

Illuminator: Mark 3

Order code: MM038



About your purchase

We are delighted that you have chosen the MicroAvionics Illuminator Mark 3 and hope you agree with our opinion that this product brings fresh options to the Ultralight Equipment Marketplace. The Xenon strobe is proven, reliable, lightweight and inherently yields a near point-source intense bright light, as preferred by even the most modern commercial Aircraft. These are ideal characteristics for Anti-Collision systems but until now, older systems have struggled to deliver on those capabilities or suffered other drawbacks.

MicroAvionics now combine high-speed Embedded Microprocessors and Patented concepts to update and reposition Xenon as an Effective supplement to your Aircraft Safety Systems. Our investment includes a thorough technical analysis and the best that modern, Industrial grade Electronics can offer. Because of this, You can expect High Brightness and Efficiency, Long service-life, Low Noise, Adaptability and full Support for 1,2 or 3 head systems from one product.

Set-up is straightforward and a choice of programmable flash patterns and dynamic rate control bring flexibility without performance sacrifices. Add or remove a strobe head and your Illuminator Mark 3 adjusts flash thresholds automatically. There is no need to measure flash rates or set function switches. Calculated rate-scaling and built in Power-draw analysis means you can run to the regulated limits with just one control, whatever pattern you choose.

About this Manual

Extreme strobe Intensity means high visibility, which enhances Safety for you and your Passengers whether you are in-flight or on the ground. The Illuminator MK3 drives multiple Xenon beacon heads solidly and reliably, using High Voltages and components that charge and release very large internal Energy reservoirs quickly– So whilst fitting is not difficult, attention to detail is called for during installation and use. Please read instructions from start to finish before fitting begins and keep this manual for future reference.

MicroAvionics is committed to ongoing product design using leading edge technology, build quality, testing and after-sales service. We will always value your comment and opinion. As for all Aircraft Equipment, inspection and maintenance of the system and interaction with other Aircraft Equipment should form part of your Test and Maintenance Schedule. This Manual describes installation and operating instructions for the MicroAvionics Illuminator MK3, installed with Firmware 8KN-V2.0 If you are unclear on any part of this document or if any questions arise, your Authorised supplier will be pleased to help you.

SYSTEM CONNECTIONS, CONTROLS AND INDICATORS

Inlet and Controls (Left Hand Seen from Top)

Power Inlet : Switch : LED Indicators : Rate Adjust



Strobe Connections (Right Hand Side Seen from Top)

Channels 1, 2 and 3



WARNING: High Voltages and Stored Energy

The Illuminator MK3 uses high voltages and stores Energy with large internal reservoirs to deliver excellent Strobe brightness. This means that certain precautions are needed, so please read this section thoroughly.

All pins of the strobe head connectors 1,2 and 3 will present High Voltages during operation - AND for several minutes after the power is turned off, whether heads are connected or not. Never allow anyone to touch exposed electrical connections at any time and You must Wait Five (5) minutes or more after power-off before making changes to the wiring, connectors or any other part of the system.

You Must:

1. Ensure all connections are insulated from - and are inaccessible to anyone, before and during any phase of Aircraft operations. We suggest you securely cover all unused outlets and plug-in terminal block connections with heat shrink sleeving.
2. Add this warning notice to your Aircraft technical manual: 'The Aircraft strobe system generates High Voltages. Do not touch any Electrical connections as this may result in Electric Shock'.
3. Provide an EARTH BOND from the Illuminator MK3 case to the Aircraft Chassis Ground using cable and terminations that is equal to - or greater than the rating of the power supply feed wires. Etch the anodising off of the strobe driver before you bolt the earth wire.
4. Make sure that all Electrical connections are sound, well tightened and free of contamination. Loose or damaged connections can overheat and/or produce Sparks.
5. Ensure all cabling is free from damage such as cracking and insulation failure over the entire length
6. Never power the strobe system if the Illuminator MK3 itself or any wiring/connectors within 25 Centimetres of the outlet terminals is wet, or suffers condensation. Water and other fluids can support current flow on the surface of insulation. Operating in this unserviceable condition may also damage the system beyond repair and this will invalidate your Warranty.
7. Remove or protect the Illuminator MK3 if it may otherwise become wet whilst washing the Aircraft.

