

GD SERIES

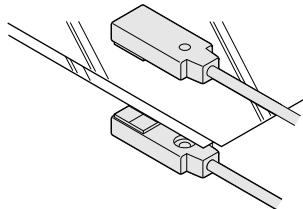
Metal-sheet Double-feed Detector



From Ultra-thin Lead Frames to Iron Sheets...
Double Feed Detection
of Various Metal Sheets

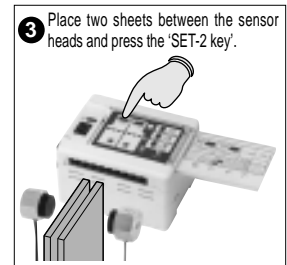
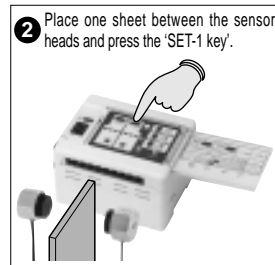
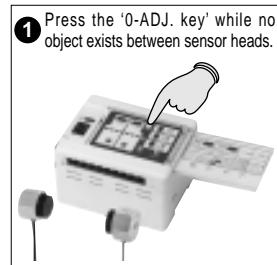
Double Metal Sheets Reliably Detected

The high-end **GD** sensing technology reliably detects double feeds of any metal sheet 0.01mm, or more, thick.



Easy Sensitivity Setting with Actual Samples

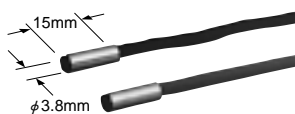
Optimum sensitivity setting is easy by using the teaching function with actual samples.



Three Types of Sensor Heads for Various Objects

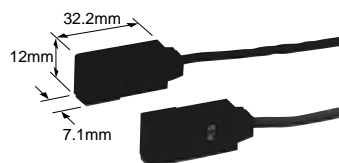
Small object detection sensor head/GD-3

This is an extremely small sensor head, only $\phi 3.8 \times 15$ mm, suitable for detecting small components.



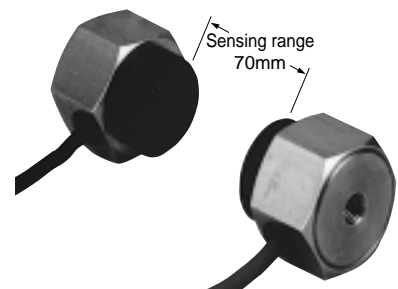
High precision sensor head/GD-10

It is suitable for high precision detection of double feeds of leadframes or thin metal sheets.




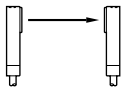
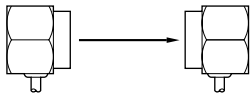
Long sensing range sensor head/GD-20

It achieves a long sensing range of 70mm. Further, it employs a robust metal case with IP67 protection to withstand harsh environment.



