

# Metal-sheet Double-feed Detector GD Series

MJE-GD(03) No.0030-70V

Thank you very much for using Panasonic products. Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product. Kindly keep this manual in a convenient place for quick reference.

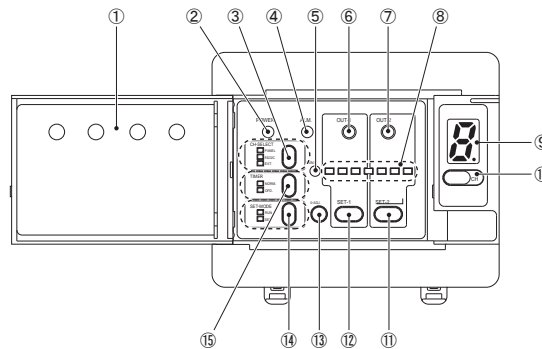
## WARNING


- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.
- Make sure to use the sensor heads and controllers in the specified combinations. If they are used in any other combination, the sensor heads may get damaged.

## 1 OUTLINE

- This product detects double feeds of metal sheets, lead frames, etc.  
The sensitivity is easily set by teaching with actual samples.

## 2 FUNCTIONAL DESCRIPTION

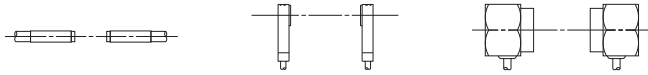


Description		Function																																																															
①	Panel cover	—																																																															
②	Power indicator (Green)	• Lights up when the power is ON.																																																															
③	Channel select key (CH-SELECT)	<div>• Specifies whether channel selection is by panel operation, by external channel select inputs, or through RS-232C communication. □PANEL: Selection is by channel select key. □LOCK: Locks channel selection. In case of <b>GD-C2</b>, this is (<b>GD-C2</b>: ) also the setting for channel selection by external RS-232C device through RS-232C. □EXT.: Selection is by external channel select inputs. • The table below gives the key and external input operation for each channel selection method.</div> <div>O: Operable</div> <table><tr><th colspan="2">Mode</th><th>PANEL</th><th>LOCK (RS-232C)</th><th>EXT.</th></tr><tr><th colspan="2">Operation</th><th>O (Note)</th><th>O (Note)</th><th>O (Note)</th></tr><tr><td rowspan="6">Panel keys</td><td>RUN / SET selection</td><td>O (Note)</td><td>O (Note)</td><td>O (Note)</td></tr><tr><td>Timer mode selection</td><td>○</td><td>○</td><td>○</td></tr><tr><td>SET-1</td><td>○</td><td>○</td><td>○</td></tr><tr><td>SET-2</td><td>○</td><td>○</td><td>○</td></tr><tr><td>0-ADJ.</td><td>○</td><td>○</td><td>○</td></tr><tr><td>Channel shift</td><td>○</td><td></td><td></td></tr><tr><td rowspan="6">External inputs</td><td>RUN / SET</td><td>○</td><td>○</td><td>○</td></tr><tr><td>SET-1</td><td>○</td><td>○</td><td>○</td></tr><tr><td>SET-2</td><td>○</td><td>○</td><td>○</td></tr><tr><td>IN-0</td><td></td><td></td><td>○</td></tr><tr><td>IN-1</td><td></td><td></td><td>○</td></tr><tr><td>IN-2</td><td></td><td></td><td>○</td></tr></table> <div>Note: The RUN / SET selection with the SET-MODE key on the panel is effective only when the RUN / SET selection input is High (RUN mode).</div>				Mode		PANEL	LOCK (RS-232C)	EXT.	Operation		O (Note)	O (Note)	O (Note)	Panel keys	RUN / SET selection	O (Note)	O (Note)	O (Note)	Timer mode selection	○	○	○	SET-1	○	○	○	SET-2	○	○	○	0-ADJ.	○	○	○	Channel shift	○			External inputs	RUN / SET	○	○	○	SET-1	○	○	○	SET-2	○	○	○	IN-0			○	IN-1			○	IN-2			○
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④	Self-diagnosis indicator (Red)	• SET mode: Lights up under normal condition. RUN mode: Lights up on error.																																																															
⑤	Sensing mode indicator (Green, Yellow)	<div>• Indicates the sensing mode. • Lights up green: Normal sensing mode • Lights up yellow: Precise sensing mode • Refer to '●Sensing Mode' in '6 EXPLANATION OF FUNCTIONS'.</div>																																																															
Description		Function																																																															
⑥	Comparative output-1 (OUT-1) indicator (Green)	• Lights up when OUT-1 is OFF. • Blinks twice on completion of zero adjustment (0-ADJ.) or SET-1 setting in SET mode.																																																															
⑦	Comparative output-2 (OUT-2) indicator (Red)	• Lights up when OUT-2 is OFF. • Blinks twice on completion of zero adjustment (0-ADJ.) or SET-2 setting in SET mode.																																																															
⑧	Sensing level indicator (Yellow × 1, Green × 6)	• Seven LEDs show the sensing level. • More the number, thicker or larger the object sheets are, more are the LEDs which light up. • LEDs light up one after the other during teaching. • All LEDs blink at the same time if the teaching fails.																																																															
⑨	Channel display	<div>• Shows the present channel (1 to 8). • Blinks during SET mode. • The decimal point informs whether the set level data has been stored.</div> <div> Lights up → Stored Turns off → Not stored ← Decimal point</div> <div>• When an error occurs, the display indicates the error code. • Refer to '●Self-diagnosis (Alarm) function' in '6 EXPLANATION OF FUNCTIONS'.</div>																																																															
⑩	Channel shift key	• The channel can be selected by the channel shift key when CH-SELECT is set at PANEL.																																																															
⑪	SET-2 key	• Sets the two-sheet threshold level (larger number of sheets).																																																															
⑫	SET-1 key	• Sets the one-sheet threshold level (smaller number of sheets).																																																															
⑬	Zero adjustment (0-ADJ.) key	• Calibrates zero level under sheet non-existing condition.																																																															
⑭	SET-MODE key	• Switches between RUN mode and SET mode. □RUN: Detection takes place. □SET: Set-up is done.																																																															
⑮	TIMER key	• Switches timer mode. □NORM. mode: Timer not used. □OFD. mode: Delay timer (50ms approx.) used.																																																															

