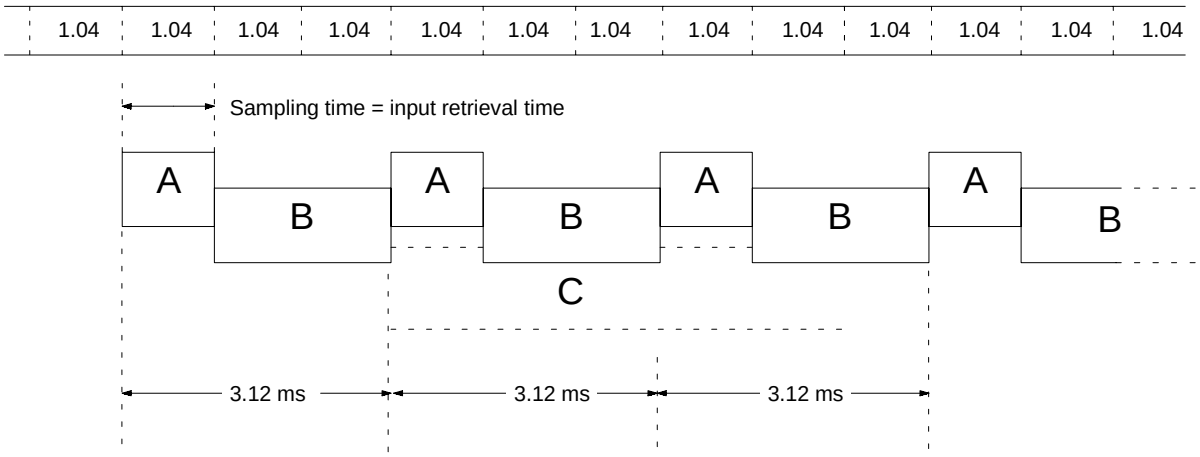
Operating parameter 3 (holding data)	Definition of delay	Delay in comparative outputs
Normal	The time required between output transistor operation and input value change.	Min.: A + B (ms) Max.: (A + B) x 2 (ms)
Sampling hold	The time required between output transistor operation and timing signal rise.	Min.: 1.04 + A + B (ms) Max.: 2.08 + A + B (ms)
Maximum hold, minimum hold, peak-to-peak hold	The time required between output transistor operation and timing signal fall.	Min.: B (ms) Max.: A + B (ms)

Timing Charts (Examples)

Example 1

The following timing chart shows the operating timing with the setting specified in the table.

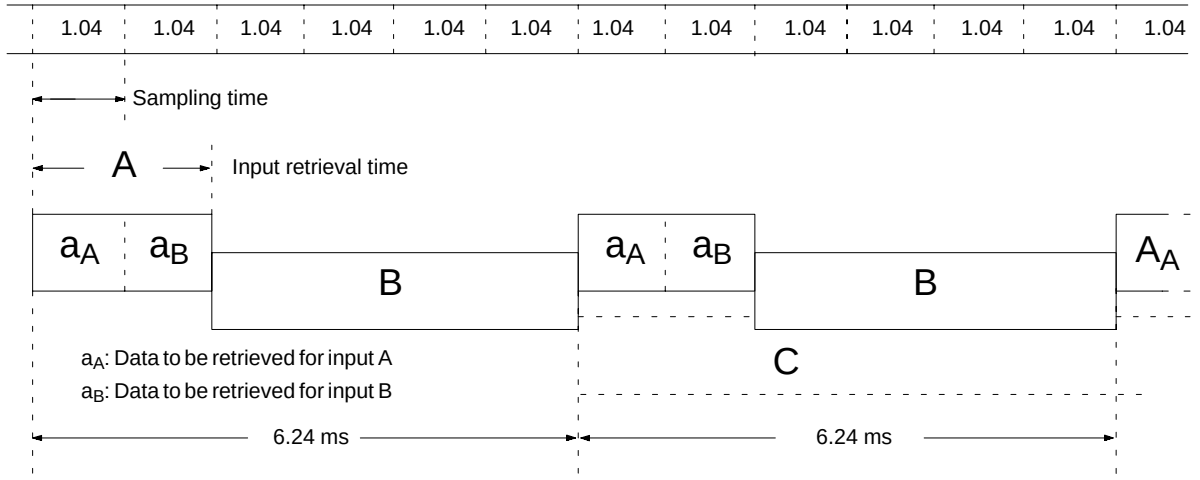
Operating parameter 1 (2-input)	A only
Operating parameter 3 (holding data)	Normal
Number of process values to be averaged	1
Delay in comparative outputs	3.12 to 6.24 ms



Example 2

The following timing chart shows the operating timing with the setting specified in the table.

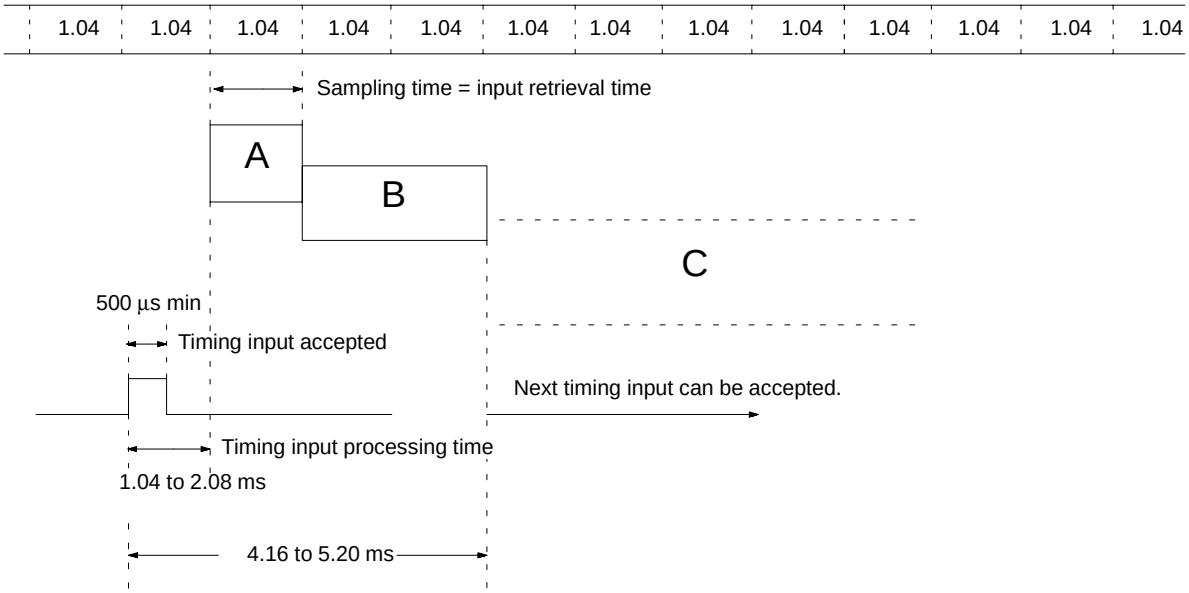
Operating parameter 1 (2-input)	A + B
Operating parameter 3 (holding data)	Normal
Number of process value averaging operations	1
Delay in comparative outputs	6.24 to 12.48 ms



Example 3

The following timing chart shows the operating timing with the setting specified in the table.

