

# DFS21 - Instructions

## Additional Features:



## DFS Dual Channel Sensor

### Channel 1 & Channel 2

- Two Individual Thresholds
- Two Individual Outputs

OR

### Channel 1 & Health Monitor

- Health Monitoring System and Display
- Auto Signal Tracking

- Intuitive numerical/percentage diagnostic OLED display
- Attractive 10mm wide housing
- Low power & wide operating voltage
- Advanced remote programming
- Six **AUTOSET** modes including window
- Crosstalk rejection between two sensors without a wire
- Programmable output/input configurations
- High-speed, High-resolution, and Long-range modes
- Combinable dual timers, and counters
- CE approved

## How To Specify

### 1. Select Sensor: DFS21

Dual Channel Digital  
Fiber Optic Sensor

### 2. Select Light Source:

R = Red  
I = Infrared

### 3. Select Connection:

Blank = 6ft cable (1.8m)  
C = 5-pin M8 connector

### Example:

DFS21 R C

DFS21  
Digital Fiber Optic Sensor

Light Source

Connection

## Features

### WIDE VARIETY OF FIBERS

Visit [www.tco.com](http://www.tco.com) for full listing.

### AUTOSET (●)

1. Push to perform AUTOSET.
2. Instantly optimizes when in Health Monitor Mode

### 3-WAY ROCKER SWITCH (▼▲)

1. Manually adjusts the threshold. +/-
2. Alters programming parameters. +/- Hold to scroll for numeric values.
3. Press down on center to switch channels. 1 2

### MODE (■)

Tap to access parameters.

### FIBER RELEASE CLAMP

Locks fibers in place.

### DUAL CHANNEL OUTPUT LEDS

1. Channel 1 or 2 each illuminates solid when output is ON.
2. Flashes when output is overloaded.

### ADVANCED DIAGNOSTIC OLED DISPLAY

See next page for complete listing.

### CONNECTION

5-Pin M8 connector or built-in cable.

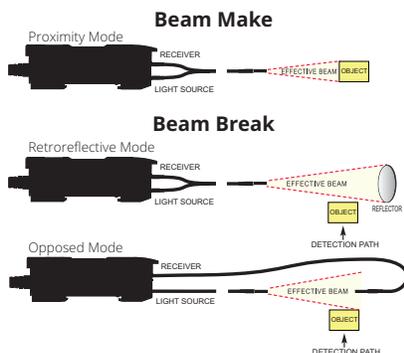
**Quick Start** The Digital Fiber Optic Sensor is designed to provide reliable detection using fiber optic light guides. Sensor is adjusted by a single push of a button; there is no guess work on the part of the operator. The sensor *default settings\** (Channel 1, Light State) will work for most applications.

Follow the three step procedure below:

\* Note: Consult all default settings on page 6.

### 1. Establish one of the following conditions:

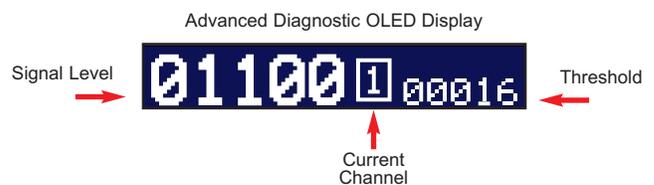
- Beam Make/Proximity** - Reflect light off object.
- Beam Break** - Remove object from light beam path.



### 2. Tap AUTOSET (●) button:

Pressing the AUTOSET button sets the sensors threshold to the desired level.

### 3. Verify setup on advanced diagnostic OLED display. If needed, the threshold can be altered by tapping up or down on the threshold adjust rocker.



# Programming

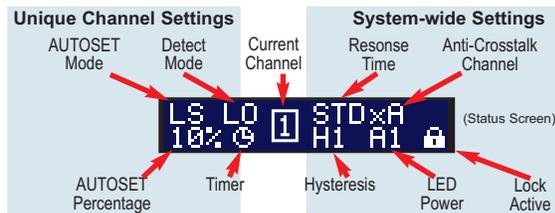


Switch between Screens 1 and 2 by pressing straight down on the 3-way toggle switch.

**When using DUAL CHANNEL:** Each channel has three parameters (AUTOSET, Detect Mode, and Timers) that can be tailored to your unique application. System wide parameters are changed in Channel 1. Follow the programming procedure contained in this section for Channels 1 and 2.

