

Thank you very much for purchasing 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

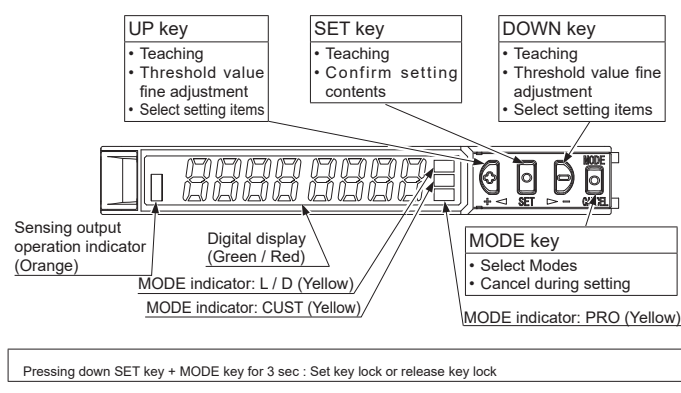
- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

1 REGULATIONS AND STANDARDS

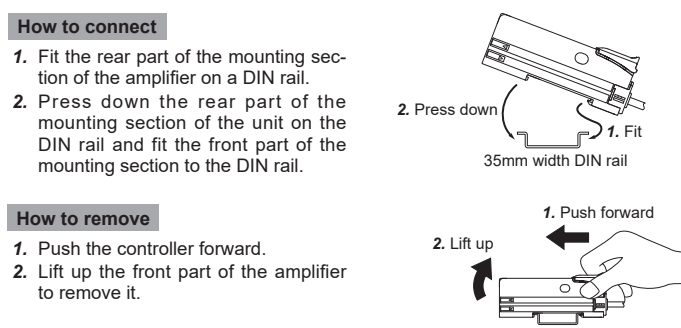
- This product conforms to the regulations and standards below.
 - <Conformity Directives / Conforming Regulations>**
 EU Law : EMC Directive 2014/30/EU
 British Legislation : EMC Regulations 2016/1091
 – Applicable Standards
 EN IEC 60947-5-2:2020
 - <Standards in US / Canada>**
 ANSILUL 60947-5-2, CAN/CSA C22.2 No.14
- Caution about UL recognition**
 In case requiring conformity of UL listing mark or C-UL listing mark, Use class 2 power supply unit.



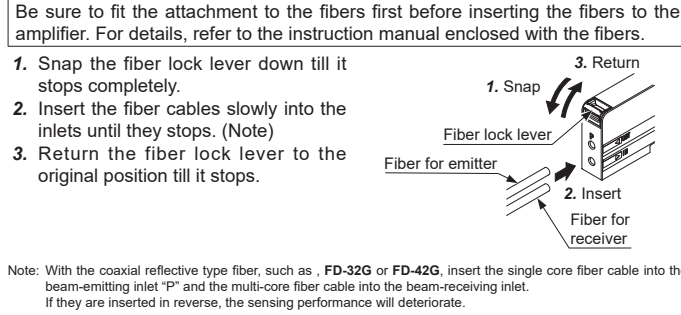
2 PART DESCRIPTION



3 MOUNTING



How to connect the fiber cable



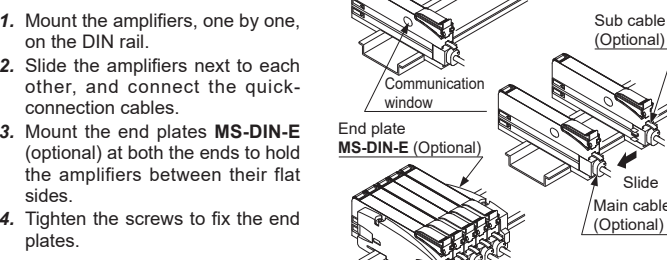
Note: With the coastal reflective type fiber, such as FD-320 or FD-420, insert the single core fiber cable into the beam-emitting inlet "P" and the multi-core fiber cable into the beam-receiving inlet. If they are inserted in reverse, the sensing performance will deteriorate.

4 INSTALL MORE AMPLIFIER OF SERIES CONNECTION TYPE

- Make sure that the power supply is OFF while adding or removing the series connection type.
- In case 2 or more the series connection types are connected in cascade, make sure to mount them on a DIN rail.
- In case installing additional amplifier of series connection type, the maximum 11 the series connection types using sub cables can be added to an amplifier using a main connection cable.
- When connecting 2 or more the series connection types in cascade, use the sub cable (optional) for the second series connection type onwards.

For mounting and removing the amplifier, refer to "3 MOUNTING."

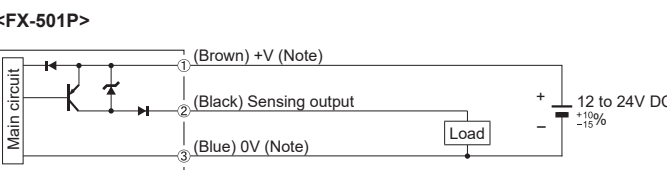
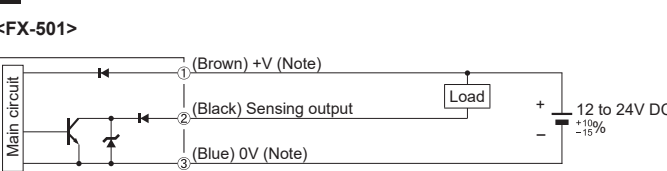
How to cascade



How to Remove

- Loosen the screws of the end plates.
- Remove the end plates.
- Slide the amplifiers and remove them one by one.

5 I/O CIRCUIT DIAGRAMS



Note: The quick-connection sub cable does not incorporate +V (brown) and 0V (blue). The power is supplied from the connector of the main cable.

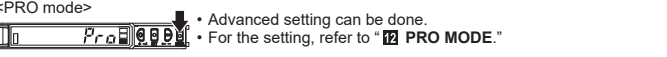
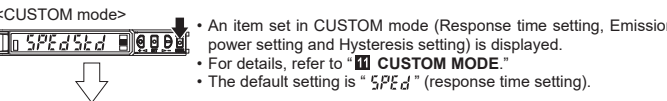
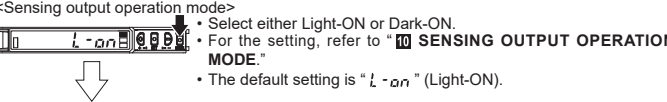
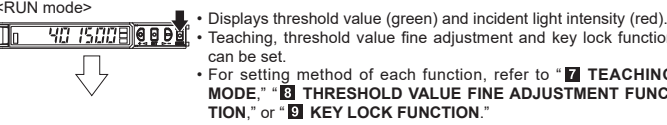
<Terminal arrangement>

Terminal No.	Terminal name
1	+V
2	Sensing output
3	0V

6 OPERATION PROCEDURE

The changed settings are not stored if turning the power OFF while setting. Therefore, confirm the settings by pressing the SET key before turning the power OFF.

- When turning ON the power, RUN mode is displayed and the digital display shows the threshold value (green) and the incident light intensity (red).

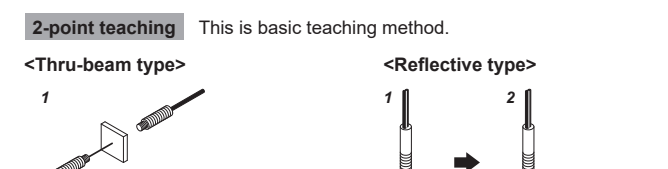


<RUN mode>

7 TEACHING MODE

- Be sure that detection may become unstable depending on the use environment in teaching if less margin is applied.
- When teaching in Window comparator mode or Hysteresis mode, a setting has to be made in PRO mode beforehand.
- In case 1-point teaching, make sure to set the shift amount. (initial value is 10% or 100)
- For the setting, refer to <PRO> in "PRO MODE OPERATION MANUAL."
- Teaching can be set in RUN mode.

