TN-AF04 How to Upgrade a D0920 Arc Detection Unit

Introduction

This guide will review how to upgrade from the Littelfuse D0920 Arc-Flash Relay and A0220 Light sensors to the Littelfuse AF0100 Arc-Flash Relay, including the physical dimensions, wiring, configuration, and operational differences, to ensure a successful upgrade of an installation in the field or a new project design.

The PGR-8800 Arc-Flash Relay can also be used to replace the D0920 depending on the feature set that is desired, and additional notes about this relay are added where relevant. While the AF0500 Arc-Flash Relay can also be used as a replacement, due to the difference in light intensity levels it is not described in this upgrade document.

A brief comparison table is included at the end of this technical note as Table 2.

Figure 1: D0920 (left) and AF0100 (right)

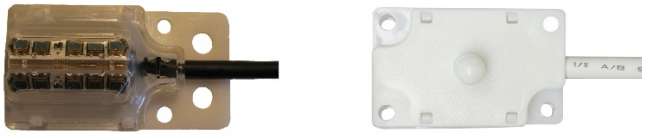


Figure 2: A0220 (left) and PGA-LS10 (right)

Table 1: Recommended Replacement Parts

Discontinued Product		Recommended Replacement	
Part Number	**Name**	**Part Number**	**Name**
D0920.0060	Arc Detection Unit	AF0100-00	Arc-Flash Relay
A0220.0010	Light Sensor with 10 m cable	PGA-LS10	Light Sensor with 10 m cable

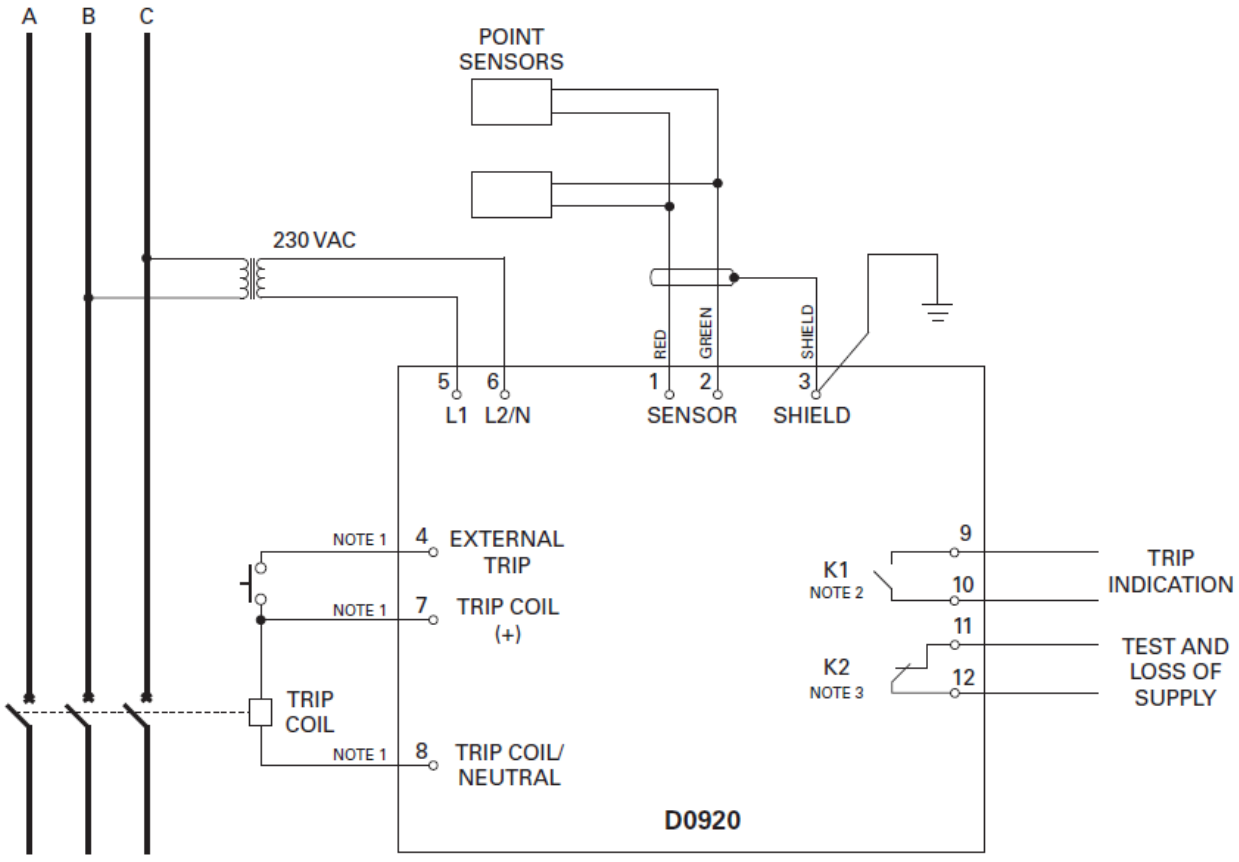
IMPORTANT: The A0220 Light Sensor can be used with the AF0100, with some limitations. The PGA-LS10 Light Sensor is not compatible with the D0920.