**When using SINGLE / HEALTH MONITOR:** Channel 1 has three parameters AUTOSET, Detect Mode, and Timers that can be tailored to your unique application as well as several system parameters. Follow the programming procedure contained in this section for Channels 1, and see page 6 for detailed instructions pertaining to Health Monitor.

- Tap **MODE** (■) to show status screen. Status Screen shows a quick overview of sensor's settings.



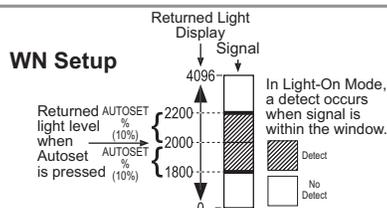
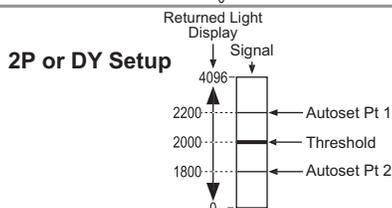
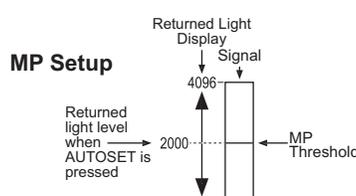
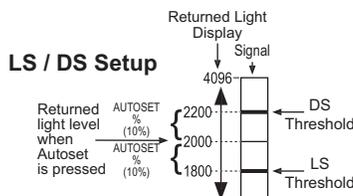
Note: Programming will time out after 60 seconds if no action is taken. Tap and hold **MODE** (■) to exit status screen.

- Tap **MODE** (■) again to access first parameter. Continue tapping to select desired parameter. Use the threshold/value **ADJUST ROCKER** (▼▲) to select or adjust a specific parameter.

## AUTOSET Modes

The sensor's automatic threshold adjustment is controlled by the AUTOSET mode. Each AUTOSET mode sets the threshold differently. Select the mode that works best for your specific application. See details at the left.

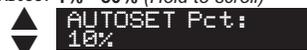
Select	AUTOSET Mode: Light State LS	<b>Light-State Set (LS):</b> Sets threshold below received light beam intensity.
▲	AUTOSET Mode: Dark State DS	<b>Dark-State Set (DS):</b> Sets threshold above received light beam intensity.
▼	AUTOSET Mode: Midpoint MP	<b>Midpoint Set (MP):</b> Sets threshold at received light beam intensity.
▲	AUTOSET Mode: Two-Point 2P	<b>Two-point Set (2P):</b> Sets threshold between received light beam intensity two point.
▼	AUTOSET Mode: Dynamic DY	<b>Dynamic Set (DY):</b> Sets threshold between received light beam high and low intensity.
▲	AUTOSET Mode: Window WN	<b>Window Set (WN):</b> Sets two thresholds equally spaced above and below received light beam intensity. Received light beam intensity within the window is a valid detect. Outside the window is not a valid detect.



## AUTOSET Percent

For Light State (LS), Dark State (DS), and Window AUTOSET Modes (WN), the offset percentage is adjustable. AUTOSET Percent determines threshold placement during AUTOSET. Placement is a percentage of received light beam intensity.

ADJUST 1% - 50% (Hold to scroll)



# Using AUTOSET

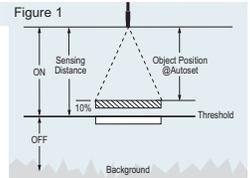


The DFS threshold is set automatically by pressing the **AUTOSET** button. There are six different ways the sensor determines the threshold. The user first must determine which type of setup mode is appropriate for the application. The simplest and most common mode we recommend is Light State (LS) setup. It is used in both beam make and beam break sensing. When using this mode, the sensor will provide the best sensitivity to fine changes in light level or contrast. This is useful for small part detection and precise leading-edge triggering. Please consult our website at <https://www.tco.com/sensors/fundamentals> or contact one of our worldwide distributors for application help. We look forward to providing any assistance you may need.

Note: OLED display will provide intuitive visual feedback during autosetting. Paying close attention to the display is important.

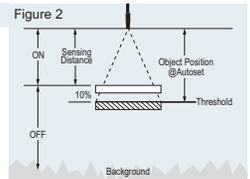
## Light State (Default)

Place object to be detected in the worst-case light-state condition and press the AUTOSET button. The threshold will be set 10%(default) below the received light-beam intensity. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 1).



