

# FOX-HD

## HIGH SPEED DIGITAL OPTICAL FIBER AMPLIFIER



### INSTRUCTION SHEET

Thank you for selecting INNO for your requirement.

This sheet describes the procedure and precautions required for installing and operating the product.

Kindly read this sheet before operating or installing the product. Store the sheet for future reference.

#### CAUTION FOR SAFETY

- ⓘ Please keep this sheet for review before use of unit.
- ⓘ Please observe the following:

**WARNING**  
Serious injury may occur if instructions are not followed

**CAUTION**  
Product failure or injury can occur if instructions are not followed

#### WARNING

- This is not a safety product and is not to be used with machinery that requires use of safety sensing and control device.
- Do not disassemble or modify this unit. It may lead to electric shock/fire.

Do not connect sensor to AC power supply.  
RISK OF EXPLOSION!

#### CAUTION

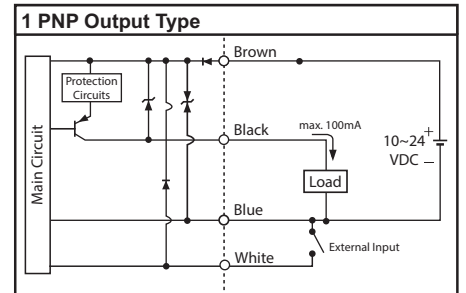
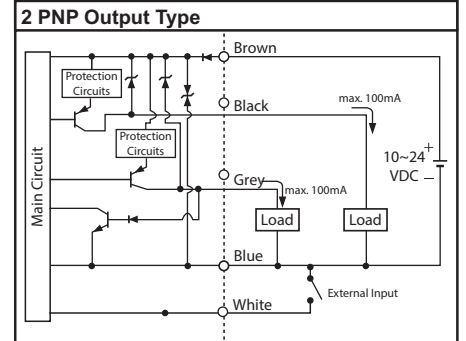
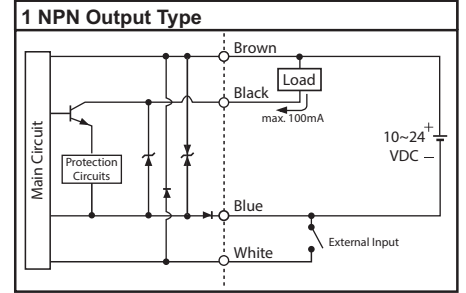
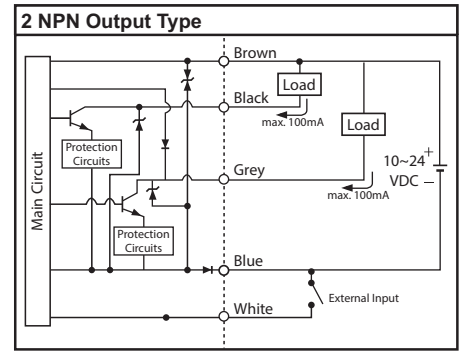
- This unit is not intended for outdoor use.
- Do not use the unit in places where there is flammable or explosive gas.
- Please observe the rated specifications in Instruction Sheet.
- Do not use this unit beyond rated power and do not supply AC power at DC power type.
- Please check the polarity of power and wrong wiring.
- Do not use this unit in places where there is vibration or impact.
- Do not use water or oil based detergent for cleaning the unit.
- Do not use excessive force to tighten the unit and do not hammer the unit.
- Please process it as industrial waste and dispose responsibly.