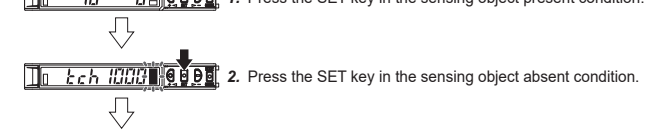
Useful when sensing object can be set



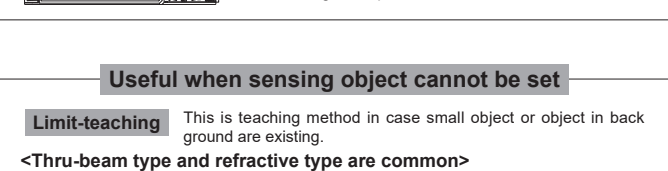
Notes: 1) The shift amount of 10% is an initial value. The shift amount can be set in PRO mode. Furthermore, the shift value can be set in incident light input. For setting method, refer to <PRO> in "PRO MODE OPERATION MANUAL." 2) If the value after setting exceeds the maximum (minimum), the maximum (minimum) sensitivity will be set.

2-point teaching (Window comparator mode / Hysteresis mode)

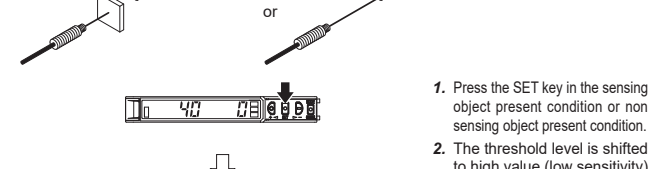
- When setting sensing output to the window comparator mode or hysteresis mode, "1_SL" and "2_SL" can be changed to another by pressing down SET key for 2 sec.
- In case conducting threshold value fine adjustment of "1_SL" or "2_SL", press down UP key or Down key, and "1_SL" or "2_SL" are displayed. Then, the threshold value fine adjustment can be conducted.



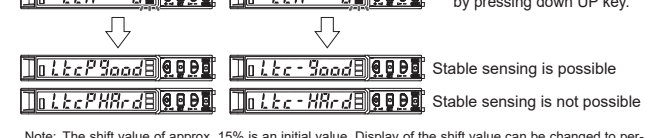
5 I/O CIRCUIT DIAGRAMS



Useful when sensing object cannot be set

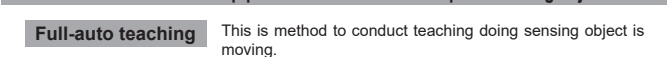


Note: The shift value of approx. 10% is an initial value. Display of the shift value can be changed to percentage (approx. 0 to 99.9% (unit 1 %)) or incident light intensity (0 to 9999 (unit 1)). For setting the shift amount, refer to <PRO> in "PRO MODE OPERATION MANUAL."



3-point teaching (Window comparator mode / Hysteresis mode)

- This is the method to conduct the 3-point teaching (P-1, P-2, P-3) and to set the threshold range by setting the threshold value (1_SL) of the mid-point between "A" and "B" and the threshold value (2_SL) of the mid-point between "B" and "C".
- When conducting teaching, use sensing objects (A, B and C) whose incident light intensities are different.
- After teaching, P-1, P-2 and P-3 will be automatically relocated in ascending order: i.e. the lowest value is placed in "A", the second lowest in "B" and the highest in "C".



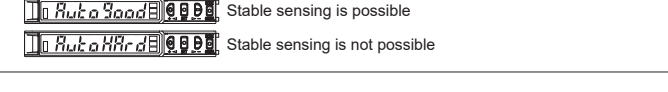
Useful when not want to stop production line and to keep the sensing object move



Note: If the value after setting exceeds the maximum (minimum), the maximum (minimum) sensitivity will be set.

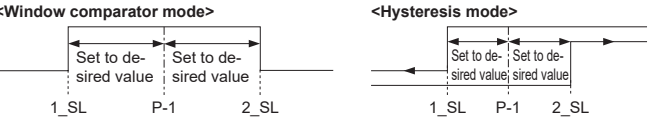
Span adjustment in rising differential mode or trailing differential mode

- Move to the rising differential mode, or the trailing differential mode in the PRO6 mode, and press the jog switch to confirm the setting. For the setting procedure, refer to <PRO6> in "PRO MODE OPERATION MANUAL."
- Return to the normal screen, press the SET key, and select Span d-01~d-08. Then, press the SET key to complete adjustment.



1-point teaching (Window comparator mode / Hysteresis mode)

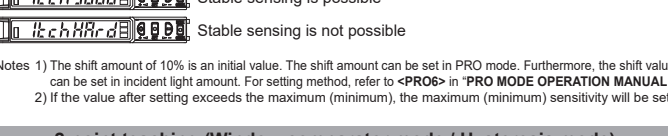
- This is method to set the shift amount to the desired value and to set the threshold range by using the 1-point teaching.



Note: The shift amount of 10% is an initial value. The shift amount can be set in PRO mode. Furthermore, the shift value can be set in incident light input. For setting method, refer to <PRO> in "PRO MODE OPERATION MANUAL."

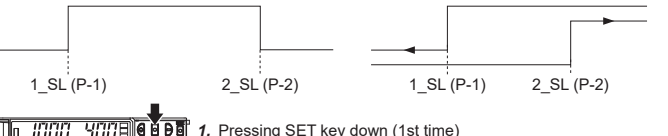
2-point teaching (Window comparator mode / Hysteresis mode)

- When setting sensing output to the window comparator mode or hysteresis mode, "1_SL" and "2_SL" can be changed to another by pressing down SET key for 2 sec.
- In case conducting threshold value fine adjustment of "1_SL" or "2_SL", press down UP key or Down key, and "1_SL" or "2_SL" are displayed. Then, the threshold value fine adjustment can be conducted.



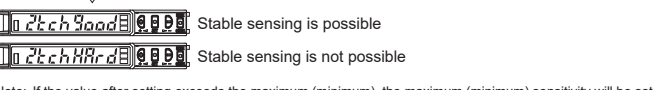
3-point teaching (Window comparator mode / Hysteresis mode)

- This is the method to conduct the 3-point teaching (P-1, P-2, P-3) and to set the threshold range by setting the threshold value (1_SL) of the mid-point between "A" and "B" and the threshold value (2_SL) of the mid-point between "B" and "C".
- When conducting teaching, use sensing objects (A, B and C) whose incident light intensities are different.
- After teaching, P-1, P-2 and P-3 will be automatically relocated in ascending order: i.e. the lowest value is placed in "A", the second lowest in "B" and the highest in "C".



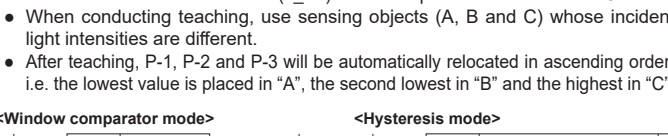
Span adjustment in rising differential mode or trailing differential mode

- Move to the rising differential mode, or the trailing differential mode in the PRO6 mode, and press the jog switch to confirm the setting. For the setting procedure, refer to <PRO6> in "PRO MODE OPERATION MANUAL."
- Return to the normal screen, press the SET key, and select Span d-01~d-08. Then, press the SET key to complete adjustment.



Span adjustment in rising differential mode or trailing differential mode

- Move to the rising differential mode, or the trailing differential mode in the PRO6 mode, and press the jog switch to confirm the setting. For the setting procedure, refer to <PRO6> in "PRO MODE OPERATION MANUAL."
- Return to the normal screen, press the SET key, and select Span d-01~d-08. Then, press the SET key to complete adjustment.

