# Back Pressure Type Indicator

**LE100** 

# Communication Instruction Manual



Thank you for purchasing the RKC instrument. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place this manual in a convenient location for easy reference.

## SYMBOL

\*\*Example 1. This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

**CAUTION** 

: This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

: This mark indicates important information on installation, handling and operating procedures.

: This mark indicates supplemental information on installation, handling and operating procedures.

: This mark indicates that all precautions should be taken for safe usage.

: This mark indicates where additional information may be located.

# / WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

# CAUTION

- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take adequate measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All highvoltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
  - The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- Do not connect modular connectors to telephone line.

## NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

i - 2

# **CONTENTS**

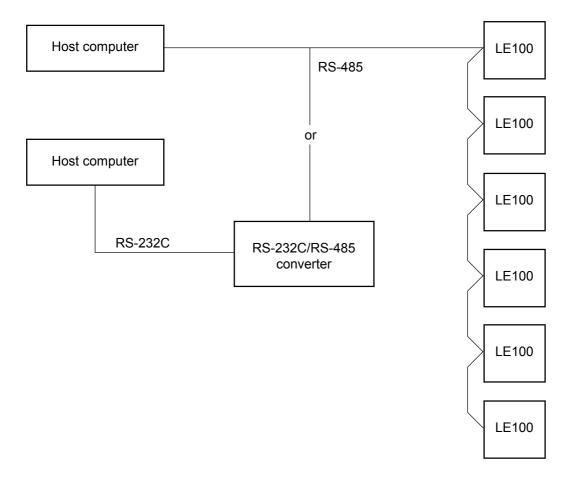
1.	OUTLINE	Page <b>1</b>
2.	SPECIFICATIONS	2
3.	. WIRING	3
4.	. SETTING	5
	4.1 Transfer to Communication Parameter Group	6
	4.2 Setting the Communication Parameters	7
	4.3 Communication Requirements	11
5.	PROTOCOL	13
	5.1 Polling	13
	5.1 Polling 5.1.1 Polling procedures	
	5.1.1 Polling procedures	14 17
	5.1.1 Polling procedures	14 17 18
	5.1.1 Polling procedures 5.1.2 Polling procedure example 5.2 Selecting 5.2.1 Selecting procedures	14 17 18
	5.1.1 Polling procedures 5.1.2 Polling procedure example 5.2 Selecting 5.2.1 Selecting procedures 5.2.2 Selecting procedure example	14 17 18 18
	5.1.1 Polling procedures 5.1.2 Polling procedure example 5.2 Selecting 5.2.1 Selecting procedures	14 17 18 18
6.	5.1.1 Polling procedures 5.1.2 Polling procedure example 5.2 Selecting 5.2.1 Selecting procedures 5.2.2 Selecting procedure example	14 17 18 21

# **MEMO**

i - 4 IMR01C02-E3

# 1. OUTLINE

The back pressure type indicator LE100 interfaces with the host computer via RKC communication protocol.



# 2. SPECIFICATIONS

**Interface:** Based on RS-485, EIA standard

**Connection method:** 2-wire system, half-duplex multi-drop connection

**Communication distance:** 1 km max.

The maximum communication distance will be affected by the

surrounding conditions.

**Synchronous method:** Start/stop synchronous type

**Communication speed:** 2400 bps, 4800 bps, 9600 bps, 19200 bps

**Data bit configuration:** Start bit: 1

Data bit: 7 or 8

Parity bit: Without, Odd or Even

Stop bit: 1 or 2

**Protocol:** ANSI X3.28 subcategory 2.5, A4

Polling/selecting type

**Error control:** Vertical parity (With parity bit selected)

Horizontal parity (BCC check)

**Communication code:** ASCII 7-bit code

**Termination resistor:** Externally connected

**Xon/Xoff control:** None

**Maximum connections:** 32 instruments maximum including a host computer

Signal logic: RS-485

Signal voltage	Logic
$V(A) - V(B) \ge 2V$	0 (SPACE)
$V(A) - V(B) \le -2 V$	1 (MARK)

Voltage between V (A) and V (B) is the voltage of (A) terminal for the

(B) terminal.

# 3. WIRING

# / WARNING

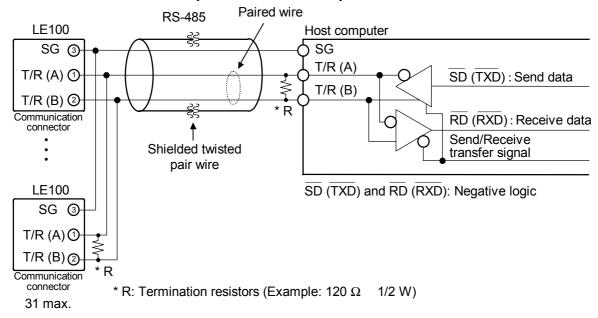
To prevent electric shock or instrument failure, do not turn on the power until all the wiring is completed.

## ■ Connector pin number and signal details

Pin No.	Signal name	Symbol
1	Send data/Receive data	T/R (A)
2	Send data/Receive data	T/R (B)
3	3 Signal ground	

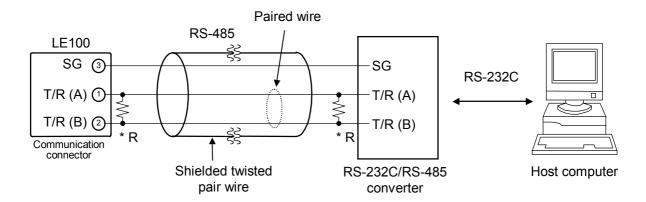
# ■ Wiring method

## • Connection to the RS-485 port of the host computer



#### Connection to the RS-232C port of the host computer

A RS-232C/RS-485 converter is required.