#### SPECIFICATIONS

\*For details on Customized/ Special Models contact Seller

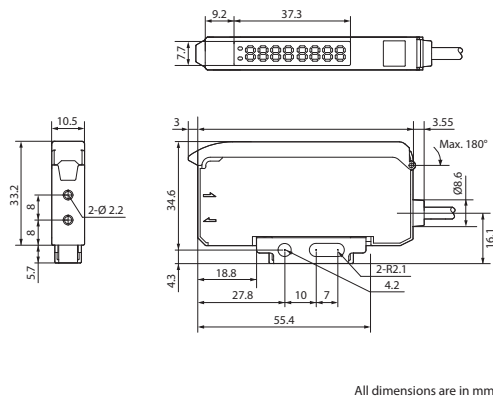
Type	NPN Output	PNP Output
*Models	1 Output	FOX-HD-SN-2M
	2 Output	FOX-HD-SP2-2M
Light Source	Red LED, 632nm	
Response Time (modes)	High Speed: 16μs; Fast: 70μs; Standard: 250μs; Long Distance: 500μs; Power Long Distance: 1ms; Ultra Long Distance: 2ms; Extra- Ultra Long Distance: 8ms	
Display	Type	37mm; Red- 4 digit 8-segment LED display; Green- 4 digit 8-segment LED display
	Power Control	3 Steps: 100%, 50%, 25%
Timer	On Delay/ Off Delay/ One Shot (1~9999ms)/ On + Off Delay/ On Delay + One Shot (1~9999ms)	
Teach Mode	2 Point/ 1 Point/ Through/ Zone/ Automatic/ Percentage/ Zero Percentage Teach	
Sensing Mode	Standard, Long Distance, Fast Modes	
Operation Mode	Light ON/ Dark ON Selectable	
Supply Voltage	10 - 24 VDC (Ripple Max 10%)	
Current Consumption	39mA max. @ 24VDC/ 28mA max. @ 24VDC (ECO mode)	
Protection Circuits	Reverse Polarity, Shortcircuit, Output Overcurrent	
Ext. Input	Teach-in, Emitter Stop, Counter Reset	
Control Output	2 Channel, NPN/ PNP	
Control Output Rating	Load Voltage: max. 30 VDC; Load Current: max 100mA; Residual Voltage: 1.8V or less	
Output Indication	CH1, CH2 - Orange LED	
Vibration Resistance	10-55Hz; 1.5mm for 2 hours in X, Y, Z directions	
Shock Resistance	50G in X, Y, Z directions 3 times	
Environmental Illuminance	Sunlight: 10,000 lux, Lamp: 3,000 lux	
Ambient Temperature	Operation: -25° ~ 55°C; Storage: -40° ~ 70°C (non-freezing; non-condensing)	
Ambient Humidity	Operation: 35 ~ 85% RH; Storage: 35 ~ 85% RH (non-condensing)	
Protection Class	IP50	
Weight	aprox. 70g with cable	
Material	PC (Cover and Case)	

#### OUTPUT CIRCUIT DIAGRAM

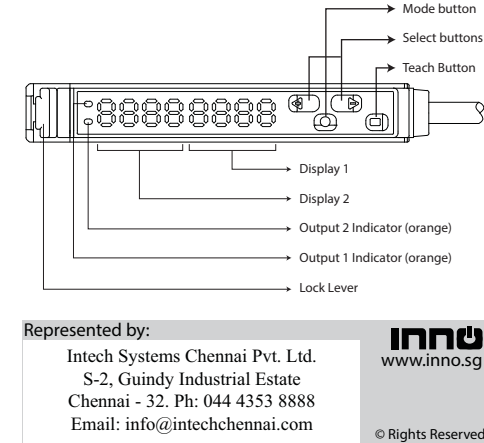


Brown : DC 10-24V  
Blue : 0V  
Black : Control Output 1  
Grey : Control Output 2  
White : External Input

#### DIMENSIONS



#### NOMENCLATURE



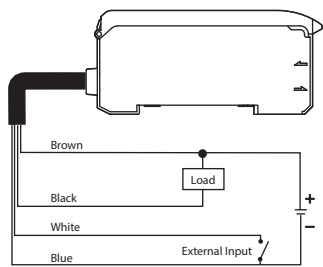
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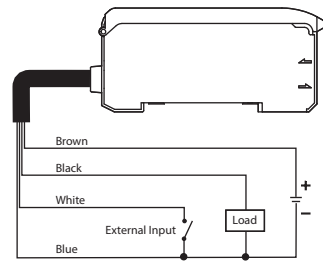
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#### CONNECTION DIAGRAM

