

Panasonic® 2D Code Reading Sensor PD60

Installation Instructions

Read these instructions carefully and carry out the installation in the prescribed manner. After installation,keep it in a safe place for reference when required.

Safety Precautions

- Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
- Do not use this product in areas with inflammable gas. It could lead to an explosion.
- Exposing this product to excessive heat or open flames could lead to damage to the lithium battery or other electronic parts.
- To prevent excessive exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assured in these specifications.
- Do not dismantle or remodel the product. It could lead to excessive exothermic heat or smoke generation.
- Do not touch the terminal while turning on electricity. It could lead to an electric shock.
- Use the external devices to function the emergency stop and interlock circuit.
- Connect the wires or connectors securely. The loose connection could cause excessive exothermic heat or smoke generation.
- Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It could lead to excessive exothermic heat or smoke generation.
- Do not undertake construction (such as connection and disconnection) while the power supply is on. It could lead to an electric shock.
- Do not bend the cables forcibly, place a heavy object on them or bring them close to a thermal appliance. It could lead to an electric shock or smoke generation.
- Pursuant to the directive 2004/108/EC, article 9(2)
 - Panasonic Electric Works Europe AG
 - Rudolf-Diesel-Ring 2 83607 Holzkirchen, Germany
- This product has been developed / produced for industrial use only.

Contents of the Package

2.7m Power I/O Cable: 1

Precautions for Installation

Observe the followings when installing or using the product.

General Cautions

- Only use Power I/O Cable and Extension Cables with the proper part numbers specified by Panasonic Electric Works Co., Ltd. Any malfunctions and damages, occurred from use of the other products, are not covered by product warranty.
- The Degrees of protection (IP67G) for the PD60 functions with the USB Cable removed and USB Plug attached. If the protection structure got wet or dusty under any other condition, malfunctions, damages and defects may occur.
- When connecting/removing the USB Cable, take care not to allow electrostatic buildup in the USB Connector by using static stopper such as wrist strap.
- Prevent impacts, such as falling off. It might cause malfunctions or damages.
- When you clean the Front Panel, wipe off with soft cloth to prevent flaws.

Environmental Precautions

- Ambient temperature : 0 °C to +40 °C (without icing and dew condensation).
- Ambient humidity : 35 to 85% RH (without icing and dew condensation at 25 °C).
- Locations where airborne dust, conductive dust, or corrosive or flammable gas is present.
- Locations where chemicals may splash the product.
- Locations subject to strong vibration or impact.
- Locations subject to direct sunlight.
- Locations near the devices that generate large switching surges, high-voltage wires (devices), power-driven lines (devices), and transmitting devices, such as radios (at least 100mm).
- Pollution Degree 2

Power Supplies

- Use a rated voltage of 21.6 to 26.4 V DC for the mains power supply. Use a power supply with more than 1A current capacity.
- Ensure to use the separate power supply for the PD-series from the motor power supply, and install a protection circuit, such as fuse.
- Prevent electrostatic buildup.

Wiring

- Root the all input/output signal cables at least 100 mm away from other cables, such as power cables or electric power cables. Connect each signal cable to be as short as possible.
- Make sure to connect noise suppressor or other noise killers to the load source when direct inductive loads (motors or relays) are connected to the external device which is connected to the PD60.
- Ground the unit exclusively so that it does not share with the other devices. Ensure to ground as closely as possible to the product and keep the length of the earth cable short.
- Lighting equipment for Image Processing System generates signal of extremely high level due to high frequency lighting. If you use external lighting, arrange the wiring of power transmission and signal cables carefully.

Before Turning on the PD60

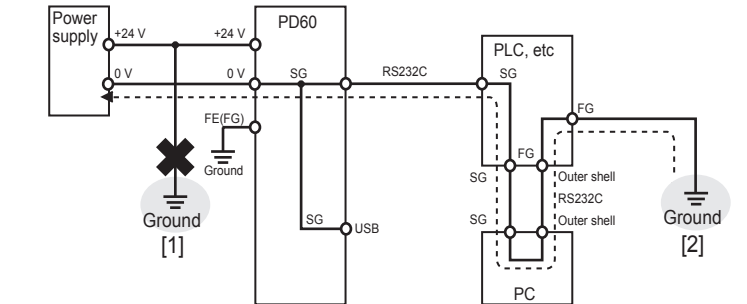
- Confirm that all wirings and connections are correct before turning on.
- After turning off, when you turn the PD60 on again wait at least 10 seconds. Otherwise it may cause malfunction to the device.
- The PD60 takes approximately 30 seconds to boot up after turning on the device. During the time the all LED Light up, but that does not mean the device has a problem.