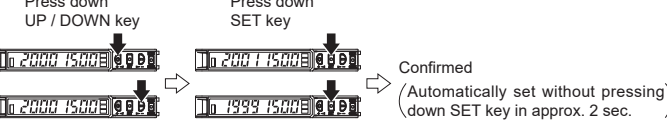


- The threshold can be set by using the threshold value fine adjustment function. For the threshold value fine adjustment function, refer to "THRESHOLD VALUE FINE ADJUSTMENT FUNCTION"

8 THRESHOLD VALUE FINE ADJUSTMENT FUNCTION

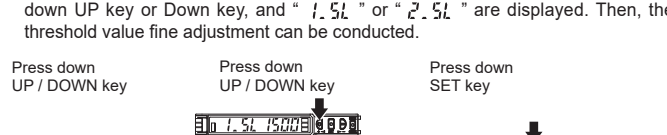
- Set the fine adjustment of threshold value in RUN mode.
- Also, the threshold value fine adjustment function can be used in forced ON output mode and forced OFF output mode.
- For setting of the sensing output, refer to <PRO6> in "PRO MODE OPERATION MANUAL."

<Normal mode, Rising differential mode or Trailing differential mode>



<Window comparator mode or Hysteresis mode>

- When setting sensing output to the window comparator mode or hysteresis mode, "1_SL" and "2_SL" can be changed to another by pressing down SET key for 2 sec.
- In case conducting threshold value fine adjustment of "1_SL" or "2_SL", press down UP key or Down key, and "1_SL" or "2_SL" are displayed. Then, the threshold value fine adjustment can be conducted.

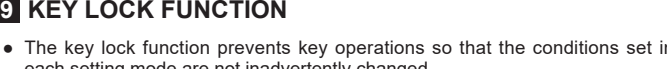


Note: It may not respond when values of "1_SL" and "2_SL" are close because of relation of hysteresis. Be sure to confirm with this device.

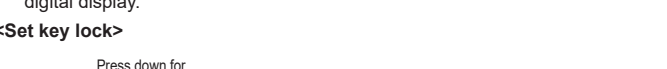
9 KEY LOCK FUNCTION

- The key lock function prevents key operations so that the conditions set in each setting mode are not inadvertently changed.
- If operating key switch after key lock is set, "Loc on" is indicated on the digital display.

<Set key lock>

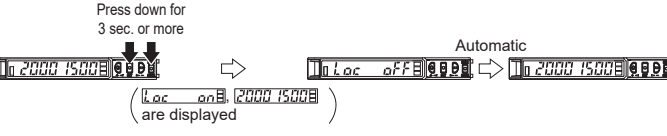


<Release key lock>



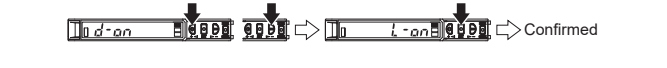
10 SENSING OUTPUT OPERATION MODE

- When MODE indicator: L / D (yellow) lights up, sensing output operation can be set.



11 CUSTOM MODE

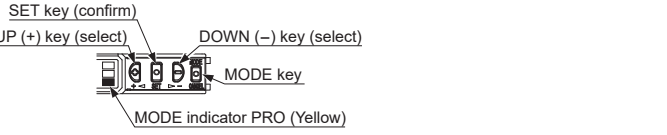
- When MODE indicator: CUST (yellow) lights up, Response time setting, Emission power setting or Hysteresis setting can be displayed.
- For the setting procedure, refer to <PRO5> in "PRO MODE OPERATION MANUAL."
- By pressing UP key or DOWN key, the setting in each item will be changed.
- Press SET key to confirm the setting.
- For setting of each item, refer to the following table.



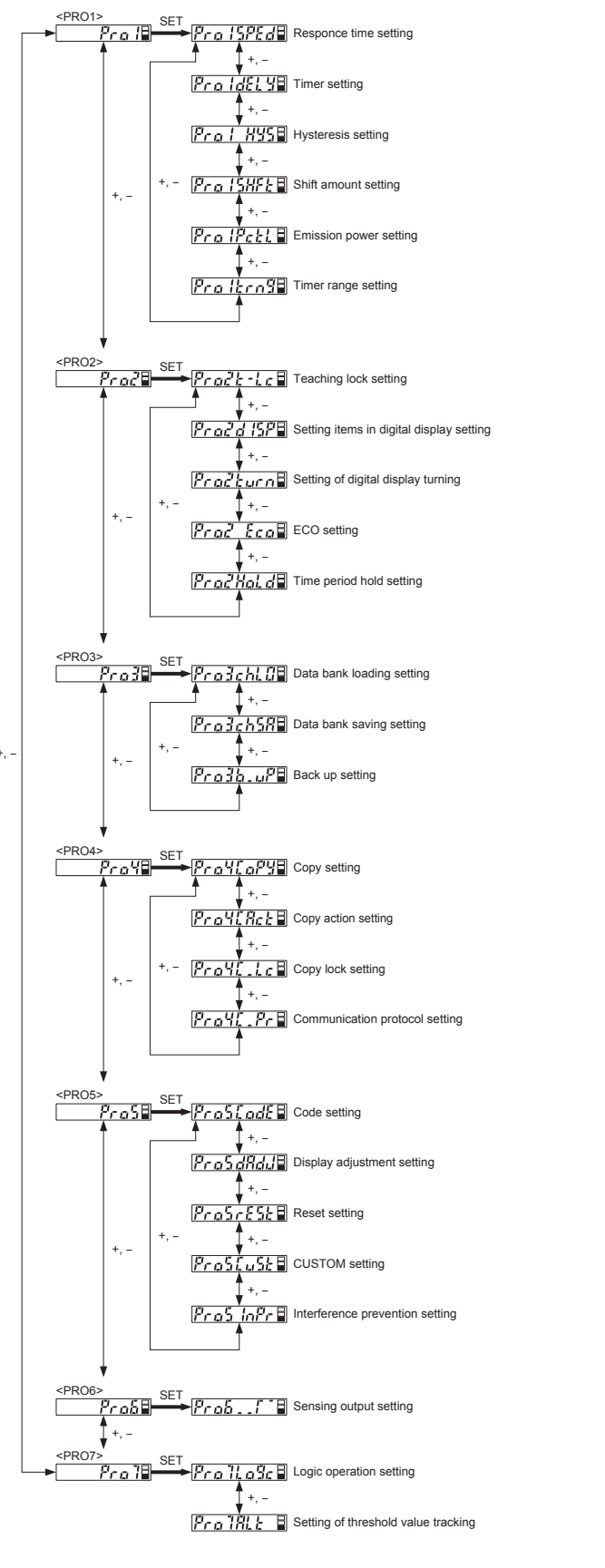
Item	Digital display	Reference Item
Response time setting	SPE dSt d	<PRO 1: Response time setting>
Emission power setting	Pc tL H-P	<PRO 1: Emission power setting>
Hysteresis setting	HYS H-D2	<PRO 1: Hysteresis setting>

12 PRO MODE

- When MODE indicator: PRO (yellow) lights up, PRO mode can be set.
- For detail of PRO mode, refer to "PRO MODE OPERATION MANUAL."