WARNING: High Intensity Light and Stroboscopic Effects

Don't look directly at strobe heads during operation and be aware that some people, for example those suffering certain types of Epilepsy, can be adversely affected by stroboscopic effects. This warrants consideration for Passengers and others who may be close enough to your Aircraft to be affected.

INSTALLATION

You should consult and follow technical advice from your flying association or governing body before you start the installation.

Choosing the right place for Your Illuminator

The Illuminator needs to be mounted securely and permanently, in a completely dry area of the Aircraft where there is unforced ventilation, far from any flammable materials or liquids. As a general guide, fix where the total length of all cable needed will be as low as possible, but consult 'Strobe Connections' paragraph for cable length limitations. Do not place the Illuminator directly in the Propwash, the Airstream or in any position where it may become damp or wet. Never cover the unit with thermally insulating materials such as blankets, foam or luggage because cool air must be allowed at the case surfaces.

Positioning Strobe Heads

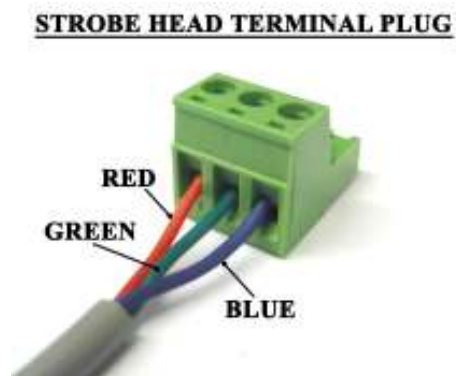
Strobe Heads should be prominent for maximum visibility and securely fixed according to applicable regulations. Avoid locations where excessive reflections from wind shields, visors or highly polished surfaces would impede the Pilot's field of view.

CABLING: General

Please read this part of the manual before cutting cables. Consult section 'positioning' and locate both Illuminator and Strobe heads. Temporarily tack the cables along the planned route before cutting cables to length. Do this before permanent fixing because splicing cables together to increase reach is not advisable, requires waterproof insulation and can impair system performance.

Strobe Head to push-in Terminal Block Wiring

Connect each correct type of Strobe Head to one terminal block header as shown below. Push this terminal block header firmly into the appropriate socket as shown in Table 1.



Use only compatible Xenon remote trigger heads, for example MicroAvionics type MM034 or MM035.

- Red:** High Voltage Xenon Feed Line (Positive)
- Green:** High Voltage Xenon Feed (Trigger)
- Blue:** High Voltage Return Line (Negative = Approximately Power Supply Negative)

Table 1 Strobe Head Connections

Number of Strobe Heads	Allowable Channel Numbers
1	Use Any: 1,2 or 3. Insulate All Unused Channels
2 *	Use 1 and 3. Insulate and cover Channel 2 outlet
3	Tail to Channel 2. Wings to channels 1 and 3

* Incorrectly connecting the centre channel (channel 2) for a two-strobe system will not cause damage but will cause an Error to halt the system until this is corrected and the power is turned off and then restored. Allow five seconds after disconnecting power before reconnecting it to allow the internal microprocessor time to fully reset.

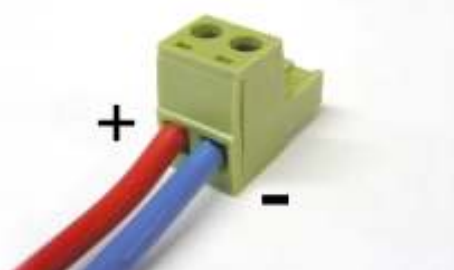
About Strobe Head cable lengths

We recommend a strobe head to Illuminator cable length of between 1.5 Metres and 7.0 Metres to balance performance and long component life. Very short cables will increase beacon flash brightness but this will also reduce the working life of some internal components, whereas longer cables will have the opposite effect. Radio Frequency noise can increase if cable lengths are above or below the recommended limits and cables that are much too long can produce unreliable results. Check table 2 for minimum cable length limit (depends on operating mode).

