

Flicker Fusion User Instructions



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Description

The Lafayette Instrument Model 12021A Flicker Fusion provides the user with a variety of versatile controls to perform accurate and timely measurements of CFF. Digital circuitry is used to provide extremely accurate frequency generation from 1.0 Hz to 100.0 Hz in 0.1 Hz steps. The LCD display allows for exact and repeatable frequency settings, while the serial port computer interface provides a means for test result storage or computer control of the device. The user options include five modes of operation to cover virtually any test requirement: Ascending Auto Frequency, Descending Auto Frequency, Continuous, Discrete, and Analog Control Mode. Three automatic profiles (Automatic Method, Adaptive Method, and Self-Control Method) are available when connected to a computer running Lafayette Instrument Company's PsymLab software (available from Lafayette Instrument Company). A serial-to-USB converter is required to connect with PsymLab.

The Lafayette Instrument viewing chamber has two lights, one for the left eye and one for the right eye. The light compartments are completely separated, allowing for four stimulus combinations to occur: left eye only, right eye only, left and right simultaneously, or left and right alternately.

The viewing chamber is constructed to control extraneous factors, which might distort CFF values. The white Electroluminescent lamps produce even illumination over a ½" diameter viewing area. The stimuli are separated by 2 ¾" center to center with a stimulus to eye distance of 15" and a viewing angle of 1.9°. The inside of the viewing chamber is a dull black to minimize reflection.

The Model 12021A Flicker Fusion is a significant improvement over the previous Model 12023A Flicker Fusion. The improved features include: frequency generation with only 0.05% error, defined sweep rate settings, 4 control push buttons and menu-driven LCD display for smaller packaging, RS-232C interface for computer control and test result storage, and hypo-allergenic silicone viewing chamber mask for a comfortable fit on the test subject's face.

Overview

The Model 12021A Flicker Fusion is designed to test for the critical flicker fusion threshold (CFF). CFF can be used as an index of the temporal resolving power of the human visual system. The threshold of the flicker fusion is determined in the following manner: a light beam is interrupted intermittently by electronic means at a slow rate, causing it to flash or flicker. If the rate of the flicker exceeds a certain rate, the light will appear steady. The rate at which flicker ceases and the light appears steady is the threshold of fusion. The rate of flicker is then decreased from steady to the point at which the light changes from steady to flicker, the threshold flicker. The average of the threshold of fusion and the threshold of flicker is called the critical flicker fusion threshold (CFF).

CFF is sensitive to a number of presentation and observer variables. Presentation variables include stimulus frequency, luminance of the stimulus, stimulus size, light/dark ration, stimulus color, and contrast. Observer variables reported to affect results include body temperature, practice, general physiological state, age, sex, and genetic variables.

Specifications

Power Supply: 10VDC @ 1.5A, 2.1mm center positive DC plug

Fuse: 0.5A 5 x 20mm fast blow

Frequency: 1.0 to 100.0 Hz in 0.1 Hz increments with an error of 0.05%

Slide Holder: 2" x 2" 35mm holder for optional 12100 neutral density filters with 0.1% to 50% light transmission

Auto Mode Ramp Rates: options of 0.5, 1, 2, and 4 Hz per second

Analog Input: 3.5mm mono phone plug with voltage range from 0.1 to 10V for 1.0 to 100.0 Hz flicker rate; ABSOLUTE MAXIMUM INPUT = 14V

External Initiate: SPST normally open hand-held switch with RCA input

External Response: SPST normally open hand-held switch with 3.5mm stereo plug

RS-232C Port Settings: 9600 baud, no parity, 8 data bits, 1 stop bit

Typical Maximum Luminance: 58 Cd/m²

Viewing Angle: 1.9°

Light/Dark Ratio: 1:1

Stimulus Color: White

Viewing Chamber Mask: hypo-allergenic black silicone; mask may be cleaned with an alcohol wipe

Control Size: 8 5/8"W x 6.5"L x 3 1/4"H; Weight 1.8 lbs

Viewing Chamber Size: 7"W x 19"L x 16"H; Weight 7.4 lbs

Parts Included

- 1 – Control Unit
- 1 – Viewing Chamber
- 1 – 10 VDC wall mount AC adapter
- 1 – DB9 Female to Female cable
- 1 – DB15 Male to Female cable
- 1 – Single hand-held push button
- 1 – Dual hand-held push button

Operating Instructions

1. With all power off, connect the DB15 cable from the CONTROL connector on the rear of the viewing chamber to the VIEWING CHAMBER connector on the rear of the control chassis.
2. Connect the black hand-held subject response switch to the external response connector on the rear of the viewing chamber.
3. If external stimulus initiation is desired, connect the silver hand-held push button to the EXTERNAL INITIATE connector on the rear of the control chassis.
4. If computer control is desired, connect the serial cable from the COMM.PORT connector on the rear of the control chassis to communication ports 1 or 2 of the computer.
5. Once the above connections are completed, plug the wall mount AC adapter plug into the DC POWER jack on the rear of the control chassis.
6. Familiarize yourself with the following menu driven controls
7. In each mode the subject may respond by pressing either side of the black subject response key.