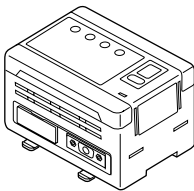
ORDER GUIDE

Sensor heads

Type	Appearance	Sensing range (between sensor heads)	Detectable sheet thickness	Model No.	Applicable controllers																																																						
Small object detection		10mm	Standard sensing object size: 20 × 20mm <table border="1"> <thead> <tr> <th>Material</th> <th>Setting distance</th> <th>5mm</th> <th>10mm</th> </tr> </thead> <tbody> <tr> <td>Iron (SPCC)</td> <td></td> <td>0.01 to 0.1mm</td> <td>0.03 to 0.1mm</td> </tr> <tr> <td>Aluminum</td> <td></td> <td>0.015 to 1mm</td> <td>0.015 to 1mm</td> </tr> <tr> <td>Copper</td> <td></td> <td>0.018 to 1mm</td> <td>0.018 to 0.3mm</td> </tr> <tr> <td>Brass</td> <td></td> <td>0.03 to 1mm</td> <td>0.03 to 0.5mm</td> </tr> <tr> <td>Stainless steel (SUS304)</td> <td></td> <td>0.3 to 1mm</td> <td>0.3 to 1mm</td> </tr> </tbody> </table>	Material	Setting distance	5mm	10mm	Iron (SPCC)		0.01 to 0.1mm	0.03 to 0.1mm	Aluminum		0.015 to 1mm	0.015 to 1mm	Copper		0.018 to 1mm	0.018 to 0.3mm	Brass		0.03 to 1mm	0.03 to 0.5mm	Stainless steel (SUS304)		0.3 to 1mm	0.3 to 1mm	GD-3	GD-C3																														
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High precision		30mm	Standard sensing object size: 80 × 80mm <table border="1"> <thead> <tr> <th rowspan="2">Material</th> <th colspan="2">Setting distance</th> <th>20mm</th> <th>30mm</th> </tr> <tr> <th colspan="2">Applicable controllers</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="2">Iron (SPCC)</td> <td colspan="2">GD-C1/C2</td> <td>0.07 to 1mm</td> <td>0.07 to 0.5mm</td> </tr> <tr> <td colspan="2">GD-C3</td> <td>0.01 to 0.3mm</td> <td>0.01 to 0.1mm</td> </tr> <tr> <td rowspan="2">Aluminum</td> <td colspan="2">GD-C1/C2</td> <td>0.03 to 6mm</td> <td>0.03 to 2mm</td> </tr> <tr> <td colspan="2">GD-C3</td> <td>0.015 to 1mm</td> <td>0.015 to 1mm</td> </tr> <tr> <td rowspan="2">Copper</td> <td colspan="2">GD-C1/C2</td> <td>0.03 to 6mm</td> <td>0.03 to 2mm</td> </tr> <tr> <td colspan="2">GD-C3</td> <td>0.018 to 1mm</td> <td>0.018 to 1mm</td> </tr> <tr> <td rowspan="2">Brass</td> <td colspan="2">GD-C1/C2</td> <td>0.03 to 6mm</td> <td>0.03 to 2mm</td> </tr> <tr> <td colspan="2">GD-C3</td> <td>0.01 to 1mm</td> <td>0.01 to 1mm</td> </tr> <tr> <td rowspan="2">Stainless steel (SUS304)</td> <td colspan="2">GD-C1/C2</td> <td>0.1 to 6mm</td> <td>0.1 to 2mm</td> </tr> <tr> <td colspan="2">GD-C3</td> <td>0.05 to 2mm</td> <td>0.05 to 1mm</td> </tr> </tbody> </table>	Material	Setting distance		20mm	30mm	Applicable controllers				Iron (SPCC)	GD-C1/C2		0.07 to 1mm	0.07 to 0.5mm	GD-C3		0.01 to 0.3mm	0.01 to 0.1mm	Aluminum	GD-C1/C2		0.03 to 6mm	0.03 to 2mm	GD-C3		0.015 to 1mm	0.015 to 1mm	Copper	GD-C1/C2		0.03 to 6mm	0.03 to 2mm	GD-C3		0.018 to 1mm	0.018 to 1mm	Brass	GD-C1/C2		0.03 to 6mm	0.03 to 2mm	GD-C3		0.01 to 1mm	0.01 to 1mm	Stainless steel (SUS304)	GD-C1/C2		0.1 to 6mm	0.1 to 2mm	GD-C3		0.05 to 2mm	0.05 to 1mm	GD-10	GD-C1 GD-C2 GD-C3
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Long sensing range		70mm	Standard sensing object size: 200 × 200mm <table border="1"> <thead> <tr> <th>Material</th> <th>Setting distance</th> <th>35mm</th> <th>70mm</th> </tr> </thead> <tbody> <tr> <td>Iron (SPCC)</td> <td></td> <td>0.07 to 10mm</td> <td>0.07 to 6mm</td> </tr> <tr> <td>Aluminum</td> <td></td> <td>0.03 to 10mm</td> <td>0.03 to 6mm</td> </tr> <tr> <td>Copper</td> <td></td> <td>0.03 to 10mm</td> <td>0.03 to 6mm</td> </tr> <tr> <td>Brass</td> <td></td> <td>0.03 to 10mm</td> <td>0.03 to 6mm</td> </tr> <tr> <td>Stainless steel (SUS304)</td> <td></td> <td>0.1 to 10mm</td> <td>0.1 to 6mm</td> </tr> </tbody> </table>	Material	Setting distance	35mm	70mm	Iron (SPCC)		0.07 to 10mm	0.07 to 6mm	Aluminum		0.03 to 10mm	0.03 to 6mm	Copper		0.03 to 10mm	0.03 to 6mm	Brass		0.03 to 10mm	0.03 to 6mm	Stainless steel (SUS304)		0.1 to 10mm	0.1 to 6mm	GD-20	GD-C1 GD-C2																														
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Note: Only the combinations between the sensor heads and the controllers described in the above table are allowed. Any other combination may damage the connected sensor heads.

