Fiber Sensor Controller

PFD RM

INSTRUCTION MANUAL

We appreciate you for purchasing HanYoung NUX Co., Ltd product.Before using the product you have purchased, check to make sure that it is exactly what you ordered. Then, please use it following the instructions below.

HEAD OFFICE
1381-3, Juan-Dong, Nam-Gu Incheon, Korea
TEL: (82-32)876-4697 FAX: (82-32)876-4696

■ Safety information

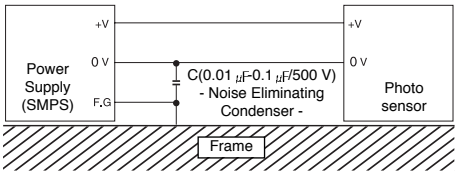
Before you use, read safety precautions carefully, and use this product properly. The precautions described in this manual contains important contents related with safety; therefore, please follow the instructions accordingly. The precautions are composed of DANGER, WARNING and CAUTION.

⚠ WARNING

1. To prevent defection or malfunction of this product, supply proper power voltage in accordance with the rating.
2. Since this product is not designed with explosion-protective structure, do not use it at any place with flammable or explosive gas.
3. Remove this product while the power is off. Otherwise, it may cause malfunction or electric shock.
4. Due to the danger of electric shock, use this product installed onto a panel while an electric current is applied.

⚠ CAUTION

1. The contents of this manual may be changed without prior notification.
2. If you use the product with methods other than specified by the manufacturer, there may be bodily injuries or property damages.
3. Avoid continuously switching the power source On and Off.
4. Use a dry cloth to wipe off the substance when cleaning the lens or cases. Never use thinner or organic solvents.
5. Do not use this product at any place with much dust, vibration or impact.
6. Before inserting power source, make sure that the circuit wiring is properly connected.
7. In the case of wiring loaded inductors such as DC Relay and others to output, use diode, varistor and others to prevent surge.
8. To avoid malfunction caused by noise, do not put high voltage or power line with sensor wire in a same conduit
9. Make its wiring be shorter as possible and wire extension shall be within 30 m.
10. Consider the fact that the sensing distance may be varied in accordance with the size, color, surface condition, material, glossy, non-glossy or others of a sensing object.
11. Prevent strong disturbance light such as sunlight and others which directly enter into the directional angle of the sensor by putting a glare shield.
12. In the case of using multiple sensors (more than 2 sensors), there is a possibility of malfunction caused by mutual interference so, for Through-Beam type, sensors shall be installed in a divergent way or there shall be proper distance between them.
13. When using the Switching Power Supply as the power source, earth the Frame Ground (F.G) terminal and be sure to connect the noise-eliminating condenser between 0 V and F.G.



※ If you do not follow the contents described in the safety information then it is possible to be a cause of the product's malfunction so please follow them.

■ Ordering information

Model	Code		Description
PFD	□	□ □	10 bit A/D, 4Digit
Light source	R		Red LED
Use		M	Multi-functions(MARK/RPM/COUNTER)
External output		N	NPN Open collector
		P	PNP pen collector

※ Multifunction: With built-in RPM/Count function, control output is possible without a separate meter.