### 3 MOUNTING

#### ● Placing of sensor heads

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

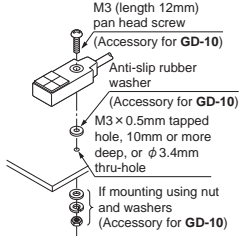


- Keep a distance from any magnet or a device generating magnetic field. It may degrade the detectability.

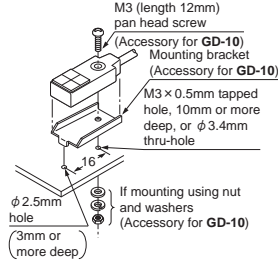
#### ● Mounting of sensor heads

##### GD-10

##### <Fixing at one point>

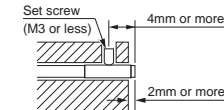


##### <Fixing at two points>



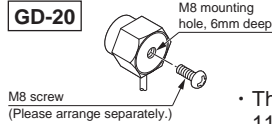
- The tightening torque should be 0.5N·m or less.
- To mount the sensor head with a nut, the thru-hole should be  $\phi 3.4\text{mm}$ . (The mounting board must be 2.3mm, or less, thick.)

##### GD-3



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

##### GD-20



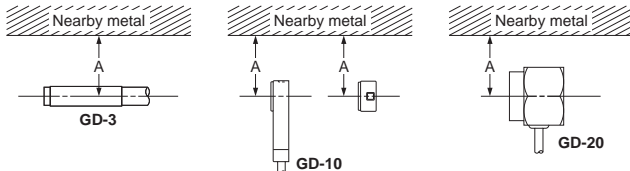
- The tightening torque should be 11.2N·m or less.

#### ● 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.

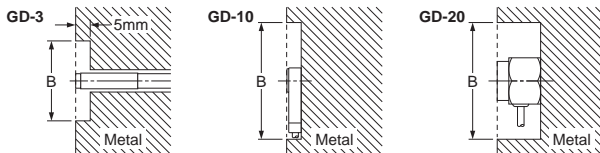


##### Dimension A (in case of iron)

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.



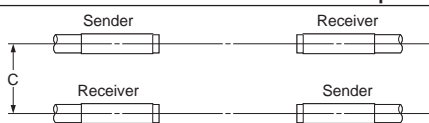
##### Dimension B (in case of iron)

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

#### ● Interference prevention

- When two or more sensor heads are mounted in parallel, keep a minimum separation distance as specified below to avoid interference.