Note on Connecting the Positive Terminal of the Power Supply to Ground

Confirm the following before connecting the positive terminal of the power supply to ground.

- Install another power supply for PD60. Do NOT connect the positive terminal of the power supply to ground (See [1] in the figure below).
- When you are obliged to ground the positive terminal of the power supply, do not ground the FG terminal of an external device because the SG terminal of the PD60 may be connected to ground via the FG terminal. (See [2] in the figure below).

For some computers, the SG terminal of RS232C port and the outer shell of the connector have already been connected. The +24 V terminal of the PD60 is not insulated. When the computer is connected, the SG terminal of the PD60 and the computer is connected, the SG terminal of the PD60 and the FG terminal of an external device will be connected. This connection causes a short-circuit condition and results in damaging the internal circuit.

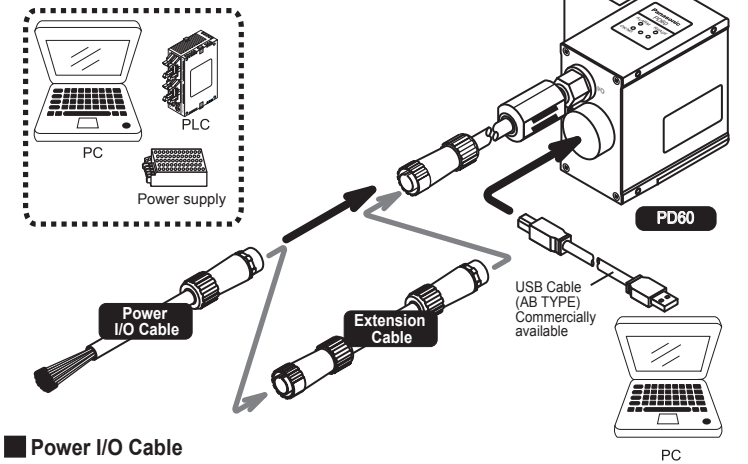


Note on Connection to the PD60

- Be sure to remove power from the Controller before connecting or disconnecting the peripherals to the device.
- Arrange the wiring no to apply load on the cable connector joints.

System Configuration

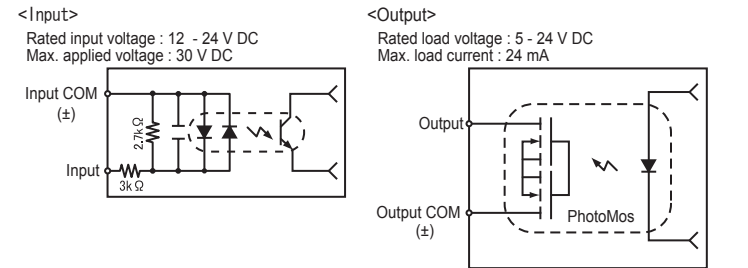
2D Code Reading Sensor	PD60
Extension Cable	ANPD068-03 (cable length: 3 m) ANPD068-05 (cable length: 5 m) ANPD068-10 (cable length: 10 m)
Mounting Bracket	ANE8870
Power I/O Cable (repair parts)	ANPD068-K1 (cable length: 2.7 m)
Front Panel (repair parts)	ANPD068-P1 ANPD068-P2 (for ANPD060-02,ANPD060-04)



Power I/O Cable

Cable	Signal	Description	
White	IN-COM	IN	COM for input (IN) (±)
Red	TRIGGER		Trigger input
Orange	TYPE1		Input type number (IN) 1 bit [TYPE1:Input OFF,TYPE2:Input ON]
White/Black	OUT-COM	OUT	COM for output (OUT) (±)
Black	READY		Ready output
White/Yellow	ALARM		Alarm output
White/Brown	OK/NG	POWER	Output signal for successful read
Gray	SD		SD for RS232C (send)
White/Red	RD		RD for RS232C (receive)
Purple	SG	POWER	GND for RS232C
Brown	+24 V DC		+24 V DC for power supply
Blue	GND		GND (0 V DC) for power supply
Shield	F.E.	Functional Earth	