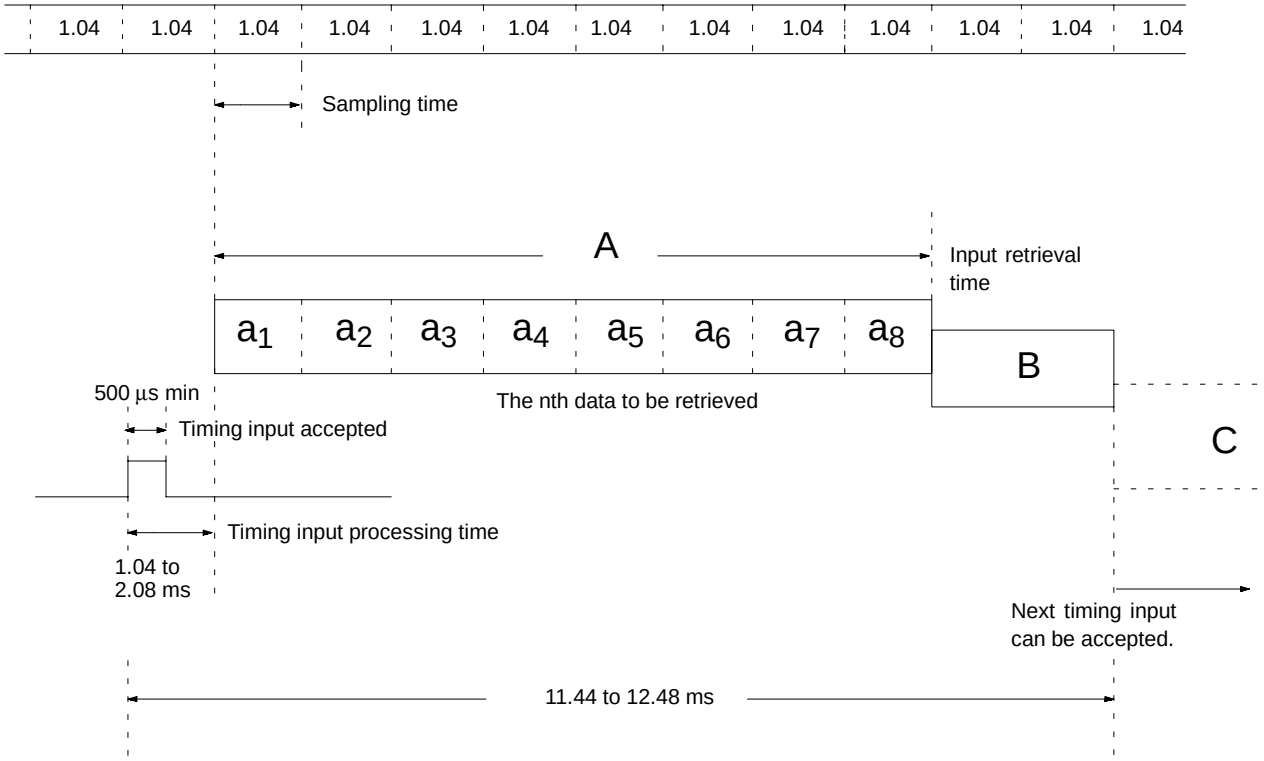
Operating parameter 1 (2-input)	A only
Operating parameter 3 (holding data)	Sampling hold
Number of process value averaging operations	1
Delay in comparative outputs	4.16 to 5.20 ms



Example 4

The following timing chart shows the operating timing with the setting specified in the table.

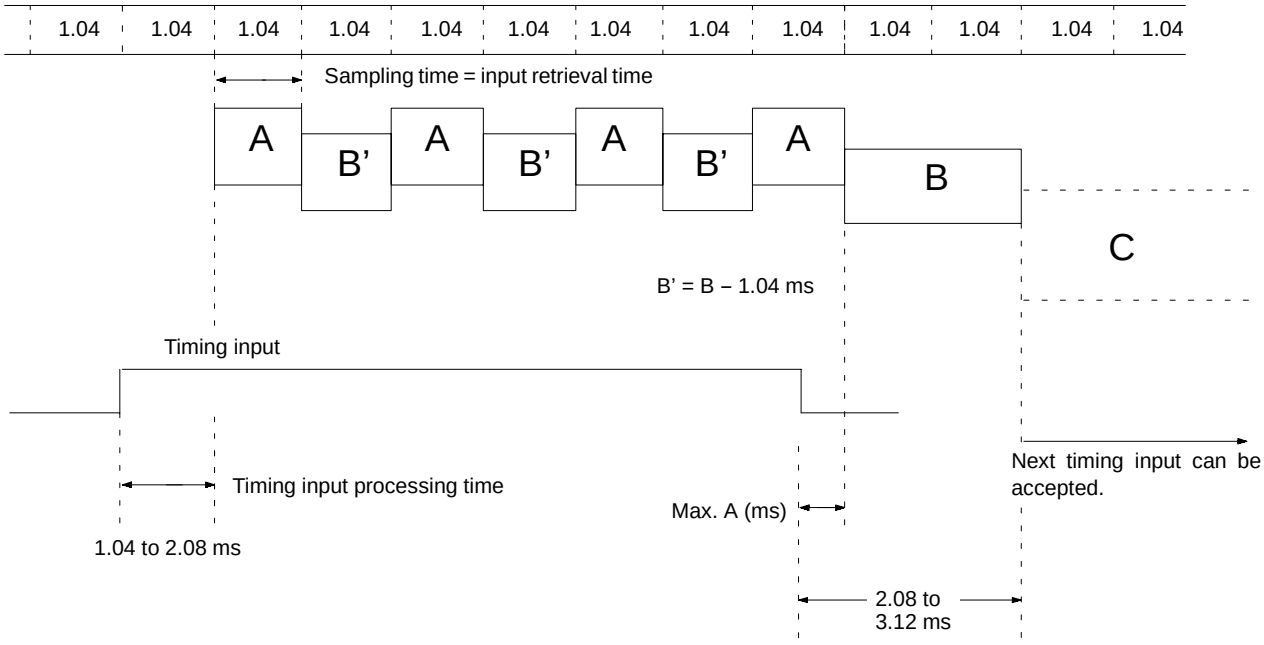
Operating parameter 1 (2-input)	A only
Operating parameter 3 (holding data)	Sampling hold
Number of process value averaging operations	8
Delay in comparative outputs	11.44 to 12.48 ms



Example 5

The following timing chart shows the operating timing with the setting specified in the table.

Operating parameter 1 (2-input)	A only
Operating parameter 3 (holding data)	Maximum hold
Number of process value averaging operations	1
Delay in comparative outputs	2.08 to 3.12 ms



SECTION 8
Application Examples

This section provides 5 application examples of K3TS use.

8-1 Height Measurement/Discrimination of Objects

The following operations are possible with K3TS:

- With a synchronous sensor, the sampling hold function makes it possible to display the height of an object and hold its value.
- The eight switchable banks make it possible for the K3TS to measure different kinds of objects smoothly.
- With the forced zero function, zero calibration can be done with ease.

