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 installation instructions, application requirements and guidelines, technical specifications, and accessories, go to www.bannerengineering.com and search for part number 177899 or your model number.

WARNING:
- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

DF-G2 Models

Model	Sensing Beam Color	Reference Sensing Range[1]	Outputs	Connector
DF-G2-NS-2M	Visible Red	1100 mm	Single NPN	2 m (6.5 ft) cable, 4-wire
DF-G2-PS-2M			Single PNP	
DF-G2W-NS-2M	Broad Spectrum White	550 mm	Single NPN	
DF-G2W-PS-2M			Single PNP	
DF-G2G-NS-2M	Visible Green	660 mm	Single NPN	
DF-G2G-PS-2M			Single PNP	
DF-G2B-NS-2M	Visible Blue	770 mm	Single NPN	
DF-G2B-PS-2M			Single PNP	
DF-G2IR-NS-2M	Infrared	2100 mm	Single NPN	
DF-G2IR-PS-2M			Single PNP	

- Models with a quick disconnect require a mating cordset
- For 9 m cable, change the suffix 2M to **9M** in the 2 m model number (example, DF-G2-NS-**9M**)
- For 150 mm (6 in) PVC cable with a 4-pin M8 quick disconnect, change the suffix 2M to **Q3** in the 2 m model number (example, DF-G2-NS-**Q3**)
- For 150 mm (6 in) PVC cable with a 4-pin M12 quick disconnect, change the suffix 2M to **Q5** in the 2 m model number (example, DF-G2-NS-**Q5**)
- For integral 4-pin M8 quick disconnect, change the suffix 2M to **Q7** in the 2 m model number (example, DF-G2-NS-**Q7**)

The following models are no longer available for order but are still covered by the information in this document.

Model	Sensing Beam Color	Reference Sensing Range	Outputs	Connector
DF-G2-NS-9M	Visible Red	1100 mm	Single NPN	9 m cable, 4-wire
DF-G2B-NS-Q5	Visible Blue	770 mm	Single NPN	150 mm cable with a 4-pin M12 quick disconnect connector
DF-G2IR-NS-Q5	Infrared	2100 mm	Single NPN	
DF-G2W-NS-Q5	Broad Spectrum White	550 mm	Single NPN	
DF-G2W-PS-2M	Broad Spectrum White	550 mm	Single PNP	9 m cable, 4-wire

[1] Excess gain = 1, Long Range response speed, opposed mode sensing. PIT46U plastic fiber used for visible LED models, IT.83.3ST5M6 glass fiber used for IR model

Original Instructions
31-Mar-26

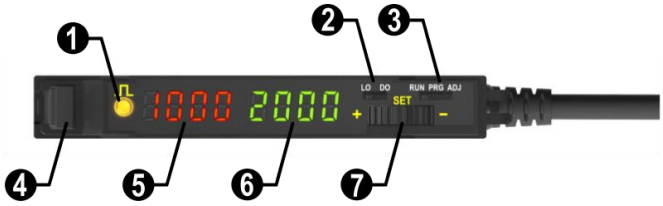
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177900
p/n: 177900 Rev. H

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

DF-G2 Overview

DF-G2 Model Features



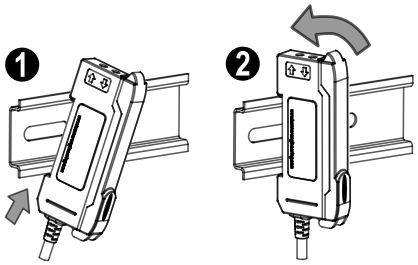
1	Output LED
2	LO/DO Switch
3	RUN/PRG/ADJ Mode Switch
4	Lever Action Fiber Clamp
5	Red Signal Level
6	Green Threshold
7	+/SET/- Rocker Button

Installation Instructions

Mounting Instructions

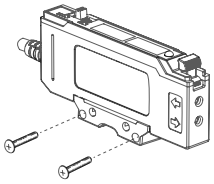
Mount on a DIN Rail

1. Hook the DIN rail clip on the bottom of the DF-G2 over the edge of the DIN rail (1).
2. Push the DF-G2 up on the DIN rail (1).
3. Pivot the DF-G2 onto the DIN rail, pressing until it snaps into place (2).