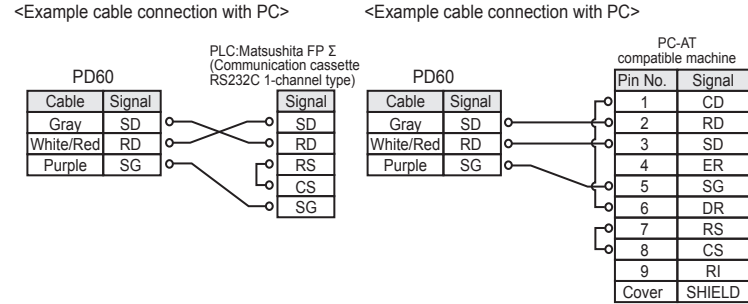
Input and Output Circuits



Note on Input/Output

- To prevent input signal chattering, use a non-contact input (transistor etc.).
- If Input to the PD60 is not turned off due to the current leakage when 2-line photoelectric sensor (or proximity sensor) is used,connect a bleeder resistor.
- The PD60 has a low load capacity so that you can connect the PD60 to a PLC, etc. Do not connect directly with a device having a high load capacity such as a valve without passing it through our Power-Photo relay.
- The output circuit contains no built-in fuse. If it is necessary to prevent from burning out the output circuit in the event of output load short circuit, mount a fuse externally. However, it may not be able to protect internal elements in the event of short circuit.

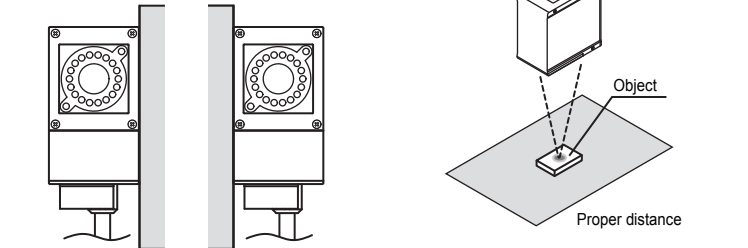
RS232C



Installing the PD60

Fixing the PD60

- Mount the PD60 by using the three mounting holes on the side of it as below.



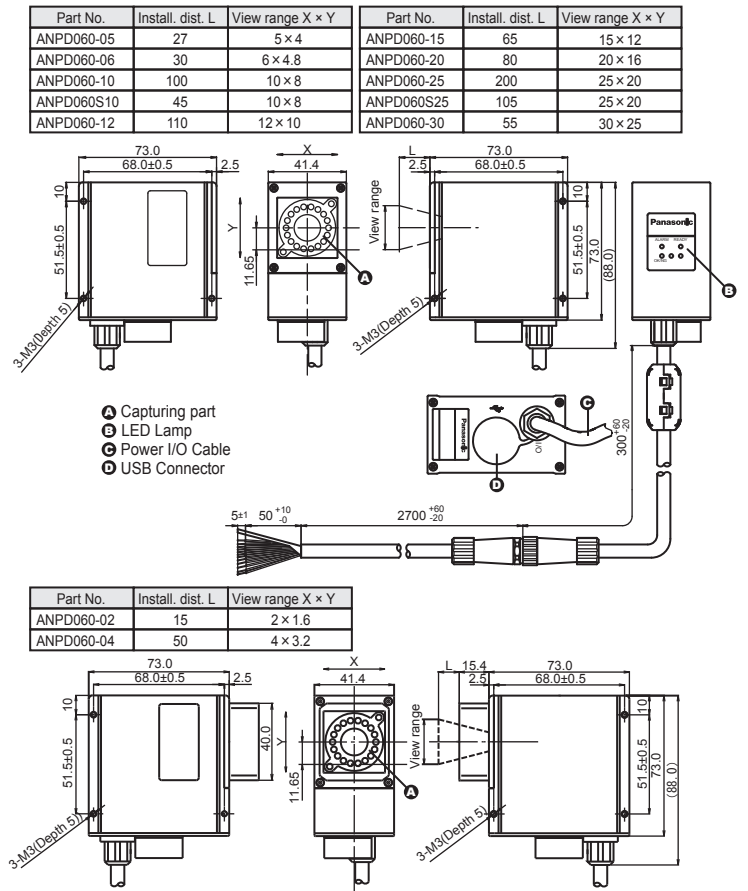
Installation Distance and Space between the Multiple PD60s

- When you mount multiple devices, keep enough distance between each unit to avoid light interference as below table.