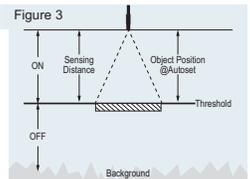
## Dark State

Place object to be detected in the worst-case dark-state condition and press the AUTOSET button. The threshold will be set 10%(default) above the received light-beam intensity. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 2).



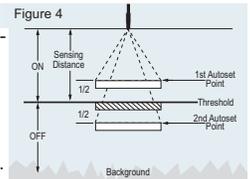
## Midpoint

Place object to be detected in position at which you want the threshold to be set and press the AUTOSET button. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 3).



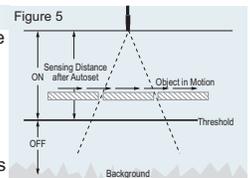
## Two-Point

Place object to be detected in the light-state condition and press the AUTOSET button. Then remove or place the object in the dark-state condition and press the AUTOSET button again. The threshold will be set between the two light-beam intensities. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 4).



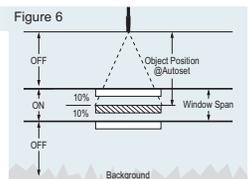
## Dynamic

Press the AUTOSET button to start the Dynamic AUTOSET. Now move the object through the beam at least once and press the AUTOSET button again to complete the Dynamic AUTOSET. The threshold is set between the highest and lowest received light levels caused by the object being passed through. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 5).



## Window

Window mode is a unique type of AUTOSET mode. Window mode creates two thresholds and can be used in a similar manner as a dual channel fiber optic sensor. Place the object in the position at which you want to be reliably detect it and press the AUTOSET button. The DFS will place two thresholds 10%(default) higher and 10%(default) lower than the returned light level. Now when the object is passed in view or through the fiber optic the object will be detected in the same position +/- 10%. The threshold offset (both thresholds) can be altered by tapping up or down on the threshold adjust rocker (see Figure 6).



## Detect Mode

Sensor output activates or deactivated when received light intensity is over the threshold. *Not available when input function is set to Remote Dark On.*

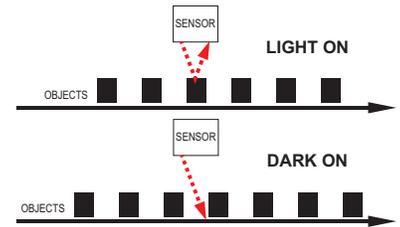


Detect Mode:  
Light On LO

Detect Mode:  
Dark On DO

**Light On (LO):** Output activates when received light intensity is over the threshold. *Note: In window mode (WN) output activates when received light intensity is inside the window thresholds.*

**Dark On (DO):** Output deactivates when received light intensity is over the threshold. *Note: In window mode (WN) output activates when received light intensity is outside the window thresholds.*



## PRESS Timer/Counter Function #:

Choose from 19 pre-configured timer/counter control functions. Each one represents a function such as on-delay, off-delay, etc. Once a function is selected, adjustable parameters of that function appear such as delay time.

**Timer Duration**  
On Delay: 10ms  
0.1 - 9.9, 10 - 9999ms  
Hold up or down to scroll.

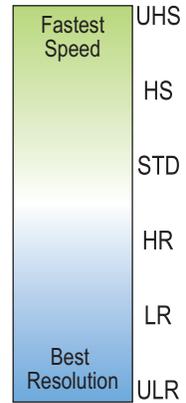
**Counter**  
Count: 0005  
0001-9999  
Hold up or down to scroll.

<p><b>00</b> Timer Func: 00 Bypass Timer not used.</p>	<p><b>10</b> Timer Func: 10 Off, Latch "OFF" Delay then Latch</p>
<p><b>01</b> Timer Func: 01 On-Delay "ON" Delay</p>	<p><b>11</b> Timer Func: 11 Blind One-Shot Blind One-Shot</p>
<p><b>02</b> Timer Func: 02 Off-Delay "OFF" Delay Pulse Stretcher</p>	<p><b>12</b> Timer Func: 12 Delayed One-Shot One-Shot Delay, then One-Shot</p>
<p><b>03</b> Timer Func: 03 One-Shot One-Shot</p>	<p><b>13</b> Timer Func: 13 Delayed Latch One-Shot Delay, then Latch</p>
<p><b>04</b> Timer Func: 04 Motion Motion Detection</p>	<p><b>14</b> Timer Func: 14 Stop, One-Shot Stop Motion, then One-Shot</p>
<p><b>05</b> Timer Func: 05 Latch Latching, Edge Triggered</p>	<p><b>15</b> Timer Func: 15 Stop, Latch Stop Motion, then Latch</p>
<p><b>06</b> Timer Func: 06 On, Off-Delay "ON" Delay then "OFF" Delay</p>	<p><b>16</b> Timer Func: 16 Latch, On-Delay Latch then "ON" Delay</p>
<p><b>07</b> Timer Func: 07 On, One-Shot "ON" Delay, then One-Shot</p>	<p><b>17</b> Timer Func: 17 Latch, One-Shot Latch, then One-Shot</p>
<p><b>08</b> Timer Func: 08 On, Latch "ON" Delay then Latch</p>	<p><b>18</b> Timer Func: 18 Count, One-Shot Count, One-Shot</p>
<p><b>09</b> Timer Func: 09 Off, One-Shot "OFF" Delay then One-Shot</p>	<p><b>19</b> Timer Func: 00 Count, Latch Count, Latch</p>

