DF-G1 Expert™ Dual Display Fiber Optic Light Receiver

Quick Start Guide

Advanced sensor with dual digital displays for use with plastic and glass fiber optic assemblies

For complete technical information about this product, including dimensions, accessories, and specifications, see *http://www.bannerengineering.com* and search 176768.

WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

Overview

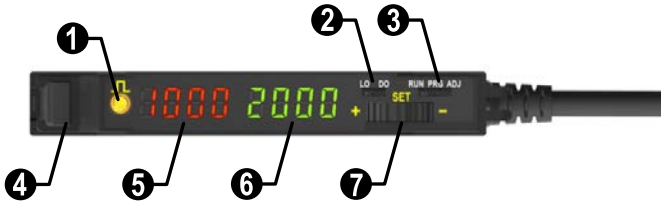


Figure 1. DF-G1 Model Features

1	Output LED
2	LO/DO Switch
3	RUN/PRG/ADJ Mode Switch
4	Lever Action Fiber Clamp
5	Red Signal Level
6	Green Threshold
7	+/SET/- Rocker Button

Models

Model	Outputs	Connector[1]
DF-G1-NR-2M	Single NPN	2 m (6.5 ft) cable, 4-wire
DF-G1-PR-2M	Single PNP	
DF-G1-NR-Q5	Single NPN	150 mm (6 in) PVC pigtail, M12 Euro QD connector, 4-pin
DF-G1-PR-Q5	Single PNP	
DF-G1-NR-Q7	Single NPN	Integral M8 Pico QD connector, 4-pin
DF-G1-PR-Q7	Single PNP	

[1] Connector options:
- A model with a QD connector requires a mating cordset.
- For 9 m cable, change the suffix 2M to 9M in the 2 m model number (example, DF-G1-NR-9M).
- For 150 mm (6 in) PVC pigtail, M8 Pico QD connector, 4-pin change the suffix 2M to Q3 in the 2 m model number (example, DF-G1-NR-Q3).

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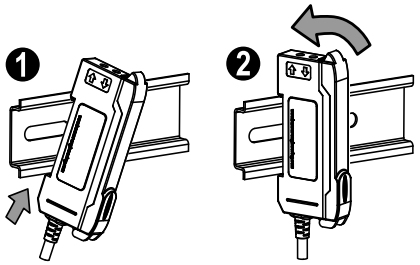
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Installation Instructions

Mounting Instructions

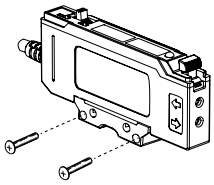
Mount on a DIN Rail

1. Hook the DIN rail clip on the bottom of the DF-G1 over the edge of the DIN rail (1).
2. Push the DF-G1 up on the DIN rail (1).
3. Pivot the DF-G1 onto the DIN rail, pressing until it snaps into place (2).



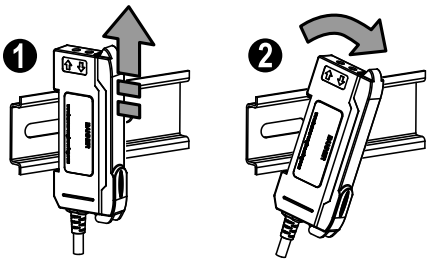
Mount to the Accessory Bracket

1. Position the DF-G1 in the SA-DIN-BRACKET.
2. Insert the supplied M3 screws.
3. Tighten the screws.



Remove from a DIN rail

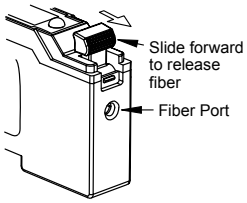
1. Push the DF-G1 up on the DIN rail (1).
2. Pivot the DF-G1 away from the DIN rail and remove it (2).



Installing the Fibers

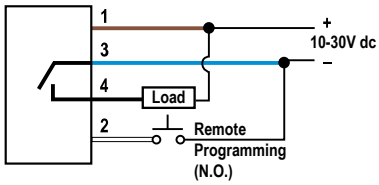
Follow these steps to install glass or plastic fibers.