Dimensions and Wiring

The AF0100 can be installed on a DIN rail and directly replace the D0920 in most installations, as the height and depth of the AF0100 is equal to or less than the D0920. The AF0100 is slightly wider than the D0920 (by 23 mm), so some small adjustment of components may be necessary.

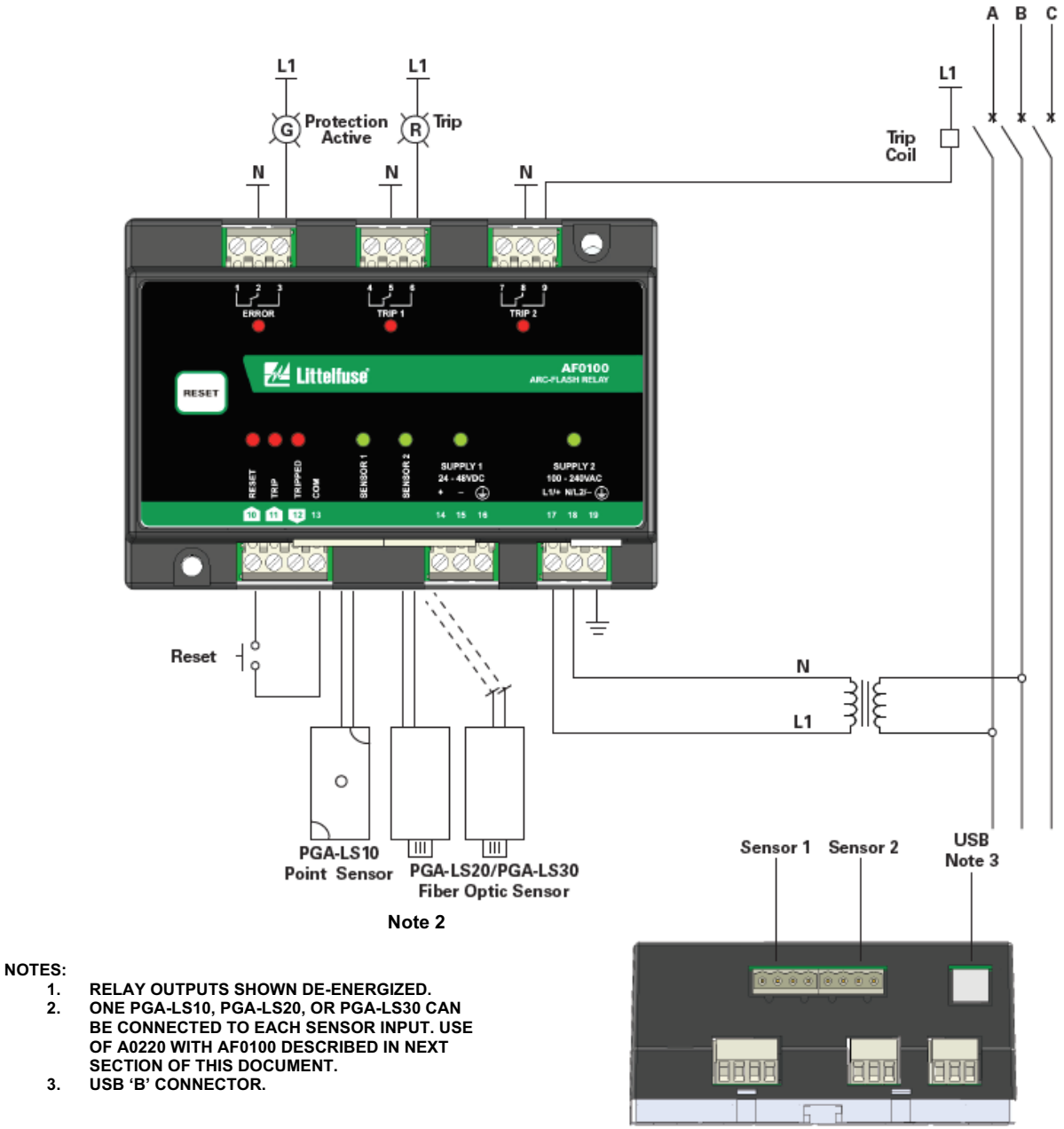
Wiring from the D0920 can be connected to the AF0100, utilizing the notes below as a reference. See Figures 3 and 4 for typical wiring diagrams.