##### In case the sender and another sensor's receiver are placed adjacently

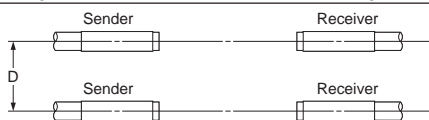


##### Dimension C (in case of iron)

Setting distance (Note)	5mm	10mm	20 (35) mm	30 (70) mm
Model No.				
GD-3	60mm	80mm	—	—
GD-10	160mm			220mm
GD-20	370mm			

Note: The value in the brackets is for GD-20.

##### In case the respective senders and receivers are placed adjacently



##### Dimension D (in case of iron)

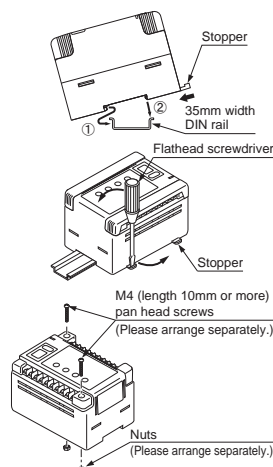
Setting distance (Note)	5mm	10mm	20 (35) mm	30 (70) mm
Model No.				
GD-3	30mm	50mm	—	—
GD-10	200mm			250mm
GD-20	450mm			

Note: The value in the brackets is for GD-20.

#### ● Mounting of controller

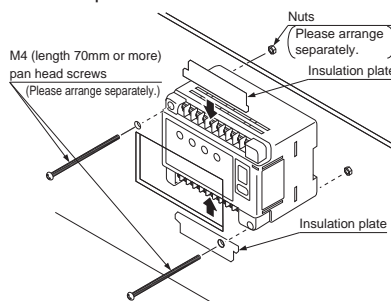
##### On DIN rail

- 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.
  - Press and fit the rear portion of the mounting section on the 35mm width DIN rail.
- ※ To remove, insert a flathead screwdriver into the stopper and pull out.

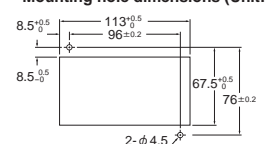


##### On panel

- To mount the controller on a panel, use two M4 pan head screws 70mm, or more, long and the tightening torque should be 1.2N·m or less. If your mounting panel is metallic, insert the attached insulation plates at the terminals.



##### \*Mounting hole dimensions (Unit: mm)

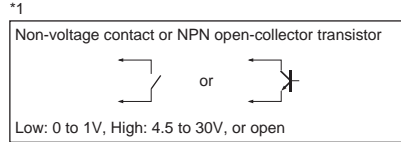
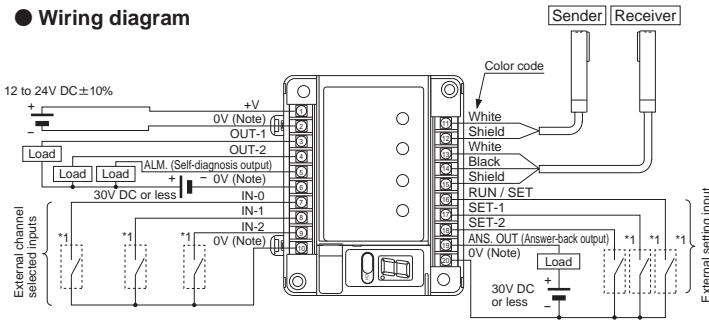


##### On board with screws

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

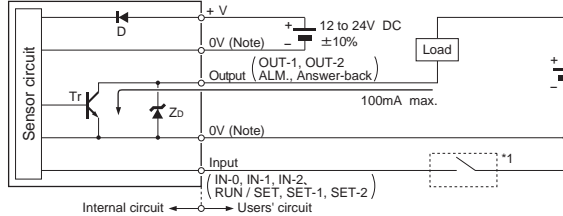
## 4 CONNECTION

### ● Wiring diagram



Note: The terminal ②, 0V of power supply, is isolated from 0V of input / output circuitry for noise immunity. However, if you except to share the power supply with the output loads, connect terminals ② and ⑥, terminals ② and ⑩, or terminals ② and ⑭ to make 0V common.