Power Inlet

Check the inlet supply requirements listed in specifications and then connect using wire of appropriate rating (please check Electrical Specifications) with in-line fusing described below.

POWER INLET TERMINAL PLUG



FUSING

You must fit a fuse in-line with the Positive feed from the Power Supply according of a value and type listed in the Electrical Specifications table. Do not use a fuse of a higher rating or different type, as will cause a loss of protection against some faults, such as reverse polarity protection and will also invalidate your warranty. The fuse holder itself must be continuously rated for at least 15 Amps. Do not fuse the negative power supply lead.

If the fuse blows repetitively on power-up, stop, wait for internal reservoir discharge for five minutes and then investigate the cause. Incorrect polarity applied to the Inlet power terminals for example will destroy the fuse. If you have acquired your Illuminator as a second user, check the fuse and ensure the type and rating are correct.

Radio Frequency Interference (RFI) Emissions and Susceptibility

The Illuminator MK3 employs a combination of filters and design tactics to limit Emissions and help protect against stray Electric and Magnetic fields. However, all High Efficiency switching circuits produce and respond to unwanted noise to some extent. RFI performance can be enhanced by doing these things when fitting:

1. Use shorter wire lengths where possible but check that strobe wiring is not less than the recommended length in 'strobe connections' paragraph. Tie wrap the power and strobe wiring as close as possible to secure and appropriate Airframe chassis parts.
2. Make sure that the supply is within the range specified for normal operation at the Illuminator power inlet terminals. If the battery is too old or too weak, or if the power supply wiring is too thin, more noise than normal can be produced.
3. Don't use the Aircraft Earth / Chassis Ground as the Negative return for Power. This connection must return separately to the Power Supply. Positive and Negative power wires should also run parallel to each other, all the way from the Illuminator to the supply feed.
4. Don't coil unused wiring in a loop. Instead, cut to slightly more than the minimum length needed. If there is a small length of excess cable, use tie-wraps and fold wiring back on itself but avoid using a very tight bending radius;



Like this



Not like this

Always test your Avionics systems, Communications and Navigation Radios after Installation or if the system configuration, flash pattern or rate is adjusted. It is normal for RFI to slightly affect some Airband frequencies more than others and the actual noise 'profile' will change slightly with system settings and layout, so you should retest if changes occur.

BEFORE FIRST USE

Either one, two or three Xenon heads may be connected to your Illuminator MK3 and it will automatically detect and respond to your set-up. Check the Strobe Connection guide (Figure 1) to verify that compatible Xenon strobe heads are fed from the correct channels as some wiring combinations are not allowed. Make sure that all connections are correct, secure and that you read and noted all instructions, warnings and installed the system as described.

If you interrupt the power supply, even if it has only been switched on very briefly, you must wait for internal Energy reservoirs to discharge before making any changes to the system, as described in the earlier section of this manual: "WARNING: High Voltages and Stored Energy"

Your Illuminator MK3 is now ready to switch on. If already fitted to your Aircraft, some settings such as the flash pattern might have been previously set but this is easily changed to your preference as explained later in the manual.

NORMAL OPERATION

1. Power on

Switch on the 12 Volt power to the Illuminator MK3. Provided that no faults are found during the start-up sequence below, no user action is needed and normal operation will commence.

2. Automatic Self-test

The system will always run a short test lasting less than 15 Seconds, before starting normal operation. The BLUE Led is on at this time. During the test, all serviceable heads will flash alternately several times. The Illuminator MK3 now knows which channels are connected, which have heads that are working properly, and which are either disconnected or faulty.

Any channels that are not connected to a serviceable head will be locked-out and no attempt is made to trigger them again whilst power is applied, however, high voltages will still be present on all strobe head channels and continue to do so after power is removed.