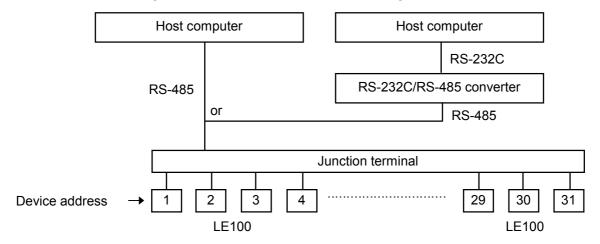
\* R: Termination resistors (Example: 120  $\Omega$  1/2 W)

When the host computer uses **Windows 95/98/NT**, use a RS-232C/RS-485 converter with an automatic send/receive transfer function.

Recommended: CD485, CD485/V manufactured by Data Link, Inc. or equivalent.

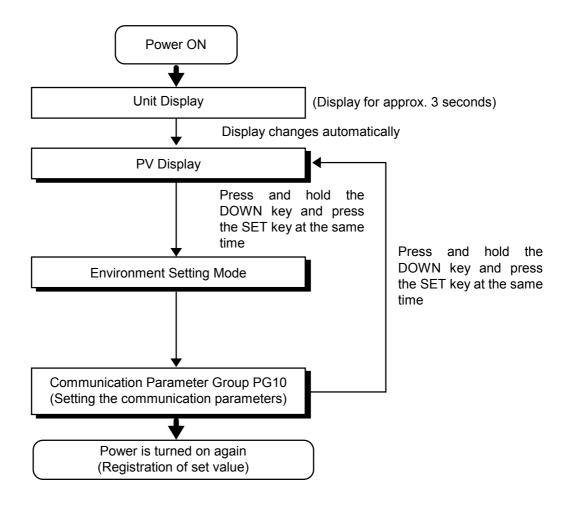
The cable is provided by the customer.

# ■ Connection with up to 31 LE100 and one host computer



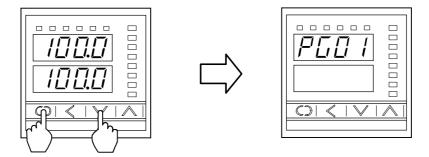
# 4. SETTING

To establish communication parameters between host computer and LE100, it is necessary to set the device address, communication speed, data bit configuration and interval time on each LE100 in the communication parameter group.

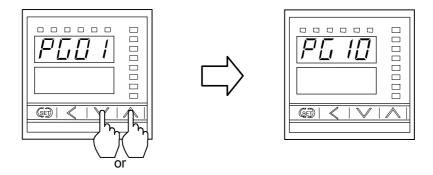


# 4.1 Transfer to Communication Parameter Group

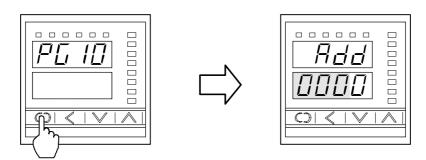
1. To go to the environment setting mode, you must be in PV display. Press and hold the DOWN key and press the SET key at the same time to initiate environment setting mode. The first parameter to be displayed will be the PG01.



2. Press the UP key or DOWN key to change the present display to the communication parameter group *PG10*.



3. Press the SET key. The first parameter to be displayed will be the device address, Add.

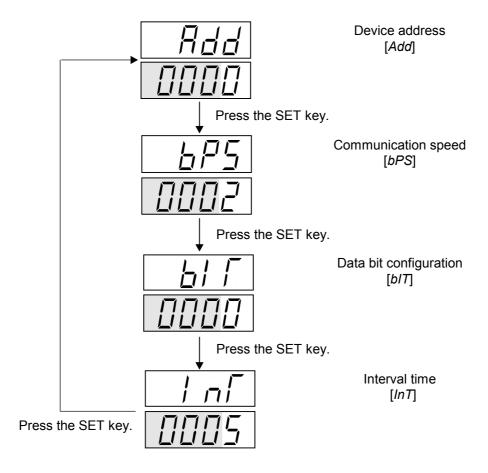


When let communication parameter group finish, press and hold the DOWN key and press the SET key at the same time. The display changes to the PV display.

# 4.2 Setting the Communication Parameters

To select parameters in communication parameter group, press the SET key. The parameters are displayed and sequenced in the order of device address, *Add*, communication speed, *bPS*, data bit configuration, *bIT* and interval time set value, *InT*.

# ■ Setting procedure



## ■ Registration of set value

After completing all communication parameter settings, turn on the power again, and register the set value which changed.

# ■ Description of each parameters

Symbol	Name	Setting range	Description	Factory set value
(Add)	Device address	0 to 99	Please set it not to duplication in multi-drop connection.	0
(bPS)	Communication speed	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps	Set the same communication speed for both the LE100 and the host computer.	2
(bIT)	Data bit configuration	See data bit configuration table	Set the same data bit configuration for both the LE100 and the host computer.	0
(InT)	Interval time *	0 to 250 ms	The LE100's interval time must match the specifications of the host computer.	5

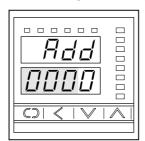
## Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	Without	1
1	8	Without	2
2	7	Even	1
3	7	Even	2
4	7	Odd	1
5	7	Odd	2

<sup>\*</sup> The interval time for the LE100 should be set to provide a time for host computer to finish sending all data including stop bit and to switch the line to receive data. If the interval time between the two is too short, the LE100 may send data before the host computer is ready to receive it. In this case, communication transmission can not be conducted correctly. For a successful communication sequence to occur, the LE100's interval time must match the specifications of the host computer.