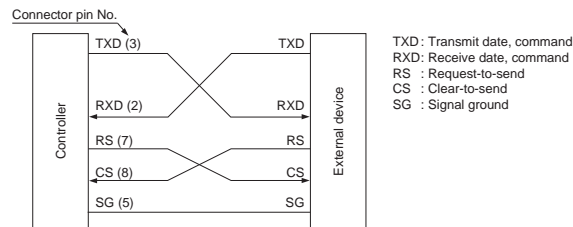
### ● I/O circuit diagram



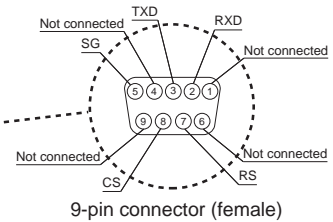
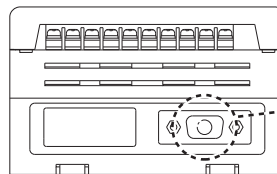
Note: 0V of power supply is isolated from 0V of input / output circuitry. To share the power supply with a load, both the 0V terminals should be short-circuited.

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

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



### Pin arrangement



## 5 SENSITIVITY SETTING

### Teaching through operation panel

Procedure	Operation
①	Turn the power on. • Check that the power indicator lights up.
②	Open the panel cover.
③	Select 'PANEL' by pressing 'CH-SELECT key'. • This enables the keys on the panel.
④	Select one of eight channels by pressing the 'channel shift key'. To modify a previously stored date, choose the particular channel. Otherwise, choose any channel from 1 to 8. • If the selected channel does not have data stored in it, the self-diagnosis indicator lights up.
⑤	Enter into the SET mode from RUN mode by pressing the 'SET-MODE key'. (Note 5) • The self-diagnosis indicator lights up. • The designated channel number blinks.
⑥ (Note 1) (Note 2)	Press the '0-ADJ. key' while no object exists between the sensor heads. • After the sensing level indicators light up one after the other for about four cycles, both OUT-1 and OUT-2 blink twice at the same time.
⑦ (Note 1)	Place one sheet between the sensor heads, and then press the 'SET-1 key'. • The sensing level indicators blink one after the other for about four cycles. After that, OUT-1 blinks twice. • Hold the object steadily between the sensor heads while the sensing level indicators are lighting up in rotation.
⑧ (Note 1)	Place two sheets between the sensor heads, and then press the 'SET-2 key'. • The sensing level indicators light up one after the other for about four cycles. After that, OUT-2 blinks twice. • Hold the object steadily between the sensor heads while the sensing level indicators are lighting up in rotation.
*	If the teaching fails, all the sensing indicators blink at the same time. In this case, repeat the sensitivity setting after changing the setting of the sender and the receiver.
⑨	Return to the 'RUN mode' from SET mode by pressing the 'SET-MODE key'. • The self-diagnosis indicator turns off. [If it does not turn off, an error may be inherent. Refer to <b>EXPLANATION OF FUNCTIONS</b> : ●Self-diagnosis (Alarm) function'.] • The indicated channel number changes from blinking into continuous lighting. • During the RUN mode, the '0-ADJ. key', 'SET-1 key', and 'SET-2 key' are ineffective.

Notes: 1) The order of the above procedure at ⑥, ⑦ and ⑧ is arbitrary.

The 'SET-1 key' searches the one-sheet level, and the 'SET-2 key' the two-sheet level. After having selected the SET mode, only by pressing either one once, the one-sheet or two-sheet levels are not undated. After having pressed the 'SET-1' and 'SET-2' keys once in SET mode, as long as it is in SET mode, the one-sheet or the two-sheet level is updated by pressing either SET keys. The moment the RUN mode is set, the data is confirmed. (Setting complete)

2) The zero-sheet level is set for one channel after the sensor heads are installed, there is no need to set it again for the other channels.

(However, set the one-sheet level and the two-sheet level on each channel, once again, when 0-ADJ. key is pressed since this resets the zero-sheet level as per the prevailing conditions.)

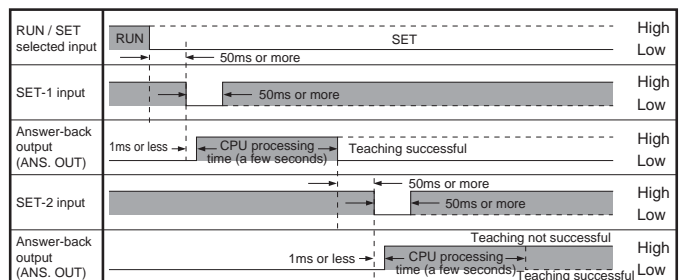
3) The set data is not erased even if turns the power off.

4) If the setting of the sender and receiver is changed after teaching, detection may become unstable. In this case, perform the teaching once again.

### Teaching by external input

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

#### <Time chart>



Notes: 5) In case the set indicator blinking, double-feed teaching cannot be conducted.