Settings

Level 3

FUn1: A (A only)
FUn2: oFF (No previous average comparison)
FUn3: SOH (Sampling hold)

Level 2

In: 4O20 (4 to 20 mA)
dISP: ---
AvE: 8
tOd: 0.00
oFOd: ---

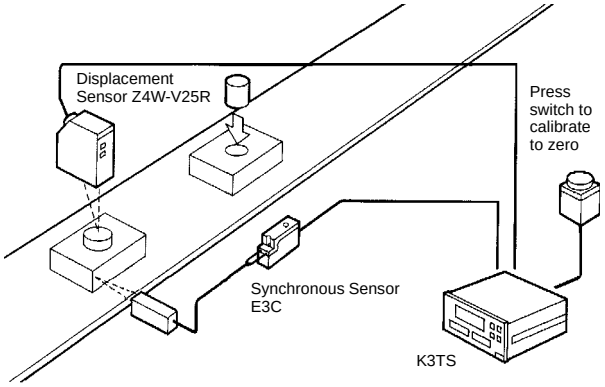
Level 1

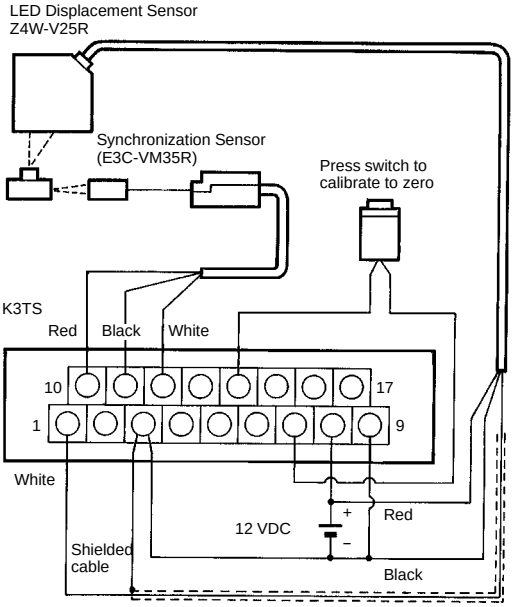
CSt0 to CSt7:
(Example: Checks if the deviations in the objects are within a range of ±0.1 mm.)
HH = 1.50
H = 0.10
L = O0.10
LL = O1.50
(Adjust according to the object)
HYS = ---
SCAL: If X_2 = 20.00, Y_2 = −4.00
If X_1 = 4.00, Y_1 = 4.00
Prot: (set to on if necessary, after all setting operations have been completed.)
"---" indicates parameters that are not displayed.

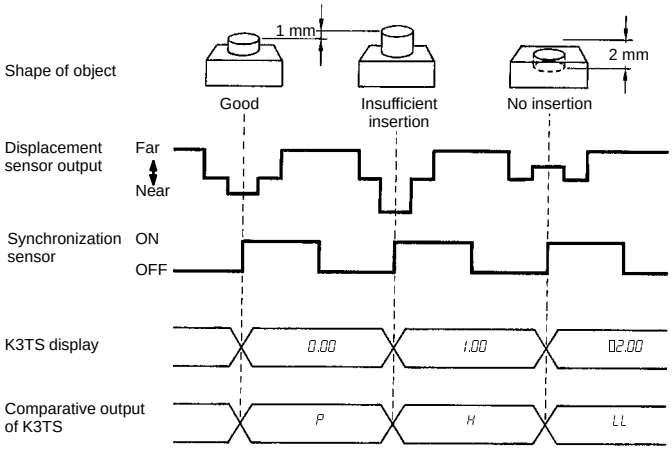
Dimensional Check of Molding Parts

The K3TS can be used to check the dimensions of molding components and the height of each component after processing.

Dimensional Check after Mounting Objects







8-2 Measurement of Discs

The following operations are possible with K3TS:

- The output signal of the linear sensor varies continuously. The peak-to-peak hold function makes it possible to measure the difference between the maximum value and minimum value of the signal in order to measure the decentering of disc-shaped objects.
- The measuring operation is carried on while the TIMING input (a push switch in this example) is ON. When the TIMING input is OFF, the K3TS will hold the final result.

Settings

Level 3

FUn1: A (A only)
FUn2: oFF (No previous average comparison)
FUn3: PPOH (Peak-to-peak hold)

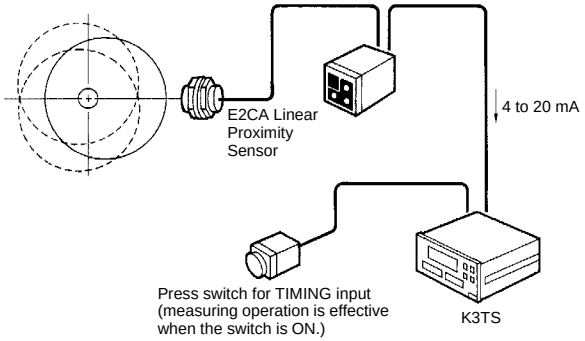
Level 2

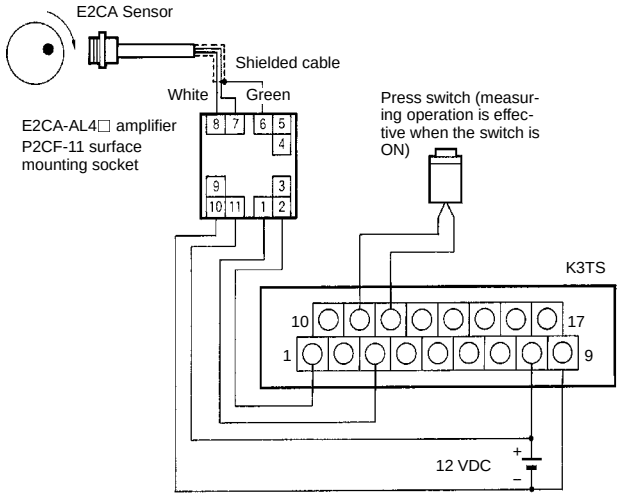
In: 4O20 (4 to 20 mA)
dISP: ---
AvE: 8
tOd: 0.00
oFOd: ---

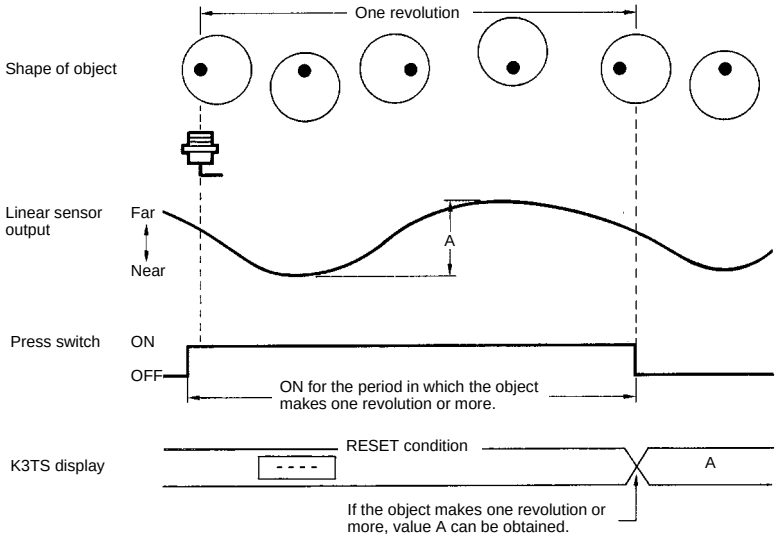
Level 1

CSt0 to CSt7: (When the comparative output is used, set HH, H, L, and LL.)
HYS = ---
SCAL: If X_2 = 20.00, Y_2 = 20.00
If X_1 = 4.00, Y_1 = 4.00
Prot: (set to on if necessary, after all setting operations have been completed.)
"---" indicates parameters that are not displayed.

The decentering of the shafts of objects can be measured. If they are not metal objects, use an optical displacement sensor or a supersonic displacement sensor.