# ■ Setting procedure example

1. Go to the communication parameter group PG10 so that device address, Add, is displayed. Present set value is displayed, and the least significant digit brightly lit.

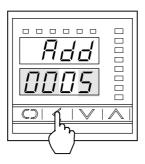


Device address

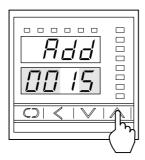
**2.** Set the device address. Press the UP key to enter *5* at the least significant digit. Example: Setting the device address to 15.



3. Press the  $\langle R/S \rangle$  key to brightly lit the tens digit.

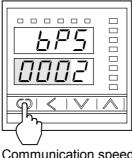


4. Press the UP key to enter 1 at the tens digit.



Continued on the next page.

5. Press the SET key to set the value thus set. The display changes to the next communication parameter. It the SET key is not pressed within 1 minute, the present display returns to the PV display and the value set here returns to that before the setting is changed.



Communication speed

6. After completing all communication parameter settings, turn on the power again, and register the set value which changed.

# 4.3 Communication Requirements

## ■ Processing times during data send/receive

The LE100 requires the following processing times during data send/receive.

Whether the host computer is using either the polling or selecting procedure for communication, the following processing times are required for LE100 to send data:

- -Response wait time after LE100 sends BCC in polling procedure
- -Response wait time after LE100 sends ACK or NAK in selecting procedure

#### Polling procedure

Procedure details	Time (ms)		
	MIN	TYP	MAX
Response send time after LE100 receives ENQ	1.0	2.0	3.0
Response send time after LE100 receives ACK	1.5	2.5	3.5
Response send time after LE100 receives NAK	1.0	2.0	3.0
Response send time after LE100 sends BCC	_	0.8	1.0

#### Selecting procedure

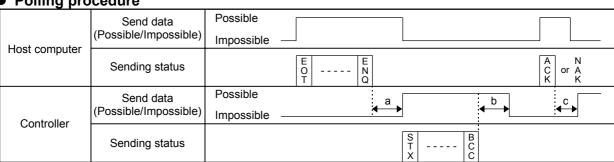
Procedure details		Time (ms)			
	MIN	TYP	MAX		
Response send time after LE100 receives BCC	2.0	3.0	4.0		
Response wait time after LE100 sends ACK	_	0.8	1.0		
Response wait time after LE100 sends NAK	_	0.8	1.0		

Response send time is time at having set interval time in 0 ms.

# ■ RS-485 (2-wire system) send/receive timing

The sending and receiving of RS-485 communication is conducted through two wires; consequently, the transmission and reception of data requires precise timing. Typical polling and selecting procedures between the host computer and LE100 are described below:

Polling procedure



- a: Response send time after LE100 receives [ENQ] + Interval time
- b: Response send time after LE100 sends BCC
- c: Response send time after LE100 receives [ACK] + Interval time or Response send time after LE100 receives [NAK] + Interval time

 Selecting procedure Possible Send data (Possible/Impossible) Impossible Host computer ВСС Sending status Possible Send data b (Possible/Impossible) Impossible Controller or A A C K Sending status

- a: Response send time after LE100 receives BCC + Interval time
- b: Response wait time after LE100 sends ACK or Response wait time after LE100 sends NAK
  - To switch the host computer from transmission to reception, send data must be on line. To check if data is on line, do not use the host computer's transmission buffer but confirm it by the shift register.
  - Whether the host computer is using either the polling or selecting procedure for communication, the following processing times are required for LE100 to send data:
    - -Response wait time after LE100 sends BCC in polling procedure
    - -Response wait time after LE100 sends ACK or NAK in selecting procedure

#### ■ Fail-safe

A transmission error may occur with the transmission line disconnected, shorted or set to the high-impedance state. In order to prevent the above error, it is recommended that the fail-safe function be provided on the receiver side of the host computer. The fail-safe function can prevent a framing error from its occurrence by making the receiver output stable to the MARK (1) when the transmission line is in the high-impedance state.

#### ■ Data backup

The nonvolatile memory (EEPROM) for data backup has limitations on the number of memory rewrite times (approx. 100,000 times). Avoid using the memory to frequently change the set value via communication.

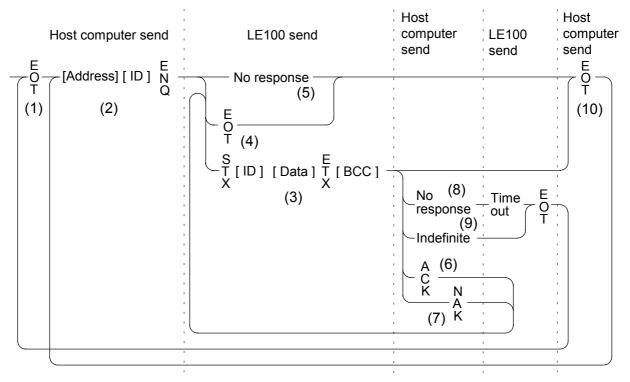
# 5. PROTOCOL

LE100 uses the polling/selecting method to establish a data link. The basic procedure is followed ANSI X3.28 subcategory 2.5, A4 basic mode data transmission control procedure (Fast selecting is the selecting method used in LE100).

- The polling/selecting procedures are a centralized control method where the host computer controls the entire process. The host computer initiates all communication so the LE100 responds according to queries and commands from the host.
- The code use in communication is 7-bit ASCII code including transmission control characters.
  The transmission control characters are EOT (04H), ENQ (05H), ACK (06H), NAK (15H), STX (02H) and ETX (03H). The figures in the parenthesis indicate the corresponding hexadecimal number.