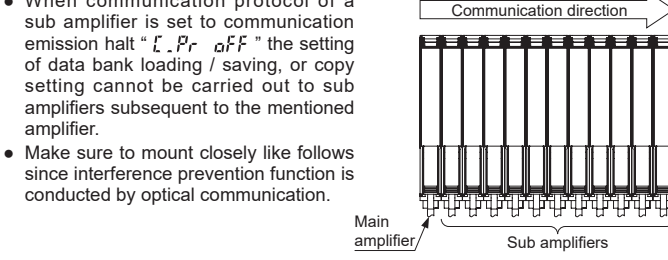


Procedure

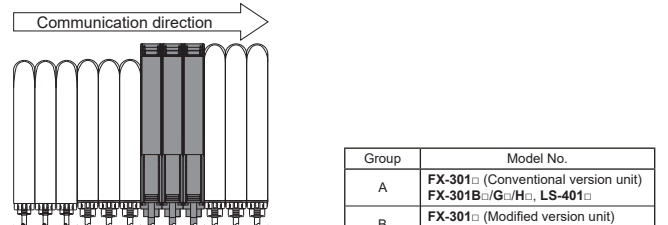


13 OPTICAL COMMUNICATION

- When the setting of data bank loading / saving, copy setting, or copy action setting is conducted via optical communications, cascade the sub amplifiers right side to the main amplifier as follows. However, in case using data bank loading / saving, use FX-502 or FX-505-C2 as main amplifier.
- If an amplifier is under any of the following conditions, the setting of data bank loading / saving, or copy setting cannot be carried out.
 - Copy lock setting is set to copy lock ON "L-on".
 - Digital display is blinking.
 - External input setting of main amplifier is set to "InPt SELF". (Only data-bank loading / saving)
- When communication protocol of a sub amplifier is set to communication emission half "L.Pr oFF" the setting of data bank loading / saving, or copy setting cannot be carried out to sub amplifiers subsequent to the mentioned amplifier.
- Make sure to mount closely like follows since interference prevention function is conducted by optical communication.



- When this product and other products (e.g. fiber sensor amplifiers, pressure sensor controllers, etc.) are connected together in cascade, install those products so that they are in order of Group A, B, D and C as shown in the right figure. This product is included in Group D.



Group	Model No.
A	FX-301: (Conventional version unit)
B	FX-301B: (G.H., LS-401)
C	FX-301: (Modified version unit)
D	LS-403: DPS series

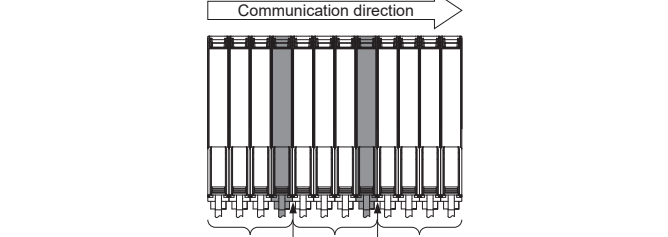
- As for the products that are located between different groups, affix the amplifier protection seal FX-MB1 (optional) on the communication window of each corresponding product.
- Within each group, identical models should be connected in a lump.
- In case conducting copy setting of this device and other FX-500 series together, functions which are incorporated in this device will be copied but functions which are not incorporated in this device will not be copied.

14 INTERFERENCE PREVENTION FUNCTION

- This device incorporates an interference prevention function by setting different emitting frequencies from an interference prevention function by optical communication.
- For interference prevention function setting procedure, refer to <PRO5> in "PRO MODE OPERATION MANUAL."
- Possible number of amplifiers for interference prevention function is different as shown in table below.

Interference prevention function setting	Response time					
	H-SP	FAST	STD	LONG	U-LG	HYPR
IP-1	0	2	4	8	8	12

- In case putting in more amplifiers than limit of interference prevention function, put the amplifier protection seal to amplifier which is adjacent of end of an amplifier that the interference function is valid or set OFF in communication protocol setting of the end of amplifier that the interference prevention function is valid.
- Example: Putting in 12 of this device and set STD of response time setting.
 - Possible number of interference prevention is 4.
 - Put the amplifier protection seals 4th and 5th amplifiers and between 8th and 9th amplifiers or change the communication protocol setting of 4th and 8th to OFF since interference prevention works from 1st to 4th, from 5th to 8th and 9th to 12th.



- In case mounting more amplifiers whose response time setting are different, put protection seal between amplifiers that have different response time setting or set communication protocol setting of the upper amplifier to OFF.
- For communication protocol setting procedure, refer to <PRO4> in "PRO MODE OPERATION MANUAL."

15 ERROR INDICATION

Error indication	Description	Remedy
Er 01	EEPROM is broken or reached the end of its working life.	Please contact our office.
Er 02	EEPROM writing error	
Er 11	Load of the sensing output is short-circuited causing an over-current to flow.	Turn OFF the power and check the load.
Er 52	Communication error when the amplifiers are mounted in cascade.	Verify that there is no loose or clearance between amplifiers.
Er 53	Communication error between the upper communication unit and amplifiers.	Verify that there is no loose or clearance between the upper communication unit and amplifiers.

16 SPECIFICATIONS

Type	Series connection type			
	NPN output		PNP output	
Model No.	FX-601		FX-601P	
Supply voltage	12 to 24V DC ±5% Ripple P-P10% or less			
Power consumption (Note 1)	Normal operation: 960mW or less (current consumption 40mA or less at 24V supply voltage) Eco mode: 680mW or less (current consumption 28mA or less at 24V supply voltage)			
Sensing output	NPN open-collector transistor		PNP open-collector transistor	
	• Maximum sink current: 100mA (Note 1)		• Maximum source current: 100mA (Note 1)	
	• Applied voltage: 30V DC or less (Between sensing output and 0V)		• Applied voltage: 30V DC or less (Between sensing output and +V)	
	• Residual voltage: 2V or less (Note 2) [At 100mA (Note 1) sink current]		• Residual voltage: 2V or less (Note 2) [At 100mA (Note 1) source current]	
Output operation	Switchable either Light-ON or Dark-ON			
Short-circuit protection	Incorporated			
Response time	H-SP: 25µs or less, FAST: 60µs or less, STD: 250µs or less, LONG: 2ms or less, U-LG: 4ms or less, HYPR: 24ms or less, Selectable			
Protection	IP40 (IEC)			
Ambient temperature	-10 to +55°C (if 4 to 7 units are mounted in cascade: -10 to +50°C or if 8 to 18 units are mounted in cascade: -10 to +45°C) (No dew condensation or icing allowed)			
Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH			
Material	Enclosure: Polycarbonate, Key: Polycastal, Protective cover: Polycarbonate			
Weight (Main body only)	Approx. 15g			
Accessory	FX-MB1 (Amplifier connection seal): 1 set.			

Notes: 1) 50mA max. If 5 or more series connection types are connected together.
 2) In case of using the quick-connection cable (cable length 5m) (optional).
 3) Cables are not accessories. Be sure to use cables in table below.

<Series connection type>

Cable length 1m	Cable length 2m		Cable length 5m	
	Main cable	Sub cable	Main cable	Sub cable
FX-501:	CN-73-C1	CN-71-C1	CN-73-C2	CN-73-C5
			CN-73-C5	CN-71-C5

17 CAUTIONS

- This product has been developed / produced for industrial use only.
- Make sure that the power supply is OFF while adding or removing the amplifiers.
- Take care that if a voltage exceeding the rated range is applied, or if an AC power supply is directly connected, the product may get burnt or be damaged.
- Take care that short-circuit of the load or wrong wiring may burn or damage the product.
- 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.
- The specification may not be satisfied in a strong magnetic field.
- 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.
- The ultra long distance (U-LG, HYPR) mode is more likely to be affected by extraneous noise since the sensitivity of that is higher than the other modes. Make sure to check the environment before use.
- Do not use during the initial transient time (H-SP, FAST, STD: 0.5 sec., LONG, U-LG, HYPR: 1 sec.) after the power supply is switched ON.
- Be sure to use the quick connection cable (optional) as cable. When you extend the cable, be sure to use cables which have 0.3mm² or more of conductor cross-section area. Extension up to total 100m is possible. However, in order to reduce noise, make the wiring as short as possible.
- Make sure that stress by forcible bend or pulling is not applied to the sensor cable joint and fiber cable.
- This product is suitable for indoor use only.
- Avoid