Part No.	View range	X, Y	Install. dist.
ANPD060-02	2×1.6	0	15
ANPD060-04	4×3.2	80	50
ANPD060-05	5×4	30	27
ANPD060-06	6×4.8	30	30
ANPD060-10	10×8	160	100
ANPD060S10	10×8	70	45
ANPD060-12	12×10	180	110
ANPD060-15	15×12	110	65
ANPD060-20	20×16	160	80
ANPD060-25	25×20	320	200
ANPD060S25	25×20	180	105
ANPD060-30	30×25	90	55

External Dimensions and Names of Parts

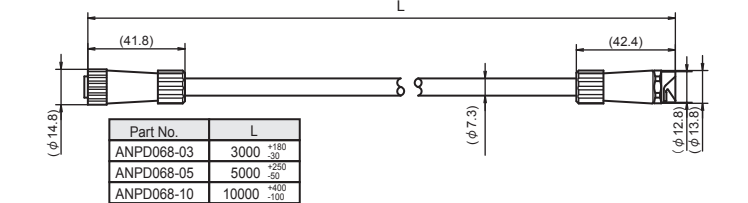
PD60



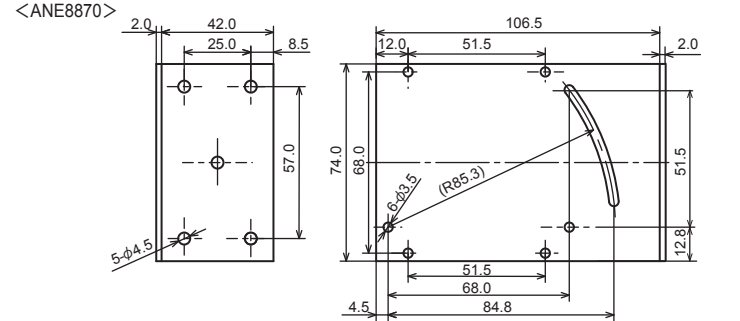
Part No.	Install. dist. L	View range X × Y
ANPD060-02	15	2 × 1.6
ANPD060-04	50	4 × 3.2

Part No.	Install. dist. L	View range X × Y
ANPD060-15	65	15 × 12
ANPD060-20	80	20 × 16
ANPD060-25	200	25 × 20
ANPD060S25	105	25 × 20
ANPD060-30	55	30 × 25

Extension Cable



Mounting Bracket



Conformity to the EMC Standards

- The PD60 comply with the EMC standards in the following EMC Directive:
 - EMC Directive(2004/108/EC)
 - EN 61000-6-4
 - EN 61000-6-2
- The product must fulfill the following conditions:
 - No USB (Tool software: PDT00L) communication
 - Ferrite core (ZCAT1730-0730A by TDK) must be used for the wirings.
 - Mounting Bracket ANE8870 must be used for grounding (see the following figure).

Specifications

General Specifications

Item	Specifications
Rated voltage	24 V DC
Allowable voltage range	21.6 to 26.4 V DC (with ripples)
Rated current consumption	0.5 A or less
Operating ambient temperature	0 to +40 °C (without icing and dew condensation)
Storage ambient temperature	-20 to +60 °C (without icing and dew condensation)
Operating ambient humidity	35 to 85 % RH (without icing and dew condensation at 25 °C)
Storage ambient humidity	35 to 85 % RH (without icing and dew condensation at 25 °C)
Noise resistance	1000 V pulse width 50 ns/1 μs, Noise Simulation Method was used
Vibration resistance	10 to 55 Hz 1 sweep / min., half amplitude 0.75 mm, 30min. each in X/Y/Z direction
Shock resistance	196 m/s ² , 5 times each in X/Y/Z direction
Insulation resistance (initial value)	100 MΩ or more (500 V DC Insulation resistance was used) *1)
Breakdown voltage (initial value)	500 V AC/one minute (600V AC/one second), cutoff current 10mA *1)
Degrees of protection	IP67G (IEC60529) *2)
Weight	Approx.500 g (including 2.7 m Power I/O Cable)

*1) Tested with the varistor and the condenser at the primary side of the power supply for the internal circuit removed.
*2) Tested with USB Cable disconnected and the USB Plug attached.