E2CA Linear
Proximity
Sensor
4 to 20 mA
Press switch for TIMING input
(measuring operation is effective
when the switch is ON.)
K3TS


E2CA Sensor
Shielded cable
White
Green
E2CA-AL4□ amplifier
P2CF-11 surface
mounting socket
Press switch (measur-
ing operation is effec-
tive when the switch is
ON)
K3TS
10
17
1
9
12 VDC
+
–


One revolution
Shape of object
Linear sensor
output
Far
Near
A
Press switch
ON
OFF
ON for the period in which the object
makes one revolution or more.
K3TS display
RESET condition
- - - -
A
If the object makes one revolution or
more, value A can be obtained.

8-3 Measurement of Plate Thickness

The following operations are possible with the K3TS:

- Using two displacement sensors, the plate thickness can be measured by setting operating parameter to K − (A + B) and by converting the outputs of the displacement sensors into actual figures (the thickness of the plates).
- With the forced zero function, object thickness can be compared with that of a standard object and the deviation can be measured with ease.

Settings

Level 3

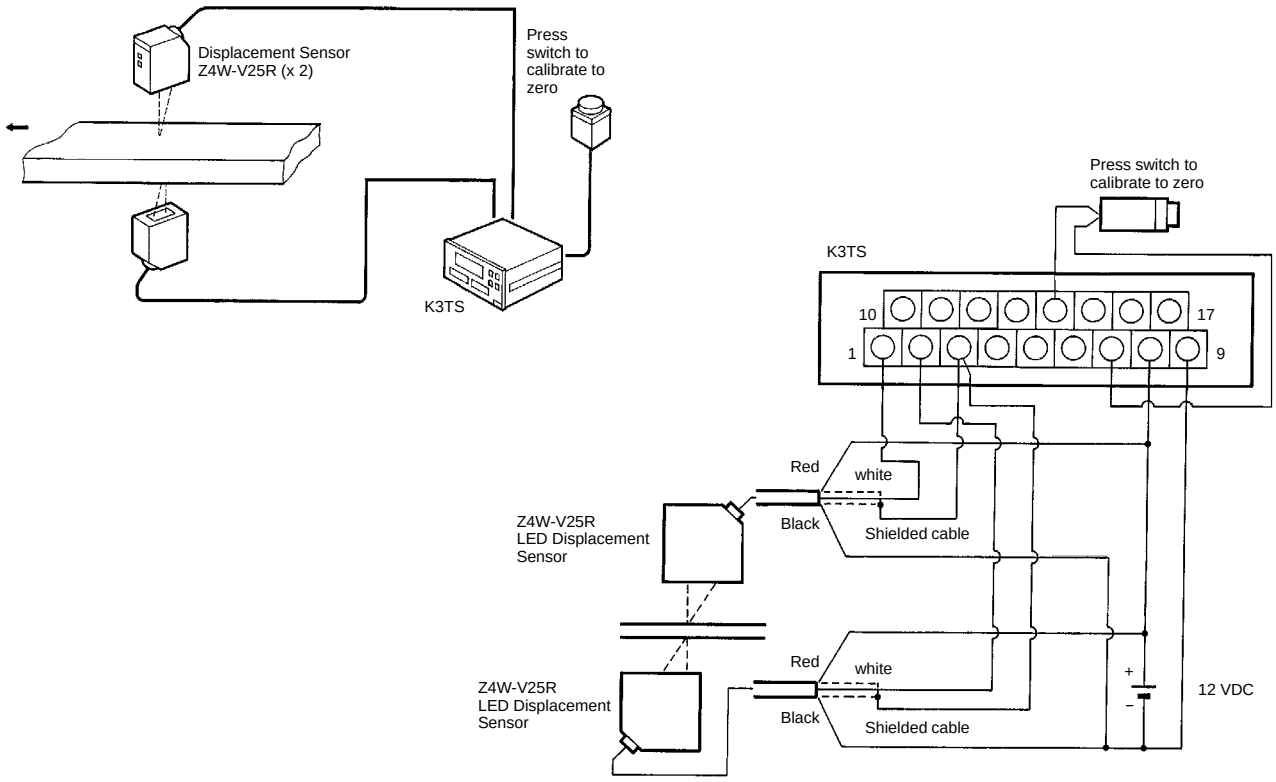
FUn1: MOAb (K − (A + B))
FUn2: oFF (No previous average comparison)
FUn3: norn (Normal)

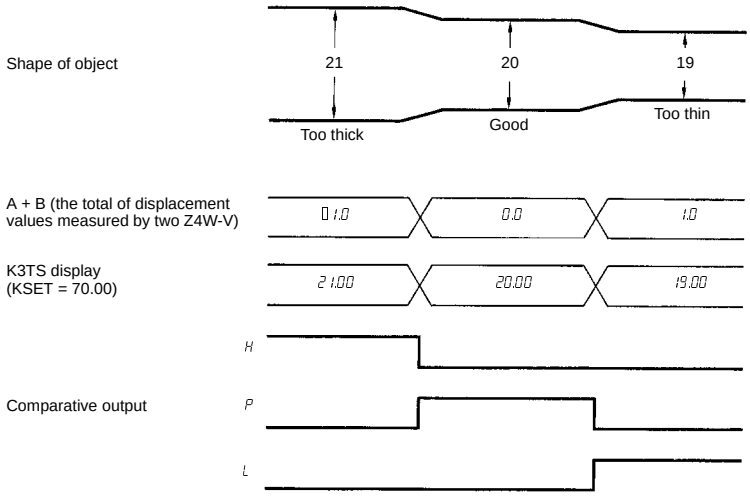
Level 2

in: 4020 (4 to 20 mA)
dISP: FASt
AuE: 8
tOd: ---
oFOd: 0.00

Level 1

CSt0 to CSt7: (Example: Checks if the objects are within a thickness of 20 (standard thickness) ±0.5 mm.)
HH = 22.00
H = 20.50
L = 19.50
LL = 18.00
(Adjust according to the object)
HYS = 001
SCAL: If X_2 = 8.00, Y_2 = 42.00
If X_1 = 40.00, Y_1 = 58.00
(Input the results of operation for X and Y.)
MSEt: (Set the standard sensor distance in mm.)
Prot: (set to on if necessary, after all setting operations terminate.)
"---" stands for a parameter that is not displayed.


Displacement Sensor
Z4W-V25R (x 2)
Press
switch to
calibrate to
zero
K3TS
Press switch to
calibrate to zero
K3TS
10
17
1
9
Red
white
Black
Shielded cable
Z4W-V25R
LED Displacement
Sensor
Red
white
Black
Shielded cable
Z4W-V25R
LED Displacement
Sensor
+
–
12 VDC


Shape of object
21
20
19
Too thick
Good
Too thin
A + B (the total of displacement
values measured by two Z4W-V)
1.0
0.0
1.0
K3TS display
(KSET = 70.00)
21.00
20.00
19.00
H
Comparative output
P
L

8-4 Checking Height Differences

The following operations are possible with the K3TS:

- Using two displacement sensors, the difference in the level of an object surface can be measured by setting operating parameter to A − B.
- With the forced zero function, the difference in the level of an object surface can be compared with that of a standard object.