The error release method is pressing down SET-1 and SET-2 together more than 5 seconds or making SET-1 or SET-2 input wire Lo side more than 5 seconds.

Conduct the teaching after the set indicator (red) is changed to blinking.



## 6 EXPLANATION OF FUNCTIONS

### ● Sensing mode

- The **GD** series has two sensing modes, one is the normal sensing mode and the other is the precise sensing mode. They are automatically selected by the characteristics of the object.

#### Normal sensing mode



The **GD** series goes into this mode when the number of objects (e.g., large metal sheets) is distinguished with relative ease.

#### Precise sensing mode



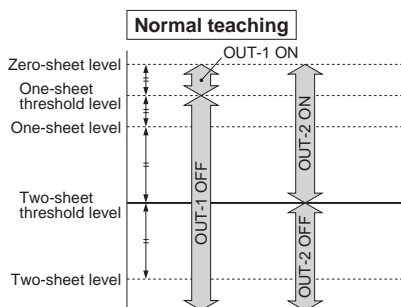
Lead frame etc.

The **GD** series goes into this mode when the number of objects (e.g. lead frames) is difficult to distinguish. In this mode, the sensitivity difference is so minute between two sensing levels that vibration and ambient temperature changes must be carefully managed.

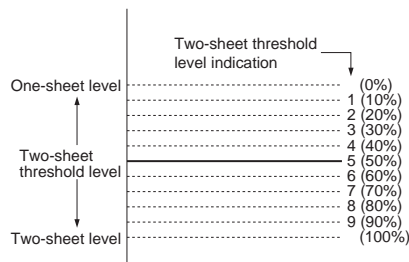
- The sensing mode indicator lights up green during the normal sensing mode, but lights up yellow during the precise sensing mode.

### ● Two-sheet threshold level shift function

- In normal teaching, the two-sheet threshold level is automatically set at the center or the one-sheet level and the two-sheet level. The two-sheet threshold level shift function enables you to shift the two-sheet threshold level towards, either, the one-sheet level, or, the two-sheet level, in four steps. Consequently, if either one of the detection levels is stable, then by shifting the two-sheet threshold level towards that side, stable detection is possible even if the other detection level is unstable. Further, since by shifting the two-sheet threshold level, the difference between it and, either, the one-sheet level, or, the two-sheet level can be made small, fine detection is also possible.



#### Two-sheet threshold level shift function



In normal teaching, the two-sheet threshold level is set at 5 (50%)

### ● Timer function

- The **GD** series is incorporated with a fixed delay timer of 50ms approx. Since the signal output is extended by a fixed time interval, this is useful when the connected device has a slow response time or when small objects are detected and the output signal width is small.

Note: Once the timer becomes effective, it acts upon both OUT-1 and OUT-2 of all channels.

### ● 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

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

#### Setting procedure

Step	Operation
①	Perform normal teaching.
②	Select 'RUN mode' by 'SET-MODE key'. <div> <div>■ RUN</div> <div>□ SET</div> </div>
③	<div> <div>0-ADJ.</div> <div>Press '0-ADJ. key' for more than 3 sec.</div> <div>                     • '-' is displayed on the channel display as the sensor enters the two-sheet threshold level shift mode.                      • When '0-ADJ. key' is released, the '-' display changes to a blinking display of '5', which is the two-sheet threshold level before the shift.                      • The self-diagnosis indicator lights up in the two-sheet threshold level shift mode.                 </div> </div>
④	<div> <div>SET-1</div> <div>SET-2</div> <div>Shift the two-sheet threshold level by pressing either 'SET-1 key' or 'SET-2 key'.</div> <div>                     • Each time 'SET-1 key' is pressed, the two-sheet threshold level shifts as '5' → '4' → '3' → '2' → '1', i.e., towards the one-sheet level.                      [It becomes easier for OUT-2 (two-sheet output) to go OFF.]                      • Each time 'SET-2 key' is pressed, the two-sheet threshold level shifts as '5' → '6' → '7' → '8' → '9', i.e., towards the two-sheet level.                      [It becomes more difficult for OUT-2 (two-sheet output) to go OFF.]                 </div> </div>
⑤	<div> <div>After having shifted the two-sheet threshold level, press '0-ADJ. key' till '-' appears on the channel display.</div> <div>(The shifted two-sheet threshold level is stored and the sensor returns to the RUN mode.)</div> <div>• The self-diagnosis indicator turns off.</div> </div>

- Make sure to press '0-ADJ. key' after shifting the two-sheet threshold level. If 'CH-SELECT key', 'SET-MODE key' or 'CH key' is pressed, although the sensor returns to the RUN mode, the shifted two-sheet threshold level is not stored.
- With respect to a single teaching data, make sure to shift the two-sheet threshold level only once. In case you wish to shift the level once again, do so after performing the normal teaching again.