Specifications for the PD60

Item	Specifications
Part number	ANPD060-02 ANPD060-04 ANPD060-05 ANPD060-06
Installation distance	15±0.5 50±2.5 27±1 30±1.5
View range (mm)	2 × 1.6 4 × 3.2 5 × 4 6 × 4.8
Minimum cell size(μm) *1)	29 × 29 57 × 57 71 × 71 85 × 85
Part number	ANPD060-10 ANPD060S10 ANPD060-12 ANPD060-15
Installation distance	100±5 45±2 110±5.5 65±3
View range (mm)	10 × 8 10 × 8 12 × 10 15 × 12
Minimum cell size(μm) *1)	142 × 142 142 × 142 170 × 170 213 × 213
Part number	ANPD060-20 ANPD060-25 ANPD060S25 ANPD060-30
Installation distance	80±4 200±10 105±5 55±2.5
View range (mm)	20 × 16 25 × 20 25 × 20 30 × 25
Minimum cell size(μm) *1)	284 × 284 355 × 355 355 × 355 426 × 426
Compliant 2D Code	Data Matrix Code (ECC200), QR Code(model1,2,MicroQR)
Light-sensitive element	Monochrome C-MOS
Number of effective pixels	352 pixels (horizontal) × 288 pixels(Vertical), 100 thousand pixels
Light source for capturing image	White LED
Expected life time	Light intensity drops to 50% under the condition of over 30,000-hour operation (temperature: 25 °C, internal trigger: ON, reading time: 60 ms, exposure time: 3 ms)
Exposure time	Interlocked with shutter timing (0.03 to 50 ms)
Height-adjustment indication	Red LED
Indication sign	at OK LED Lamp (back side);Green LED
Input/ Output	Parallel Power I/O Cable Input Photo-coupler input : 2 inputs (TRIGGER : 1 bit, PRODUCT TYPE SWITCH : 1 bit) Output Photo-Mos output : 3 outputs (READY : 1 bit, ALARM : 1 bit, OK/NG : 1bit) Serial Power I/O Cable (RS232C communication, Max. 57600bit/s) USB USB Cable (AB TYPE), commercially available PC I/F USB1.1 Support OS Windows Vista®, Windows® XP, Windows® 2000, Windows® Me , Windows® 98SE

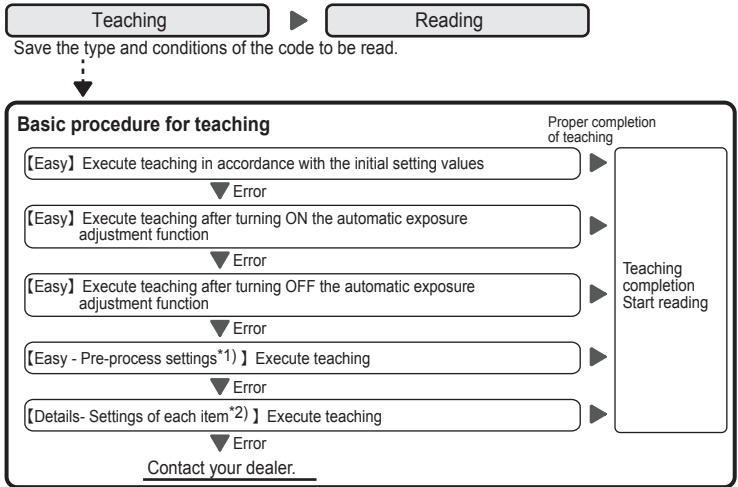
*1) Light-sensitive element : 5 pixels

Before Test Operation

Please check the followings:

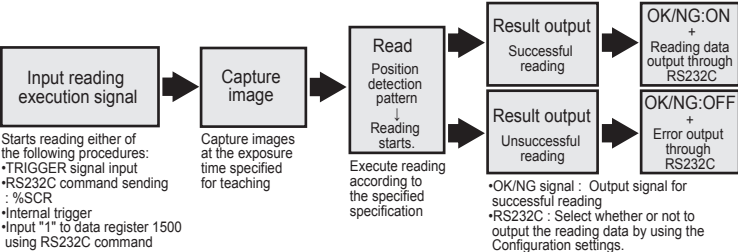
- Note With the power supply turned OFF.
- Is the PD60 surely fixed?
- Are the connectors attached firmly?
- Are cable connections (voltage, polarity, signal cables, etc.) made correctly?