1. Open the dust cover.
2. Move the fiber clamp forward to unlock it.
3. Insert the fiber(s) into the fiber port(s) until they stop.
4. Move the fiber clamp backward to lock the fiber(s).
5. Close the dust cover.

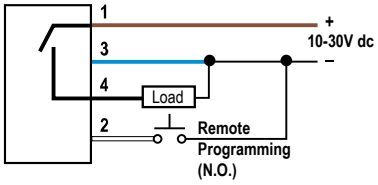


Wiring Diagrams

NPN Models



PNP Models



Key

1 = Brown
2 = White
3 = Blue
4 = Black

NOTE: Open lead wires must be connected to a terminal block.

Top Panel Interface

Opening the dust cover provides access to the top panel interface. The top panel interface consists of the RUN/PRG/ADJ mode switch, LO/DO switch, +/SET/- rocker button, dual red/green digital displays, and output LED.



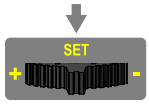
RUN/PRG/ADJ Mode Switch

The RUN/PRG/ADJ mode switch puts the sensor in RUN, PRG (Program), or ADJ (Adjust) mode. RUN mode allows the sensor to operate normally and prevents unintentional programming changes via the +/SET/- rocker button. PRG mode allows the sensor to be programmed through the display-driven programming menu (see Program Mode below). ADJ mode allows the user to perform Expert TEACH/SET methods and Manual Adjust (see Adjust Mode below).



LO/DO Switch

The LO/DO switch selects Light Operate or Dark Operate mode. In Light Operate mode, the output is ON when the sensing condition is above the threshold. (For Window SET, the output is ON when the sensing condition is inside the window.) In Dark Operate mode, the output is ON when the sensing condition is below the threshold. (For Window SET, the output is ON when the sensing condition is outside the window.)



+/SET/- Rocker Button

The +/SET/- rocker button is a 3-way button. The +/- positions are engaged by rocking the button left/right. The SET position is engaged by clicking down the button while the rocker is in the middle position. All three button positions are used during PRG mode to navigate the display-driven programming menu. During ADJ mode, SET is used to perform TEACH/SET methods and +/- are used to manually adjust the threshold(s). The rocker button is disabled during RUN mode, except when using Window SET, see *Window SET* on page 6.



Red/Green Digital Displays

During RUN and ADJ modes, the Red display shows the signal level, and the Green display shows the threshold. During PRG mode, both displays are used to navigate the display-driven programming menu.



Output LED

The output LED provides a visible indication when the output is activated.

Operating Instructions

Remote Input

For more information about how to perform TEACH/SET methods and to program the sensor remotely, see *www.bannerengineering.com* and search 176768.

Run Mode



Run mode allows the sensor to operate normally and prevents unintentional programming changes. The +/SET/- rocker button is disabled during RUN mode, except when using Window SET, see *Window SET* on page 6.