■ Rating

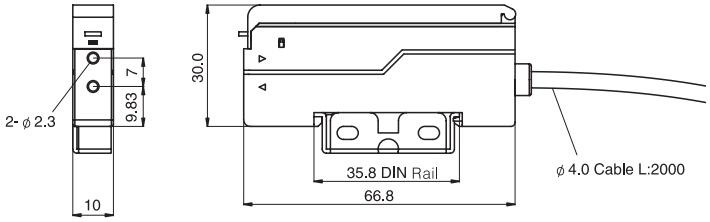
Type		Digit Display
Kinds		Multi functions
Model	NPN	PFD-RMN
	PNP	PFD-RMP
Rated Voltage		12-24 V d.c ±10 % (Ripple 10 % Max.)
Current Consumption		50 mA Max.
Output	Main	Control : Open collector output, 100 mA
	Subsidiary	Stability :Open collector output, 100 mA
External Input		Remote / Reset input
Mtensity of light		0-1000
Multi -functions	COUNTER	400 cps, Up/Down, 0~9999
	RPM	12~9999 rpm
Output		(Light On) / (Dark On) Output NORMAL , ON DELAY, OFF DELAY, ONE Shot Time Output
On/Off Delay		1 ~ 9999 ms
Light source / Wavelenght		Wavelength / 660 nm
Protection Circuit		Protection circuit from reversed power supply connection, Output short-circuit protection
Response time		1ms Max
Varation rate		10 % Max
Display form		LED 7, 4 digits FND
Sensitivity fixation		Auto-teaching, Manual
Additional functions		Adjustable bightness, 180° rotation display Display time fixation, Zero reset, Initial reset, Lock function
Operating Ambient illumination		Sunligint : 10,000 lx Max., Incandescent lamp : 3,000 lx Max.
Operating Ambirut temp.		Operating : -10 ℃ ~+ 55 ℃, Storage : -25 ℃ ~ +70 ℃ (Without freezing)
Operating Ambient Humidity		35 ~ 85 % R.H.
Vibration Resistance		10-55 Hz(Cycle for 1 minute), Double amplitude : 1.5 mm, in each direction X · Y · Z for 2 hours
Shock Resistance		500 ㎨ (50 G), X · Y · Z for 3 times
Dielectric Strength		500 V a.c (50-60 ㎐ for 1 minute)
Insulation Resistance		Above 20 ㏁ (500 V d.c)
Connection Method		DIN rail
		cable 2 m, 5 P, 4 Ø
Accessory		Bracket

■ Multi-functions

Multi-functions	Counter	• UP / DOWN mode, Free scale 1~999 • Range: 0 ~ 9999 • Counting speed: 400 cps (50 % duty) • Output mode : N, F, C, R, K, P, Q, A 8 kinds • External reset : Min. signal width 5 ms
	RPM	• Range : 0 ~ 9999 rpm • Speed guard output • Free scale : 1 ~ 1000 Measring • Cycle setting

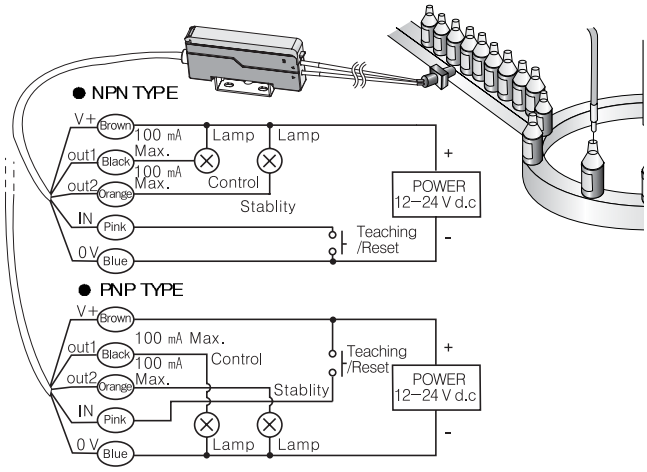
Cautions) Use by combining the Fiber Unit in the form of transmission type at the time of RPM/Count Measurement.
Malfunction can occur from the increase in the light receiving change range by speed when using for the reflection purpose.
Distance measurement at the optical measurement mode changes in accordance with the Fiber Cable and within 20m is recommended.

■ Dimension



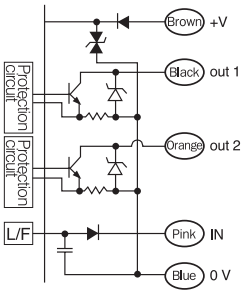
■ Wiring

■ Circuit wiring & Fixture

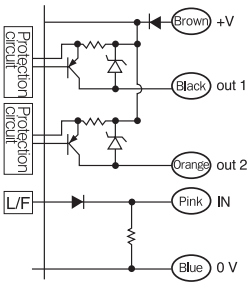


■ Input / Output circuit

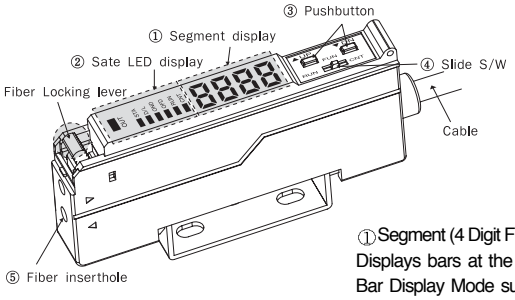
■ NPN type



■ PNP type



■ Name of parts

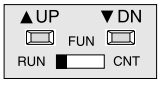


①Segment (4 Digit FND) Display
Displays bars at the Number, Letter, and Bar Display Mode such as the amount of light entering, mode error message, set up values, and set up items