The following are system wide parameters that can only be adjusted in Channel 1.  
(Change channels by pressing straight down on the rocker switch if necessary).

### Response Time

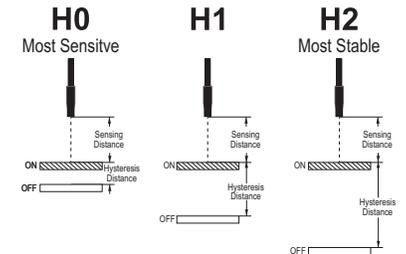
Select which mode that best fits the performance need of your application. Sensor speed, range, and sensitivity are optimized for best performance.



Select	Response Time: Ultra-High-Speed	<b>Ultra-High-Speed (UHS):</b> Fastest response time (50us). <i>Not available in Asynchronous Anti-Crosstalk Mode.</i>
▲	Response Time: High-Speed	<b>High-Speed (HS):</b> Fast response time with higher sensitivity (125us). <i>Not available in Asynchronous Anti-Crosstalk Mode.</i>
▼	Response Time: Standard	<b>Standard (STD):</b> Good balance of response time and range for general purpose sensing (250us).
▲	Response Time: High-Resolution	<b>High-Resolution (HR):</b> Improved resolution for general purpose sensing (1ms).
▼	Response Time: Long-Range	<b>Long-Range (LR):</b> General purpose sensing with improved range (4ms).
▲	Response Time: Ultra-Long-Range	<b>Ultra-Long-Range (ULR):</b> Special purpose sensing with maximum sensitivity and range (16ms).

### Hysteresis

To avoid false triggers for example due to object vibration. Adjusts the span between the operate point and the release point of the sensor output. Low hysteresis increases sensitivity and high hysteresis increases sensing stability.

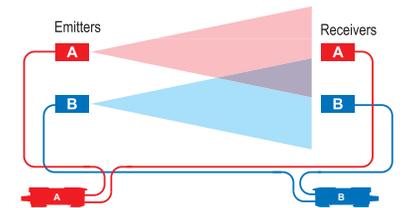


Select	Hysteresis: Low	<b>Low (H0):</b> Reduced hysteresis for increased sensitivity.
▲	Hysteresis: Standard	<b>Standard (H1):</b> Automatic adjustment depending on signal level.
▼	Hysteresis: High	<b>High (H2):</b> Increased hysteresis for increased stability.

### Anti-Crosstalk

Turns on Asynchronous Anti-Crosstalk rejection for two sensors. *Note: Channels 1 and 2 cannot be set as Channels A and B; anti-crosstalk is for use of two separate sensors. Not available for UHS and HS modes.*

### Asynchronous Crosstalk



Select	Anti-Crosstalk: Disabled	<b>Disabled:</b> Turns off Anti-Crosstalk rejection.
▲	Async Crosstalk: Channel A	Assign one sensor to channel A and the other to channel B.
▼	Async Crosstalk: Channel B	

### LED Power

Emitter LED power set for Channel 1 will override Channel 2 (both will always be the same), so use Low or High only to prevent invalid Channel 2 setting.

Select	LED Power: AUTO	<b>Auto:</b> automatically determined during Channel 1 AUTOSSET.
▲	LED Power: Low	<b>Low:</b> Cuts power to prevent saturation. Example: short range.
▼	LED Power: High	<b>High:</b> Boosts power when signal level is low. Example: long range.

### Channel Configuration

Choice of a Channel 1 and 2, or Channel 1 with Health Monitor.