#### <Time chart>

Sensing condition	Operation
One-sheet or more (OUT-2; Two-sheets or more)	NORM. mode
Under one-sheet (OUT-2; Under two-sheets)	OFD. mode

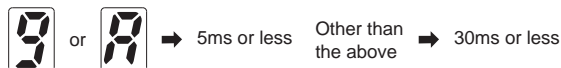
Timer period: T = 50ms approx.

Description	Channel display	Sensing level indicators	Self-diagnosis indicator (Note)	Self-diagnosis output (Note)	Countermeasures
On power	1	Blink	Lights up	OFF	Please contact our office.
During operation	0	Blink	Lights up	OFF	Check connection of sender cable.
	2	Blink	Lights up	OFF	Check keys on panel.
	Present channel number	—	Lights up for 1 sec.	OFF for 1 sec. (self-restoration)	Change the setting.
	Present channel number	—	Lights up	OFF	Select the channel in which data is stored.
During RS-232C communication (GD-C2 only)	3	Blink 10 times	Lights up	ON	Check RS-232C protocol (baud rate, parity, stop bits, data bits).
	4	Blink	Lights up	ON	Check if the terminal code is correctly sent.

- 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'.

The response time of the controllers, **GD-C1** and **GD-C2**, can be confirmed by the following procedure.

- ② The channel display shows an alphanumeric character that represents the response time in the right.

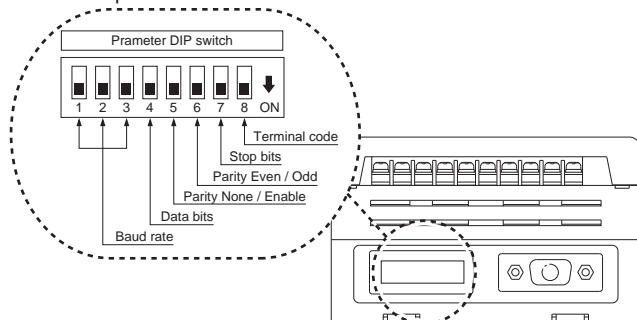


- All keys on the operation panel are locked when the channel shift key is pressed for 3 sec. or more (unless CH-SELECT is set on 'PANEL'). To release the lock, press the channel shift key for 3 sec., or more, again.

● **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.

- 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

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



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

Note: Make sure to turn the power off when set the parameter DIP switch. When turn the power on, the set contents are reflected.  
After setting, be sure to mount the protective cover.

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

- If the sent command is ineffective, **GD-C2** returns 'Not Available'.
- All characters including send and response statements are based on ASCII code.

Syntax: **Statement** + **Numerical data** + **CR (ETX)**

Syntax: **Statement** + **CR (ETX)**

<Type of commands>

[illegible]

Statement	Usage
RCH	<p>Read the data of the presently designated channel.  Send: <math>[RCH] + [CR(ETX)]</math>  Response: <math>[RCH]_{\square} \times \times_{\square} \Delta \Delta \Delta \Delta_{\square} \square \square \square \square \square \square + [CR(ETX)]</math></p>
RRC 1 to 8	<p>Assign the channel and read its data.  Send: <math>[RRC\ 1\ to\ 8] + [CR(ETX)]</math>  Response: <math>[RRC\ 1\ to\ 8]_{\square} \times \times_{\square} \Delta \Delta \Delta \Delta_{\square} \square \square \square \square \square \square + [CR(ETX)]</math></p>
RAC	<p>Read data of all channels.  Send: <math>[RAC] + [CR(ETX)]</math>  Response: <math>[RAC]_{\square} \times \times_{\square} \Delta \Delta \Delta \Delta_{\square} \square \square \square \square \square \square \times \times_{\square} \Delta \Delta \Delta \Delta_{\square} \square \square \square \square \square \square</math>  <div style="display: flex; justify-content: space-around; margin-top: -10px;"> <span>Channel 1</span> <span>Channel 2</span> </div> <math>\square \square \square \square \square \square \dots \square \times \times_{\square} \Delta \Delta \Delta \Delta_{\square} \square \square \square \square \square \square + [CR(ETX)]</math>  <div style="text-align: center; margin-top: -10px;">Channel 8</div> </p>
RAD	<p>Read only the sensing level data of the present channel.  Send: <math>[RAD] + [CR(ETX)]</math>  Response: <math>[RAD]_{\square} \star \star \star \star + [CR(ETX)]</math>  <div style="text-align: center; margin-top: -10px;">Sensing level data (Note)</div> </p>
OUT 0	<p>Read the present sensing condition.  Send: <math>[OUT\ 0] + [CR(ETX)]</math>  Response: <math>[OUT\ 0]_{\square} \nabla + [CR(ETX)]</math>  <div style="text-align: center; margin-top: -10px;">Sensing condition (0: Zero-sheet sensing, 1: One-sheet sensing, 2: Two-sheet sensing)</div> </p>
OUT 1	<p>Read the present sensing level (the number of LEDs which light up).  Send: <math>[OUT\ 1] + [CR(ETX)]</math>  Response: <math>[OUT\ 1]_{\square} \diamond + [CR(ETX)]</math>  <div style="text-align: center; margin-top: -10px;">Sensing level (0 to 7)</div> </p>