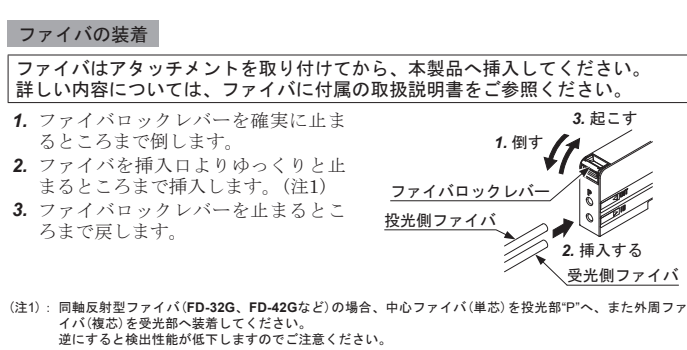
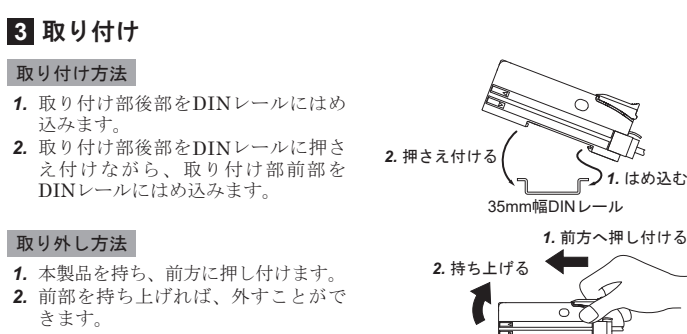
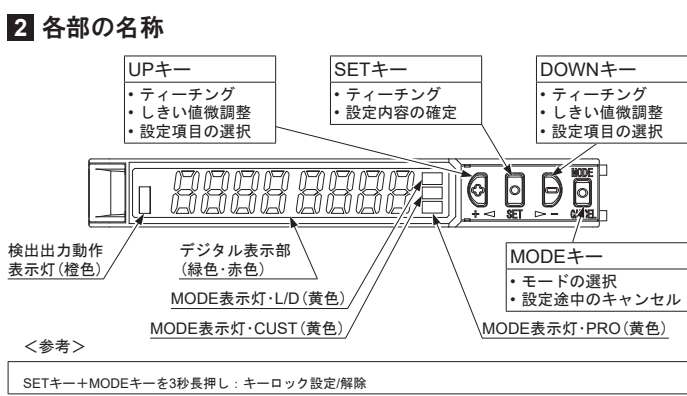
Panasonic 取扱説明書

デジタルファイバセンサアンプ FX-501□

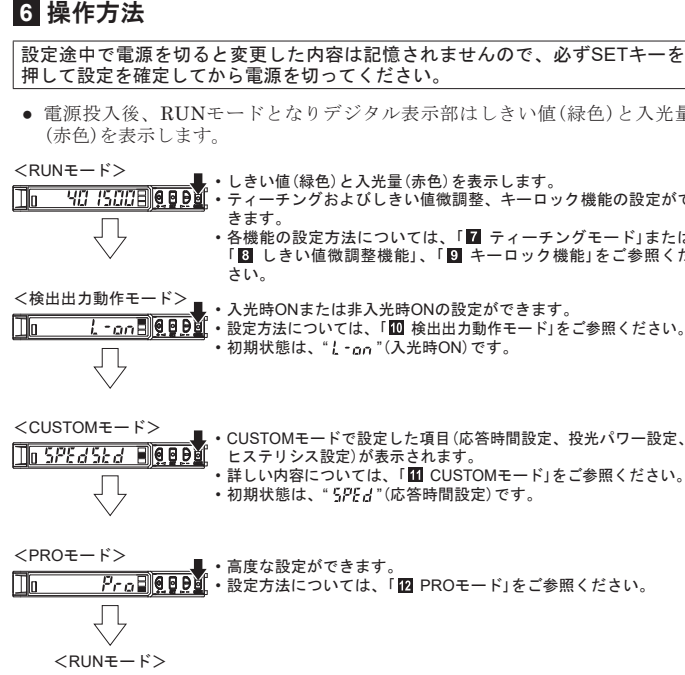
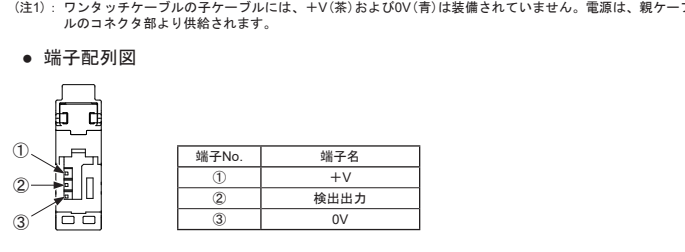
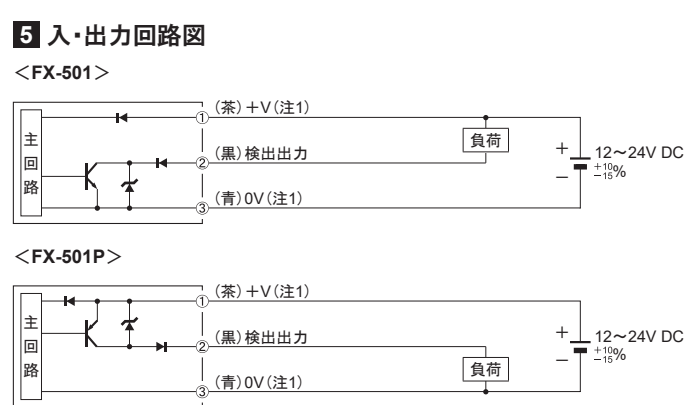
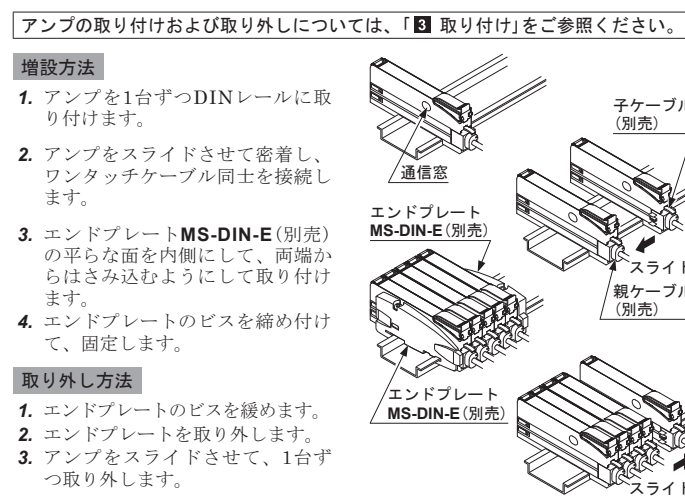
このたびは、パナソニック製品をお買い上げいただき、ありがとうございます。
ご使用前にこの取扱説明書をよくお読みになり、正しく最適な方法でご使用ください。
尚、この取扱説明書は大切に保管してください。

- ### 警告
- 本製品は、人体保護用の検出装置として使用しないでください。
 - 人体保護を目的とする検出には、OSHA、ANSIおよびIEC等の各国の人体保護に関する法律および規格に適合する製品をご使用ください。