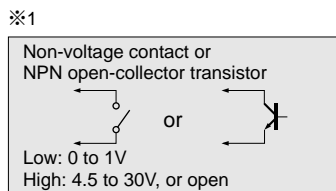
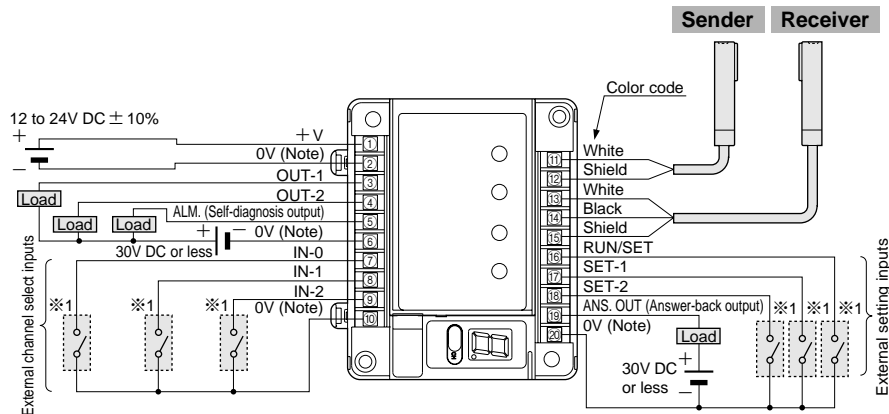
Controllers

Type	Appearance	Model No.
Standard		GD-C1
With RS-232C		GD-C2
Small object detection		GD-C3

Make sure to use the sensor heads and the controller together in the above combinations.

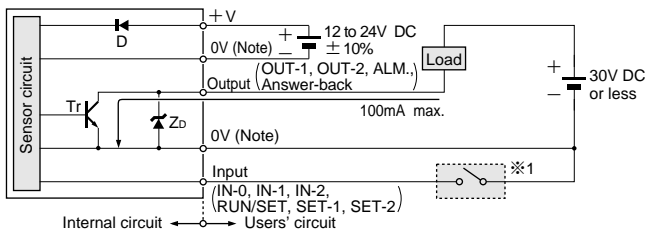
I/O CIRCUIT AND WIRING DIAGRAMS

Wiring diagram



Note: Terminal ②, 0V of power supply, is isolated from 0V of input/output circuitry for noise immunity. However, if you expect to share the power supply with the output loads, connect terminals ② and ⑥, terminals ② and ⑩, or terminals ② and ⑳ to make 0V common.

I/O circuit diagram



Note: 0V of power supply is isolated from 0V of input/output circuitry. To share the power supply with a load, both the 0V terminals should be short-circuited.

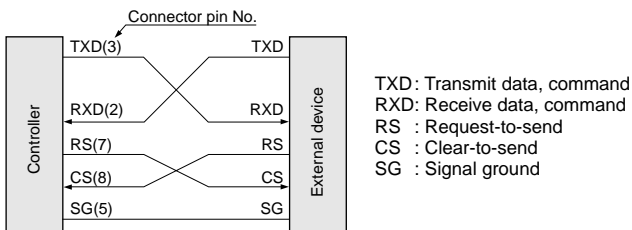
Symbols ... D: Reverse supply polarity protection diode
Zd: Surge absorption zener diode
Tr: NPN output transistor

External channel select truth table

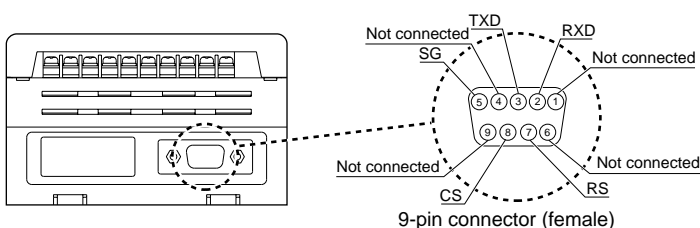
Input / Channel No.	IN-0	IN-1	IN-2
1	L	H	H
2	H	L	H
3	L	L	H
4	H	H	L
5	L	H	L
6	H	L	L
7	L	L	L
8	H	H	H