- The 230 Vac supply can be wired to the Supply 2, 100 – 240 Vac input (17/18) on the AF0100-00. Connect the AF0100 ground terminal (19) to the earth/ground bus in the panel. Note the AF0100-00 offers a second supply input for 24 – 48 Vdc which can be connected simultaneously for redundancy. Alternatively, the AF0100-10 offers only the 24 – 48 Vdc if that is the desired control power for the relay.
- If a normally open EXTERNAL TRIP switch is in use on terminal 4, it can be re-wired across the TRIP (11) and COM (13) terminals. Any connection from one side of the switch to the trip coil wiring as it was with the D0920 must be removed. Do not connect any voltage to the TRIP or COM terminals on the AF0100.
- Wiring connected to K1 (9/10) TRIP INDICATION on the D0920 can be connected to TRIP 2 (8/9) on the AF0100.
- Wiring connected to K2 (11/12) TEST AND LOSS OF SUPPLY on the D0920 can be connected to ERROR (1/2) on the AF0100. Note the following operational differences with the AF0100:
    - The ERROR output will operate in the case of loss of supply. It will also operate in the case of other alarm conditions, such as loss of sensor (if using PGA-LS series sensors), loss of one power supply (if more than one supply is connected on the AF0100-00 model).
    - The AF0100 does not have a test mode, therefore there is no indication of this mode.
- The TRIP COIL (7/8) output on the D0920 is a charged capacitor circuit. The AF0100 provides a standard mechanical relay output, also called a dry contact. Confirm that the device being tripped in the case of an arc flash has an externally powered trip circuit or trip coil that does not rely on a charged capacitor. **Failure to verify this could result in the breaker or other interrupting device not to operate during an arc flash.** Once this trip circuit is verified (with any necessary changes made), the TRIP COIL output wiring can be connected to TRIP 1 (5/6) on the AF0100.
- See the next section regarding light sensor connections.



NOTES:
1. **CAUTION**: DANGEROUS VOLTAGE IS PRESENT AT TERMINALS 4,7, AND 8, SOURCED FROM AN INTERNAL STORAGE CAPACITOR. A SELF-DISCHARGE CIRCUIT WILL DISCHARGE THE STORAGE CAPACITOR TO A SAFE LEVEL WITHIN TWO MINUTES AFTER THE AC SUPPLY HAS BEEN DISCONNECTED.
2. RELAY CONTACT IS SHOWN DE-ENERGIZED.
3. RELAY CONTACT IS CLOSED WHEN TEST MODE IS SELECTED, OR DURING LOSS OF SUPPLY.