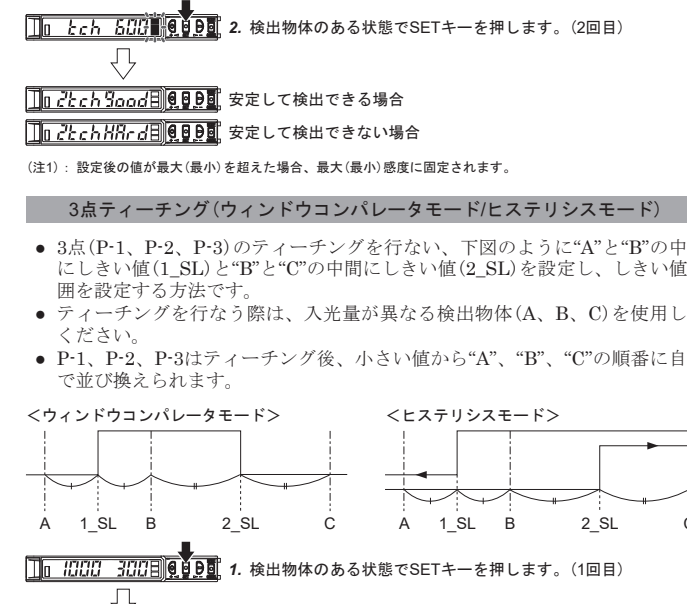
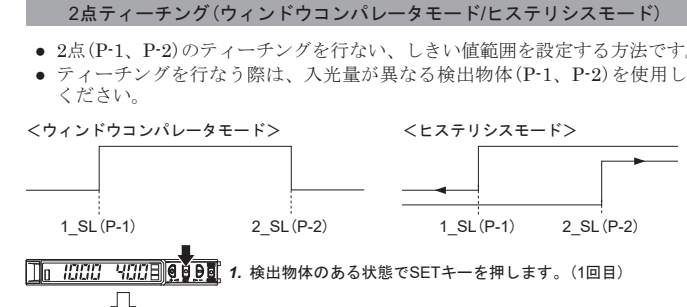
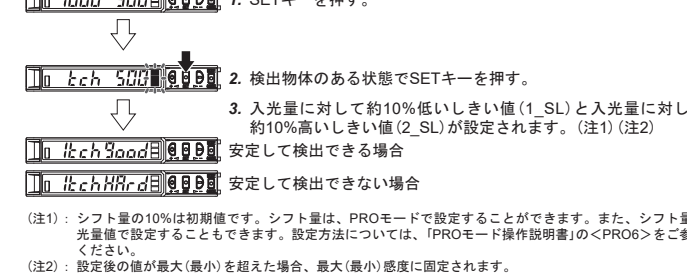
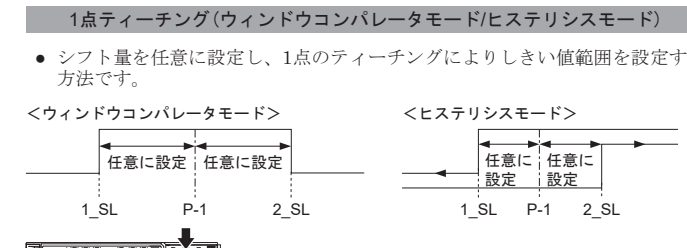
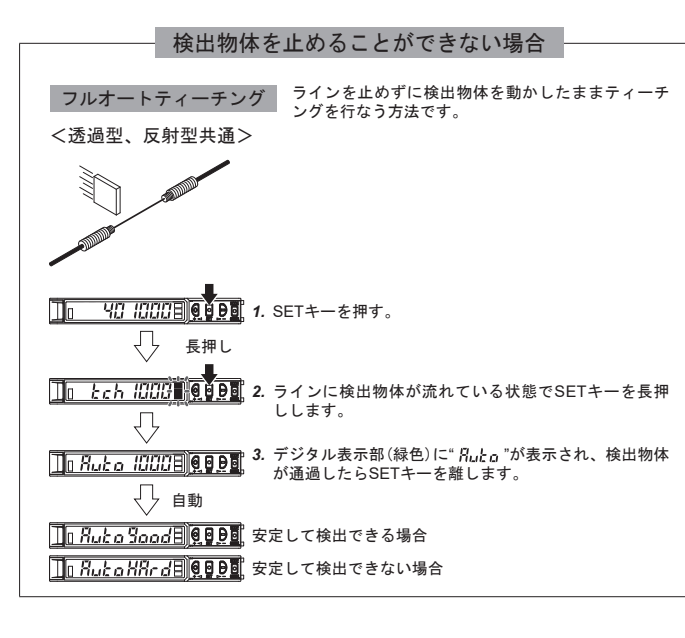
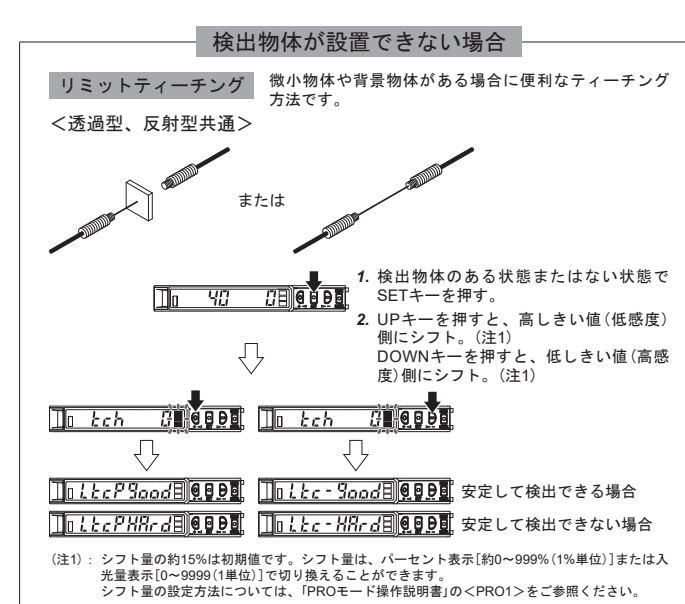
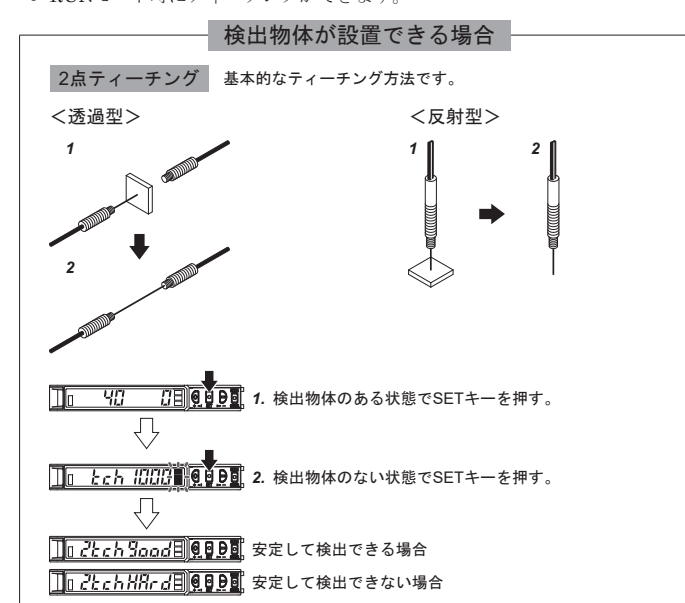
- ### 1 適合規制/規格
- 本製品は、下記の規格/規制に適合しています。
 - <適合指令/適合法規>**
EU規制：EMC指令2014/30/EU
英国規制：EMC規制2016/1091
 - 適用規格**
EN IEC 60947-5-2:2020
 - <米国/カナダ規格>**
ANSI/UL 60947-5-2、CAN/CSA C22.2 No.14
 - UL認証に関する注意事項
ULリスタンディング・マーク/IC-UL ULリスタンディング・マーク適合が必要な場合、CLASS 2対応の電源ユニットを使用してください。



- ### 4 連結コネクタタイプの増設
- 連結コネクタタイプの増設および取り外しは、必ず電源を切ってから行なってください。
 - 2台以上の連結コネクタタイプを増設する場合は、必ずDINレールに取り付けてください。
 - 連結コネクタタイプを増設する場合、親ケーブル(別売)を使用したアンプ1台に対して子ケーブル(別売)を使用したアンプは最大15台までとなります。但し、光通信や干渉防止機能を使用する場合は、最大11台となります。
 - 2台以上の連結コネクタタイプを増設する場合、2台目以降に使用するワンタッチケーブルは、子ケーブル(別売)を使用してください。