9 Configuring the Basic Settings



10 Read Sequence (Basic Sequence)

- When the PD60 read the same code as the type and conditions of the registered 2D code, the device outputs the OK or NG signal and the data that the device read to the external device through RS232C. (You can select whether or not to output the signal and data to the external device through RS232C.) You can store one pair of codes per product type and up to seven pairs of product types in the PD60. In the basic sequence, the PD60 executes reading only once following the selected product type.



Read Time

- Read time is a total of the following three kinds of time.

Read Time	1 Exposure	0.03 – 50.00 ms :specified by using the Teaching function
	2 Transmission	4 ms : fixed
	3 Calculation	30 – 200 ms :varies depending on the type and condition of the 2D code

11 Parallel I/O

Input

- Inputting the signals to the Power I/O Cables through the external device performs the operations shown in the table below.

Signal name	Description
TRIGGER	Starts reading
TYPE	Switches product types (Type1⇔2)

(The PD60 does not accept input signals during teaching)

Output

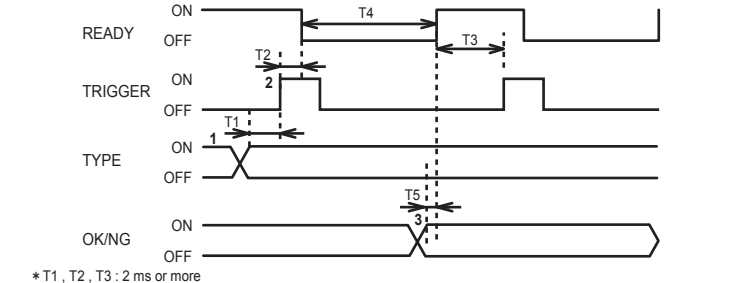
- The PD60 outputs the following signals to the external device.

Signal name	Description
ALARM	Turns on when teaching is not finished properly
READY	Turns on when the device becomes ready for reading Turns off when the device starts reading
OK/NG	Turns on for OK reading result Turns off for NG reading result

Input/Output Timing

<Execution of reading>

- When you perform inspection by inputting the TRIGGER signal from external device, follow the timing chart shown below.



- Make sure the READY signal is ON, and then input TYPE signal.

The signal changes the product type to that you input. Input the signal for Product Type switch more than two milliseconds before the inspection execution (trigger) signal. (T1≥2 ms)

- Make sure the READY signal is ON, and input TRIGGER signal for more than 2 ms (or more than T2 time).

It might take approximately 750 ms as maximum to change or read data via RS232C communication, or to establish USB communication (PDTOOL), using external device at the same time.

The READY signal turns off, and the PD60 begins reading (T4 = reading time). If you have set capture delay time (CAP.D), the PD60 begins capturing the image after recognizing the TRIGGER signal and the setting time has passed.

When the READY signal is ON again, wait more than 2ms (T3) before inputting TRIGGER signal.

- The PD60 outputs reading result as the OK/NG signal and turns on the READY signal.

If you have set the output delay time (OUT.D), the PD60 outputs the OK/NG signal and turns on the READY signal after finishing reading and the output delay time has passed. (T5 = 1 ms)

<Product Type Switch>

- You can switch between product types 1 and 2. Use RS232C command to switch to the product types 3 and after 3. You can switch the product type simply by changing the state of signal. The state of TYPE signal is always monitored except while the PD60 is reading a 2D code. Therefore, keep the state of the TYPE signal until the next product type switching.

- Switching the product types

No.	TYPE
1	OFF
2	ON

You can switch between the product types 1 and 2 by turning on/off the TYPE signal.