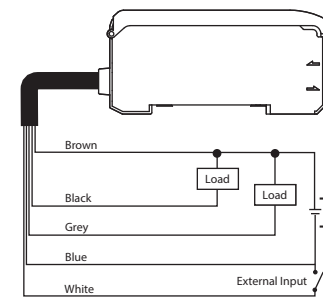
##### FOX-HD-SN-2M



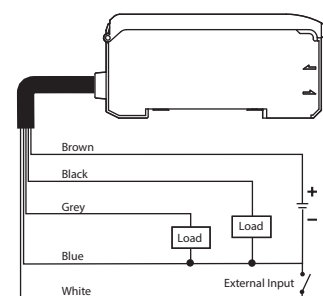
##### FOX-HD-SP-2M



##### FOX-HD-SN2-2M

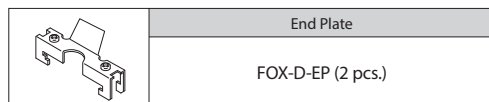


##### FOX-HD-SP2-2M



Brown : DC 10-24V  
Blue : 0V  
Black : Control Output 1  
Grey : Control Output 2  
White : External Input

#### OPTIONAL PART



#### TEACHING

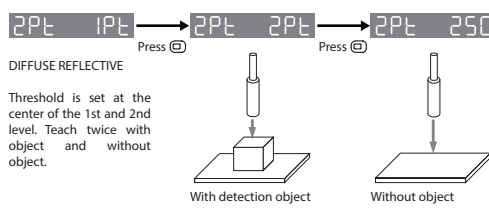
Press the **TEACH** button for 3 seconds to enter the teaching mode.

Press **MODE** buttons to select the appropriate teaching mode, press **TEACH** button to make the teach in the selected mode.

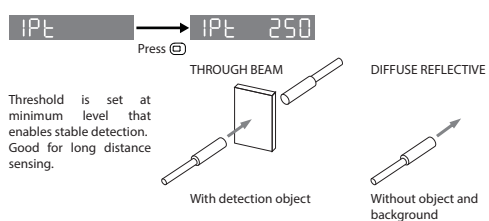
When teaching is complete, it goes back to the RUN mode after the threshold blinks.

You can refer to the current sensing level by pressing **MODE** button while teaching.

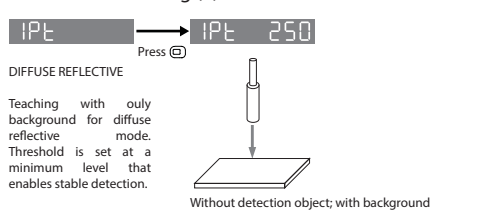
##### Two Point Teaching



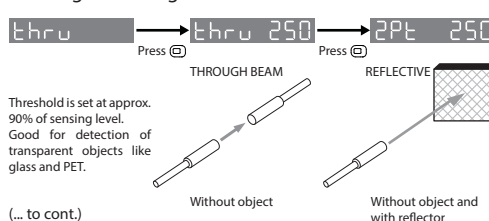
##### One Point Teaching (1)



##### One Point Teaching (2)



##### Through Teaching

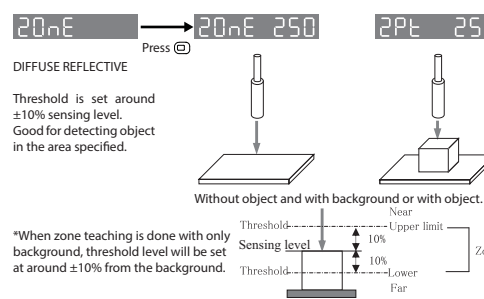


Threshold is set at approx. 90% of sensing level. Good for detection of transparent objects like glass and PET.

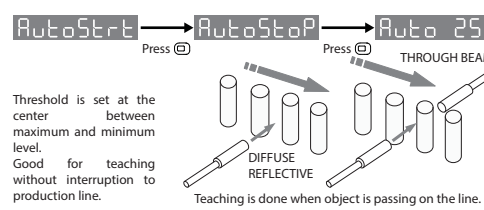
(... to cont.)

