Single / Dual Display Fiber Optic Amplifiers

BF5 Series

INSTRUCTION MANUAL

TCD210065AA

Autonics

Thank you for choosing our Autonics product.
Read and understand the instruction manual and manual thoroughly before using the product.
For your safety, read and follow the below safety considerations before using.
For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.
Keep this instruction manual in a place where you can find easily.
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.
Follow Autonics website for the latest information.

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.(e.g., nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, economic loss or fire.
02. Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.
Failure to follow this instruction may result in explosion or fire.
03. Install the unit on DIN rail to use.
Failure to follow this instruction may result in fire.
04. Do not disassemble or modify the unit.
Failure to follow this instruction may result in fire.
05. Do not connect, repair, or inspect the unit while connected to a power source.
Failure to follow this instruction may result in fire.
06. Check 'Connections' before wiring.
Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. Use the unit within the rated specifications.
Failure to follow this instruction may result in fire or product damage.
02. Use a dry cloth to clean the unit, and do not use water or organic solvent.
Failure to follow this instruction may result in fire.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- When connecting an inductive load such as a DC relay, remove surge by using a diode or varistor.
- Use the product after 3 sec of the power input.
- The power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Wire as short as possible and keep it away from high voltage lines or power lines to prevent surge and inductive noise.
- When using switching mode power supply (SMPS), ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove noise.
- Since external disturbance light (sunlight, fluorescent lighting, etc.) can cause product malfunction, use the product with a light shield or slit.
- When sensing an object with the maximum sensitivity, an error of sensing distance can occur due to the deviation of each feature.
- Turn off the power of the fiber optic amplifier before installation or removal.
- When installing the fiber optic unit, check the bend radius of each unit written on the product manual. If the installed unit that has the bend radius under the rated range, causing optical loss so the sensing distance is shortened.
- Be sure not to scratch the surface of the fiber optic unit.
- Do not pull the cable of the fiber optic unit that is connected to the amplifier.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000 m
  - Pollution degree 2
  - Installation category III

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

BF5 ❶ - ❷ 1 - ❸

❶ Light source
R: Red LED
G: Green LED
B: Blue LED

❷ Display part
D: Dual display
S: Single display

❸ Control output
N: NPN open collector output
P: PNP open collector output

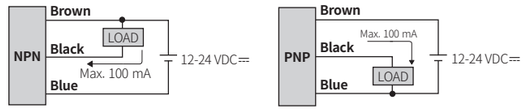
Product Components

- Product
- Connector cable
- Instruction manual
- Side connector

Sold Separately

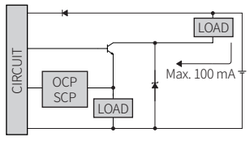
- Fiber optic units
- Communication converter: BFC Series

Connections

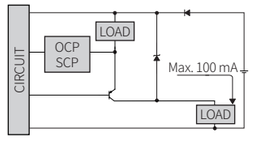


Circuit

■ NPN open collector output



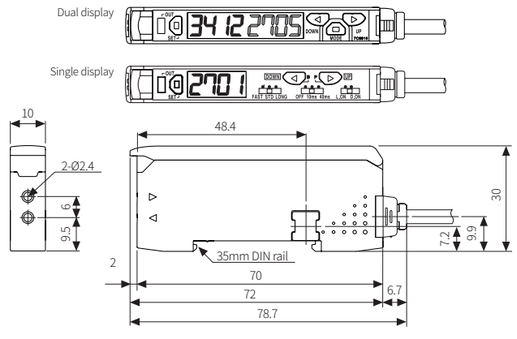
■ PNP open collector output



- OCP (over current protection), SCP (short circuit protection)

Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.



Error

Error	Cause	Troubleshooting
Err	In RUN mode, the overcurrent has been detected from the output circuit.	Remove the overcurrent due to the overload.
Erb	- Slave fails to execute the Master's instructions such as 1:M copy, load all, save all, and group teaching due to unstable communication lines. - Another communication error occurs.	- Check the cascaded amplifiers. - Check the circuitry around the side connector and hardware condition.

Specifications

Model	BF5R-D1-□	BF5G-D1-□	BF5B-D1-□
Light source	Red LED	Green LED	Blue LED
Peak emission wavelength	660 nm, modulated	530 nm, modulated	470 nm, modulated
Response time	Standard (500 μs), Long distance (4 ms), Ultra long distance (10 ms), Ultra fast (50 μs), Fast (150 μs) mode		
Sensitivity setting	Manual, Teaching (Auto-tuning, 1-point, 2-point, positioning)		
Operation mode	Light ON, Dark ON		
Measured value display	7-segment LCD, 4-digit (decimal, percentage)		
Operation mode of the timer	OFF, OFF Delay, ON Delay, One-shot		
Max. cascading units	≤ 31 units		
Mutual interference prevention	≤ 8 units		
Indicator	Operation indicator (red), display screen (PV display part: red LED, SV display part: green LED)		
Approval	CE EAC	CE EAC	CE EAC
Unit weight (packaged)	≈ 20 g (≈ 138 g)	≈ 20 g (≈ 138 g)	≈ 20 g (≈ 138 g)

Model	BF5R-S1-□
Light source	Red LED
Peak emission wavelength	660 nm, modulated
Response time	Standard (500 μs), Long distance (4 ms), Fast (150 μs) mode
Sensitivity setting	Manual, Teaching (Auto-tuning)
Operation mode	Light ON, Dark ON
Measured value display	7-segment LCD, 4-digit (decimal, percentage)
Operation mode of the timer	OFF Delay (time range: OFF, 10 ms, 40 ms)
Mutual interference prevention	≤ 8 units
Indicator	Operation indicator (red), display screen (PV / SV display part: red LED)
Approval	CE EAC
Unit weight (packaged)	≈ 20 g (≈ 138 g)