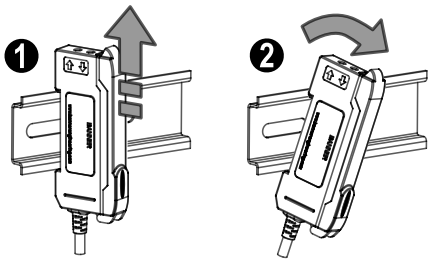
Mount to the Accessory Bracket (SA-DIN-BRACKET)

1. Position the DF-G2 in the SA-DIN-BRACKET.
2. Insert the supplied M3 screws.
3. Tighten the screws.



Remove from a DIN rail

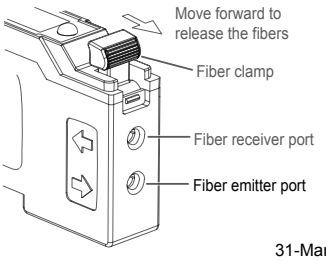
1. Push the DF-G2 up on the DIN rail (1).
2. Pivot the DF-G2 away from the DIN rail and remove it (2).



Installing the Fibers in a DF-Gx Sensor

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.

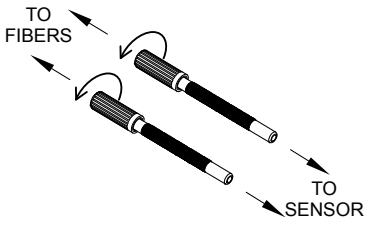


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For optimum performance of IR models, if applicable, glass fibers must be used.

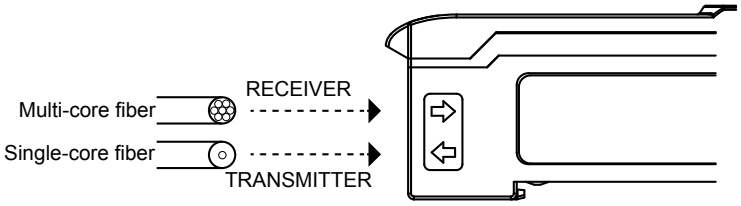
Fiber Adapters

If a thin fiber with less than 2.2 mm outer diameter is used, install the fiber adapter provided with the fiber assembly to ensure a reliable fit in the fiber holder. Align the fibers to the end of the adaptors. Banner includes the adapters with all fiber assemblies.



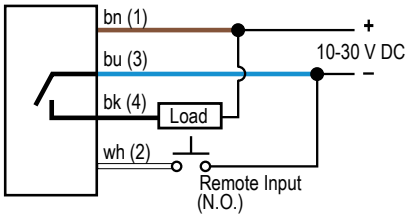
Fiber Outer Diameter (mm)	Adapter Color
Ø 1.0	Black
Ø 1.3	Red
Ø 2.2	No adapter needed

When connecting coaxial-type fiber assemblies to the amplifier, install the single-core (center) fiber to the Transmitter port, and the multi-core (outer) fiber to the Receiver port. This will result in the most reliable detection.

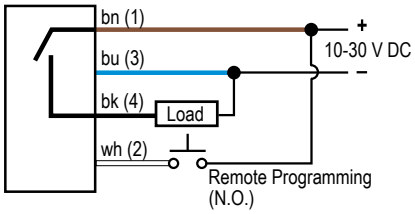


Wiring Diagrams

NPN models



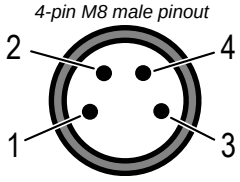
PNP models



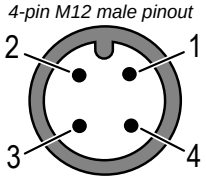
Key

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

4-pin M8 male pinout



4-pin M12 male pinout



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.