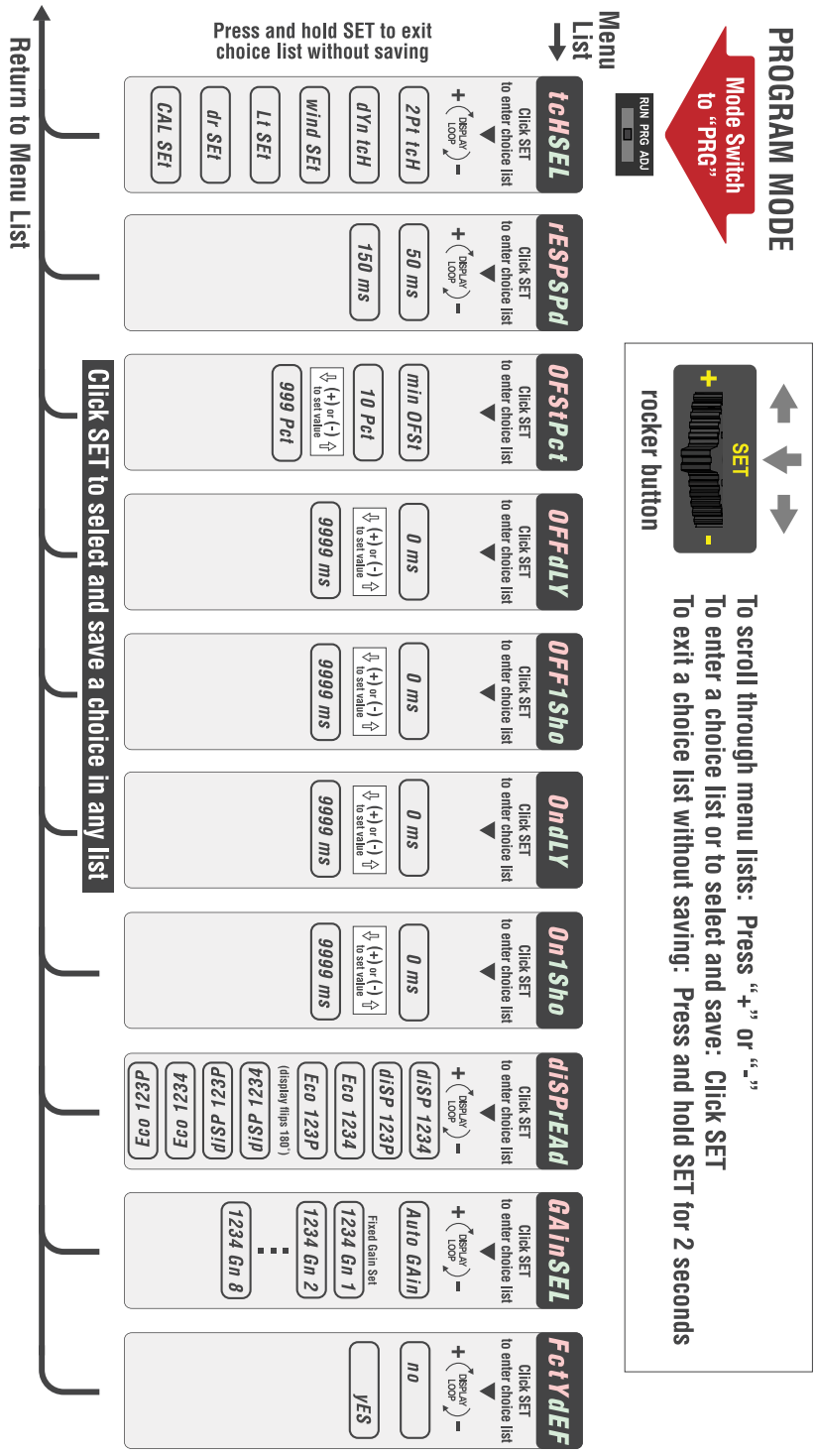
Program Mode



Program (PRG) mode allows the following settings to be programmed in the DF-G1:

Factory Default Settings:

Setting	Factory Default
Threshold	5000
TEACH Selection	Two-Point TEACH
Response Speed	50 ms
Offset Percent	50%
OFF Delay	0 (Disabled)
OFF One-Shot	0 (Disabled)
ON Delay	0 (Disabled)
ON One-Shot	0 (Disabled)
Display Readout	Numeric, ECO disabled, Normal Orientation
Gain Selection	Auto Gain





Adjust Mode

Sliding the RUN/PRG/ADJ mode switch to the ADJ position allows the user to perform Expert TEACH/SET methods and Manual Adjustment of the threshold(s).

Two-Point TEACH

- Establishes a single switching threshold
- Threshold can be adjusted by using the "+" and "-" rocker button (Manual Adjust)

Two-Point TEACH is used when two conditions can be presented statically to the sensor. The sensor locates a single sensing threshold (the switch point) midway between the two taught conditions, with the Output ON condition on one side, and the Output OFF condition on the other.

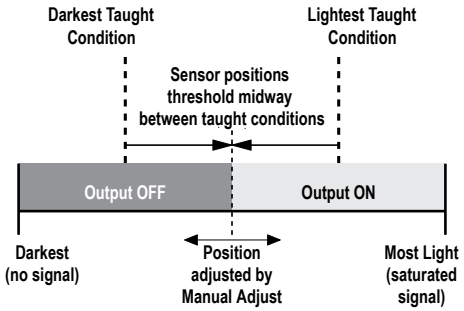


Figure 2. Two-Point TEACH (Light Operate shown)

The Output ON and OFF conditions can be reversed by using the LO/DO (Light Operate/ Dark Operate) switch.