# 5.1 Polling

Polling is the action where the host computer requests one of the connected LE100s to transmit data. An example of the polling procedure is shown below:



ID: Identifier

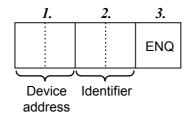
# 5.1.1 Polling procedures

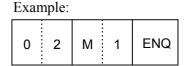
## (1) Data link initialization

Host computer sends EOT to the LE100s to initiate data link before polling sequence.

# (2) Data sent from host computer - Polling sequence

Host computer sends polling sequence with the format shown below:





#### 1. Device address (2 digits)

The device address specifies the LE100 to be polled and each LE100 must have its own unique device address.

For details, see 4.2 Setting the Communication Parameters (P. 7).

#### 2. Identifier (2 digits)

The identifier specifies the type of data that is requested from the LE100.

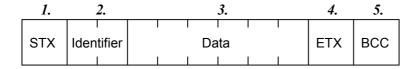
For details, see **5.3 Communication Identifier List (P. 22)**.

#### *3.* ENQ

The ENQ is the transmission control character that indicates the end of the polling sequence. The ENQ must be attached to the end of the identifier. The host computer then must wait for a response from the LE100.

#### (3) Data sent from the LE100

If the polling sequence is received correctly, the LE100 sends data in the following format:



#### 1. STX

STX is the transmission control character which indicates the start of the text transmission (identifier and data).

2. Identifier (2 digits) For details, see 5.3 Communication Identifier List (P. 22).

The identifier indicates the type of data (measured value, status and set value) sent to the host computer.

#### 3. Data (6 digits)

Data is the information being sent from the LE100. It is expressed in decimal ASCII code including a minus sign (-) and a decimal point. No zero suppression is made.

## **4.** ETX

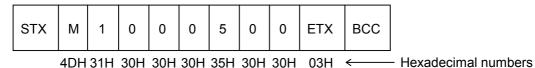
ETX is a transmission control character used to indicate the end of text transmission.

#### 5. BCC

BCC (Block Check Character) detects error using horizontal parity and is calculated by horizontal parity (even number).

Calculation method of BCC: *Exclusive OR* all data and characters from STX through ETX, not including STX.

#### Example:



BCC = 4DH  $\oplus$  31H  $\oplus$  30H  $\oplus$  30H  $\oplus$  30H  $\oplus$  35H  $\oplus$  30H  $\oplus$  30H  $\oplus$  03H = 7AH Value of BCC becomes 7AH.

## (4) EOT sent from the LE100 (Ending data transmission from the LE100)

In the following cases, the LE100 sends EOT to terminate the data link:

- When the specified identifier is invalid
- When there is an error in the data type
- When all the data has been sent

## (5) No response from the LE100

The LE100 will not respond if the polling address is not received correctly. It may be necessary for the host computer to take corrective action such as a time-out.

## (6) ACK Acknowledgment

An acknowledgment ACK is sent by the host computer when data received is correct. When the LE100 receives ACK from the host computer, the LE100 will send any remaining data of the next identifier without additional action from the host computer.

For the identifier, see **5.3 Communication Identifier List (P. 22)**.

When host computer determines to terminate the data link, EOT is sent from the host computer.

## (7) NAK Negative acknowledge

If the host computer does not receive correct data from the LE100, it sends a negative acknowledgment NAK to the LE100. The LE100 will re-send the same data when NAK is received. This cycle will go on continuously until either recovery is achieved or the data link is corrected at the host computer.

## (8) No response from host computer

When the host computer does not respond within approximately three seconds after the LE100 sends data, the LE100 sends EOT to terminate the data link.

#### (9) Indefinite response from host computer

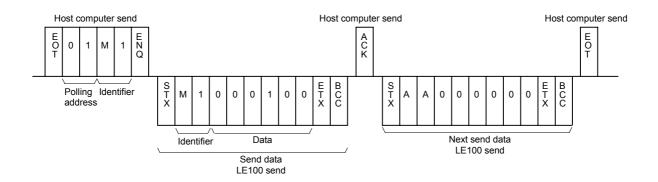
The LE100 sends EOT to terminate the data link when the host computer response is indefinite.

## (10) EOT Data link termination

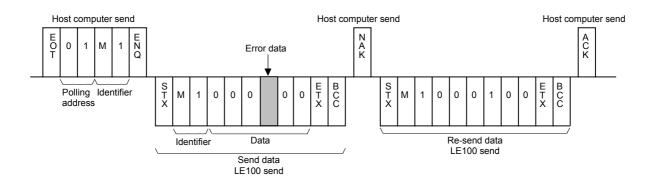
The host computer sends EOT message when it is necessary to suspend communication with the LE100 or to terminate the data link due lack of response from the LE100.

# 5.1.2 Polling procedure example

## ■ Normal transmission

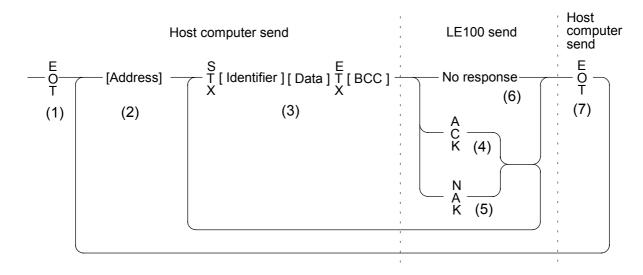


## **■** Error transmission



# 5.2 Selecting

Selecting is the action where the host computer requests one of the connected LE100s to receive data. An example of the selecting procedure is shown below:



# 5.2.1 Selecting procedures

## (1) Data link initialization

Host computer sends EOT to the LE100s to initiate data link before selecting sequence.

# (2) Sending selecting address from the host computer

Host computer sends selecting address for the selecting sequence.