Note: Both the one-sheet level data and the two-sheet level data are represented by decimal numbers from '0 to 4.095'.



- ③ Other commands  
Syntax: [Statement] + [CR (ETX)]

#### <Type of commands>

Statement	Usage
\$	Enter into RS-232C communication from other accesses.
RNM	Enter into panel access.
EXT.	Enter into EXT. access.
CH 1 to 8	Change channel.
LOCK	Disable panel and EXT. accesses.
UNLOCK	Enable panel and EXT. accesses.
PLOCK	Disable the operation panel.
TIM 0	Enter into 'NORM. (non-timer)' timer mode.
TIM 1	Enter into 'OFD. (timer usage)' timer mode.
SMD 0	Enter into 'SET mode'.
SMD 1	Enter into 'RUN mode'.
ADJ 0	Execute zero adjust command. (Zero-sheet level teaching) • After the command execution, the following response is given depending on the teaching condition. On successful teaching: [OK] + [CR (ETX)] On unsuccessful teaching: [NG] + [CR (ETX)]

Statement	Usage
SET 1	Execute SET-1 command. (One-sheet level teaching) • After the command execution, the following response is given depending on the teaching condition. On successful teaching: [OK] + [CR (ETX)] On unsuccessful teaching: [NG] + [CR (ETX)]
SET 2	Execute SET-2 command. (Two-sheet level teaching) • After the command execution, the following response is given depending on the teaching condition. On successful teaching: [OK] + [CR (ETX)] On unsuccessful teaching: [NG] + [CR (ETX)]

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

## 8 CAUTIONS

- Make sure to check the ability of the sensor to detect the number of sheets of your actual objects before use. If real objects differ from teaching samples in size or in characteristics, or the detecting condition deviates, an error may occur. Please note that magnetic metals or metals with low magnetic permeability such as steel especially have a strong tendency.
- In situations when magnets are in close proximity such as during electromagnetic conveyance, this causes malfunctions due to electromagnetic disorder.
- When conducting minute detections, favorable sensing conditions are obtained only after having elapsed 60 minutes after the initial introduction of the power supply.
- Make sure that the power supply is off while wiring.
- Take care that wrong wiring will damage the sensor.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- Do not operate the sensor for a few seconds immediately after supplying power because of transient conditions including self-diagnosis time.
- The sensor head cable can be extended up to 20m max. by using an equivalent shielded cable. However, when using the sensor head in places having excessive noise, make the cable as short as possible.
- This sensor is suitable for indoor use only.