Select	Channel Config: Dual Channel	<b>Dual Channel:</b> Channels 1 and 2 are independent.
▲	Channel Config: Single / Health	<b>Single / Health:</b> Reconfigures Channel 2 to be used as the Health Monitor. <b>See page 6 for Health Monitor information.</b>

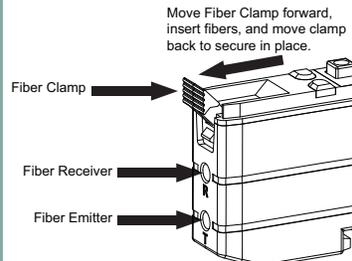
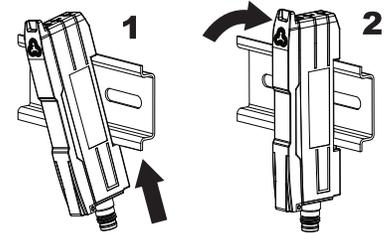
### Output Mode

Outputs can be set one of three ways:

Select	Output Mode: PNP - Source	<b>PNP - Source:</b> PNP transistor open collector output.
▲	Output Mode: NPN - Sink	<b>NPN - Sink:</b> NPN transistor open collector output.
▼	Output Mode: Push/Pull	<b>Push/Pull:</b> NPN and PNP transistor connected in a push/pull configuration.

### Mounting on a DIN Rail

1. Hook the DIN rail clip on the bottom of the sensor under the edge of the DIN rail.
2. Gently push and pivot the sensor onto the DIN rail, pressing until it snaps into place.



### Installing the 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 secure the fiber(s).
5. Close the dust cover.

## Input Functions

Select input to be performed:

Select ▲ ▼	Input Function: Remote Set	<b>Remote set:</b> An AUTOSET function is performed when input wire is transitioned from idle to active and returned. <i>Note: input wire can be used in addition to the AUTOSET button.</i>
	Input Function: Remote Command	<b>Remote command:</b> Sensor parameters can be adjusted via defined pulses. See chart on page 7.
	Input Function: Interrogate	<b>Interrogate:</b> Sensor output is latched when input wire is transitioned from idle to active.
	Input Function: Gate	<b>Gate:</b> Sensing is gated. Detection is enabled when input is active.
	Input Function: Remote Dark On	<b>Remote Dark On:</b> Detect Mode is determined by input state. Dark On mode is used when input is active.
	Input Function: Remote Lockout	<b>Remote Lockout:</b> Remote lock of the AUTOSET, up and down adjust and most mode functions.
Input Function: Disabled	<b>Disabled:</b> To ignore unwanted signals.	

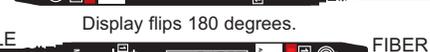
## Input Polarity

Select the active state of the input.

Select ▲ ▼	Input Polarity ] Active High	<b>Active High:</b> Selects active High.
	Input Polarity [ Active Low	<b>Active Low:</b> Selects active Low.

## Display Mode

Selects between numeric and percentage modes and flips orientation.

Select ▲ ▼	Display Mode: Numeric	→	04095 00016	→	FIBER  CABLE	
	Display Mode: Percentage	→	99.9% 01.0%	→	FIBER  CABLE	
	Display flips 180 degrees.					
	Display Mode: Numeric	→	00016 04095	→	CABLE  FIBER	
Display Mode: Percentage	→	01.0% 99.9%	→	CABLE  FIBER		

## Lock Mode

Locks buttons. *Note: Input wire remains unlocked.*

Select ▲ ▼	Button Lock: Disabled	<b>Disabled:</b> Adjustments made by anyone.	<b>Sensor Locked</b>
	Button Lock: Enabled	<b>Enabled:</b> Prevents unauthorized tampering. To unlock, tap MODE to scroll through menu to Button Lock and select Disabled to unlock.	

Displayed when sensor is locked.