Hand-held Subject Response Switch

A. Luminance Adjust (Figure 1)

This adjustment is only available upon powering up of the device. The stimulus luminance may be adjusted using push button #1 to increase and push button #2 to decrease. Push button #3 will continue to the mode selection. The luminance percentage represents the percent of the maximum stimulus luminance available. Even though the stimulus lamps have been pre-aged to minimize decay, as the lamps age some decay in luminance will be present, however the left and right stimulus lamps will decay at the same rate.

Figure 1: Luminance Adjust



B. Mode Selections (Figure 2)

1. Ascending Auto Frequency (>AUTOFREQ)

After selecting luminance or reset, select his mode with push button #1. Once the mode is selected, select the desired stimulus for activation using push buttons #1 to #4 in Figure 3. Once the stimulus is selected, select the desired sweep rate for the test using push buttons #1 to #4 in Figure 4. Once the sweep rate is selected, the display will show the mode that has been selected and the lower limit frequency, Figure 5. Push buttons #1 to #4 will now perform the functions labeled below the buttons. To increase the frequency setting use #1, to decrease the frequency setting use #2, to initiate the test use #3, and to reset back to the mode selection screen use #4. Once initiated, the selected stimulus will activate and flicker at the lower limit. The flicker frequency will increase at the selected sweep rate until a response or reset occurs. When a response is made the frequency is halted and the stimulus is deactivated. Press #3 to reset for the next test. Press #3 again to reset back to the mode selection window. If the upper limit frequency of 100.0 Hz is reached or the reset button is pushed, the stimulus is deactivated and the frequency is reset to the starting lower limit.

2. Descending Auto Frequency (<AUTOFREQ)

After selecting luminance or reset, select this mode with push button #2. Once the mode is selected, select the desired stimulus for activation using push buttons #1 to #4 in Figure 3. Once the stimulus is selected, select the desired sweep rate for the test using push buttons #1 to #4 in Figure 4. Once the sweep rate is selected, the display will show the mode that has been selected and the upper limit frequency, Figure 5. Push buttons #1 to #4 will now perform the functions labeled below the buttons. To increase the frequency setting use #1, to decrease the frequency setting use #2, to initiate the test use #3, and to reset back to the mode selection screen use #4. Once initiated, the selected stimulus will activate and flicker at the upper limit. The flicker frequency will decrease at the selected sweep rate until a response or reset occurs. When a response is made the frequency is halted and the stimulus is deactivated. Press #3 to reset for next test. Press #3 again to reset back to the mode selection window. If the lower limit frequency of 1.0 Hz is reached or the reset button is pushed, the stimulus is deactivated and the frequency is reset to the starting upper limit.

3. Continuous (CONTIN)

After selecting luminance or reset, select this mode with push button #3. Once the mode is selected, select the desired stimulus for activation using push buttons #1 to #4 in Figure 3. Once the stimulus is selected, the display will show the mode that has been selected and the current frequency, Figure 5. Push buttons #1 to #4 will now perform the functions labeled below the buttons. To increase the frequency setting use #1, to decrease the frequency setting use #2, and to reset back to the mode selection screen use #4. The stimulus is on continuously in this mode, therefore the initiate push button is not used.

4. Discrete (DISCRT)

After selecting luminance or reset, select this mode with push button #4. Once the mode is selected, select the desired stimulus for activation using push buttons #1 to #4 in Figure 3. Once the stimulus is selected, the display will show the mode that has been selected and the current frequency, Figure 5. Push buttons #1 to #4 will now perform the functions labeled below the buttons. To increase the frequency setting use #1, to decrease the frequency setting use #2, to initiate the test use #3, and to reset back to the mode selection screen use #4. Once initiated, the selected stimulus will activate and flicker at the current frequency. The flicker frequency will remain constant until a response or reset occurs. When a response or reset occurs the stimulus is deactivated.

5. Analog

This mode is not selectable through the control push buttons. Analog frequency control is only available in Continuous Mode. Connect the analog input through the 3.5mm mono ANALOG INPUT connector on the rear of the control chassis, using the center pin for the positive voltage. The control will automatically detect when an analog voltage between 0.1 and 10V is present, with 0.1V = 1.0 Hz and 10V = 100.0 Hz. The frequency will adjust in 1.0 Hz steps as the voltage is changed. Analog voltages below 0.1V will set the frequency at 1.0 Hz and analog voltages above 10V will set the frequency at 100.0 Hz. To exit the Analog Mode, push the reset push button. This will return to the mode selection window, Figure 2. **WARNING:** The maximum allowable analog input voltage without damaging the control unit is 14V.