L: Low (0 to 1V), H: High (4.5 to 30V, or open)

RS-232C wiring diagram (GD-C2 only)



Pin arrangement

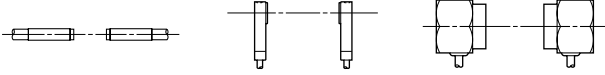


PRECAUTIONS FOR PROPER USE

Mounting

Placing of sensor heads

- Make the sender and receiver face each other and align their sensing center line.

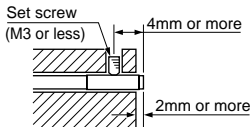


- Keep a distance from any magnet or a device generating magnetic field. It may degrade the detectability.
- Surrounding metal influences the detectability. Please contact our office for more details.
- If more than one set of sensor heads are closely mounted, detectability may be affected. Please contact our office for more details.

Mounting sensor heads

<GD-3>

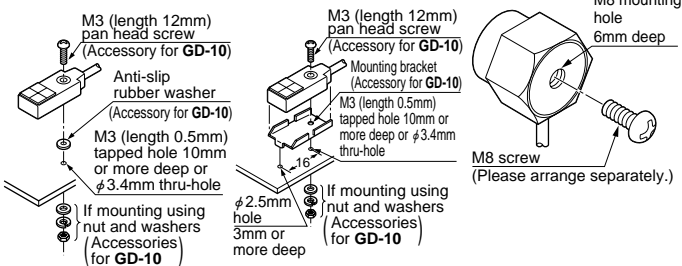
Mounting with set screw



- Use a set screw (M3 or less), and the tightening torque should be 0.12N·m or less.

<GD-10>

Fixing at one point Fixing at two points

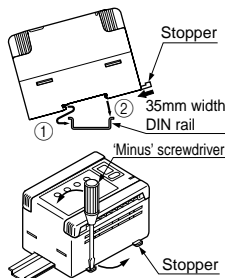


- The tightening torque should be 0.5N·m or less.
- To mount the sensor head with a nut, the thru-hole should be $\phi 3.4$ mm. (The mounting board must be 2.3mm, or less, thick.)
- The tightening torque should be 11.2N·m or less.

Mounting of controller

<On DIN rail>

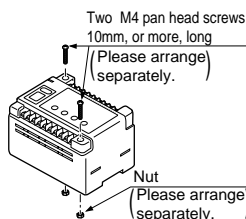
- ① With the stopper pressed in the direction of the arrow (it locks), fit the front portion of the mounting section of the amplifier on the 35mm width DIN rail.
- ② Press and fit the rear portion of the mounting section on the 35mm width DIN rail.



※To remove, insert a 'minus' screwdriver into the stopper and pull out.

<On board with screws>

- Use two M4 pan head screws 10mm, or more, long. The tightening torque should be 1.2N·m or less.

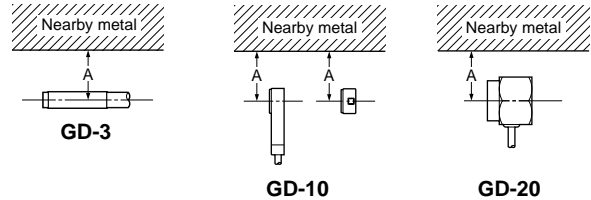


Distance from nearby metals

- As metals near the sensor head may affect the sensing performance, pay attention to the following points.

Influence of nearby metal

- The sensor head must be separated from nearby metal by a minimum distance as specified in the table below.

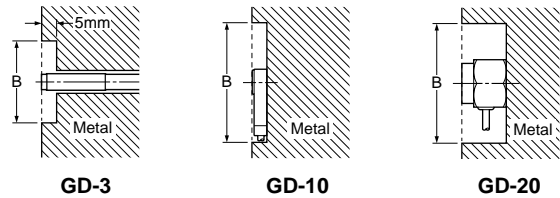


<Dimension A (in case of iron)>

Setting distance	5mm	10mm	30mm	70mm
Model No.				
GD-3	15mm	20mm	—	—
GD-10	100mm			—
GD-20	100mm			

Embedding in metal

- The sensing performance may be affected if the sensor is completely embedded in a metal. Keep a minimum clearance between the sensor head and the metal as specified in the table below.