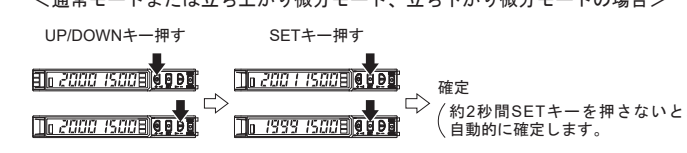


- ### 7 ティーチングモード
- ティーチングは、使用環境により余裕度が少ないと検出が不安定になりますので、ご注意ください。
 - ウィンドウコンパレータモードおよびヒステリシスモードのティーチングを行う場合は、事前にPROモードで設定を行ってください。
 - 1点ティーチングの場合は、シフト量(初期値は10%または100)の設定も行なってください。
 - 設定方法については、「PROモード操作説明書」の「PRO6」をご参照ください。
 - RUNモード時にティーチングができます。

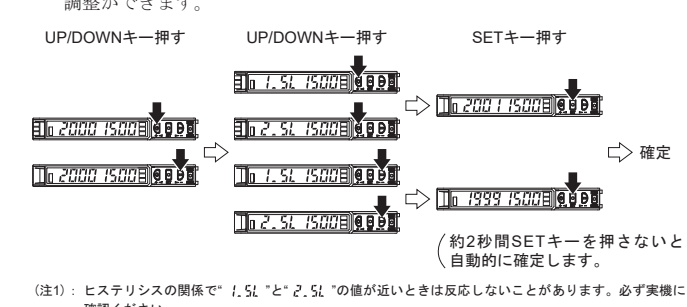


- しきい値は、しきい値微調整機能で設定できます。しきい値微調整機能については、「3 しきい値微調整機能」をご参照ください。

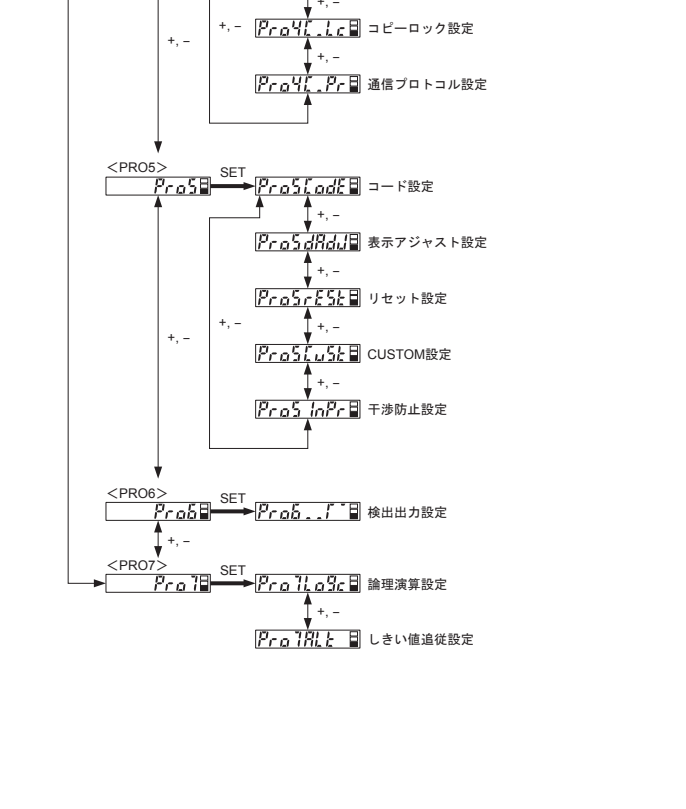
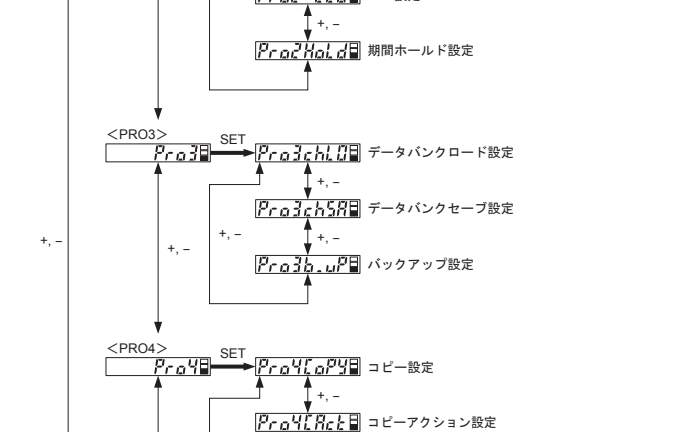
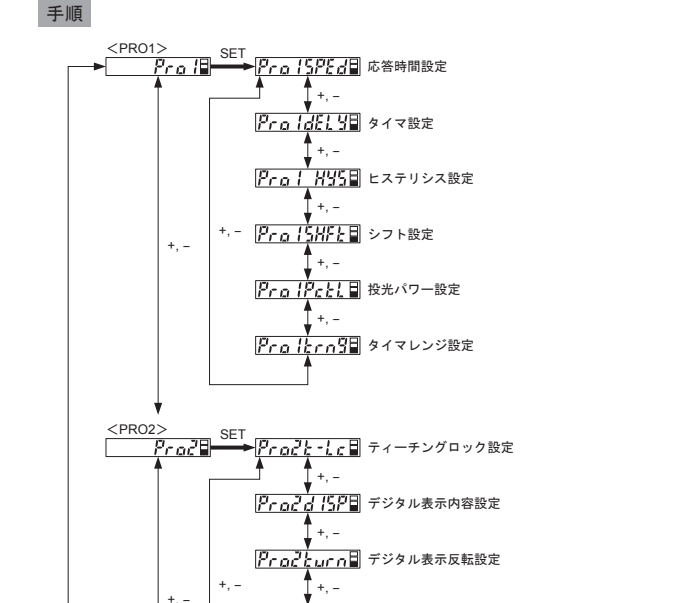
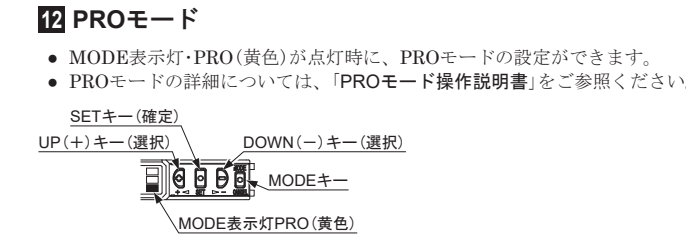
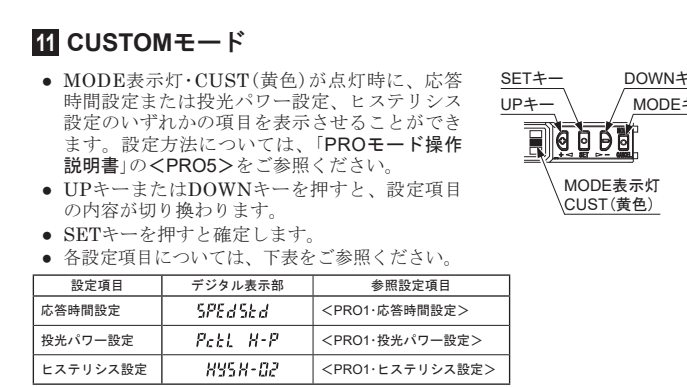
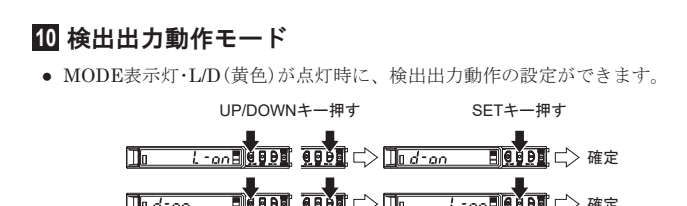
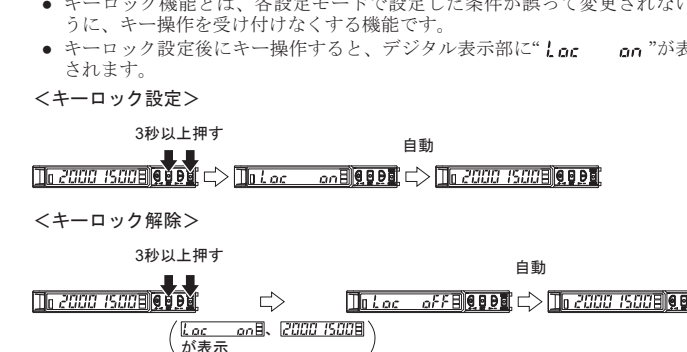
- ### 3 しきい値微調整機能
- RUNモード時にしきい値の微調整ができます。
 - 強制ON出力モードまたは強制OFF出力モードの場合もしきい値の微調整ができます。
 - 検出力の設定については、「PROモード操作説明書」の「PRO6」をご参照ください。