Figure 3: D0920 Typical Wiring Diagram



NOTES:

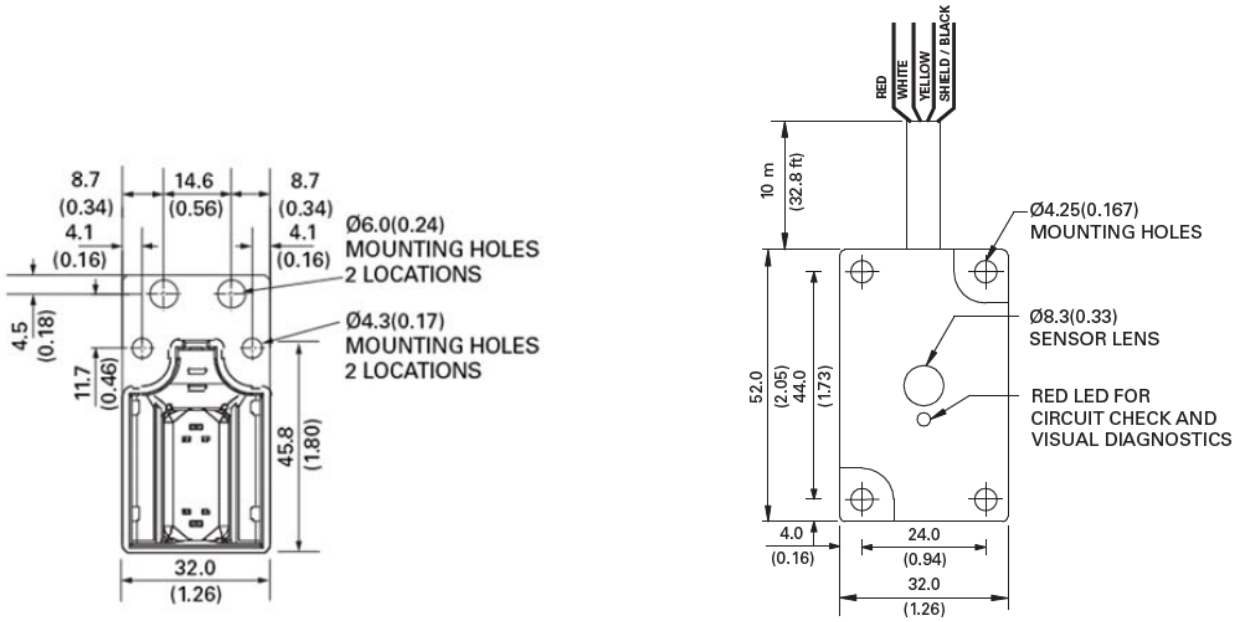
1. **RELAY OUTPUTS SHOWN DE-ENERGIZED.**
2. **ONE PGA-LS10, PGA-LS20, OR PGA-LS30 CAN BE CONNECTED TO EACH SENSOR INPUT. USE OF A0220 WITH AF0100 DESCRIBED IN NEXT SECTION OF THIS DOCUMENT.**
3. **USB 'B' CONNECTOR.**

Figure 4: AF0100 Typical Wiring Diagram

Light Sensors

To take advantage of the sensor health check and status indication of the newer PGA-LS series of light sensors, it is typically recommended to replace the A0220 light sensors when replacing the relay. Note that only one PGA-LS series light sensor can be connected to each relay sensor input on the AF0100 or PGR-8800. The PGA-LS10 Point Sensor can easily replace the A0220 sensor, as it fits within the same width and length envelope. However, the mounting hole locations are different due to the sensor design. See Figure 5 for sensor dimensions.

The PGA-LS series of light sensors cannot be used with the D0920.



*Note: Dimensions in mm (inches)

A0220 Point Sensor **PGA-LS10 Point Sensor**

Figure 5: A0220 and PGA-LS10 Dimensions

If desired, the existing A0220.0010 light sensors can be connected to the AF0100 or PGR-8800. Note that the sensor self-check function provided on the AF0100 and PGR-8800 will not operate with the A0220. This means the arc-flash relay will report that there is no sensor connected, and the sensor LED on the relay (which normally shows green for valid sensor) will be turned off.

If using the PGR-8800 with the A0220, change the light sensor range in the USB configuration software from Standard (9 – 25 klux) to Sensitive (3 – 25 klux) to be roughly aligned with the D0920 and A0220 operation.