## Default Setting Chart

CHANNEL 1	CHANNEL 2	HEALTH MONITOR	Default	Other Options
AUTOSET MODE	AUTOSET MODE		Light-State	Dark-State, Midpoint, Two-point, Dynamic, Window
AUTOSET PERCENT	AUTOSET PERCENT		10%	1% - 50%
DETECT MODE	DETECT MODE		Light On	Dark On
TIMER	TIMER		Bypass	Timer 1-19
TIMER DURATION	TIMER DURATION		10ms	0001 - 9999ms
RESPONSE TIME			Standard	Ultra-High-Speed, High-Speed, High-Resolution, Long-Range, Ultra-Long-Range
HYSTERESIS			Standard	Low, High
ANTI-CROSSTALK			Disabled	Asynchronous Channel A, Asynchronous Channel B
LED POWER			Auto	Low, High
CHANNEL CONFIG.			Dual Channel	Single / Health
OUTPUT MODE			PNP - Source	NPN - Sink, Push/Pull
INPUT FUNCTIONS			Remote Set	Remote Command, Interrogate, Gate, Remote Dark On, Remote Lockout
INPUT MODE			Active High	Active High, Active Low
DISPLAY MODE			Numeric	Percentage, Numeric Flipped, Percentage Flipped
LOCK MODE			Unlocked	Enabled
		MARGIN TRACKING	Disabled	Automatic
		REQUIRED MARGIN	Good	Great, Low
		ALERT MODE	Active High	Active Low

## Factory Reset

Hold down MODE (■) on power up, then hit up or down (▲▼). Sensor will return to all settings to factory default (see chart above).



# Health Monitor System

Dual Channel Mode

Single Channel / Health Monitor Mode



Change between Dual Channel and Single Channel with Health Monitor by changing Channel Configuration parameter. See page 4 for details.

Switch between Screens 1 & 2 by pressing straight down on the 3-way toggle switch.

**IMPORTANT:**  
To use the **Health Monitor** the sensor must be put in **Single / Health mode**.



Current Margin      AUTO Margin Tracking      Threshold

## Setting up Health Monitor Parameters:

### Margin Tracking

When enabled, automatic adjustments will be made to the threshold if the margin gets too low.



**Automatic:** The sensor will automatically make small adjustments to the threshold setting.  
**Disabled:** Adjustments will need to be made manually.

### Health Channel Alarm and "Required Margin" Parameter

If the health monitor detects a problem, an alarm is sent via the health channel output. You can choose how sensitive to set the alarm via the **Required Margin** parameter. If you set the parameter to "Good" you will get an alarm when the margin is less than "Good". The alarm is self-resetting when the monitor detects that margins have returned to a "Good" level.

### Required Margin

Choose how sensitive to set the alarm.



**Low:** Alarms when the margin is less than Low (less than 25% filled).  
**Good:** Alarms when the margin is less than Good (less than 50% filled).  
**Great:** Alarms when the margin is less than Great (less than 100% filled).

### Tracking Optimizer

When **Margin Tracking System** is enabled, automatic adjustments will be made to the threshold to maintain margin over time. This optimizes the sensing application, and manual adjustment won't be needed.

### Alert Mode

Select the active state of the output.



**Active High:** Selects active High.  
**Active Low:** Selects active Low.



Pressing the **AUTOSET** button with the health channel selected will instantly optimize the threshold-maximizing margin.

## About: Health Monitor System



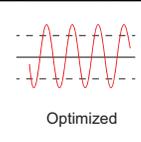
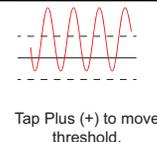
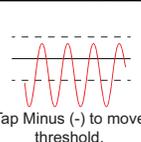
The term **contrast** is commonly used when characterizing fiber-optic sensor performance. **Contrast** is the light difference between the light-state and dark-state conditions of a sensing task. The sensors switching threshold is placed between these two conditions via the **AUTOSET** button during a setup. When the setup is complete the sensors diagnostic screen is used to determine if enough margin is present above and below the threshold for stable operation. This is done by passing an object through the light beam while watching the screen.



This is most useful when the object moves slowly past the fiber-optics. In general, numerical displays are ineffective for monitoring sensor performance at fast and even moderate production line speeds. The **DFS21** includes a new feature to address this issue. We use a unique algorithm to track how far above (+Margin) and how far below (-Margin) the signal goes relative to the threshold over multiple events.

We then turn the second channel output into a health channel output and the second channel display into a health monitor meter to display the tracked margin.

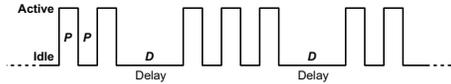
The more filled the health monitor meter the better the margin. At the bottom left of the screen, sensor performance is categorized as Poor, Low, Good, or Great. The bargraph display has steps to indicate the difference between the 4 levels. Fully filled is "Great", 50% is "Good", 25% filled is "Low" and less than that is Poor. The system requires ongoing events to evaluate margin. This screen can be left active. When the health monitor meter is underfilled, tapping the appropriate manual adjust - or + can increase margin.