Settings

Level 3

FUn1: A-b (A–B)
FUn2: oFF (No previous average comparison)
FUn3: S-H (Sampling hold)

Level 2

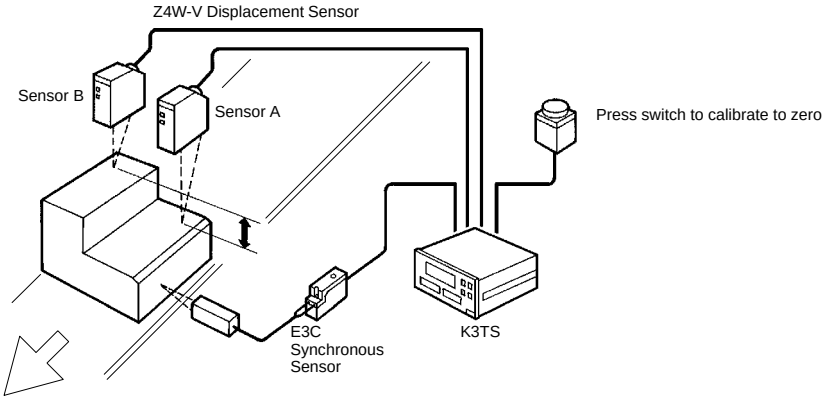
In: 4-20 (4 to 20 mA)
dISP: ---
AvE: 8
t-d: 0.00
oF-d: ---

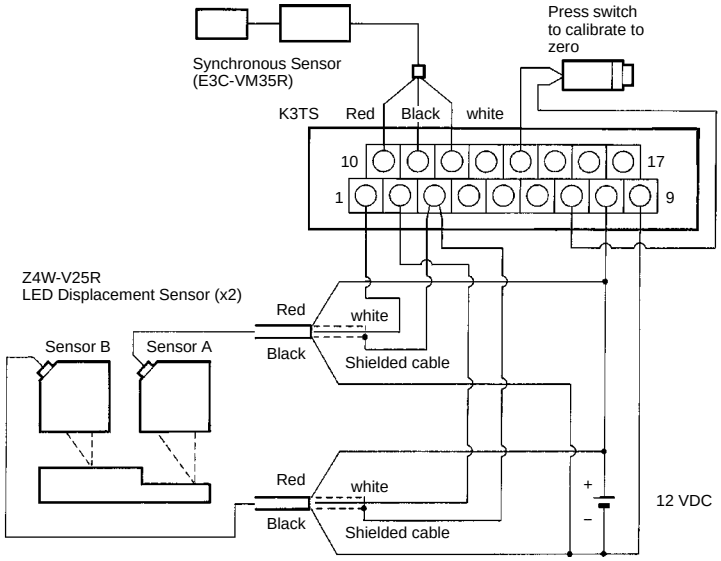
Level 1

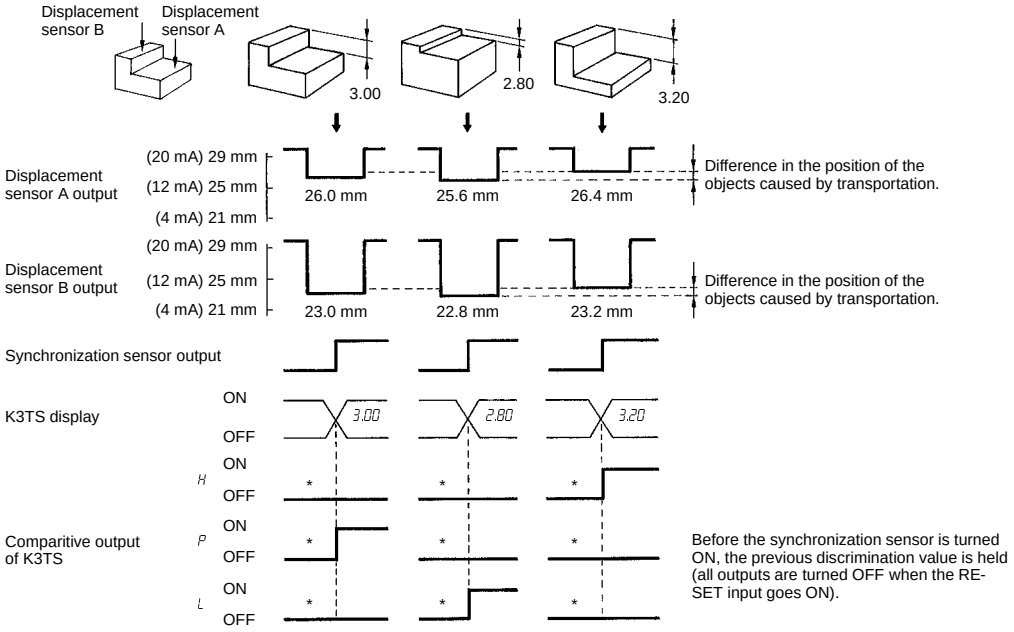
CST0 to CST7: (Example: Checks if the objects are within a thickness of 3 (standard thickness) ±0.1 mm.)
HH = 4.00
H = 3.10
L = 2.90
LL = 2.00
(Adjust according to the object)
HYS = ---
SCAL: If X_2 = 0.00, Y_2 = 0.00
If X_1 = 16.00, Y_1 = 8.00
(Input the results of operation for X and Y.)
Prot: (set to on if necessary, after all setting operations have been completed.)
"---" indicates parameters that are not displayed.

This method can be applied to an ordinary dimensional checking operation. By measuring the distance between the upper surface of the object and the belt conveyor, the dimension of the object will be measured accurately even if the belt is not evenly flat.

Dimensional Check of Molding Parts







8-5 Detection of the Protruding Portion of Cylindrical Objects

The deflection of cylindrical objects does not influence the detecting operation. Therefore the objects can be rolled.
For example, the burr or a protruding part of a rubber roller or a molded object can be detected.

The following operations are possible with the K3TS:

- With the previous average comparison value function, only a rapid change in value will be checked, and a slow change in value (such as a change due to the deflection of the cylindrical sensing object) will be dismissed.

Settings

Level 3

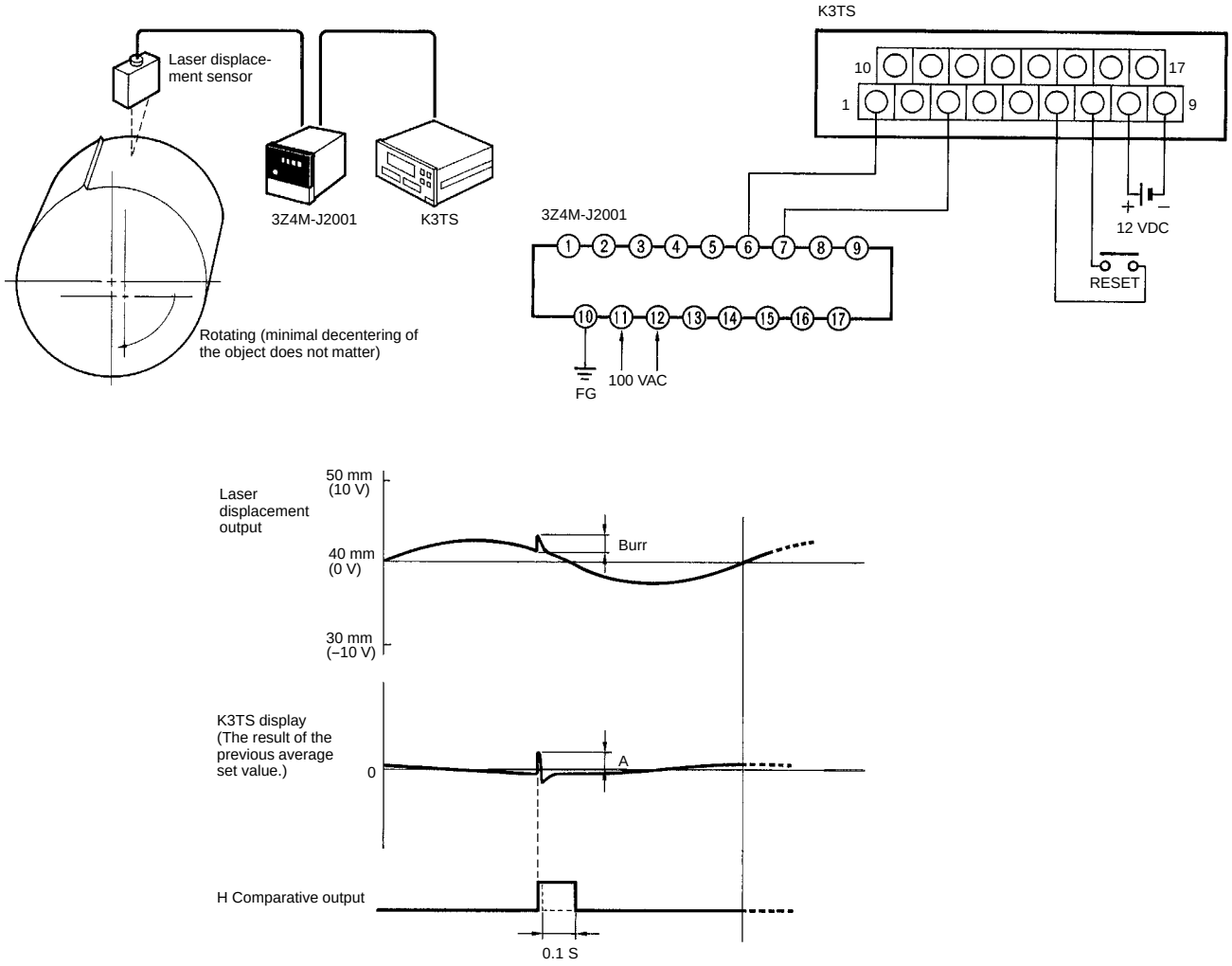
FUn 1: A (A only)
FUn2: on (Previous average comparison)
FUn3: norn (Normal)