②LED Display (State)
Displays the state of Fiber Sensor
- OUT: Lights on for interface output (OUT1)
- STB: Displays safe regions at the RUN Mode (OUT2))
  Sensor input display is on over the set up region at the RPM/Count Mode
- D/L: Lights on for Light On and Lights off for Dark On
- OND: Lights on when On Delay is set at the Output
- OFD: Lights on when Off Delay is set at the Output
- RUN: Lights on when operating at RUN
- CNT: Lights on when operating at CNT (Up Counter / Down Counter / RPM)
  (RUN and CNT simultaneously light on when operating at the RPM Mode)

③Push Button (▲UP, ▼DN)
Function change and value set up at each executive mode (RUN, FUN, CNT)

④Slide S/W (RUN, FUN, CNT)
Sets up executive modes and priority operation at all functions

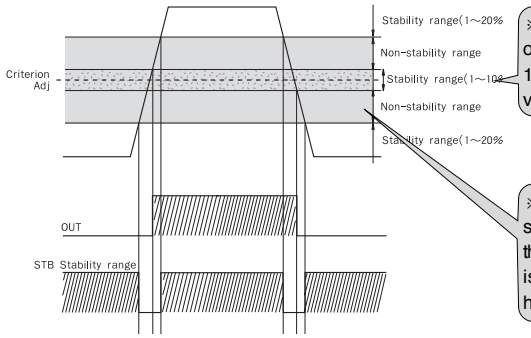


- RUN: General Fiber Sensor Operation Mode
  Various light amount set up & display function
  (Ordinary Light Amount Display / Bar Display / Maximum, Minimum HOLD Display / Percent Display)
  Displacement Set Up function (OFFSET)
  Various Auto Teaching Function
- FUN: Various Additional Function Set Up Mode
  PAGE1: Sensor Manual Sensitivity Set Up Page
  PAGE2: Sensor Output Mode Set Up Page
  PAGE3: Count/RPM Function Set Up Page
  PAGE4: Additional Function Set Up Page
- CNT: Holds one operation mode from Up Counter, Down Counter, and RPM display functions.
  (FUN → Operates with Counter or RPM display according to the function set at the [3-1] Mode.)

※Caution: Refer to the Parameter Chart for the Detailed Set Up and function of FUN

⑤Optical Fiber Unit Input Hole External Diameter: ∅2.2 mm Fiber unit

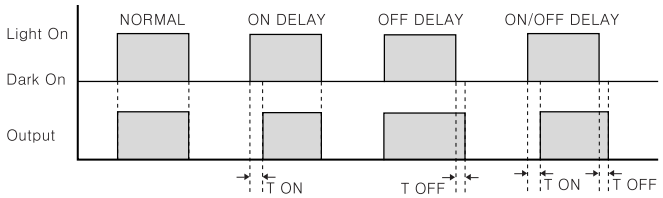
■ Depending on receiving level,OUT, STB operation



※ The set up range of hysteresis is 1~10% of the criterion value.

※The set up range of stability is 2~20% of the criterion value and is greater than the hysteresis value.

■ Delay setting and Output operation (in Light ON)



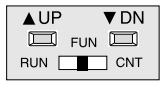
■ Various display function

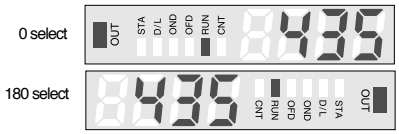
※How to operate a button

▲• press UP button in short
▲– press UP button in long
▼• press DN button in short
▼– press DN button in long

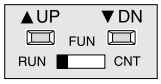
■ 180° rutation display

(Changeable at FUN mode[4-4]





■ Various guantty of light display



Changeable a display mode press at RUN mode ▲•

●Light Volume

●BAR Display

b - - - Light Volume 0
b - - 1 Light Volume is more than 1
b - - H More than Low limit value of Stability
b - 1H More than Low limit value of Adjust
b - HH Less than High limit value of Adjust
b 1HH Less than High limit value of Stability
bHHH More than High limit walue of(Stability+10)