12 Serial Communication (RS232C)

Communication Specifications

Item		Specification
Communication method		Semi-duplex
Synchronous method		Asynchronous
Communication speed		9600, 14400, 19200, 38400, 57600 bit/s (initial value : 9600) Selectable using the configuration function
Transmission code		ASCII (two-byte characters are output in Shift-JIS)
Communication distance		Max. 15 m (communication speed: 19200 bit/s)
Transmission format	Bit length	8 bit
	Stop bit	1 bit
	Parity	None
	Flow control	None
	BCC	Yes (2 digits) * The PD60 can receive 2 digits of asterisk marks (Continuous Output can be switched between Yes or No)
	Terminal code	CR (0DH) / NONE:No terminal code / CR+LF (0DH 0AH) / EOT (04H) /ETX (03H)
	Continuous output	CR (0DH) / NONE:No terminal code / CR+LF (0DH 0AH) / EOT (04H) /ETX (03H)
	Output per command request	c _R (0DH)

Command Message and Response Message

- There are three types of commands to be input from the external device to the PD60.

•%S : To start reading when internal trigger signal is turned off
•%L : To read reading data and call the setting value
•%M : To write (or change) the setting value

Execution of Reading

[External device → PD60]

% S C_R

[Response 1] When the PD60 continuous output signal is turned on and successfully reads the code .

Reading data BCC C_R * Terminal code can be changed by using the configuration function.

<Response Example> Read code : QR code (7 characters), Terminal code : None

Read data	123PD60	7 characters
Output data	1 2 3 P D 6 0 BCC	BCC is a two-digit block check code.

[Response 2] When the PD60 continuous output signal is turned on and fails to read the code.

E R C_R

[Response 3] When the PD60 continuous output signal is turned off.

* The response is returned regardless of reading results.
* If you need read data, use the "%L" command to request read data to the PD60.

Reading out the Read Data and Setting Value

[External device → PD60]

% L Head register No. Terminal register No. BCC C_R

[Response 1] Normal

% L Stored value in the specified register BCC C_R

* You can read out the stored data in multiple registers only when the number of the registers are serial (e.g. Read data = 11001-12355). For reading out the data in separate registers, read out each word in several batches. Specify the same number for the head register and terminal register to read out one word

<Response Example> Read code : QR code, Read data = "123PD60 "

Read data	123PD60										7 characters												
Response message	Stored value in the register																						
	%	L	3	2	3	1	5	0	3	3	3	6	4	4	0	0	3	0	BCC	C _R			
			Low			High			Low			High			Low			High					
Stored characters	Data register			High			Low			The characters to be read are stored in data area in ascending order, from 11001. If the byte count of read data is odd, low eight bits of the terminal register stores "NULL".													
	11001			1			2																
	11002			3			P																
	11003			D			6																
	11004			0			NULL																

Writing a Setting Value

[External device → PD60]

% M Register No. Writing data BCC C_R

[Response 1] Normal

% M C_R

Format

[Register No.]

Register No.
X10⁴ | X10³ | X10² | X10¹ | X10⁰

[Data:Integer]

Data:Integer
X16¹ | X16⁰ | X16³ | X16²
Low High

Error response

% ! Error code * X16¹ | X16⁰ BCC C_R

[BCC]

BCC
X16¹ | X16⁰

[Data:Actual value]

Data:Actual value
X16¹ | X16⁰ | X16³ | X16² | X16⁵ | X16⁴ | X16⁷ | X16⁶
Low High Low High

* Error codes

41:Format error	Excess or deficit of the command data
42: Support error	Out of range of the register numbers
61: Data error	Out of range of the data,Undefined data format
62: Mode error	The PD60 is not in the mode to accept commands

List of Register Numbers

- This list is for Ver.2.50.