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RUN/PRG/ADJ Mode Switch



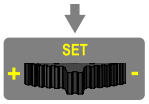
The RUN/PRG/ADJ mode switch puts the sensor in RUN, PRG (Program), or ADJ (Adjust) mode. RUN mode allows the sensor to operate normally and prevents unintentional programming changes via the +/SET/- button. PRG mode allows the sensor to be programmed through the display-driven programming menu (see "Program Mode" on page 4). ADJ mode allows the user to perform Expert TEACH/SET methods and Manual Adjust (see "Adjust Mode" on page 5).

LO/DO Switch



The LO/DO switch is used to select 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 mode, 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 177899.

Run Mode

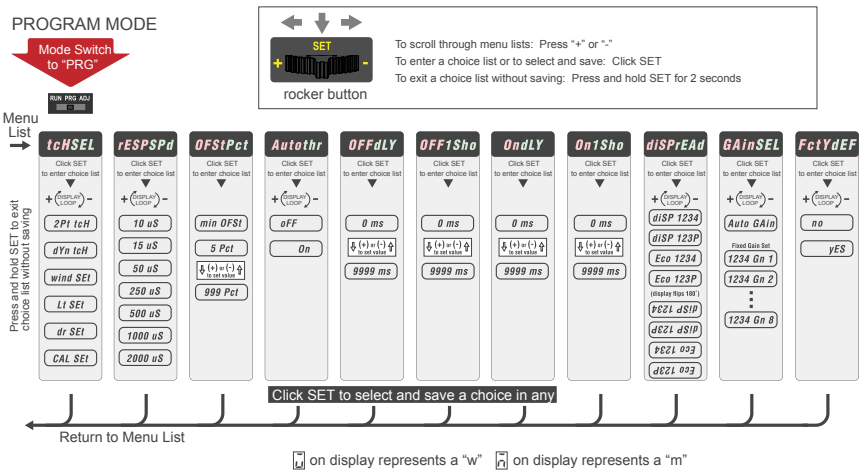
Run mode allows the sensor to operate normally and prevents unintentional programming changes. The +/SET/- rocker button is disabled during RUN mode, except when using Window SET.

Program Mode

Program (PRG) mode allows the following settings to be programmed in the DF-G2:

Factory Default Settings:

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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).

TEACH Procedures

The instruction manual has detailed instructions for these TEACH modes:

- Two-Point TEACH
- Dynamic TEACH
- Window SET
- Light SET
- Dark SET
- Calibration SET

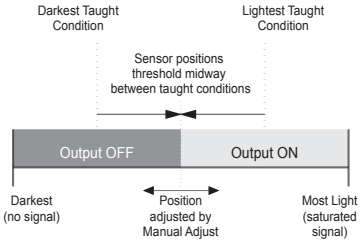
Two-Point TEACH

- 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.

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

Two-Point TEACH (Light Operate shown)



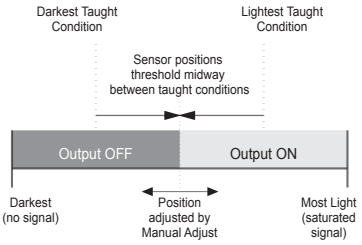
Dynamic TEACH

- 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.

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

Dynamic TEACH (Light Operate shown)



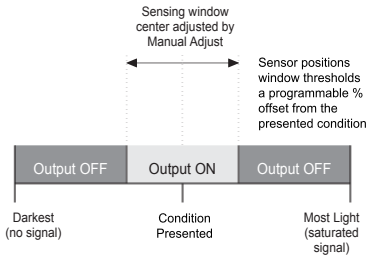
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Window SET

- 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 for programming the Offset Percent setting

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.