Power supply	12-24 VDC⎓ ±10% (ripple P-P: ≤ 10%)
Current consumption	≤ 50 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 24 VDC⎓
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC⎓, PNP: ≤ 3 VDC⎓
Protection circuit	Reverse power protection circuit, output short over current protection circuit, surge protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC⎓ megger)
Dielectric strength	1,000 VAC~ 50 / 60 Hz for 1 min
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s² (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-10 to 50 °C, storage: -20 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
Protection rating	IP40 (IEC standard)
Connection	Connector cable
Cable spec.	Ø 4 mm, 3-wire, 2 m
Wire spec.	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm
Tightening torque for fiber optic unit	≥ 2kgf
Material	Case: PBT, cover: PC

Supporting Functions & Mode Settings

- For more detailed information on functions and settings, refer to the manual.

■ Dual display model

RUN	[MODE] 3 sec	→	Program mode	[MODE] 3 sec	→ RUN
	[SET]	→	Teaching sensitivity setting	Auto	→
	[SET] 3 sec	→	Group teaching	Auto	→
	[◀] or [▶]	→	Manual sensitivity setting	Auto after 3 sec	→
	[MODE] 5 sec	→	Data bank mode	[MODE] 3 sec	→
	[SET] + [▶]	→	Anti-saturation function	Auto	→
	[MODE]	→	Incident light level monitoring	[MODE] or auto after 1 min	→
	[MODE] 7 sec	→	Initialization	Auto	→

■ Single display model

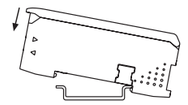
RUN	[SET]	→	Teaching sensitivity setting	Auto	→ RUN
	[SET] 3 sec	→	Group teaching	Auto	→
	[◀] or [▶]	→	Manual sensitivity setting	Auto after 3 sec	→
	[SET] + [▶]	→	Anti-saturation function	Auto	→
	[▶] 3 sec	→	Incident light level monitoring	[▶] or auto after 1 min	→
	[◀] 3 sec	→	Measured value display	Auto	→

Mode	Switch settings	Setting range
Response time	FAST STD LONG	FST: fast mode (150 μs) STD: standard mode (500 μs) LONG: long distance mode (4 ms)
Time of the timer	OFF 10ms 40ms	Timer operation mode: OFF Delay Time: OFF, 10 ms, 40 ms • Refer to the 'Timing Chart of the Timer.'
Operation mode	L.ON D.ON	L.ON (Light ON): when the light is received state, operation indicator turns ON. D.ON (Dark ON): when the light is interrupted state, operation indicator turns ON.

DIN Rail Mount and Removal

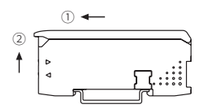
■ Mount

01. Hang up the holder on the backside of the amplifier to the DIN rail (35 mm).
02. Press the front side of the amplifier toward the DIN rail.



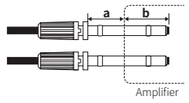
■ Removal

01. Slide the amplifier to direction ①.
02. Lift the front side of the amplifier to direction ②.



Insert Fiber Optic Unit

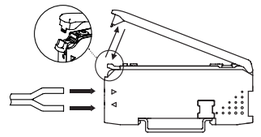
01. Lift the protective cover and lower down the lever lock.
02. Insert the cable of the fiber optic unit to the slot completely.
(▷ : receiver part, ◁ : emitter part)



Length (mm)	Receiver part	Emitter part
a 01)	8	
b	13	

01) With the adaptor attached

03. Lift the lever lock to fix the fiber optic unit and close the protective cover.



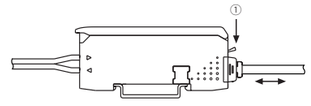
Connect and Remove Connector Cable

■ Connection

Insert the connector into the amplifier mounted to the DIN rail with a click.

■ Removal

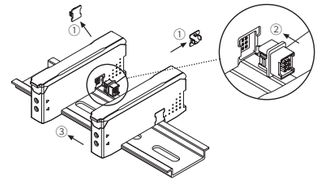
Press the connector part to direction ① and pull it.



Cascade the Amplifiers

- Cascading multiple amplifiers is available via the side connector. (max. 31 units)
- Make sure that if you connect the side connector with excessive force, it may cause extruded pins.
- Be sure to mount the side connector to fit tightly. Otherwise, the communication connection and the function of mutual interference prevention may not normally work.
- All amplifiers share the supply power from the one.
- When power is supplied, assigning channels o the cascaded amplifiers automatically (direction: →, channel number: +1). Be aware that the channel number cannot be changed, and it is not saved when turning off the power.
  - Dual display model: it is available to check P-9. Channel in the program mode.
  - Single display model: it is only available when the power is supplied for the first time.
- The function of mutual interference prevention activates after cascading amplifiers with supplying power. (max. 8 units)

01. Turn OFF the power of all amplifiers.
02. Remove the side cover (①) on the amplifier and mount the side connector (②) to the socket.
03. Hang up the amplifier to the DIN rail and push it to direction ③.
04. Be sure to check the connection of the amplifiers and side connector.



18, Bansong-ro 513Beon-gil, Haeundae-gu, Busan, Republic of Korea, 48002
www.autonics.com | +82-51-519-3232 | sales@autonics.com

Autonics