#### TEACHING (cont.)

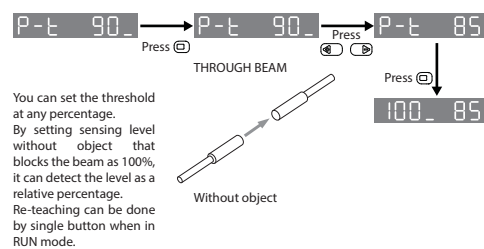
##### Zone Teaching



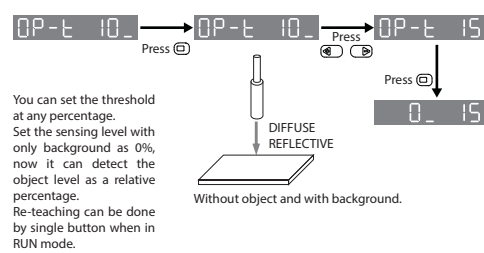
##### Automatic Teaching



##### Percent Teaching



##### Zero Percent Teaching



##### Exit the Teaching Mode

**End tEch** → By pressing **TEACH** button it goes back to RUN mode

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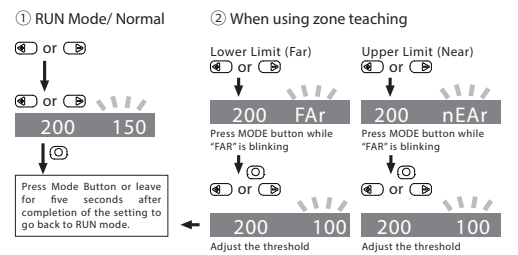
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#### TEACHING AND ADJUSTMENTS

##### Manual Adjustment of Threshold

When in RUN mode, press **MODE** or **MODE** then, threshold display blinks. Now it can be adjusted. Adjust the threshold by pressing **MODE** or **MODE**. The upper and lower threshold value can be adjusted when it is in Zone Teaching mode



##### Error Display in Teaching

An error message is displayed in the event of error during adjustment.

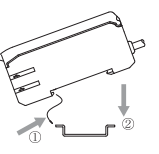
Err1	Sensing level is not enough
Err2	Sensing level is saturated
Err3	Difference of sensing level between two points

#### MOUNTING AND ADJUSTMENTS

##### Din Rail Mounting

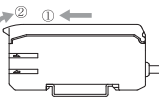
###### Attachment of Amplifier Unit

Hook the claw on the connecting side of fiber cable to the DIN rail. Then press down the hook until it locks.



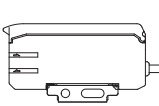
###### Removal of Amplifier unit

Pushing the unit in the direction of ①, hold up the connecting side of fiber cable and remove the unit.



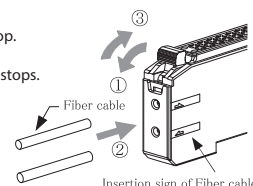
##### Direct Mounting

Attach the metal plate in the amplifier and screw the plate onto any even surface.



##### Connecting Fiber Sensor Cables

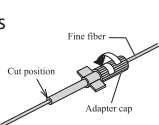
- Open fiber lock lever.
- Insert fiber into holes till they stop. (approx. 15mm)
- Press the fiber lock lever until it stops.



Note: When using coaxial reflection fiber, set single core fiber/ white lined fiber to the emitter. Then set the multi-strand fine wick fiber to the receiver.

##### Connecting Fine Fiber Sensor Cables

- Turn adapter cap anti-clockwise completely, then appropriately insert the fiber. Lock the fiber by turning the adapter cap clockwise
- Cut the excess fiber with fiber cutter.



**BASIC FUNCTION SETTING**

Press "MODE" button over 3 sec.

Choose the setup value by **◀** and **▶**. Select the setup by **⏏** and go back to top of each menu. "\*" is default value.

1. Output mode  
 L-on ON by sensing light (Light ON) \*  
 L-off ON by blocking light (Dark ON)

2. Response speed  
 r-1-HS High Speed response time:16µs  
 r-2-FS Fast response time:70µs  
 r-3-ST Standard response time:250µs \*  
 r-4-LG Long response time:500µs  
 r-5-PL Power Long response time:1ms  
 r-6-UL Ultra Long response time:2ms  
 r-7-EL Extra Long response time:8ms

Choose fast mode when detecting object moving fast at close distance. Choose slow mode for detecting object at longer distance.