3. Head Detection Display

When the self test is completed, if no fault is found, the BLUE led is turned off and All white channel indicator LEDs to which a serviceable head is connected will flash on and off three times at a rate of approximately one blink per second.

4. Normal Operation

Normal operation starts and continues whilst adequate power is applied. The intended flash pattern is repeated on the three white LED's.

ALL USER ADJUSTMENTS

Changing either the flash rate or pattern requires that power is applied to the unit. This means that all strobe head channel connections should be considered at high voltage and care must be taken to avoid the risk of electric shock. Make sure all unused connections are properly insulated and read the warning: "High Voltages and Stored Energy" section of this manual before you begin.

ADJUSTING THE FLASH RATE

This is easily adjusted at any time during normal operation after the start-up test sequence has completed. Insert a small, insulated cross-head screwdriver through the Flash Rate aperture and twist to desired setting between fully anticlockwise (Minimum rate) and fully clockwise (Maximum rate). Do not force the internal potentiometer beyond the mechanical end stops.

The rate scale range is calculated, applied and recalled automatically at start-up and limits depend on both the number of heads connected and the flash pattern. The minimum flash rate is set at 40FPM. The Maximum flash rate varies depending on the number of heads and selected mode. In Single head full power modes (Modes 1,2,3) the maximum flash rate is reduced to avoid delivery of otherwise excessive power. Note there is always a short delay of one flash cycle before changes to the rate selection potentiometer are applied.

CHOOSING THE FLASH PATTERN (Mode Selection)

Your Illuminator 3 supports a wide array of flash patterns. You may wish to choose a particular pattern to help discriminate between other flyers in a group, upon the basis of visibility requirements or to control operating power. The flash pattern is stored and recalled automatically at power-up.

Choose the desired pattern from Table 2 and note the white LED state for the required result, then follow the procedure below. Note that the availability of flash patterns depends on the number of serviceable heads that have been connected. Low power modes are available for all head configurations to maximise battery life.

1. Switch on the 12 Volt power to the Illuminator MK3
2. The Automatic Self-test starts and the BLUE led turns on
3. Within 3 seconds of power up, press the control button. The BLUE led will now turn off.
4. The test sequence completes as normal and the Head Detection display shows which heads are connected
5. The BLUE led will now blink slowly to show that the flash pattern selection mode is active and the currently selected flash pattern is shown on the three WHITE LED's (LED1,2,3).
6. To toggle through all the available flash patterns, push and release the control button. The white LED pattern will change each time the control button is pushed. When the white LED pattern is as required for the selected flash pattern mode, stop pressing the control button. Do not remove power until the next step is completed or changes will not be applied and the sequence above will need to be repeated. If you do not press the control button at all during this stage, the flash pattern will remain unchanged.
7. Approximately 10-20 seconds after the last control button press, the BLUE led will stop blinking. At this point the selected flash pattern is saved for automatic recall each time the unit is powered up. The flash pattern has now been changed and normal operation will start after a short delay.

NOTES FOR CONTROLLING OPERATING CURRENT

The Average operating current of the Illuminator 3 at any particular supply voltage is dependant on:

1. **Flash rate:** Minimum rate > Minimum average current consumption in any given operating mode.
The flash rate does not affect strobe brightness.
2. **Mode:** Choose a low power mode from Table 2 to minimise the operating current and power consumption.
The strobe brightness is reduced slightly in low power modes.

Table 2 Flash Pattern Selection Guide

KEY

Pattern channel codes: L = Left Channel, R = Right Channel, T = Tail Channel, A = Any Channel

Minimum Flash rate: 40FPM nominal set-point for all modes

Maximum flash rate: Dependant on Mode selection and number of Heads (See below)