Figure 2: Mode Selection



Figure 3: Stimulus Selection



Figure 4: Sweep Rate Selection



Figure 5: Operate Window



C. Stimulus Selection

1. Left - Only left stimulus flickers.
2. Right - Only right stimulus flickers.
3. Coincident- Both stimuli flicker at the same time.
4. Alternate- Left and Right stimulus flicker alternately.

D. Sweep Rate Selection

The rate at which the frequency changes in either automatic mode.

1. 0.5 Hz per second
2. 1 Hz per second
3. 2 Hz per second
4. 4 Hz per second

Running with PsymLab Software

Lafayette Instrument Company's PsymLab software contains three protocols that may be used to administer tests, save results along with subject information, and create reports. These protocols include: Automatic Method, Adaptive Method, and Self-Control Method.

Connecting to a computer running PsymLab requires a serial-to-USB converter (Model 12021A-USB) in addition to the DB9 serial cable provided with the device. Power up the Model 12021A control before starting the software.

In Automatic Method, PsymLab automatically runs a test using the Ascending Auto Frequency Mode to determine the fusion frequency and the Descending Auto Frequency Mode to determine the flicker frequency. The results of these two tests are averaged to obtain the CFF value. In this method, the subject responds by pressing either side of the hand-held subject response switch.

In Adaptive Method, PsymLab uses the Discrete Mode to display fixed frequencies and allows the test subject to respond to the frequencies as "flicker" or "fusion". PsymLab uses the responses to "zero in" on the CFF value. Please notice the symbols on the black hand-held subject response switch. The half-moon shape with dotted lines extending out symbolizes a response of "flicker". The half-moon shape with solid lines extending out symbolizes a response of "fusion".

In Self-Control Method, PsymLab uses the Continuous Mode to display a starting frequency and allows the test subject to select whether to increase or decrease the frequency. The test is complete when the test subject cannot discern whether the frequency is a flicker or a constant. Please notice the symbols on the black hand-held subject response switch. The "+" symbolizes a response to increase the frequency. The "-" symbolizes a response to decrease the frequency. The amount of the increase or decrease becomes smaller as the subject "zeros in" on the CFF.

More details on these methods and corresponding settings are available in the PsymLab manual.

Photosensitivity Warning

A small percentage of people may experience symptoms of photosensitivity when exposed to flashing lights. These symptoms include feelings of nausea, dizziness, migraines, visual distortions, or photosensitivity induced seizures characterized by one or more of the following: lightheadedness, altered vision, eye or face twitching, jerking or shaking of arms or legs, disorientation, confusion, loss of consciousness or convulsions that can lead to injury from falling or collision. Symptoms can occur in individuals with no history of seizures or epilepsy. Immediately stop using the Flicker Fusion if you experience any of the above symptoms. Consult a physician before using the Flicker Fusion if you or a relative have a history of seizures or epilepsy.

Terms and Conditions

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Phone, Fax, Email or Mail-in Orders

All orders need to be accompanied by a hard copy of your purchase order. All orders must include the following information:

- Quantity
- Part Number
- Description
- Your purchase order number or method of pre-payment
- Your tax status (include tax-exempt numbers)
- Shipping address for this order
- Billing address for the invoice we'll mail when this order is shipped
- Signature and typed name of person authorized to order these products
- Your telephone number
- Your email address
- Your FAX number

Domestic Terms

There is a \$50 minimum order. Open accounts can be extended to most recognized businesses. Net amount due 30 days from the date of shipment unless otherwise specified by us. Enclose payment with the order; charge with VISA, MasterCard, American Express, or pay COD. We must have a hard copy of your purchase order by mail, E-mail or fax. Students, individuals and private companies may call for a credit application.

International Payment Information

There is a \$50 minimum order. Payment must be made in advance by draft drawn on a major US bank; wire transfers to our account; charge with VISA, MasterCard, American Express, or confirmed irrevocable letter of credit. Proforma invoices will be provided upon request.

Exports

If ordering instrumentation for use outside the USA, please specify the country of ultimate destination, as well as the power requirements (110V/60Hz or 220V/50Hz). Some model numbers for 220V/50Hz will have a "C" suffix.

Quotations

Quotations are supplied upon request. Written quotations will include the price of goods, cost of shipping and handling, if requested, and estimated delivery time frame. Quotations are good for 30 days, unless otherwise noted. Following that time, prices are subject to change and will be re-quoted at your request.

Cancellations

Orders for custom products, custom assemblies or instruments built to customer specifications will be subject to a cancellation penalty of 100%. Payment for up to 100% of the invoice value of custom products may be required in advance. Cancellation for a standard Lafayette Instrument manufactured product once the product has been shipped will normally be assessed a charge of 25% of the invoice value, plus shipping charges. Resell items, like custom products, will be subject to a cancellation penalty of 100%.