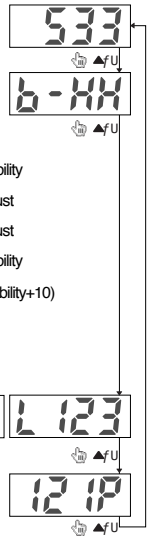
●Max. / Min. HOLD display

Display Max. and Minimum value during flickering

H534 L 123

●Percentage display

· Display 100P as standard
· If set 300 as setting value
- If light value is 300, 330P display
- If light value is 990, 100P display

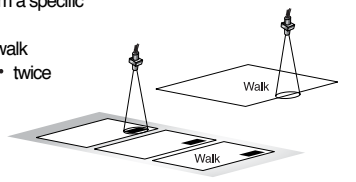


■ AutoTeaching Mode

• Auto Teaching Mode Entry: Press ▼– at the RUN Mode. ("TEAC" => "bxxx")
• Auto Teaching Mode Removal: Restores to the RUN Mode execution from the Teaching Mode when ▲– is pressed.
The set up outline described in the below is the set up method at the Teaching Mode.

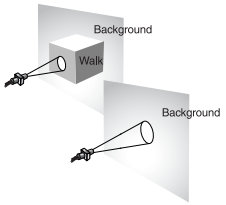
RUN FUN

● <1 Point Teaching >※ when detecting from a specific location of walk



• Place it at the location for detecting the walk
• Complete the set up by pressing ▼• twice (once: "bxxx" switch, twice: "_OK_")
(The set up value becomes the optimal value of 300~700 range.)
※ Walk : Object, Object to be Detected

● <2 Point Teaching> when detecting delicate walk (limited region detection)
Out if it is over 1/2 of the walk light amount and background light amount

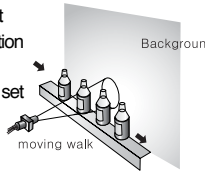


• Place it at the location for detecting the walk
• Press ▼• once. (Automatic Gain Adjustment) ("bxxx" switch)
• Remove the walk initially placed at the location. (Only background remains)
• Complete the set up by pressing ▼• once. ("_OK_")

● <Maximum Light Amount> when detecting walk using transmission type fiber

• Place it at the location for detecting the walk
• Complete the set up by pressing ▼• twice (once: "bxxx" switch, twice: "_OK_")

● <Auto Teaching> when detecting moving walk without stopping it



• Move the walk from the conveyor or operate the body of revolution (motor, etc.)
• Difference of light amount will be automatically distinguished for set up after about 10 seconds when ▼– is pressed.
("AT_9"-> "AT_8"... "AT_0" -> "_OK_")

● Viewing Adjust Value at the Teaching Mode
When verifying the adjust value after 1 Point, 2 Point, Maximum Light Amount and Auto Teaching
• Displays the adjust value when ▲• is pressed once (if the adjust value is 540, "A500")
• The sensor returns to the Teaching Mode when ▲• is pressed once again. ("bxxx")

■ Initial default value

	Manual sensitivty setting (Basic input setting)		SENSOROUTPUT (RUN MODE)		COUNTER/RPM SET (CNT MODE)		Subsidiary function setting	
	1 Group	Set value	2 Group	Set value	3 Group	Set value	4 Group	Set value
1	GAIN	7	DARK/LIGHT	L	MODE(UP,DN,RPM)	UP	LOCK	DS
2	ADJUST	500	ON DELAY	OFF	PRESCALE	1	BRIGHT	7
3	HYSTERESIS	10	OFF DELAY	OFF	SETTING HI	100	BRIGHT TIME	OFF
4	STABILITY	20	ONE SHOT	OFF	SETTINGLOW	100	DISPLAY 180	0
5			TIME INPUT SW	AUTO CH1	OUT1 MODE ONE SHOT TIME	(CNT)C (RPM)L	DEFAULT	-
6			CHANEL			50		

Refer to the Parameter Group Set Up for the Details on the Adjusted Values.
1) Move to the next parameter group by pressing ▲• when the parameter is displayed.
2) Current mode and current set up condition is displayed when moving the parameter.
3) Set up can be changed by firmly pressing on to ▼– for long time.
4) Just move the Slide S/W to RUN or CNT to move to the executive mode after completing the set up