LED On: *

LED Off: -

(HP) = High Power Modes (LP) = Low Power Modes

MCL: Minimum strobe head to Illuminator cable length for all connected heads

Mode	LED 1	LED 2	LED 3	Single Head	Two Heads	Three Heads
1 (HP)	-	-	*	1 Flash per cycle A,A,A etc. FPM (Max): 60 MCL = 5.0M	1 Flash per cycle, Alternating: L, R FPM (Max): 80 MCL = 3.0M	2 Flash per cycle, Alternate: (L-T), (R-T) FPM (Max): 100 MCL = 1.5M
2 (HP)	-	*	-	2 Flashes per cycle (A-A),(A-A) FPM (Max): 60 MCL = 5.0M	2 Flashes per cycle. Alternating: (L-R), (R-L) FPM (Max): 80 MCL = 3.0M	3 Flashes per cycle, Alternate: (T-L-R), (T-R-L) FPM (Max): 100 MCL = 1.5M
3 (HP)	-	*	*	3 Flashes per cycle (A-A-A),(A-A-A) FPM (Max): 60 MCL = 5.0M	2 Flashes per cycle. Alternating: (L-L), (R-R) FPM (Max): 80 MCL = 3.0M	3 Flashes per cycle, Alternating (T-L-L), (T-R-R) FPM (Max): 100 MCL = 1.5M
4 (LP)	*	-	*	1 Flash per cycle – A,A,A etc. FPM (Max): 80 MCL = 5.0M	1 Flash per cycle, Alternating: L, R FPM (Max): 80 MCL = 1.5M	2 Flash per cycle, Alternating (L-T), (R-T) FPM (Max): 100 MCL = 1.5M
5 (LP)	*	*	-	2 Flashes per cycle (A-A),(A-A) FPM (Max): 80 MCL = 5.0M	2 Flashes per cycle. Alternating: (L-R), (R-L) FPM (Max): 80 MCL = 1.5M	3 Flashes per cycle, Alternating (T-L-R), (T-R-L) FPM (Max): 100 MCL = 1.5M
6 (LP)	*	*	*	3 Flashes per cycle (A-A-A),(A-A-A) FPM (Max): 80 MCL = 5.0M	2 Flashes per cycle. Alternating: (L-L), (R-R) FPM (Max): 80 MCL = 1.5M	3 Flashes per cycle, Alternating (T-L-L), (T-R-R) FPM (Max): 100 MCL = 1.5M

SYSTEM FAULTS / TROUBLESHOOTING

Several built-in hardware and software features work together to enhance fault tolerance for high reliability in flight. If a recoverable fault occurs during operation this condition will be described in Table 3. In this case, the system will automatically restart in the quickest possible manner.

If a non-recoverable fault occurs such as described in Table 4, the system will be shut down or the in-line fuse will be blown. If faults are observed at any time, you should always investigate and eliminate the root cause at the first opportunity.

Table 3: RECOVERABLE FAULTS

ROOT CAUSE	System Behavior during fault	Indicator lamps	ACTION	Behaviour after clearing the fault
Under Voltage or Insufficient available power	Flash rate is reduced or halted depending on severity. Possible Increased time to complete <u>Automatic Self-test phase</u>	Blue LED flashes quickly (5 blinks per sec.)- And: WHITE LED1 is ON	Check the Battery condition and verify the power cable rating	<u>Brief supply interruption</u> : Normal operation resumes. <u>Long duration supply interruption</u> : A full restart sequence will occur.
Temporary Over-Voltage. Warning: Inlet voltages greater than the specified maximum will cause permanent, irrecoverable damage	Head triggering is halted for all channels (interruption of normal flash pattern).	No change	Check the Battery condition, power supply feed and Alternator regulator if applicable	Normal operation resumes automatically
Temporary Over-temperature *	Flash rate becomes intermittent. Possible Increased time to complete <u>Automatic Self-test phase</u>	No change	Improve cooling or reduce the flash rate. Check Illuminator MK 3 position	Normal operation resumes automatically

- Over-temperature behaviour is defined only for internal component reliability. This feature is not a substitute for the requirement to ensure that cooling requirements are met. Persistent operation with an over-temperature condition will reduce the working life of internal components. Please see specifications for absolute temperature limits.

Table 4: NON - RECOVERABLE FAULTS

Faults in this category will either produce a full shutdown or blow the fuse to protect internal components from damage. Such faults cannot be corrected in-flight.