Item type	Item	Supported command	Data register No.	Range of values	Remarks
READING	Reading result	L	10000	-	Reading results 00 (00h) : Successful reading 48 (30h) : Symbol detection error 1 49 (31h) : Symbol detection error 2 65 (41h) : Decode error 81 (51h) : Unspecified code error 83 (53h) : Error correction rate error 96 (60h) : Excess of Max. time limit 153 (99h) : Not measured 256 (100h) : Is being measured
					Type of the read code 0: QR code 1: Data Matrix code
					Error correction rate (Indeterminate when the device has not measured or failed to read the code)
					Processing time (Unit: 0.1 ms for 1 [Returns the processing time(000.0 ms - 999.9 ms) as a four-digit hexadecimal number])
					Reading rate (Unit: 0.01% for 1 [Returns the reading rate (00.00 % - 100.00 %) as a four-digit hexadecimal number])
	Reading result (supplemental information)	L	10050	0 - 255	Maximum contrast value (Indeterminate when the device has not measured or failed to read the code)
					Minimum contrast value (Indeterminate when the device has not measured or failed to read the code)
					X coordinate of left upper area of the 2D code to be read
					Y coordinate of left upper area of the 2D code to be read
					X coordinate of right upper area of the 2D code to be read
CONFIGURATION	Initialization of reading rate	M	10100	1(fixed)	Initializes the read rate
	Measurement result (Reading data)	L	11000	0 - 2710	The number of bytes of read data (Indeterminate when the device has not measured or failed to read the code)
	Product type	M / L	1400	1 - 7	M command: Switches product types L command: Acquires the current product type
	Execution of reading	M	1500	1	Start reading
	Status of output	L	1600	0 - 1	READY signal (1:ON / 0:OFF)
				0 - 1	ALARM signal (1:ON / 0:OFF)
				0 - 1	OK/NG signal (1:ON / 0:OFF)
	Initial product type	M / L	3200	1 - 7	The number of product type to be called at startup
	Internal trigger	M / L	3300	0 - 1	0: ON / 1: OFF
	Capture delay	M / L	3400	0 - 5000	Unit : ms
	Output delay	M / L	3500	0 - 5000	Unit : ms 0 / 20 / 40 / 60 / 80 / 100 / 120 / 140 / 160 / 180 / 200 / 500 / 1000 / 5000
	RS232C communication speed	M / L	3600	96 - 576	96 / 144 / 192 / 384 / 576
	Light ON/OFF	M / L	3800	0 - 1	0: OFF / 1: ON
	Initialization (initial state)	M	3900	1	Return to the factory initial value
	Save image conditions	M / L	4200	0 - 2	0: OFF / 1: ALL / 2: NG Image only
	Continuous (automatic) output of reading data	M / L	5300	0 / 1	0: ON (the PD60 automatically outputs the read data for each reading) 1: OFF (the PD60 outputs the read data only when receiving the command for requiring data)
	Terminal code for continuous data output	M / L	5400	0 - 3 / 99	Selection of terminal codes when memory No. 5300 = 0 0 : CR (0DH) *initial value 1 : CR+LF (0DH + 0AH) - [two bytes] 2 : EOT (04h) 3 : ETX (03h) 99: None
	LED	M / L	5450	-	Some part of LED light is turned off. 5450 for each bit => 1: ON / 2: OFF Bit 4 Bit 3 Bit 2 Bit 1 Bit 0 Left Low - Right Up

Item type	Item	Supported command	Data register No.	Range of values	Remarks
CONFIGURATION	Time limit of reading	M / L	3112	0 - 5000	0: No limit Unit:ms
	BCC in Continuous output, ON/OFF	M / L	5410	0 / 1	0: OFF (BCC is not added) 1: ON (BCC is added)

Communication Conditions

- RS232C communication is not available while selecting Teaching mode in PDTOOL.
- There are following limitations of reading command %S and data register 1500:
You cannot use the reading command %S and data register 1500 when the internal trigger setting is ON.
Send the reading command %S and data register 1500 when the READY signal is ON and internal trigger setting is OFF.

13 PDTOOL (Ver. 2.50 or more)

Operating Environment

PC	IBM PC / AT compatible machine
OS	Windows Vista® , Windows® XP, Windows® 2000, Windows® Me , Windows® 98SE
Required storage capacity	20 MB or more
CPU	PentiumⅢ 600 MHz or more
Built-in memory	128 MB or more
Resolution	1024x768 or more
Display color	High Color(16 bit) or more
Communication system	USB1.1/USB2.0

How To Obtain PDTOOL

- You can download free of charge the data from our website.
Downloading it requires registration of your information.

See our website of Automation control:

<http://panasonic-electric-works.net/ac/>

Please click " Machine Vision " on opened page.

How To Operate PDTOOL

- Refer to the PDTOOL help files for further details of the operation instructions of the PDTOOL.
- You can download the PDTOOL Help file in PDF format from our website.
Downloading it requires registration of your information.

See our website of Automation control:

<http://panasonic-electric-works.net/ac/>

Please click " Machine Vision " on opened page.

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