Level 2

Cn: 9.999 (±9.999 V)
dCSP: FASt
AuE: 8
tOd: ---
oFOd: 0.10 (0.1 s) (Set appropriate time)

Level 1

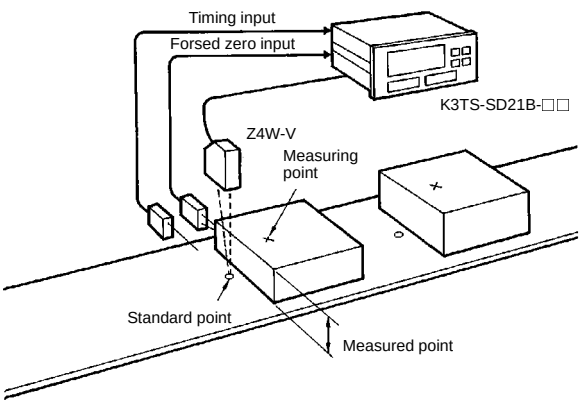
CSt0 to CSt 7:
H = 5.00
L = 000
(Take the rolling speed and the burr of the objects into consideration before setting.)
If X_2 = 9.999, Y_2 = 9.999
If X_1 = –9.999, Y_1 = –9.999
Prot: (set to on if necessary, after all setting operations have been completed.)
"---" indicates parameters that are not displayed.



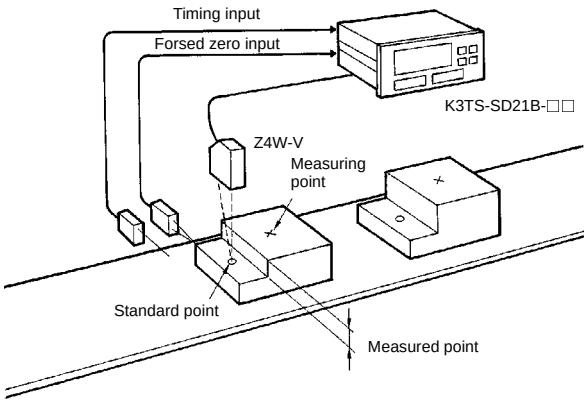
8-6 Examples for Forced Zero RAM Models

In the following applications, the zero value is changed repeatedly for measurement purposes.

Standard Height Change



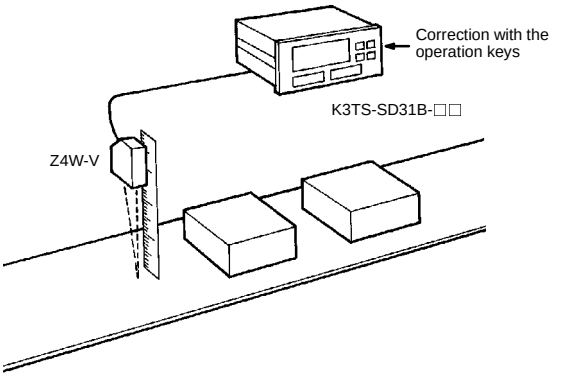
Height Difference Measurement of Each Object



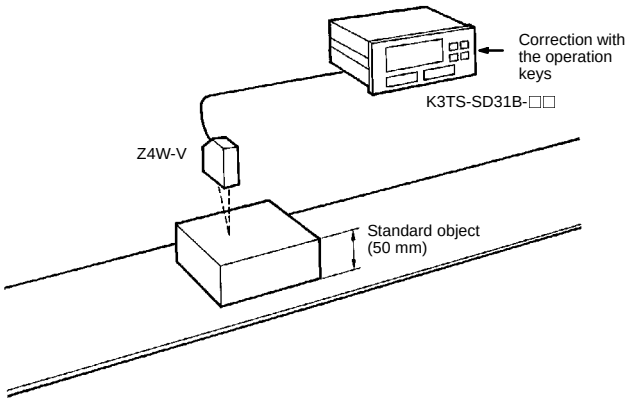
8-7 Examples for Display Shift Function Models

In the following applications, errors are corrected.

Correction of the Sensor Mounting Position



Correction of Height Measurement Values



Correction of sensor errors caused by object colors, materials, and angles.

SECTION 9
Troubleshooting

If an error message appears while using the K3TS Intelligent Signal Processor, the problem may originate from either the incorrect use of the Intelligent Signal Processor or from external sources such as a faulty sensor. This troubleshooting section suggests some possible sources of error and the corrective actions to be taken.

Troubleshooting Guide

The following table shows possible errors during the K3TS Intelligent Signal Processor operation and corrective actions to be taken.

Item	Condition	Error message	Output status				Corrective action
			Comparative outputs	BCD output	Linear output	Communications	
Device failure	CPU RAM error, external memory error, memory data error.	Err	OFF	OFF	OFF	OFF	Turn the power OFF and then ON again once. If the error persists, contact OMRON.
	Corrupted data.	CCS	OFF	OFF	OFF	OFF	Turn the power OFF and then ON again once. If the error persists, press the mode key and set all parameters again.
Sensor failure	Disconnection or short-circuiting of sensor A.	□□□A	OFF	OFF	OFF	OFF	Check for disconnection, short-circuiting, or wiring of sensor A and repair if necessary.
	Disconnection or short-circuiting of sensor B.	□□□b	OFF	OFF	OFF	OFF	Check for disconnection, short-circuiting, or wiring of sensor B and repair if necessary.
Reset	Reset the K3TS.	□□□□	OFF	OFF	OFF	OFF	Check the RESET input. If the K3TS is set to TIMING HOLD state, check the TIMING input.
Overflow, underflow	Input value or display value outside range.	9999 Blinks	Continues	Continues OVER ON	Continues	Continues OVER ON	Keep the input value and display value within the range.
Output type change	When output type has changed.	CCHG	OFF	OFF	OFF	OFF	Check the output type. If correct, press the mode key. At this time, the parameters are initialized; therefore, set the parameters again. If the error persists, contact OMRON.
Output type error	Output type other than specified.	Err□□	OFF	OFF	OFF	OFF	Turn the power OFF and then ON again once. If the error persists, contact OMRON.