If using the AF0100 with the A0220 sensor, note that the AF0100 will report an ERROR after an arc-flash event. To clear this error, press and hold the RESET button for 20 seconds to redetect

connected sensors. If password protection is enabled, use the USB configuration software to reset the ERROR.

Where two A0220 sensors are connected in parallel to the D0920, the light measured by the sensors is added together. This parallel connection can also be connected to the AF0100 or PGR-8800 as shown in Figure 6, noting the same increased light measurement will occur.

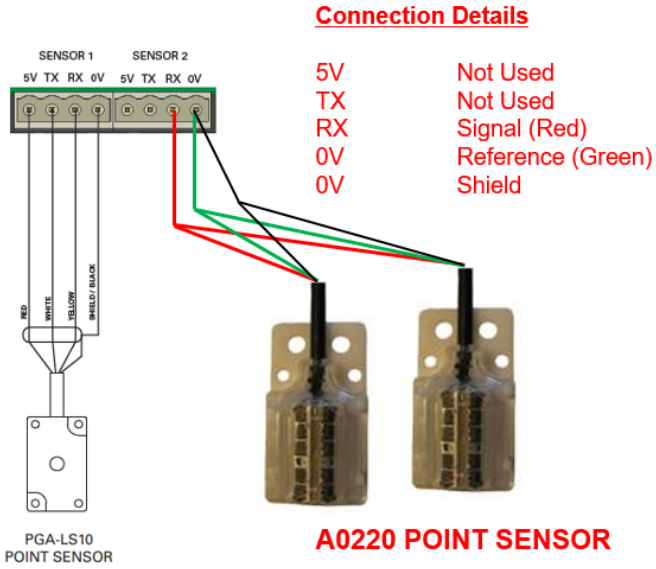


Figure 6: Connecting A0220 light sensors to the AF0100

Test and Reset

The D0920 has a two-position switch, marked ACTIVE and TEST. The AF0100 does not have a TEST mode, and will always be monitoring for arc events while powered. If an error is present which could compromise protection, the ERROR output on the AF0100 will de-energize and the red LED will be on.

In addition to the front-panel RESET button, a remote reset button can also be wired between the RESET (10) and COM (13) terminals on the AF0100.

For further information on AF0100 configuration, the AF0100 Product Manual is available at www.littelfuse.com/af0100.

Table 1: Short Arc-Flash Relay Comparison

CHARACTERISTIC	AF0100	PGR-8800	D0920.0060
Power Supply	**AF0100-00:** 120/240 Vac/Vdc, 12-48 Vdc; **AF0100-10:** 12-48 Vdc only	100-240 Vac, 110-250 Vdc, 14-48 Vdc	240 Vac
Dimensions	128 mm W x 90 mm H x 60 mm D	200 mm W x 130 mm H x 54 mm D	105 mm W x 90 mm H x 60.5 mm D
Mounting	Surface, DIN-rail	Surface, DIN-rail with PGA-0031	DIN-rail
Sensor Inputs	Two (with sensor check)	Six (with sensor check)	One* **Up to 2 sensors can be used in parallel; light intensity is additive*
Sensor Types	PGA-LS series Point and Fiber	PGA-LS series Point and Fiber	A0220 series Point Only
Cable Provided	10 m	10 m	10 m
Max Sensor Cable Length	50 m	50 m	50 m
Light Intensity Adjustment	3-25 klux	3-25 klux	2-24 klux
Outputs	2 x NO/NC 1 x NO	1 x NO, 3 x NO/NC	2 x NO, 1 x NC
Fastest Trip Output	<5 ms typ (Mechanical x2)	<1 ms (IGBT)	<1 ms (Charged Capacitor)
Trip Outputs Max Current Rating	30 A (0.2 s) 6 A (continuous)	30 A (0.2 s)	3.5 Ws (Joule) at 325 Vdc, 68 µF
Trip Zones	2	4	1
Configuration Settings	USB	USB and Front Panel	Front Panel
Breaker Status Input	No	Yes	No
Datalogging	No	Yes	No
Temperature	-40 to 70° C	-40 to 70° C	-25 to 70° C
Certifications	cULus, FCC, CE, RCM	UL, CSA, FCC, CE, DNV	CE, CCC

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