## 9 SPECIFICATIONS

### ● Sensor heads

Type		Small object detection		High precision		Long sensing range	
Item	Model No.	GD-3		GD-10		GD-20	
Applicable controllers		GD-C3 (Note 1)		GD-C1, GD-C2, GD-C3		GD-C1, GD-C2	
Sensing range (between sensor heads)		10mm or less		30mm or less		70mm or less	
Detectable sheet thickness (Note 2)		Standard sensing object size: 20 × 20mm		Standard sensing object size: 80 × 80mm		Standard sensing object size: 200 × 200mm	
Material	Setting distance	5mm	10mm	20mm	30mm	35mm	70mm
	Applicable controllers						
Iron (SPCC)	GD-C1 / GD-C2	—	—	0.07 to 1mm	0.07 to 0.5mm	0.07 to 10mm	0.07 to 6mm
	GD-C3	0.01 to 0.1mm	0.03 to 0.1mm	0.01 to 0.3mm	0.01 to 0.1mm	—	—
Aluminum	GD-C1 / GD-C2	—	—	0.03 to 6mm	0.03 to 2mm	0.03 to 10mm	0.03 to 6mm
	GD-C3	0.015 to 1mm	0.015 to 1mm	0.015 to 1mm	0.015 to 1mm	—	—
Copper	GD-C1 / GD-C2	—	—	0.03 to 6mm	0.03 to 2mm	0.03 to 10mm	0.03 to 6mm
	GD-C3	0.018 to 1mm	0.018 to 0.3mm	0.018 to 1mm	0.018 to 1mm	—	—
Brass	GD-C1 / GD-C2	—	—	0.03 to 6mm	0.03 to 2mm	0.03 to 10mm	0.03 to 6mm
	GD-C3	0.03 to 1mm	0.03 to 0.5mm	0.01 to 1mm	0.01 to 1mm	—	—
Stainless steel (SUS 304)	GD-C1 / GD-C2	—	—	0.1 to 6mm	0.1 to 2mm	0.1 to 10mm	0.1 to 6mm
	GD-C3	0.3 to 1mm	0.3 to 1mm	0.05 to 2mm	0.05 to 1mm	—	—
Protection		IP67 (IEC)				IP67 (IEC), IP67g (JEM)	
Ambient temperature		-10 to +60°C, Storage: -25 to +70°C					
Ambient humidity		45 to 85% RH, Storage: 35 to 95% RH					
Material		Enclosure: Stainless steel (SUS 303), Sensing face: ABS		Polyallylate		Sensing face: Polyacetal, Main body: Stainless steel	
Cable		Sender: 0.3mm <sup>2</sup> single core shielded cable, 3m long Receiver: 0.1mm <sup>2</sup> 2-core shielded cable, 3m long				Sender: 0.5mm <sup>2</sup> single core shielded cable, 3m long Receiver: 0.3mm <sup>2</sup> 2-core shielded cable, 3m long	
Weight		90g approx.		80g approx.		440g approx.	
Accessory		—		Sensor head mounting bracket: 1 set for sender and receiver		—	

- Notes: 1) Since it is possible that **GD-3** may get damaged if controllers **GD-C1** or **GD-C2** are connected to it, make sure to use controller **GD-C3** along with **GD-3**.  
2) The above detectable sheet thicknesses are typical data at the given sensing distance. The allowable thickness will differ from the range described in the above table at other setting distances. Further, double feeds of aluminum foils can also be detected at distances shorter than the above. Please contact our office for details.

### ● Controllers

Type		Standard	With RS-232C communication function	Small object detection
Item	Model No.	<b>GD-C1</b>	<b>GD-C2</b>	<b>GD-C3</b>
Supply voltage		12 to 24V DC ± 10% Ripple P-P 10% or less		
Current consumption		12V DC: 700mA or less, 24V DC: 400mA or less		
Output (OUT-1, OUT-2, ALM., Answer-back)		NPN open-collector transistor • Maximum sink current: 100mA • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 1V or less (at 100mA sink current) 0.4V or less (at 16mA sink current)		
Output operation		OUT-1: OFF above the one-sheet threshold level OUT-2: OFF above the two-sheet threshold level ALM.: OFF when an error occurs Answer-back: Refer to the time chart of the <b>5 SENSITIVITY SETTING</b> .		
Short-circuit protection		Incorporated		
Response time		Automatically selected either 5ms or less, or 30ms or less, depending on the object		5ms or less
Ambient temperature		-10 to +50°C (No dew condensation or icing allowed), Storage: -25 to +70°C (Note)		
Ambient humidity		45 to 85% RH, Storage: 35 to 90% RH		
Material		Heat-resistant ABS		
Weight		440g approx.		
Accessory		Insulation plate: 2 pcs.		

Note: When conducting minute detections, the detection may be affected if the ambient temperature greatly changes from the teaching. In this case, perform the teaching again or use the product under the equable temperature.

## Panasonic Industrial Devices SUNX Co., Ltd.

<http://panasonic.net/id/pidsx/global>

#### Overseas Sales Division (Head Office)

2431-1 Ushiyama-cho, Kasugai-shi, Aichi, 486-0901, Japan  
Phone: +81-568-33-7861 FAX: +81-568-33-8591

About our sale network, please visit our website.

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