Appendix A
Standard Models

The K3TS Intelligent Signal Processor is suited to essentially any application. The following lists the standard models available:

K3TS - □ □ □ □ □ - □ □
1 2 3 4 5 6 7

1, 2: Input Sensors Codes
SD: DC voltage/current inputs

3: Series number
1: Standard Specifications
2: Forced zero RAM
3: Display shift function

4: Power supply voltage
1: 100 to 240 VAC
2: 12 to 24 VDC

5: Type of display
B: Set value LED display
D: Thumbwheel switches (See note 4)

6, 7: Output Type Codes
C1: 3 comparative relay contact outputs (See note 1)
(H, PASS, L: SPDT)
C2: 5 comparative relay contact outputs (See note 2)
(HH, H, L, LL: SPST-NO; PASS: SPDT)
C5: 5 comparative relay contact outputs (See note 2)
(HH, H, L, LL: SPST-NC; PASS: SPDT)
T1: 5 transistor outputs (See note 3)
(NPN open collector)
T2: 5 transistor outputs (See note 3)
(PNP open collector)

Note
1. Thumbwheel Switches Models only.
2. Set Value LED Display Models only.
3. Thumbwheel switches models have the following transistor outputs only: H, PASS, and L.
4. Thumbwheel switches models have standard specifications only.

Optional Output Types

Processors with the following outputs are also available:

Set value LED display	Thumb-wheel switches	Option output type codes/output configuration
Yes	Yes	B4: BCD output + 5 transistor outputs (NPN open collector) (See note)
Yes	---	L4: 4 to 20 mA + 5 transistor outputs (NPN open collector)
Yes	---	L5: 1 to 5 V + 5 transistor outputs (NPN open collector)
Yes	---	L6: mV/digit + 5 transistor outputs (NPN open collector)
Yes	---	S5: RS-485 + 5 transistor outputs (NPN open collector)
Yes	---	S6: RS-422 + 5 transistor outputs (NPN open collector)

Note Thumbwheel Switches Models have the following transistor outputs only: H, PASS, and L.

Appendix B
Sensor Models

The following lists the applicable sensor models that can be used with the K3TS Intelligent Signal Processor along with the K3TS factory-set parameters associated with the use of these sensors. Examples of prescaling settings are also given.

Applicable Sensors

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

Linear Sensors

Sold separately.

Displacement Sensors

Sensor	Model	Cn	SCAL					SCAL description
			X_1	Y_1	X_2	Y_2	Decimal	
LED displacement sensor	Z4W-V25R	4020	0400	2100	2000	2900	oo.oo	21 to 29 mm (25±4 mm)
Laser displacement sensor	Z4W-A2	4020	0400	4500	2000	5500	oo.oo	45 to 55 mm (50±5 mm)
Laser displacement meters	3Z4M-J1001-□	4020	0400	3000	2000	5000	oo.oo	30 to 50 mm (40±10 mm)
	3Z4M-J2001-□ (See note)	9999	05000	3500	5000	4500	oo.oo	30 to 50 mm (40±10 mm)
	3Z4M-J1222-□	4020	0400	700	2000	1300	ooo.o	70 to 130 mm (100±30 mm)
	3Z4M-J2222-□ (See note)	9999	05000	8500	5000	1150	ooo.o	70 to 130 mm (100±30 mm)
Laser displacement sensors	Z4M-W40	9999	04000	3000	4000	5000	oo.oo	30 to 50 mm (40±10 mm)
	Z4M-W100	9999	04000	0600	4000	1400	ooo.o	60 to 140 mm (100±40 mm)
Parallel-beam linear sensor	Z4LA-1030	105	1000	1000	5000	0000	oo.oo	0 to 10 mm (sensing width)
Ultrasonic displacement sensors	E4DA-LS E4DA-WL1C (See note)	4020	0400	3000	2000	7000	oo.oo	30 to 70 mm (50±20 mm)

Note The maximum output range of the 3Z4M-J2 is ±10 V. However, since the input range for K3TS scaling is ±9.999 V, the output range of the 3Z4M-J2 is set to ±5.000 V (50% output). Yet there is no scaling error, even if the output range exceeds 50%.

Linear Proximity Sensors

Sensor	Amplifier	in	SCAL					SCAL description
			X_1	Y_1	X_2	Y_2	Decimal	
E2CA-XISRAA	E2CA-AN4C E2CA-AL4C	4-20 4-20	0400 0400	0300 0300	2000 2000	1500 1500	0.000 0.000	0.3 to 1.5 mm (8 X 8 X 1 mm)
E2CA-X2A	E2CA-AN4D E2CA-AL4D	4-20 4-20	0400 0400	0400 0400	2000 2000	2000 2000	0.000 0.000	0.4 to 2.0 mm (12 X 12 X 1 mm)
E2CA-X5A	E2CA-AN4E E2CA-AL4E	4-20 4-20	0400 0400	1000 1000	2000 2000	5000 5000	0.000 0.000	1.0 to 5.0 mm (18 X 18 X 1 mm)
E2CA-X10A	E2CA-AN4F E2CA-AL4F	4-20 4-20	0400 0400	0200 0200	2000 2000	1000 1000	00.00 00.00	2.0 to 10.0 mm (30 X 30 X 1 mm)

Contact Linear Sensors

Sensor	Amplifier	in	SCAL					SCAL description
			X_1	Y_1	X_2	Y_2	Decimal	
Contact linear sensors	D5M-5□□	4-20	0400	0000	2000	5000	0.000	0 to 5 mm
	D5M-10□□	4-20	0400	0000	2000	1000	00.00	0 to 10 mm

Pressure Sensors

Model	in	SCAL					SCAL description
		X_1	Y_1	X_2	Y_2	Decimal	
E8CA-R8	4-20	0400	0800 (-7800)	2000	0800 (7800)	0.000 (00.00)	–0.8 to 0.8 kgf/cm^2 (–78 to 78 kpa)
E8AA-M05	4-20	0400	0000 (0000)	2000	5000 (4900)	0.000 (000.0)	0 to 5 kgf/cm^2 (0 to 490 kpa)
E8AA-M10	4-20	0400	0000 (0000)	2000	1000 (9800)	00.00 (000.0)	0 to 10 kgf/cm^2 (0 to 980 kpa)

Timing Sensors

Sold separately.