# Remote Command Programming

In Remote Command Mode a limited set of options can be configured via the input wire. This is accomplished by sending a simple sequence of pulses on Q2 (white wire). For example, sending a sequence of three pulses followed by three pulse followed by two pulses selects dark on mode.

## Example of 2 - 3 - 2 pulse command



Pulse width (P) is 40ms - 400ms.  
The delay between sets of pulses (D) is 0.75 - 5 seconds.

Pulses are displayed while being received. Valid commands are executed immediately. Holding the input active will cancel a partial command.

## AUTOSET

A single pulse command initiates an AUTOSET. A second single pulse command is required to complete Two-Point and Dynamic AUTOSETs.

Setting	Option	Icon	Pulse Sequence	Notes
AUTOSET	Channel 1		1 - - -	A single pulse initiates AUTOSET. An additional pulse command is required to complete AUTOSET for two-point and dynamic modes.
	Channel 2		2 - - -	
<b>PER CHANNEL</b>				
AUTOSET Mode	Light-State	LS	3 - 1 - 1	(Window) Invalid when Health Monitor enabled
	Dark-State	DS	3 - 1 - 2	
	Midpoint	MP	3 - 1 - 3	
	Two-Point	2P	3 - 1 - 4	
	Dynamic Set	DY	3 - 1 - 5	
	Window	WN	3 - 1 - 6	
AUTOSET Percent	1%	01%	3 - 2 - 1	Percentage will affect the next Light, Dark AUTOSET.  Immediate effect on Window Size
	2%	02%	3 - 2 - 2	
	5%	05%	3 - 2 - 3	
	10%	10%	3 - 2 - 4	
	20%	20%	3 - 2 - 5	
	50%	50%	3 - 2 - 6	
Detect Mode	Light On	LO	3 - 3 - 1	
	Dark On	DO	3 - 3 - 2	
Timer Function	Bypass	⊗	3 - 4 - 1	
	On-Delay	⊗	3 - 4 - 2	
	Off-Delay	⊗	3 - 4 - 3	
	One-Shot	⊗	3 - 4 - 4	
	Motion	⊗	3 - 4 - 5	
	On, Off-Delay	⊗	3 - 4 - 6	
	On, One-Shot	⊗	3 - 4 - 7	
	Off, One-Shot	⊗	3 - 4 - 8	
	Blind One-Shot	⊗	3 - 4 - 9	
	Delayed One-Shot	⊗	3 - 4 - 10	
	Stop, One-Shot	⊗	3 - 4 - 11	
Timer 1 Duration	1ms		3 - 5 - 1	
	2ms		3 - 5 - 2	
	5ms		3 - 5 - 3	
	10ms		3 - 5 - 4	
	20ms		3 - 5 - 5	
	50ms		3 - 5 - 6	
Timer 2 Duration	1ms		3 - 6 - 1	
	2ms		3 - 6 - 2	
	5ms		3 - 6 - 3	
	10ms		3 - 6 - 4	
	20ms		3 - 6 - 5	
	50ms		3 - 6 - 6	
<b>SHARED</b>				
Button Lock	Disabled		4 - 1 - 1	
	Enabled	🔒	4 - 1 - 2	
Display Mode	Numeric		4 - 2 - 1	
	Percentage		4 - 2 - 2	
	Numeric (Flipped)		4 - 2 - 3	
	Percentage (Flipped)		4 - 2 - 4	
Response Time	Ultra-High-Speed	UHS	4 - 3 - 1	Anti-Crosstalk Disabled
	High-Speed	HS	4 - 3 - 2	Anti-Crosstalk Disabled
	Standard	STD	4 - 3 - 3	
	High Resolution	HR	4 - 3 - 4	
	Long-Range	LR	4 - 3 - 5	
	Ultra-Long-Range	ULR	4 - 3 - 6	
Hysteresis	Low	H0	4 - 4 - 1	
	Standard	H1	4 - 4 - 2	
	High	H2	4 - 4 - 3	
Anti-Crosstalk	Disabled		4 - 5 - 1	
	Async-Channel A	xA	4 - 5 - 2	Changed but ignored in UHS & HS
	Async-Channel B	xB	4 - 5 - 3	Changed but ignored in UHS & HS
LED Power	Auto	#A	4 - 6 - 3	
	High Power	IP	4 - 6 - 3	
	Low Power	OP	4 - 6 - 3	
<b>HEALTH MONITOR</b>				
Channel Config.	Dual Channel		5 - 1 - 1	
	Single / Health		5 - 1 - 2	
Margin Tracking	Disabled		5 - 2 - 1	
	Enabled	A	5 - 2 - 2	
Required Margin	Low		5 - 3 - 1	
	Good		5 - 3 - 2	
	Great		5 - 3 - 3	
Alert Mode	Normally Open		5 - 4 - 1	Active High in Push/Pull Mode
	Normally Closed		5 - 4 - 2	Active Low in Push/Pull Mode
Active Channel	Channel 1		6 - 1 - 1	Invalid with Health enabled
	Channel 2		6 - 2 - 1	