Dynamic TEACH

- Teaches on-the-fly
- Establishes a single switching threshold
- Threshold can be adjusted using "+" and "-" rocker button (Manual Adjust)

Dynamic TEACH is best used when a machine or process may not be stopped for teaching. The sensor learns during actual sensing conditions, taking multiple samples of the light and dark conditions and automatically setting the threshold at the optimum level.

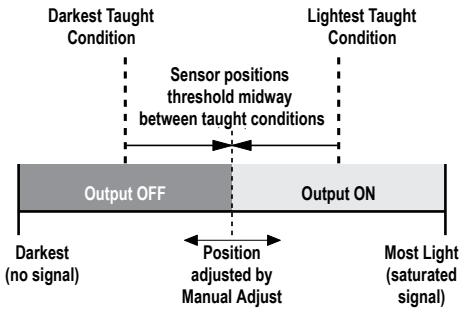


Figure 3. Dynamic TEACH (Light Operate shown)

The output ON and OFF conditions can be reversed using the LO/DO switch.

Window SET

- Sets window thresholds that extend a programmable % offset above and below the presented condition
- All other conditions (lighter or darker) cause the output to change state
- Sensing window center can be adjusted using "+" and "-" rocker button (Manual Adjust)
- Recommended for applications where a product may not always appear in the same place, or when other signals may appear

- See Program Mode in the user's manual for programming the Offset Percent setting (to increase/decrease the window size)

A single sensing condition is presented, and the sensor positions window thresholds a programmable % offset above and below the presented condition. In LO mode, Window SET designates a sensing window with the Output ON condition inside the window, and the Output OFF conditions outside the window.

NOTE: For Window SET and Light SET, the maximum offset threshold percent is 90%.

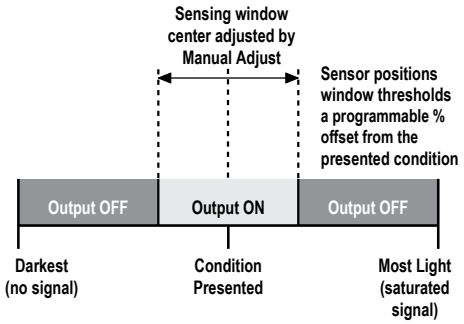


Figure 4. Window SET (Light Operate shown)

Output ON and OFF conditions can be reversed using the LO/DO switch.

Light SET

- Sets a threshold a programmable % offset below the presented condition
- Changes output state on any condition darker than the threshold condition
- Threshold can be adjusted using "+" and "-" rocker button (Manual Adjust)
- Recommended for applications where only one condition is known, for example a stable light background with varying darker targets
- See *Program Mode* on page 5 for programming the Offset Percent setting

A single sensing condition is presented, and the sensor positions a threshold a programmable % offset below the presented condition. When a condition darker than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO setting.

NOTE: For Window SET and Light SET, the maximum offset threshold percent is 90%.

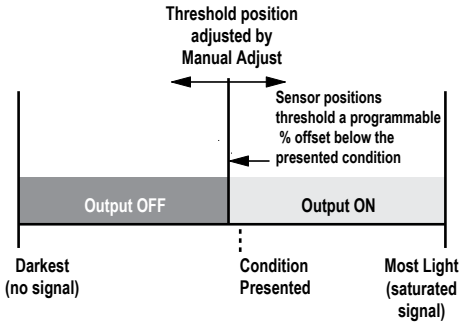


Figure 5. Light SET (Light Operate shown)

Dark SET

- Sets a threshold a programmable % offset above the presented condition
- Any condition lighter than the threshold condition causes the output to change state
- Threshold can be adjusted using "+" and "-" rocker button (Manual Adjust)
- Recommended for applications where only one condition is known, for example a stable dark background with varying lighter targets
- See *Program Mode* on page 5 for programming the Offset Percent setting

NOTE: Offset Percent MUST be programmed to Minimum Offset to accept conditions of no signal (0 counts).

A single sensing condition is presented, and the sensor positions a threshold a programmable % offset above the presented condition. When a condition lighter than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO setting.