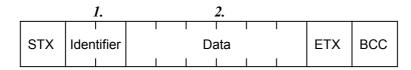
#### Device address (2 digits)

The device address specifies the LE100 to be selected and each LE100 must have its own unique device address.

For details, see 4.2 Setting the Communication Parameters (P. 7).

# (3) Data sent from the host computer

The host computer sends data for the selecting sequence with the following format:



For the STX, ETX and BCC, see **5.1 Polling (P. 13)**.

#### 1. Identifier (2 digits)

The identifier specifies the type of data that is requested from the LE100, such as set value.

For details, see **5.3 Communication Identifier List (P. 22)**.

#### 2. Data (Maximum 6 digits)

Data is the information being sent to the LE100. It is expressed in decimal ASCII code including a minus sign (-) and a decimal point (period).

#### About numerical data

The data that receipt of letter is possible

- Data with numbers below the decimal point omitted or zero suppressed data can be received.
  - <Example> When data send with -001.5, -01.5, -1.5, -1.50, -1.500 at the time of -1.5, LE100 can receive a data.
- When the host computer send data with decimal point to item of without decimal point, LE100 receives a message with the value which cut off below the decimal point.

<Example> When setting range is 0 to 200, LE100 receives as a following.

Send data	0.5	100.5
Receive data	0	100

• LE100 receives value in accordance with decided place after the decimal point. The value below the decided place after the decimal point is cut off.

<Example> When setting range is -10.00 to +10.00, LE100 receives as a following.

Send data	5	058	.05	-0
Receive data	-0.50	-0.05	0.05	0.00

#### The data that receipt of letter is impossible

LE100 sends NAK when received a following data.

+ Plus sign and the data that gained plus sing				
- Only minus sign (there is no figure)				
	Only decimal point (period)			
	Only minus sign and decimal point (period)			

## (4) ACK Acknowledgment

An acknowledgment ACK is sent by the LE100 when data received is correct. When the host computer receives ACK from the LE100, the host computer will send any remaining data. If there is no more data to be sent to LE100, the host computer sends EOT to terminate the data link.

#### (5) Negative acknowledge NAK

If the LE100 does not receive correct data from the host computer, it sends a negative acknowledgment NAK to the host computer. Corrections, such as re-send, must be made at the host computer. The LE100 will send NAK in the following cases:

- When an error occurs on communication the line (parity, framing error, etc.)
- When a BCC check error occurs
- When the specified identifier is invalid
- When receive data exceeds the setting range

# (6) No response from LE100

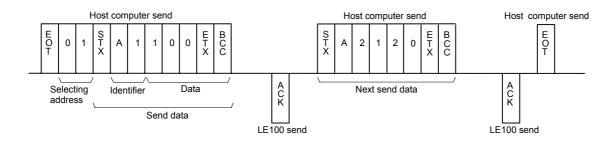
The LE100 does not respond when it can not receive the selecting address, STX, ETX or BCC.

## (7) EOT Data link termination

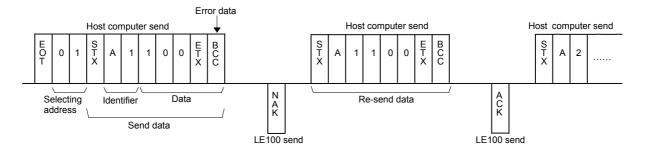
The host computer sends EOT when there is no more data to be sent from the host computer or there is no response from the LE100.

# 5.2.2 Selecting procedure example

## ■ Normal transmission



## **■** Error transmission



# 5.3 Communication Identifier List

Communication is not possible when an identifier is specified that the LE100 can not recognize.

The number of digits for data is 6.

(Attribute RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Descrip	tion	Factory set value	Attrib -ute
Measured value (PV)	M1	Within input range <sup>1</sup>			RO
Output 1 status <sup>2</sup>	AA	0: OFF	1: ON		RO
Output 2 status <sup>2</sup>	AB	0: OFF	1: ON		RO
Output 3 status <sup>2</sup>	AC	0: OFF	1: ON		RO
Output 4 status <sup>2</sup>	AD	0: OFF	1: ON		RO
Output 5 status <sup>2</sup>	AE	0: OFF	1: ON		RO
Output 6 status <sup>2</sup>	AF	0: OFF	1: ON		RO
Output 7 status <sup>3</sup>	AG	0: OFF	1: ON		RO
Output 8 status <sup>3</sup>	AH	0: OFF	1: ON		RO
Burnout	B1	0: OFF	1: ON		RO

<sup>&</sup>lt;sup>1</sup> Input range table

Unit setting	Unit	Range	Notes
0	mm	0 to 400 (1250)	The high limit is determined by the specific gravity setting.
1	%	0.0 to 100.0	% display of liquid level.
2	%	0.0 to 100.0	% display of pressure.
3	l	0 to 360	The decimal point position depends on the decimal point position selection.
4	m <i>l</i>	0 to 360	The decimal point position depends on the decimal point position selection.
5	kPa	0 to 9.807	
6	Pa	0 to 9807	

<sup>&</sup>lt;sup>2</sup> This is the identifier effective when output type other than OFF are selected.

Continued on the next page.

<sup>&</sup>lt;sup>3</sup> This is the identifier effective when output 8 points specification and any output type other than OFF are selected.