# Specifications

## SUPPLY VOLTAGE & CURRENT

- 8-30 Vdc
- 28ma @ 24Vdc, 49ma @ 12Vdc
- Reverse polarity protected
- Transient spike protected

## OUTPUT

- Configurable NPN, PNP or Push-Pull
- 150mA output current
- Short circuit & transient spike protected
- Saturation voltage: < 0.3Vdc @ 10mA < 2Vdc @150mA

## INPUT

- Configurable active high/low
- Transient spike protected
- Configurable function: Remote setting or commands, Interrogate, Gate, Dark-On, Lockout, and Latch Reset.

## POWER-UP DELAY

- 300ms. No output pulse on power-up.

## RESPONSE TIME (Dependent on Mode)

- Ultra-High-Speed (UHS) 50µs
- High-Speed (HS) 125µs
- Standard (STD) 250µs
- High-Resolution (HR) 1ms
- Long-Range (LR) 4ms
- Ultra-Long-Range (ULR) 16ms

## REPEATABILITY (Dependent on Mode)

- UHS 12µs.
- HS, STD, HR, LR, ULR (15.635µs)
- Asynchronous crosstalk enabled (31.25µs)

## MAXIMUM RANGE

(RED) (INFRARED)

### Opposed Mode

- UHS 20in (508mm) 34in (878mm)
- HS 28in (711mm) 48in (1219mm)
- STD 32in (813mm) 57in (1463mm)
- HR 47in (1193mm) 69in (1756mm)
- LR 60in (1524mm) 83in (2121mm)
- ULR 75in (1905mm) 118in (3000mm)

### Proximity Mode

- UHS 8in (203mm) 10in (254mm)
- HS 11in (279mm) 14in (355mm)
- STD 13in (330mm) 15in (381mm)
- HR 16in (406mm) 20in (508mm)
- LR 21in (533mm) 23in (584mm)
- ULR 28in (711mm) 28in (707mm)

When anti-crosstalk is enabled maximum range specifications are reduced 30%.

Note: Opposed tests utilized: PF-Z-78TL (Red)

Proximity tests utilized: PFD-Z-78M64 (Red)

## LIGHT IMMUNITY

- High immunity to most ambient light, including high efficiency lighting and high intensity strobes.

## MUTUAL INTERFERENCE REJECTION

- Asynchronous: Two sensor max. responds to selected A or B Channel.

## COMBINABLE DUAL TIMERS & COUNTERS

- On-Delay, Off-Delay, One-Shot, Motion
- Latching function
- Counters (counting range up to 9999)
- Each channel can use a unique timer/counter
- Timer range: 0.1 - 0.9ms, 1ms - 9,999ms

## LED LIGHT SOURCE

- 4 element LED, Red = 660nm
- IR = 880nm (Use glass fibers with Ø2.2mm connection only).

## DISPLAY

- 96 X 16 white dot matrix OLED
- Display numerical range depended on processing mode
- UHS - 1,023
- HS - 2,047
- STD - 4,095 (default setting)
- HR - 16,383
- LR - 32,767
- ULR - 65,535

## LED INDICATORS

- Each channel has a separate LED indicator, Channel 1 and Channel 2.
- Output: Red LED. Illuminates when output is ON. Flashes when either output is overloaded.

## CONNECTIONS

- M8, 5-pin
- Attached cable: 5-wire 6ft (1.8m)

## OPERATING TEMPERATURE

- 5°C to 55°C (41°F to 131°F) - Electrical.

## HOUSING CONSTRUCTION

- Chemical resistant, high-impact polycarbonate

## RATINGS & CERTIFICATIONS

- IP50
- CE
- UL pending



RoHS Compliant  
Product subject to change without notice

## Dimensions

## DFS21 Digital Fiber Optic Sensor