Photoelectric Sensors

Classification		Model	Specifications		
			Power supply voltage	Control output	Residual voltage
3-wire DC	NPN	E3XR-□E4□ E3S-X3 E3L E3HF E3HS E3HT E3HC	12 to 24 VDC±10% Ripple (p-p) 10% max.	80 mA max.	0.75 V max. at 10 mA
		E3C-GE4 E3C-WE4			
		E3XR-CC4 E3X E3S-□G4□ E3S-LS5C4 E3S-LS20C4 E3C-JC4(P)		100 mA max.	0.7 V max. at 10 mA
		E3C-WH4F			
		E3N		200 mA max.	1 V max. at 10 mA
		E3ML		80 mA max.	
		E3S-LS3C1D	5 to 12 VDC Ripple (p-p) 10% max.	30 mA max.	
		E3S-A/B	10 to 30 VDC Ripple (p-p) 10% max.	100 mA max.	0.4 V max. at 16 mA

Proximity Sensors

Classification		Model	Specifications		
			Power supply voltage	Control output	Residual voltage
3-wire DC	NPN	TL-X-E TL-X-L (DC)	12 to 24 VDC	200 mA max.	1 V max. at 10 mA
		E2EC	5 to 24 VDC	100 mA max.	0.5 V max. at 10 mA
		TL-X□C	12 to 24 VDC	50 mA max.	
		E2C-JC4A E2E-□C TL-W□MC TL-T□E E2EV E2K-F□C		100 mA max.	
		E2C-GE4 TL-N□E TL-F□E TL-H□E			
		E2E-X□E (-P1) E2F-X□E TL-W5E E2K-C□E		200 mA max.	
		E2C-AM4A E2C-WH4A E2Q-N□E3			
		TL-X□E			1 V max. at 10 mA
		E2M-□P	24 VDC±15%		0.5 V max. at 10 mA

Appendix C
Specifications

Specifications and Ratings

The following lists the ratings and characteristics of the K3TS Intelligent Signal Processor:

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	15 VA max. (max. AC load); 10 W max. (max. DC load)
Insulation resistance	10 MW min. (at 500 VDC) between external terminal and case
Dielectric withstand voltage	2,000 VAC min. for 1 min between external terminal and case
Noise immunity	+1,500 V on power supply terminals in normal or common mode +1 ms, 100 ns for square-wave noise with 1-ns rise
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: 100 m/s^2 (approx. 10G) for 3 times each in X, Y, and Z directions Destruction: 300 m/s^2 (approx. 30G) for 3 times each in X, Y, and Z directions
Ambient temperature	Operating: –10% to 55%C (with no icing) Storage: –20% to 65%C (with no icing)
Ambient humidity	Operating: 35% to 85% (with no condensation)
Ambient atmosphere	Must be free of corrosive gas

Characteristics

Input signal	DC voltage/current (4 to 20 mA, 1 to 5 V, +9.999 V) 2 channels
A/D conversion method	Sequential conversion system
Sampling time	1.04 ms
Display refresh period	0.1/1.0/2.0/3.0/4.0 s (switch selectable)
Max. displayed digits	4 digits (+9999)
Display	7-segment LED
Polarity display	"–" is displayed automatically with a negative input signal.
Zero display	Leading zeroes are not displayed
Scaling function	Programmable with front-panel key inputs (range of display: +9999 with a decimal position of 10^{-1} to 10^{-3})
Display shift function	With front key input in a range between –9999 and 9999, applicable to models incorporating a display shift function.
2-input operation function	A, A + B, A – B, K – (A + B), (1 – B/A) x 100, B/A x 100
HOLD function	Sampling hold (The data at the rising edge of the TIMING input is held.) Maximum hold (The maximum data while TIMING input is ON is held.) Minimum hold (The minimum data while TIMING input is ON is held.) Peak-to-peak hold (The difference between the maximum value and the minimum value of the data while TIMING input is ON is held.)
External controls	TIMING: (TIMING input) HOLD: (Process value held) RESET: (Maximum/minimum data reset, measurement reset) ZERO: (Forced zero) BANK: (Selection of one bank out of 8 banks of set values)
Comparative output hysteresis setting	Programmable with front-panel key inputs (001 to 999 digits).
Timing delay	1.99 s max.
Output OFF delay	1.99 s max.
Other functions	Set values protect, average value comparison mode, setting of number of process values to average (1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192)
Output configuration	Relay contact outputs (5 or 3 outputs), Transistor outputs (NPN open collector) (BCD, linear, and communications models are available by special order)
Delay in comparative outputs	Normal parameter: 6.24 ms Sampling HOLD parameter: 5.20 ms
Enclosure rating	Front panel: IEC IP50 Rear case: IEC IP20 Terminals: IEC IP00
Memory protection	Non-volatile memory (EEPROM)

Measuring Ranges

Input range	Measuring range	Input impedance	Reliability (at 25%+5%C)	Instantaneous overload
4 to 20	2.40 to 26.00 mA	10 W	1-ch. input: +0.1%FS +1 digit max.	+200 mA
1 to 5	0.600 to 6.500 V	1 MW	2-ch input: +0.2%FS +1 digit max.	+200 V
9.999	+9.999 V	1 MW		+200 V

List of Factory-set Parameters

Setting level	Parameter		Displayed characters		Initial value
Level 1	Set value		CSt0 to 7	HH	9999
				H	9999
				L	9999
				LL	9999
	Hysteresis		HYS	---	001
	Prescaling		SCAL	X_2	2000
				Y_2	2000
				X_1	400
				Y_1	400
				Decimal	00.00
	Display shift	Shift value	InDS	---	0000
		Shift protect	PrDS	---	oFF
	K constant		MSEt	---	0000
	Linear output range		LSEt	LH	9999
				LL	9999
	Set value protect		Prot	---	oFF
Level 2	Input range		In	---	420
	Display refresh period		dISP	---	FASt
	Process values averaging		AvE	---	8
	TIMING-delay		tDd	---	0.00
	OFF-delay		oFDd	---	0.00
	Unit no.		UnIo	---	00
	Baud rate		bPS	---	9600
Level 3	Operating parameter 1		Fun1	---	A
	Operating parameter 2		Fun2	---	oFF
	Operating parameter 3		Fun3	---	norn

Index

O

P

R

S

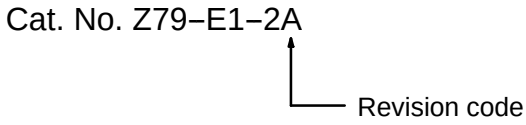
T

U

Z

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	October 1991	Original production
1A	June 1992	**Page 67**: Z4W-VS changed to Z4W-V and KSET = 20.00 changed to KSET = 70.00 in the bottom diagram. **Page 82**: The information in “Delay in comparative inputs” of the Characteristics table has been replaced.
1B	November 1992	**Page 18**: Information about short-circuiting terminals has been added after the diagrams in *5-2 Timing Sensors*.
2	October 1993	**Page 6**: Information added to PV display status indicator row in table. **Page 7**: DATA TEACH key row corrected. **Page 12**: INB− corrected to INB+ for the terminal configuration. Open collector configuration for the common input terminals corrected. **Page 13**: Circuit diagram in table corrected. **Page 18**: Information added after the note. **Page 20**: Setting level 1 column in diagram corrected. **Pages 22 to 24**: Model numbers added to table. Prescale value row added to table. **Page 24**: Prescale value row in table corrected. **Page 26**: Information added after graphic. **Page 36**: Information added after second paragraph. **Page 37**: Decimal points in display graphic added. **Pages 53, 54**: Forced Zero operation information corrected. **Pages 57, 59**: First sentence was rewritten. **Page 59**: Decimal point in display graphic added. **Page 61,62:** New subsection added. **Page 63 to 67:** New section added. **Page 70:** Last sentence rewritten. **Page 70**: Level 2 data corrected. **Page 71**: Application examples added. **Page 75**: Series number information corrected.Note 4 added. **Pages 77, 78**: Sensor models added to the lists. **Page 82**: Sampling period changed to sampling time and data for it corrected. **Page 83**: Display shift rows added. **Page 85**: Table replaced. **Page 87**: Information corrected in table. **Page 90**: Display shift function row added.
2A	August 1997	**Page 54**: Paragraph added to Difference between K3TS with Forced Zero RAM Specifications and Standard K3TS.