3. Timer/Delay  
 d-ELLY OFF \*  
 d-OFDY OFF delay timer  
 d-ONDY ON delay timer  
 d-SHOT One shot timer  
 d-ONOF ON delay and OFF delay timer  
 d-ONSH ON delay and One shot timer

Timer can be set from 0.1 to 9999ms.  
 0.1 ~ 9999 9999  
 \*When choose "onF" or "onSh", each ON delay/OFF delay and ON delay/One shot timer can be set individually.

4. Expert mode  
 EPrt Enter to Expert mode (refer Expert menu)

5. Initialize  
 r-SET no No initializing \*  
 r-INIE Setup to default  
 r-USEP Setup with saved parameters

\*"USEP" is shown only when there is saved parameter by "SAVE" in Expert mode. Refer "Expert mode4-12. Saving user parameter"

End Exit Basic menu.  
 Go back to RUN mode.  
 \*It goes back to RUN mode when there is no button operation for 30 seconds. It can be changed to RUN mode by single action as well. Refer other setting.

**NOTE**  
 Some menu items won't be shown, depends on the setup. When the parameter value is ready to be set, sub-display will blink. Following parameters of the 2 output type can be specified individually for CH1 (output1) and CH2 (output2). Other parameters are specified commonly.  
**Threshold, Output Mode, Timer and its value, Teaching Menu**

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**ADVANCED FUNCTION SETTING**

Choose the setup value by **◀** and **▶**. Select the setup by **⏏** and go back to top of each menu. "\*" is default value.

A

4-1 Zero reset  
 r-ST OFF  
 oFF No action \*  
 on Reset the main display

Reset the sensing level shown on the main display to zero and shift the threshold shown on the sub display as much as the main display has shifted. This function is not active in percentage and edge detection modes.

4-2 Display mode  
 di SP di 9  
 d 9 Digital mode \* Ex) 200 220  
 bRR Bar display mode Ex) 11111  
 Bar increases according to sensing level from right  
 Pct Percent mode Ex) 100 110  
 \* "\_" means it's percentage Sensing level Threshold  
 100% 110%

4-3 Eco mode  
 Eco OFF \*  
 di SP Power off sub display (green) and darken main display (red)  
 r-ESP Double emitting cycle. Actual response time will be doubled as well.  
 r-ALL Power off sub display, darken main display and double emitting cycle. Actual response time will be doubled as well. Brightness of the display will be changed 20 seconds after the setup.

Current consumption of "Eco ALL" will be 30% less than "Eco OFF".

4-4 Rotation  
 turn OFF  
 oFF No action \* Ex) turn OFF  
 on Rotate the display Ex) 90 270

This is effective when you have to mount the sensor in the opposite direction.

4-5 Hysteresis  
 HYS P 5  
 P 5 Set from 1% to 40%  
 P 1 ~ P 40  
 1% 40%

Set the hysteresis according to the condition. When it's unstable because of chattering, set bigger percentage. To detect slight difference, set smaller percentage.

4-6 Detection mode  
 PrCS Stnd  
 Stnd Detect by sensing level \*  
 Hd\_U Detect UP edge  
 Hd\_D Detect Down edge

Set filter level for edge detection  
 Fi Lt 1000 1,000 Hz \*  
 Fi Lt 200 200 Hz  
 Fi Lt 50 50 Hz  
 Fi Lt 20 20 Hz  
 Fi Lt 5 5 Hz

Faster speed of edge detection Slower

etect changes of sensing level in a certain period.  
 \*Detect Up edge: Detect the sensing level increase  
 \*Detect Down Edge: Detect the sensing level decreasing  
 \* Only automatic teaching can be executed when edge detection is activated.  
 \* Percentage display mode is unavailable when edge detection is activated.  
 \* Only CH1 can be set to edge detection for the 2 output type.  
 \* Hysteresis will be fixed at 1% when edge detection is active.  
 \* Edge detection won't work correctly when the sensing level is saturated or there is no light received.  
 \* Filter to be "slow" to detect sensing level that swings lower.

Choose the setup value by **◀** and **▶**. Select the setup by **⏏** and go back to top of each menu. "\*" is default value.

C B

4-7 Counter  
 cnt OFF  
 oFF Counter OFF \*  
 UPc Set counting direction UP  
 dnc Set counting direction DOWN

Set counter value from 2 to 9999  
 \*This function is only for "CH2" of the 2 output type.  
 \*Threshold of CH1 is used for this function so please change to CH1 when you set threshold.