(Attribute

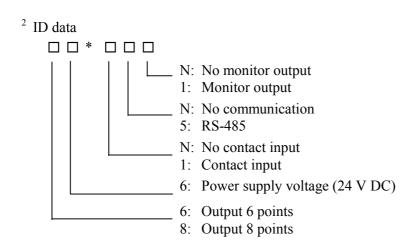
RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
Error code	ER	0: No error Except 0: Error occurs <sup>1</sup>		RO
ID data	ID	Model code <sup>2</sup>	To vary depending on the specification	RO
Specific gravity monitor	MS	0.800 to 2.500		RO
Scale low monitor	ML	Scale low to Scale high		RO
Scale high monitor	MH	Scale low to Scale high		RO
Peak hold monitor	HP	Scale low to Scale high		RO
Bottom hold monitor	HQ	Scale low to Scale high		RO

<sup>&</sup>lt;sup>1</sup> Error code

Error number	Details	Error number	Details
1	Adjusted data destruction error	32	Span setting by actual liquid error
2	EEPROM write error	64	Span adjustment execution error
4	EEPROM time out error	128	Number of wafer processing times error
8	Input capture hardware error	256	Output setting by actual liquid error
16	Emptiness adjustment execution error	512	Linearizing table creation error

If two or more errors occurs simultaneously, the total summation of these error codes is displayed.



Continued on the next page.

(Attribute RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
Number of wafer processing times monitor <sup>1</sup>	MW	1 to Number of wafer processing times setting		RO
Amount of emptiness correction monitor	MZ	-5.00 to +5.00 of full span		RO
Output 1 set value <sup>2</sup>	A1	Scale low to Scale high	1000	R/W
Output 2 set value <sup>2</sup>	A2	Scale low to Scale high	1000	R/W
Output 3 set value <sup>2</sup>	A3	Scale low to Scale high	1000	R/W
Output 4 set value <sup>2</sup>	A4	Scale low to Scale high	1000	R/W
Output 5 set value <sup>2</sup>	A5	Scale low to Scale high	1000	R/W
Output 6 set value <sup>2</sup>	A6	Scale low to Scale high	1000	R/W
Output 7 set value <sup>3</sup>	A7	Scale low to Scale high	1000	R/W
Output 8 set value <sup>3</sup>	A8	Scale low to Scale high	1000	R/W
Actual liquid output setting	A9	0: Not executed 1 to 8: Each output is executed		WO
Emptiness adjustment	AZ	0: Not executed 1: Executed	0	R/W
Number of wafer processing times <sup>1</sup>	WT	1: Executed		WO
Initializing the number of wafer processing times <sup>1</sup>	CW	0: Executed		WO
Hold reset	HR	1: Executed		WO
Interlock release 4	IR	0: Executed		WO
Set data lock	LK	<ul><li>0: Set data lock not provided.</li><li>1: Only output set value can be set.</li><li>2: All parameter cannot be set.</li></ul>	0	R/W
Default setting	IS	1: Executed		WO
Error release	EC	0: Executed		WO

<sup>&</sup>lt;sup>1</sup> This is the identifier effective when the presence of the specific gravity correction function is selected.

Continued on the next page.

<sup>&</sup>lt;sup>2</sup> This is the identifier effective when output type other than OFF are selected.

<sup>&</sup>lt;sup>3</sup> This is the identifier effective when output 8 points specification and any output type other than OFF are selected.

<sup>&</sup>lt;sup>4</sup> This is the identifier effective when the presence of the output 1 to 8 interlock is selected.

(Attribute

RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
Decimal point position selection *	LU	0: No digit below decimal point 1: 1 digit below decimal point 2: 2 digit below decimal point 3: 3 digit below decimal point	1	R/W
Number of linearizing table setting *	LT	2 to 11	11	R/W
Linearizing table setting 0 *	L0	Scale low to Scale high	0.0	R/W
Linearizing table setting 1 *	L1	Linearizing table setting 0 to Scale high	3.6	R/W
Linearizing table setting 2 *	L2	Linearizing table setting 1 to Scale high	7.2	R/W
Linearizing table setting 3 *	L3	Linearizing table setting 2 to Scale high	10.8	R/W
Linearizing table setting 4 *	L4	Linearizing table setting 3 to Scale high	14.4	R/W
Linearizing table setting 5 *	L5	Linearizing table setting 4 to Scale high	18.0	R/W
Linearizing table setting 6 *	L6	Linearizing table setting 5 to Scale high	21.6	R/W
Linearizing table setting 7 *	L7	Linearizing table setting 6 to Scale high	25.2	R/W
Linearizing table setting 8 *	L8	Linearizing table setting 7 to Scale high	28.8	R/W
Linearizing table setting 9 *	L9	Linearizing table setting 8 to Scale high	32.4	R/W
Linearizing table setting 10 *	LA	Linearizing table setting 9 to Scale high	36.0	R/W
Digital filter	F1	0 to 100 seconds (0: OFF)	3	R/W

<sup>\*</sup> This is the identifier effective when the engineering unit is set to l or ml.

Continued on the next page.

(Attribute

RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
Output 1 type selection <sup>1</sup>	XA	0: OFF 1: Process high output 2: Process low output 3: Deviation high output 4: Deviation low output	1	R/W
Output 1 deviation value setting <sup>2</sup>	DA	-50 to +50 mm	0	R/W
Output 1 interlocking function selection	QA	Without interlocking function     With interlocking function	0	R/W
Output 1 a/b contact selection	NA	0: a contact 1: b contact	0	R/W
Output 1 differential gap	HA	0.0 to 10.0 % of span	0.3	R/W
Output 1 timer setting	TA	0 to 600 seconds	0	R/W
Output 2 type selection <sup>1</sup>	XB	0: OFF 1: Process high output 2: Process low output 3: Deviation high output 4: Deviation low output	1	R/W
Output 2 deviation value setting <sup>2</sup>	DB	-50 to +50 mm	0	R/W
Output 2 interlocking function selection	QB	Without interlocking function     With interlocking function	0	R/W
Output 2 a/b contact selection	NB	0: a contact 1: b contact	0	R/W
Output 2 differential gap	НВ	0.0 to 10.0 % of span	0.3	R/W
Output 2 timer setting	TB	0 to 600 seconds	0	R/W

<sup>&</sup>lt;sup>1</sup> The high limit or low limit deviation output can be set only when the engineering unit is set to mm.