■ Parameter

※ Manual sensitivity set

■ Parameter 1 rgroup set

Move to Group 1 ▲• in FUN mode

Parameter menu and display	Explannation	Range	Setting KEY
1-1 GAIn GAIN ▲fU Move to parameter 2 Group 1-2 AdJ ADJUST 1-3 HSt HYSTERESIS 1-4 Stb STABILITY	Set up 8 levels of amplifying rate for the amplifying circuit of the light receiver.	1(min) ~8(max)	▼• : ▲• : Setting value change
	Set up the sensitivity (criterion value)	5-995 1~10 %	▲– : Setting completition/ revert
	Set up GAP of the criterion at the time of deciding the presence of walk.	2~10 %	
	Set up the safe region at the time of deciding the presence of walk.	HYSTERESIS	

1) Move to the next parameter group by pressing ▲• when the parameter is displayed.
2) Current mode and current set up condition is displayed when moving the parameter.
3) Set up can be changed by firmly pressing on to ▼– for long time.
4) Just move the Slide S/W to RUN or CNT to move to the executive mode after completing the set up,

1. When using at the Counter or RPM Measurement Mode, set up with the maximum value of [1-3]
hysteresis and [1-4] safe region (stability). (When using transmission type fiber unit)
2. In the case of Auto Teaching at the RUN Mode, GAIN [1-1] and
ADJU [1-2] values will change automatically.

■ Parameter 2 group

Move to Group 2 ▲• in FUN mode

Parameter menu and Display	Explannation	Range	Setting KEY
2-1 dL Dark_Light ▲fU Move to parameter 3 Group 2-2 on d ON_Delay 2-3 oFFd OFF_Delay 2-4 onES ONE Shot Time 2-5 E-In E-IN 2-6 CHAn CHANEL	Set up the Up Counter, Down Counter, and RPM Meter Modes.	L :Light ON d :Dark ON	▼• : Setting value change ▲– : Setting completitio/revert
	Set up the free scale.	9999 ms	▼• ▲• : Setting value change ▲– : Setting completitio/revert
	Set up the adjust value at the Counter.Set up the maximum value at RPM.		
	Set up the minimum value at RPM. (Exclusive RPM Use)		
	Set up the output motion mode of Counter and RPM Meter. Refer to the chart for details of the motion mode.	None 1-TE AUTO	
	Set up One Short Time of Out1 Port. (Unit: msec)	CH1 ch1 CH2 ch2	▼• : Setting value change ▲– : Setting completitio/revert

1) Move to the next parameter group by pressing ▲• when the parameter is displayed.
2) Current mode and current set up condition is displayed when moving the parameter.
3) Set up can be changed by firmly pressing on to ▼– for long time.
4) Just move the Slide S/W to RUN or CNT to move to the executive mode after completing the set up,

■ Parameter 3 Group setting

Move to Group 3 ▲• in FUN mode

Parameter menu and Display	Explannation	Range	Setting KEY
3-1 nddE MODE ▲fU Move to parameter 4 Group 3-2 PrE PRESCALE 3-3 S-HI SETTING HI 3-4 S-Lo SETTING LOW 3-5 OutN OUT1 MODE 3-6 onES ONE SHOT TIME	Set up the Up Counter, Down Counter, and RPM Meter Modes.	rPn Rpm Meter uP Up Counter dn Down Counter	▼• : Setting value change ▲– : Setting completitio/revert
	Set up the free scale.	1-999(Input / PRE=Display value) 1001-1999(Input ×PRE=Display value)	▼• ▲• : Setting value change ▲– : Setting completitio /revert
	Set up the adjust value at the Counter.Set up the maximum value at RPM.	1 -9999	
	Set up the minimum value at RPM. (Exclusive RPM Use)		
	Set up the output motion mode of Counter and RPM Meter. Refer to the chart for details of the motion mode.	Counter operation nFCrUPdA RPM operation SHL	
	Set up One Short Time of Out1 Port. (Unit: msec)	10,20,30,40,50,100,200, 300,400,500,1000,2000, 3000,4000,5000 msec (▼• DOWN value ▲• UP value)	

OUT2 (STB LED) is outputted whenever the sensitivity value is greater than the [1-4] value.
(Use for verifying the presence of calculation.)
1) Move to the next parameter group by pressing ▲• when the parameter is displayed.
2) Current mode and current set up condition is displayed when moving the parameter.
3) Set up can be changed by firmly pressing on to ▼– for long time.
4) Just move the Slide S/W to RUN or CNT to move to the executive mode after completing the set up