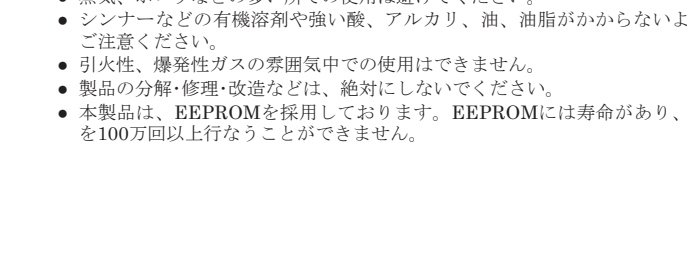
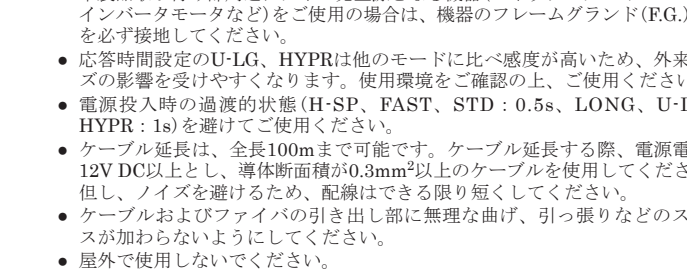
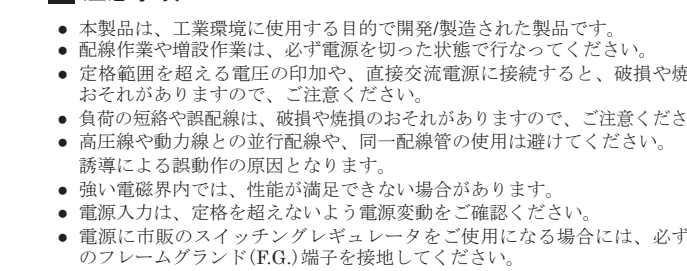
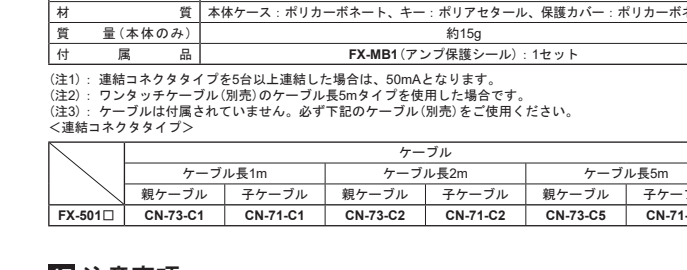
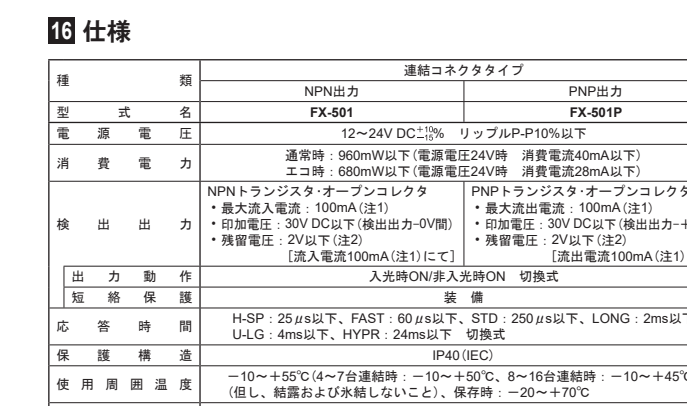
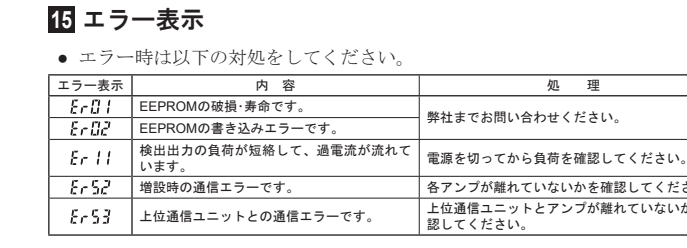
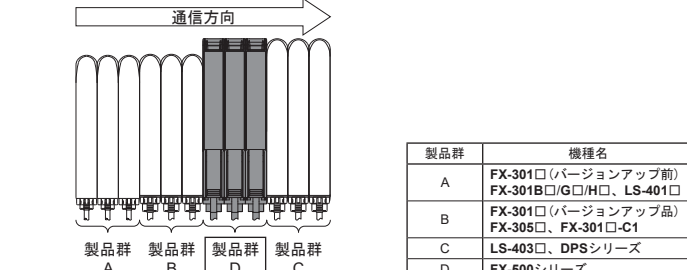
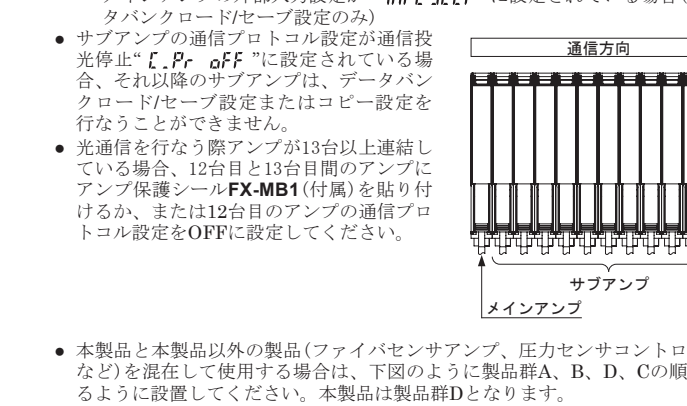
- #### <ウィンドウコンパレータモードまたはヒステリシスモードの場合>
- 検出力をウィンドウコンパレータモードまたはヒステリシスモードに設定している場合、SETキーを2秒押しすると、1_SL と 2_SL の表示が切り替わります。



- ### 9 キーロック機能
- キーロック機能とは、各設定モードで設定した条件が誤って変更されないように、キー操作を受け付けなくする機能です。
 - キーロック設定後にキー操作すると、デジタル表示部に"Loc on"が表示されます。



- ### 15 エラー表示
- エラー時は以下の対処をしてください。
- | エラー表示 | 内容 | 処理 |
|-------|-------------------------|--------------------------------|
| E1 | EEPROMの読み取りエラーです。 | 弊社までお問い合わせください。 |
| E2 | EEPROMの書き込みエラーです。 | 電源を切った後から再確認してください。 |
| E11 | 検出出力の負荷が過剰で、過電流が流れています。 | 各アンプが壊れないかを確認してください。 |
| E52 | 増設時の通信エラーです。 | 上位通信ユニットとアンプが離れていないかを確認してください。 |
| E53 | 上位通信ユニットとの通信エラーです。 | |



パナソニック インダストリー株式会社
〒571-8506 大阪府門真市大字門真1006番地
https://industry.panasonic.com/
<FAファイバ技術相談窓口>
TEL: 0120-394-205
受付時間: 平日の9時~12時、13時~17時(土日祝日、年末年始、当社休業日を除く)
Panasonic Industry Co., Ltd. 2024
2024年4月発行