Exchanges and Refunds

Please see the cancellation penalty as described above. No item may be returned without prior authorization of Lafayette Instrument Company and a completed Return Form. A copy of the Return Form or your assigned Return # (you will receive this via email after submitting the form) must be included with the returned goods. The merchandise should be packed well and fully insured. Unopened merchandise may be returned prepaid within thirty (30) days after receipt of the item and in the original shipping carton. Collect shipments will not be accepted. Returned products must be in saleable condition, and credit is subject to inspection of the merchandise.

Repairs

Instrumentation may not be returned without prior authorization by Lafayette Instrument Company and a completed Return Form. When you

complete the Form, or call Lafayette Instrument, you will receive a Return #. Your Return # number will be good for 30 days. Address the shipment to:

Lafayette Instrument Company
3700 Sagamore Parkway North
Lafayette, IN 47904, USA.

Shipments cannot be received at the LIC PO Box. Items should be packed well, insured for full value, and returned along with a copy of the Return Form or the Return #. An estimate of repair will be given prior to completion ONLY if requested in an enclosed cover letter. We must have a completed purchase order by mail or fax, or repair work cannot commence for non-warranty repairs.

Damaged Goods

Damaged instrumentation should not be returned to Lafayette Instrument prior to a thorough inspection. If a shipment arrives damaged, note damage on delivery bill and have the driver sign it to acknowledge the damage. Contact the delivery service, and they will file an insurance claim. If damage is not detected at the time of delivery, contact the carrier/shipper and request an inspection within 10 days of the original delivery. Please call the Lafayette Instrument Customer Service Department for repair or replacement of the damaged merchandise.

Limited Warranty

Lafayette Instrument Company warrants equipment manufactured by the company to be free of defects in material and workmanship for a period of one year from the date of shipment, except as provided hereinafter. The original manufacturer's warranty will be honored by Lafayette Instrument for items not manufactured by Lafayette Instrument Company, i.e. resell items. This assumes normal usage under commonly accepted operating parameters and excludes consumable products.

Warranty period for repairs or used instrumentation purchased from Lafayette Instrument is 90 days. Lafayette Instrument Company agrees either to repair or replace, at its sole option and free of part charges to the customer, instrumentation which, under proper and normal conditions of use, proves to be defective within the warranty period. Warranty for any parts of such repaired or replaced instrumentation shall be covered under the same limited warranty and shall have a warranty period of 90 days from the date of shipment or the remainder of the original warranty period whichever is greater. This warranty and remedy are given expressly and in lieu of all other warranties, expressed or implied, of merchantability or fitness for a particular purpose and constitutes the only warranty made by Lafayette Instrument Company.

Lafayette Instrument Company neither assumes nor authorizes any person to assume for it any other liability in connection with the sale, installation, service or use of its instrumentation. Lafayette Instrument Company shall have no liability whatsoever for special, consequential, or punitive damages of any kind from any cause arising out of the sale, installation, service or use of its instrumentation. All products manufactured by Lafayette Instrument Company are tested and inspected prior to shipment. Upon prompt notification by the Customer, Lafayette Instrument Company will correct any defect in warranted equipment of its manufacture either, at its option, by return of the item to the factory, or shipment of a repaired or replacement part. Lafayette Instrument Company will not be obliged, however, to replace or repair any piece of equipment, which has been abused, improperly installed, altered, damaged, or repaired by others. Defects in equipment do not include decomposition, wear, or damage by chemical action or corrosion, or damage incurred during shipment.

Limited Obligations Covered by this Warranty

1. In the case of instruments not of Lafayette Instrument Company manufacture, the original manufacturer's warranty applies.
2. Shipping charges under warranty are covered only in one direction. The customer is responsible for shipping charges to the factory if return of the part is required.
3. This warranty does not cover damage to components due to improper installation by the customer.
4. Consumable and/or expendable items, including but not limited to electrodes, lights, batteries, fuses, O-rings, gaskets, and tubing, are excluded from warranty.
5. Failure by the customer to perform normal and reasonable maintenance on instruments will void warranty claims.
6. If the original invoice for the instrument is issued to a company that is not the company of the end user, and not an authorized Lafayette Instrument Company distributor, then all requests for warranty must be processed through the company that sold the product to the end user, and not directly to Lafayette Instrument Company.

Export License

The U.S. Department of Commerce requires an export license for any polygraph system shipment with an ULTIMATE destination other than: Australia, Japan, New Zealand or any NATO Member Countries. It is against U.S. law to ship a Polygraph system to any other country without an export license. If the ultimate destination is not one of the above listed countries, contact us for the required license application forms.