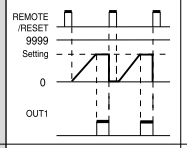
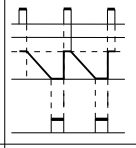
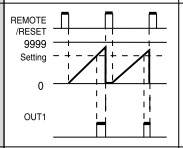
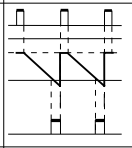
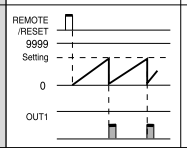
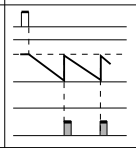
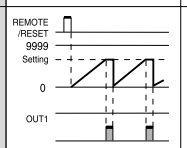
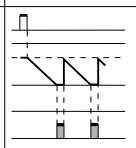
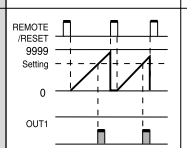
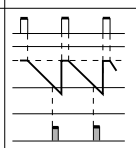
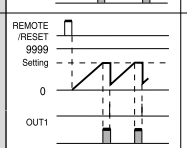
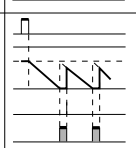
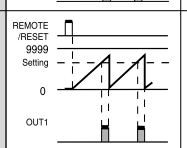
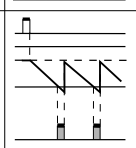
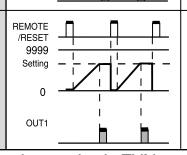
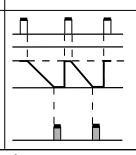
● Set Up Example
• Free Scale Set Up [3-2]
Example 1) counting one by one for input of 5 at the Counter Mode (Division Set Up 5)
Example 2) Counting in three for input of 1 at the Counter Mode, 3+1000=set up 1003
Example 3) 1/60 (set up 60) since 60rpm is 1cps when displaying as CPS at the RPM Mode
Example 4) displaying with RPMx5 for input of 5 at the RPM Mode (Set Up 5)
(Displaying RPM with 0.2 input as a base)
• Setting HI [3-3]/Setting LOW [3-4]
Example 1) Up Counter: when setting 100 as the setting value (Set Up [3-3]: 100)
Example 2) Down Counter: when counting down from 200 to 0 (Set Up [3-3]: 200)
Example 3) RPM Meter: when assigning output conditions by specifying rpm range of 500~600 (Set Up [3-3] HI: 600, Set Up [3-4] LOW: 500)

• Output operation mode [3-5]

· Function and output explan ation in RPM mode

Output mode[3-5]	Explannation
S (Standard)	Between high limit value[3-3] and low limit value[3-4] OUT1 ON, OUT2 OFF
H (High)	More than high limit value[3-3] OUT1 ON More than low limit value[3-4] OUT2 ON
L (Low)	More than high limit value[3-3] OUT1 ON More than low limit value[3-4] OUT2 ON

· Function Output explan ation in Counter Keep up value ※One shot value

		UP mode	DOWN mode	Explanations
OUTPUT Mode	n			Calculation stops and output is on when the adjust value is reached. The output off calculated value is reset at the rising Edge of Reset. Calculation begins at the declining Edge of Reset.
	F			Calculation continues even after reaching the adjust value and the output stays on. The output off calculated value is reset at the rising Edge of Reset. Calculation begins at the declining Edge of Reset.
	C			The output is generated as one short when the adjust value is reached and the calculation value is released with the Reset.
	r			The output is generated as one short when the adjust value is reached and when the calculation stop one short time is over, the calculated value starts calculation with the Reset.
	Y			The output is generated as one short when the adjust value is reached. The calculated value is reset at the rising Edge of Reset Calculation begins at the declining Edge of Reset
	P			The output is generated as one short when the adjust value is reached and the calculation value is reset. It doesn't calculate during the one short period.
	q			The output is generated as one short when the adjust value is reached and the calculated value resets and calculation begins at the declining edge where the one short ends.
	A			The output is generated as one short when the adjust value is reached and the calculation stops. The calculated value is reset at the rising Edge of Reset Calculation begins at the declining Edge of Reset

※One shot time setting in FUN mode

■ Parameter 4 group(subsichary function)