Continued on the next page.

<sup>&</sup>lt;sup>2</sup> This is the identifier effective when output type 3 (high limit deviation output) or 4 (low limit deviation output) is selected from among 1 to 8.

(Attribute

RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
Output 3 type selection <sup>1</sup>	XC	0: OFF 1: Process high output 2: Process low output 3: Deviation high output 4: Deviation low output	1	R/W
Output 3 deviation value setting <sup>2</sup>	DC	-50 to +50 mm	0	R/W
Output 3 interlocking function selection	QC	0: Without interlocking function 1: With interlocking function	0	R/W
Output 3 a/b contact selection	NC	0: a contact 1: b contact	0	R/W
Output 3 differential gap	HC	0.0 to 10.0 % of span	0.3	R/W
Output 3 timer setting	TC	0 to 600 seconds	0	R/W
Output 4 type selection <sup>1</sup>	XD	0: OFF 1: Process high output 2: Process low output 3: Deviation high output 4: Deviation low output	1	R/W
Output 4 deviation value setting <sup>2</sup>	DD	-50 to +50 mm	0	R/W
Output 4 interlocking function selection	QD	0: Without interlocking function     1: With interlocking function	0	R/W
Output 4 a/b contact selection	ND	0: a contact 1: b contact	0	R/W
Output 4 differential gap	HD	0.0 to 10.0 % of span	0.3	R/W
Output 4 timer setting	TD	0 to 600 seconds	0	R/W

<sup>&</sup>lt;sup>1</sup> The high limit or low limit deviation output can be set only when the engineering unit is set to mm.

Continued on the next page.

<sup>&</sup>lt;sup>2</sup> This is the identifier effective when output type 3 (high limit deviation output) or 4 (low limit deviation output) is selected from among 1 to 8.

(Attribute

RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
Output 5 type selection <sup>1</sup>	XE	0: OFF 1: Process high output 2: Process low output 3: Deviation high output 4: Deviation low output	1	R/W
Output 5 deviation value setting <sup>2</sup>	DE	-50 to +50 mm	0	R/W
Output 5 interlocking function selection	QE	0: Without interlocking function 1: With interlocking function	0	R/W
Output 5 a/b contact selection	NE	0: a contact 1: b contact	0	R/W
Output 5 differential gap	HE	0.0 to 10.0 % of span	0.3	R/W
Output 5 timer setting	TE	0 to 600 seconds	0	R/W
Output 6 type selection <sup>1</sup>	XF	0: OFF 1: Process high output 2: Process low output 3: Deviation high output 4: Deviation low output	1	R/W
Output 6 deviation value setting <sup>2</sup>	DF	-50 to +50 mm	0	R/W
Output 6 interlocking function selection	QF	0: Without interlocking function 1: With interlocking function	0	R/W
Output 6 a/b contact selection	NF	0: a contact 1: b contact	0	R/W
Output 6 differential gap	HF	0.0 to 10.0 % of span	0.3	R/W
Output 6 timer setting	TF	0 to 600 seconds	0	R/W

<sup>&</sup>lt;sup>1</sup> The high limit or low limit deviation output can be set only when the engineering unit is set to mm.

Continued on the next page.

<sup>&</sup>lt;sup>2</sup> This is the identifier effective when output type 3 (high limit deviation output) or 4 (low limit deviation output) is selected from among 1 to 8.

(Attribute

RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
Output 7 type selection <sup>1, 2</sup>	XG	0: OFF 1: Process high output 2: Process low output 3: Deviation high output 4: Deviation low output	1	R/W
Output 7 deviation value setting <sup>1,3</sup>	DG	-50 to +50 mm	0	R/W
Output 7 interlocking function selection <sup>1</sup>	QG	0: Without interlocking function 1: With interlocking function	0	R/W
Output 7 a/b contact selection <sup>1</sup>	NG	0: a contact 1: b contact	0	R/W
Output 7 differential gap <sup>1</sup>	HG	0.0 to 10.0 % of span	0.3	R/W
Output 7 timer setting <sup>1</sup>	TG	0 to 600 seconds	0	R/W
Output 8 type selection <sup>1, 2</sup>	ХН	0: OFF 1: Process high output 2: Process low output 3: Deviation high output 4: Deviation low output	1	R/W
Output 8 deviation value setting <sup>1, 3</sup>	DH	-50 to +50 mm	0	R/W
Output 8 interlocking function <sup>1</sup>	QH	Without interlocking function     With interlocking function	0	R/W
Output 8 a/b contact selection <sup>1</sup>	NH	0: a contact 1: b contact	0	R/W
Output 8 differential gap <sup>1</sup>	НН	0.0 to 10.0 % of span	0.3	R/W
Output 8 timer setting <sup>1</sup>	TH	0 to 600 seconds	0	R/W

<sup>&</sup>lt;sup>1</sup> This is the identifier effective when output 8 points specification are selected.

Continued on the next page.

<sup>&</sup>lt;sup>2</sup> The high limit or low limit deviation output can be set only when the engineering unit is set to mm.

<sup>&</sup>lt;sup>3</sup> This is the identifier effective when output type 3 (high limit deviation output) or 4 (low limit deviation output) is selected from among 1 to 8.