<Dimension B (in case of iron)>

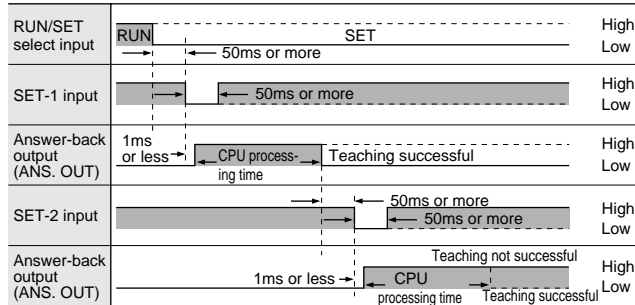
Setting distance	5mm	10mm	30mm	70mm
Model No.				
GD-3	$\phi 15$ mm	$\phi 20$ mm	—	—
GD-10	$\phi 100$ mm			—
GD-20	$\phi 300$ mm			

PRECAUTIONS FOR PROPER USE

Teaching by external input

- The teaching can also be performed by external input signals.

<Time chart>



RS-232C data transmission (GD-C2 only)

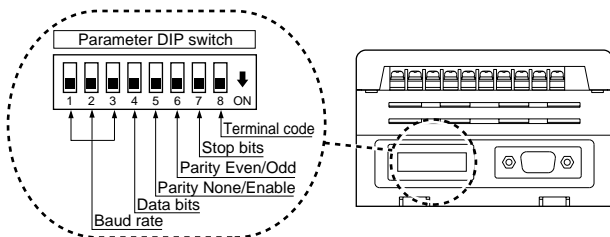
- GD-C2 can feed in the set level data into a PC or PLC memory using RS-232C serial communication and retrieve it whenever required. In this case, the taught data should be stored in the prescribed channel.

Transmission specifications

- Baud rate: Selectable from 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, or 31,250 bits/sec.
- Format: Data bits 7 bits or 8 bits
Parity check None or Enable Even or Odd
Stop bits 1 bit or 2 bits
Terminal code CR or ETX

Parameter setting

- Set the parameters with the DIP switches on GD-C2.



Switch No.	Parameter	ON	OFF
1	Baud rate	Bits/sec	
		300	600, 1,200, 2,400, 4,800, 9,600, 19,200, 31,250
		Switch No.	1 2 3 4 5 6 7 8
2	1	ON OFF ON OFF ON OFF ON OFF	OFF ON OFF ON OFF ON OFF OFF
3	2	ON ON OFF OFF ON ON OFF OFF	OFF ON OFF ON OFF ON OFF OFF
4	3	ON ON ON ON OFF OFF OFF OFF	OFF ON OFF ON OFF ON OFF OFF
4	Data bits	7 bits	8 bits
5	Parity check	Enable	None
6	Parity	Even	Odd
7	Stop bits	1 bit	2 bits
8	Terminal code	CR	ETX

Command

- All commands used to communicate with GD-C2 are classified into three groups: write command, read command, and others (ASCII coded data communication).

① Read command

Syntax: [Statement] + [CR (ETX)]

Statement	Usage
RCH	Read the data of the presently designated channel. Send: [RCH] + [CR (EXT)] Response: [RCH] x x Δ Δ Δ Δ Δ Δ O O O O □ □ + [CR (EXT)]
RRC 1 to 8	Assign the channel and read its data. Send: [RRC 1 to 8] + [CR (EXT)] Response: [RRC 1 to 8] x x x Δ Δ Δ Δ Δ O O O O O □ □ + [CR (EXT)]
RAC	Read data of all channels. Send: [RAC] + [CR (EXT)] Response: [RAC] x x Δ Δ Δ Δ Δ Δ O O O O O □ □ □ Channel 1 x x Δ Δ Δ Δ Δ Δ O O O O O □ □ □ Channel 2 ⋮ x x Δ Δ Δ Δ Δ Δ O O O O O □ □ □ + [CR (EXT)] Channel 8
RAD	Read only the sensing level data of the present channel. Send: [RAD] + [CR (EXT)] Response: [RAD] ☆ ☆ ☆ ☆ ☆ + [CR (EXT)] Sensing level data (Note 1)
OUT 0	Read the present sensing condition. Send: [OUT 0] + [CR (EXT)] Response: [OUT 0] ▽ + [CR (EXT)] Sensing condition (0: Zero-sheet sensing 1: One-sheet sensing 2: Two-sheet sensing)
OUT 1	Read the present sensing level (the number of LEDs which light up). Send: [OUT 1] + [CR (EXT)] Response: [OUT 1] △ + [CR (EXT)] Sensing level (0 to 7)