Move to Group 4 ▲• in FUN mode

Parameter menu and Display	Explannation	Range	Setting KEY
4-1 LOCK Lock ▲/u Move to parameter 1 Group ▼/u	FUN mode lock (refer to 5)	En: Enable dS: Disable	▼: ▲• setting value change ▲– : setting completition/revert
4-2 brit Bright ▼/u	Brightness setting and FND brightness control	[1-7]stages	
4-3 br_t Bright Time ▼/u	Bright Time setting Brightkeeping time	OFF, 5, 10, 15, 20, 30 sec 1, 2, 3, 4 min	
4-4 diSP Display 180 ▼/u	Display rotation (180rotation)	0: normal 180:180 rotation	
4-5 Init Default ▼/u	Default setting (Initial value setting)	Ent	

1) Move to the next parameter group by pressing ▲• when the parameter is displayed.

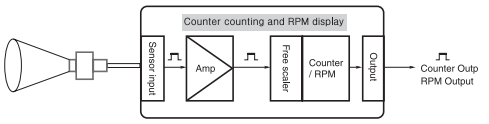
2) Current mode and current set up condition is displayed when moving the parameter.

3) Set up can be changed by firmly pressing on to ▼– for long time.

4) Just move the Slide S/W to RUN or CNT to move to the executive mode after completing the set up,

5) LOCK Release Method: Press ▲• ▲• ▼• ▲• ▲• ▼• in order

■ COUNTER / RPM internal function



Counter Function and Set Up Method

It is combining the counter function to the ordinary fiber sensor function. It can be set up to output when it yields arbitrary
calculated value by calculating the walk. The maximum calculated range is 9999. It can set up Up Counter and Down Counter
and supports the output of free scale and 8 types of motion mode that is capable of division/ 배주set up. At this time, the remote
input function is changed to external reset use. Free scale is capable of displaying division and .

●OUT2 can be used as sensor output and is generated when the display value is changed.

■ Initialization of Calculation Value at the state of CNT Mode Execution

●The calculation display is `0' at the Up Count Mode and is Setting value [3-3] at the Down Count Mode
when ▼• is pressed. Calculation stops while the key is pressed on.

● Initialization of calculated value with the remote reset external input

●Set up example at the Counter Mode (Refer to the parameter set up for the details of set up.)

※Caution) Must carry out sensor sensitivity set up process as well.

• Set Up Example Calculate up to 350 by counting one each for input of 3 at the Up Counter Mode and then one short time
Stop the calculation at 50 msec output. Reset when the remote reset is displayed and set up to begin the calculation.

FUNCTION	PAGE	SET VALUE	REMARK
Operation Mode	[3-1] [MODE]	[Up]	UP Counter setting
Free scale	[3-2] [PRE]	[0003]	3 setting
Setting Hi	[3-3] [S-HI]	[0350]	350 value
Setting Low	No use in Counter mode		
Output Mode	[3-5] [OUTM]	[n]	Refer to counter mode table
One Shot Time	[3-6] [ONES]	[500]	500 msec setting

RPM Meter Function & Set Up Method

It is the RPM Display Function. It is capable of measuring from 1~9999rpm and supports speed monitoring output and
maximum/minimum adjust output. The speed monitoring output is materialized to give out alerting output when goes beyond
10% of the adjust value. With the function support of free scale (0001~0999), CPS value can be displayed when set up at 60.
Also, it supports the division and πË¡÷ functions. However, the display value cannot exceed 400 CPS/ps value. The output is
generated in one short.

● Set Up Example at the RPM Mode (Refer to the parameter set up for the details of set up.)

※ Caution) Must carry out sensor sensitivity set up process as well.

• Set Up Example RPM is displayed in the case of one rotation based on the input of one for exclusive use
of RPM display and the output is generated by having 500rpm to 550rpm as standard. For between
500~550, set up as OUT1 ON / OUT2 OFF.

FUNCTION	PAGE	SET VALUE	REMARK
Operation Mode	[3-1] [MODE]	[Rpm]	RPM Mode setting
Free scale	[3-2] [PRE]	[0001]	1setting
Setting Hi	[3-3] [S-HI]	[0550]	OUT1 set value
Setting Low	[3-4] [S-LO]	[0500]	OUT2 set value
Output Mode	[3-5] [OUTM]	[S]	Output Mode
One Shot Time	[3-6] [ONES]	[OFF]	Real time output