Window SET (Light Operate shown)



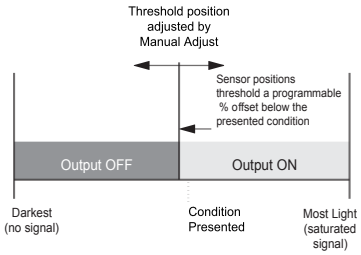
Output ON and OFF conditions can be reversed using the LO/DO switch.

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 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.

Light SET (Light Operate shown)



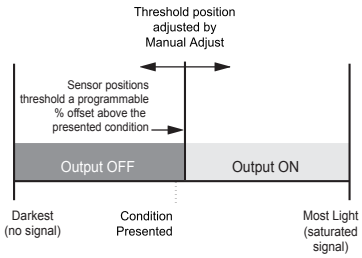
Dark SET

- 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 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.

Dark SET (Light Operate shown)



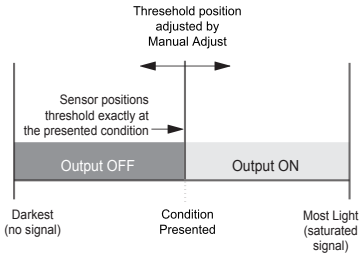
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Calibration SET

- 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.

Calibration SET (Light Operate shown)



Troubleshooting

Manual Adjustments Disabled

Manual adjustments are disabled when Auto Thresholds are ON. If a manual adjustment is attempted while Auto Thresholds are ON, the Green display will flash Auto.

Percent Minimum Difference after TEACH

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

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

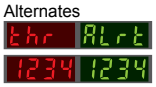
Percent Offset after SET

The Window, Dark, and Light SET methods 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)	The presented condition cannot be used for the SET method

Threshold Alert or Threshold Error

Severe contamination/changes in the taught condition can prevent the Auto Thresholds algorithm from optimizing the threshold(s).

State	Display	Description	Corrective Action
Threshold Alert	Alternates  and	The threshold(s) cannot be optimized, but the sensor's output will still continue to function	Cleaning/correcting the sensing environment and/or a re-teach of the sensor is highly recommended
Threshold Error		The threshold(s) cannot be optimized, and the sensor's output will stop functioning	Cleaning/correcting the sensing environment and/or a re-teach of the sensor is required

DF-G2x Specifications

Sensing Beam

DF-G2: Visible red, 635 nm
DF-G2W: Broad spectrum white, 450 nm to 650 nm
DF-G2B: Visible blue, 470 nm
DF-G2G: Visible green, 525 nm
DF-G2IR: Infrared, 850 nm

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Supply Voltage
10 V DC 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

Output Configuration
1 NPN or 1 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 Response Time
Super High Speed: 10 µs
High Speed: 15 µs
Fast: 50 µs
Standard: 250 µs
Medium Range: 500 µs
Long Range: 1000 µs
Long Range with immunity to Energy Efficient Lights: 2000 µs

Repeatability
Super High Speed: 5 µs
High Speed: 5 µs
Fast: 12 µs
Standard: 50 µs
Medium Range: 80 µs
Long Range: 165 µs
Long Range with immunity to Energy Efficient Lights: 165 µs

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

Connections
PVC-jacketed 2 m or 9 m (6.5 ft. or 30 ft.) 4-wire integral cable; or integral 4-pin M8 quick disconnect; or 150 mm (6 in.) cable with a 4-pin M12 quick disconnect; or 150 mm (6 in.) cable with a 4-pin M8 quick disconnect.

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

Environmental Rating
IP50, NEMA 1

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)

Certifications

Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

Industrial Control Equipment
3TJJ

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 www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (A)	Supply Wiring (AWG)	Required Overcurrent Protection (A)
20	5.0	26	1.0
22	3.0	28	0.8
24	2.0	30	0.5

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