(Attribute

RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
Monitor output high <sup>1</sup>	HV	Monitor output low to Scale high	1000	R/W
Monitor output low <sup>1</sup>	HW	Scale low to Monitor output high	0	R/W
End specific gravity setting <sup>2</sup>	EG	0.800 to 2.500	1.000	R/W
Number of wafer processing times setting <sup>2</sup>	SW	1 to 20	10	R/W
Scale low <sup>3</sup>	XX	0 to 50	0	R/W
Specific gravity setting <sup>3</sup>	SG	0.800 to 2.500	1.000	R/W
Scale 1 actual liquid setting <sup>4</sup>	J1	0 to 1250	0	R/W
Scale 2 actual liquid setting <sup>4</sup>	J2	1 to 1250	1250	R/W
Correction on the low limit side by actual liquid 2 <sup>5</sup>	J3	1: Executed		WO
Correction on the high limit side by actual liquid 2 <sup>5</sup>	J4	1: Executed		WO
Unit setting	UN	0 to 6 (See Input range table [P.22])	0	R/W
Specific gravity setting transfer <sup>6</sup>	SP	0: Manual setting 1: Actual liquid setting	0	R/W
Specific gravity correction function selection <sup>7</sup>	SS	0: Without specific gravity     correction function     1: With specific gravity correction     function	0	R/W

<sup>&</sup>lt;sup>1</sup> This is the identifier effective when the presence of the monitor function is selected.

Continued on the next page.

<sup>&</sup>lt;sup>2</sup> This is the identifier effective when the presence of the specific gravity correction function is selected.

<sup>&</sup>lt;sup>3</sup> This is the identifier effective when the specific gravity setting is changed to the manual setting.

<sup>&</sup>lt;sup>4</sup> This is the identifier effective when the specific gravity setting is changed to the actual liquid setting.

<sup>&</sup>lt;sup>5</sup> This is the identifier effective when the engineering unit is set to % (% display of pressure).

<sup>&</sup>lt;sup>6</sup> This is the identifier effective when the engineering unit is set to any unit other than % (% display of pressure), kPa or Pa.

<sup>&</sup>lt;sup>7</sup> This is the identifier effective when the engineering unit is set to mm and the specific gravity setting is changed to the manual setting.

(Attribute

RO: Read only, WO: Write only, R/W: Read and Write)

Name	lden- tifier	Description	Factory set value	Attrib -ute
DI function selection <sup>1</sup>	DS	O: For conducting the emptiness adjustment     1: For counting the number of wafer processing times	0	R/W
Volume/level display selection <sup>2</sup>	MM	0: Volume display 1: Level display	0	R/W

<sup>&</sup>lt;sup>1</sup> This is the identifier effective when the presence of the contact input and also specific gravity correction function are selected.

<sup>&</sup>lt;sup>2</sup> This is the identifier effective when the engineering unit is set to l or ml.

# 6. TROUBLESHOOTING

# / WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electric shock or instrument failure, do not turn on the power until all the wiring is completed.
- To prevent electric shock or instrument failure, do not touch the inside of the instrument.
- All wiring must be performed by authorized personnel with electrical experience in this type of work.

#### **CAUTION**

All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.

The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.

This section lists some of the main causes and solutions for communication problems.

If you can not solve a problem, please contact RKC sales office or the agent, on confirming the type name and specifications of the product.

#### ■ RKC communication

Problem	Probable cause	Solution
No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed and data bit configuration with those of the host	Confirm the settings and set them correctly
	Wrong address setting	

Continued on the next page.

Problem	Probable cause	Solution
No response	Error in the data format	Reexamine the communication program
	Transmission line is not set to the receive state after data send (for RS-485)	
EOT return	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it
	Error in the data format	Reexamine the communication program
NAK return	Error occurs on the line (parity bit error, framing error, etc.	Confirm the cause of error, and solve the problem appropriately. (Confirm the transmitting data, and resend data)
	BCC error	
	The data exceeds the setting range	Confirm the setting range and transmit correct data
	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it

# 7. ASCII 7-BIT CODE TABLE (REFERENCE)

1					<del></del>	b7	0	0	0	0	1	1	1	1
	<b>├</b>					b6	0	0	1	1	0	0	1	1
	<b>→</b>					b5	0	1	0	1	0	1	0	1
b5 t	o b7	b4	b3	b2	b1		0	1	2	3	4	5	6	7
		0	0	0	0	0	NUL	DLE	SP	0	@	P	•	p
		0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
		0	0	1	0	2	STX	DC2	"	2	В	R	b	r
		0	0	1	1	3	ETX	DC3	#	3	C	S	c	S
		0	1	0	0	4	ЕОТ	DC4	\$	4	D	T	d	t
		0	1	0	1	5	ENQ	NAK	%	5	Е	U	e	u
		0	1	1	0	6	ACK	SYM	&	6	F	V	f	V
		0	1	1	1	7	BEL	ETB	,	7	G	W	g	W
		1	0	0	0	8	BS	CAN	(	8	Н	X	h	X
		1	0	0	1	9	HT	EM	)	9	I	Y	i	у
		1	0	1	0	A	LF	SUB	*	:	J	Z	j	Z
		1	0	1	1	В	VT	ESC	+	,	K	[	k	{
		1	1	0	0	C	FF	FS	,	<	L	¥	1	
		1	1	0	1	D	CR	GS	-	=	M	]	m	}
		1	1	1	0	Е	SO	RS	•	>	N	^	n	~
		1	1	1	1	F	SI	US	/	?	О	_	0	DEL

The first edition: OCT.1999 The third edition: MAY 2001



# **RKC INSTRUMENT INC.**

HEADQUARTERS: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN

PHONE: 03-3751-9799 (+81 3 3751 9799)

E-mail: info@rkcinst.co.jp

FAX: 03-3751-8585 (+81 3 3751 8585)

IMR01C02-E3 MAY 2001