4-8 External input  
 iNPE rtrh  
 rtrh External Teaching \*  
 tESG Emitting OFF input  
 SYnc Synchronous input (hold the output)  
 crSt Counter reset

\*"crSt" is available only on the 2 output type (D3RF-TD).

4-9 ASC  
 RSc OFF \*  
 uFF ASC OFF \*  
 on Correction speed : Standard  
 FRSt Correction speed : Fast  
 H 9h Correction speed : Fastest

ASC:  
 Adjust the threshold according to sensing level that is affected by environmental condition automatically. It corrects the threshold even when the sensing level changes quickly by cleaning up contamination. This is only for Through Teaching and Percent Teaching. ASC speed:  
 "on" : adjust threshold "1" every three seconds  
 "FAST" : adjust threshold "1" every one second  
 "High" : adjust threshold "1" every 0.25 seconds  
 \*Edge detection is unavailable when ASC is active.  
 \*ASC is not available after Zone Teaching is executed.  
 \*ASC is not available on CH2 output.

4-10 Emitter power  
 SPor 1111  
 1111 Maximum \*  
 111 Minimum

Specify emitter power  
 Normally, maximum level is OK. Please lower the emitter power when sensing level is saturate.

4-11 Lock level  
 LocL L 1  
 L 1 Lock level 1 \*  
 L 2 Lock level 2  
 Lock Keys except Teaching button and buttons for switching percent display and standard level display. Only channel of the 2 output type can be changed.

You can Lock buttons actually by pressing **⏏** 3 seconds at a time.  
 \*External inputs are active on any Lock level.

4-12 Save  
 SRAE no  
 no No action \*  
 YES Save the current setup

Save the current setup parameters

End EPrt Exit Expert menu  
 Go to top of Expert menu

**OTHER SETTING**

**• Switch Channel (only for 2 output type)**  
 Press **⏏** button then, the channel number will be blinking and now we can switch to the channel.

CH1 display 200 250 CH2 CH1 CH2 display 200 100

Threshold of CH2 will be copied to CH1 under the following conditions after external teaching.  
 This is useful when you want to set single threshold level for CH1 and CH2.  
 - ASC and Edge detection are inactive.  
 - Teaching mode of CH1 is same as CH2.  
 - Display is showing level of CH2.  
 \* You can switch channel from any setup menu.

**• Key Lock**  
 Cancels all the operations. Useful to prevent accidental operation.  
 Hold down the **⏏** buttons for 2 seconds or more simultaneously in the RUN mode. Operate in the same way to cancel as well.

In locking Loc When cancelled unlc

**• Single Key RUN**  
 Press **⏏** button for 3 seconds in setup menu while sub display is not blinking to return to RUN mode.

**• Single Action Percentage Display**  
 Press **⏏** and **⏏** buttons at the same time for 2 seconds. The display switches to percentage display.

Sensing level 5000 Percent display 100

You can set this function at "Expert function setting 4.2 Display mode" as well.  
 Repeat the same action to get back to the Standard Display mode.

**• Fitting In (set sensing level to "100/0%")**  
 When "Percent Teaching" or "Zero Percent Teaching" is chosen in Teaching menu, you can set the sensing level to 100 or 0% by pressing **⏏** & **⏏** buttons at the same time. This method is effective when the sensing is unstable.

Before Fitting 90 After Fitting 100

**• Preventing Saturation while Teaching**  
 You can see light level as following by pressing Mode button **⏏** while teaching. Press Mode button **⏏** for 3 seconds. Then, the emitting level will be changed to get optimized light level, around half of saturated level, automatically. After, press Teaching button **⏏** so that the teaching is done correctly.

9999 3 seconds 9999 Adj 5000 End  
 Current Light Level Emitting power to be optimized Optimization is done

\* Saturated light level is "3000" for response speed 1-HS and 2-FS.  
 \* Saturated light level is "9999" for response speed 3-ST ~ 7-EL.  
 \* To cancel this function, set emitter power as "11111111111111" instead of "Rdu".

INTENTIONALLY LEFT EMPTY