- Notes: 1) Both the one-sheet level data and the two-sheet level data are represented by decimal numbers from '0 to 4,095'.
2) If the sent command is ineffective, GD-C2 returns 'Not Available.'
3) All characters including send and response statements are based on ASCII code.

② Write command

Syntax: [Statement] + [Numerical data] + [CR (ETX)]

Statement	Usage
SCH	Write the data into the channel presently designated. [SCH] x x x Δ Δ Δ Δ Δ Δ O O O O O □ □ + [CR (EXT)] Space or comma (.) Attribute (Note 3) Process No. (Note 1) Two-sheet level data (Note 2) One-sheet level data (Note 2)
SRC 1 to 8	Assign the channel and write data into it. The command format is the same as for SCH.
SAC	Write the data into all channels. [SAC] x x Δ Δ Δ Δ Δ Δ O O O O O □ □ □ x x Δ Δ Δ Δ Δ Channel 1 O O O O O O □ □ x x Δ Δ Δ Δ Δ Δ O O O O O □ □ □ Channel 2 Channel 8 + [CR (EXT)]

After the write command is sent, [Statement] + [CR (ETX)] is returned by GD-C2 to confirm the communication.

- Notes: 1) The GD series automatically selects the most effective sensing process according to the material and thickness of the object. The process number ranges from '00 to 47' in decimal number system.
2) Both the one-sheet level data and the two-sheet level data are represented by decimal numbers from '0 to 4,095'.
3) The data information, information on the presence of data, the sensing mode, etc., is represented by decimal numbers from '00 to 63'.
4) If the sent command is ineffective, GD-C2 returns 'Not Available.'
5) All characters including send and response statements are based on ASCII code.

PRECAUTIONS FOR PROPER USE

Self-diagnosis (Alarm) function

- The **GD** series diagnoses itself. The result lights up the self-diagnosis indicator, generates the self-diagnosis output, and shows the error code on the channel display as per the following table.

Description		Channel display	Sensing level indicators	Self-diagnosis indicator (Note)	Self-diagnosis output (Note)	Countermeasures
On power-ON	Internal circuit failure		Blink	Lights up	OFF	Contact our office.
	Disconnected sender cable		Blink	Lights up	OFF	Check connection of sender cable.
During operation	Operation key pressed for 30 sec. or more		Blink	Lights up	OFF	Check keys on panel.
	Too little contrast between one and two sheet levels	Present channel number	—	Lights up for 1 sec.	OFF for 1 sec. (self-restoration)	Change the setting.
	Selection of channel without stored data	Present channel number	—	Lights up	OFF	Select the channel in which data is stored.
During RS-232C communication (GD-C2 only)	Syntax error		Blink 10 times	Lights up	ON	Check RS-232C protocol (baud rate, parity, stop bits, data bits.)
	Memory overflow		Blink	Lights up	ON	Check if the terminal code is correctly sent.

Note: In the SET mode, the self-diagnosis indicator continuously lights up and the self-diagnosis output stays off.

Response time

- The controllers **GD-C1** and **GD-C2** automatically select the most suitable signal processing method, according to the material and thickness of the sensing object. Depending on the selected signal processing method, the response time is also automatically determined as either '5ms or less', or '30ms or less'. Further, when controller **GD-C3** is used, the response time is 5ms or less. The response time of the controllers, **GD-C1** and **GD-C2**, can be confirmed by the following procedure.

- Press '0-ADJ. key' in 'RUN mode'.
- The channel display shows an alphanumeric character that represents the response time as given below.

or → 5ms or less

Other than the above → 30ms or less

ALL-LOCK function

- All keys on the operation panel are locked when the channel shift key is pressed for 3 sec. or more (unless CH-SELECT is set on 'PANEL'). To release the lock, press the channel shift key for 3 sec., or more, again.