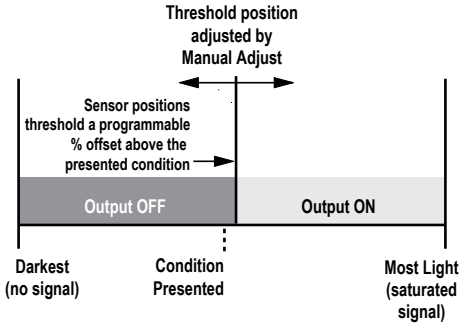


Figure 6. Dark SET (Light Operate shown)

Calibration SET

- Sets a threshold exactly at the presented condition
- Threshold can be adjusted using "+" and "-" rocker button (Manual Adjust)

A single sensing condition is presented, and the sensor positions a threshold exactly at the presented condition. When a condition lighter than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO setting.

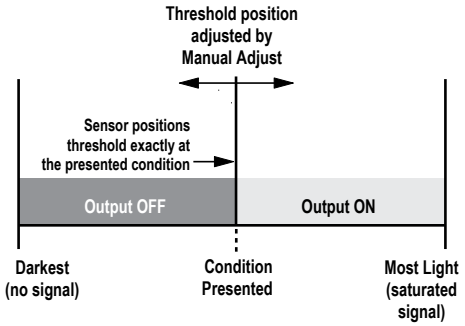


Figure 7. Calibration SET (Light Operate shown)

Troubleshooting

Percent Minimum Difference after TEACH

The Two-Point and Dynamic TEACH methods will flash a % minimum difference on the displays after a PASS or FAIL.

Value	PASS/FAIL	Description
0 to 99%	FAIL	The difference of the taught conditions does not meet the required minimum
100 to 300%	PASS	The difference of the taught conditions just meets/exceeds the required minimum, minor sensing variables may affect sensing reliability
300 to 600%	PASS	The difference of the taught conditions sufficiently exceeds the required minimum, minor sensing variables will not affect sensing reliability
600% +	PASS	The difference of the taught conditions greatly exceeds the required minimum, very stable operation

Percent Offset after SET

The Window, Dark, and Light SET methods will flash a % offset on the displays after a PASS or FAIL.

SET Result	% Offset Meaning
PASS (with % Offset)	Displays the % offset used for the SET method
FAIL (with % Offset)	Displays the minimum required % offset necessary to PASS the SET method
FAIL (without % Offset)	Presented condition cannot be used for the SET method

NOTE: For Window SET and Light SET, the maximum offset threshold percent is 90%.

Specifications

Light Detection Range
400 to 1100 nm

Supply Voltage
10 to 30 V dc Class 2 (10% maximum ripple)

Power and Current Consumption (exclusive of load)
Standard display mode: 960 mW, Current consumption < 40 mA at 24 V dc
ECO display mode: 720 mW, Current consumption < 30 mA at 24 V dc

Supply Protection Circuitry
Protected against reverse polarity and transient overvoltages

Delay at Power-Up
500 milliseconds maximum; outputs do not conduct during this time

Required Overcurrent Protection

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to *http://www.bannerengineering.com*.

Supply Wiring	Required Overcurrent Protection
20	5.0 Amps
22	3.0 Amps
24	2.0 Amps
26	1.0 Amps
28	0.8 Amps
30	0.5 Amps

Output Configuration
1 current sinking (NPN) or 1 current sourcing (PNP) output, depending on model

Output Rating
100 mA maximum load (derate 1 mA per °C above 30 °C)
OFF-state leakage current: < 5 µA at 30 V dc
ON-state saturation voltage: NPN: < 1.5 V; PNP < 2 V

Output Protection
Protected against output short-circuit, continuous overload, transient overvoltages, and false pulse on power-up

Operating Conditions
Temperature: –10 °C to +55 °C (+14 °F to +131 °F)
Storage Temperature: –20 °C to +85 °C (–4 °F to +185 °F)
Humidity: 90% at +60 °C maximum relative humidity (non-condensing)

Output Response Time
50 ms
150 ms

Temperature Drift
0.2% per °C

Construction
Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover

Environmental Rating
IEC IP50, NEMA 1

Certifications

Industrial Control Equipment 3TJJ

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