ROOT CAUSE	System Behaviour during fault	Indicator lamps	ACTION	Behaviour after clearing the fault
Reverse Polarity	Inline Fuse of correct rating blows	None	Correct the polarity and replace the fuse with the correct type and rating	Normal Operation
Strobe Head Short-circuits / channel wiring faults	Shorted channel will not flash	No Change	Check the terminal blocks and wiring integrity	Normal Operation
Disallowed strobe head configuration detected	Flash rate becomes intermittent. Possible Increased time to complete <u>Automatic Self-test phase</u>	Blue LED flashes quickly (5 blinks per sec.)- And: WHITE LED2 is ON	Refer to Table 1 and correct the problem	Normal Operation

RECORDED DATA

Your Illuminator MK3 records some technical parameters during use, monitoring actual performance for ongoing design improvements and to help with fault diagnosis. No personally identifiable data is ever collected.

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Table 5: ELECTRICAL SPECIFICATIONS

Parameter	Label	MIN	MAX	NOMINAL/IDEAL	UNITS
Operating Supply Voltage	V(in)	10.5	14.6	13.8	Volts
* (1) Supply Voltage Absolute Limits	VA(in)	-0.6 (Reversed)	+15.5		Volts
FUSE (Slow Response)	-	6.3	10	10	Amps
Temperature at Geometric Centre of Case top	Tlim	-10	70	-	Degrees Celcius
Inline Fuse Holder	-	10	-	15	Amps Continuous Rating
* (2) Supply Current	I(in)	N/A		Conditions: V(in) = 12.0 VDC TYPICAL Consumption: (HP Modes, 80 FPM): 2.5 (HP Modes, 40 FPM): 1.5 (LP Modes, 80 FPM): 2.1 (LP Modes, 40 FPM): 1.3	Amps (RMS: integrated timed average)
Flash Rate	FR	40	Up to 100	Variable (255 steps, Linearised)	Flashes per Minute
Supply Cable insertion loss plus Battery/PSU internal Resistance	R1	-	0.35	As low as possible	Ohm
Power Supply cable Rating (continuous)	I1	10	-	15	Amp

- *(1) The inlet power supply voltage must not exceed the Absolute Maximum values stated, at any time otherwise permanent damage will occur and your warranty will be invalidated
- *(2) Illuminator MK3 includes automatic Power compensation which sustains flash intensity during minor supply fluctuations. This means that for any given rate setting and flash pattern, current consumption will increase approximately in proportion to instantaneous decreases in supply voltage. Peak current demand is higher than the average typical figures given. The Average typical figures given should be used only as a guide as actual power budget for your Aircraft should be tested during installation.
- *(3) Specifications and functionality are entirely subject to revision without notice. For current information, please contact MicroAvionics or your Authorised distributor, quoting the original ordering information if possible.

Table 6: PHYSICAL SPECIFICATIONS; MASS and DIMENSIONS

Parameter	Label	Typical	UNITS
Dimensions: Illuminator MK3 Case, excluding mounting tabs	D1	135 x 44 x 65	mm
2 pole Power inlet Plug in terminal block	C1	0.03	KG
3 pole Strobe head Plug in terminal block	C2	0.05	KG
Fuse, connector, power supply cable and fixings must be added to the total mass.	A1	Measure and write-in:	KG
Mass: Illuminator MK3 Unit only	M1	0.340	KG
Mass: Cylinder Head (No cable)	M2A	0.150	KG
Mass: Tear Drop Head (No cable)	M2B	0.040	KG
Mass: Strobe Head cable	W2	0.029	KG / Metre

SERVICING

Do not remove or loosen fixings or attempt to open the casing of either the Illuminator MK3 or strobe heads because this can be very dangerous. There are no user serviceable components for any part of the system or the strobe heads. Any attempt to loosen fixings is likely to cause permanent damage and will, in any case, invalidate your warranty. Internal components contain toxic liquids under high pressure which are protected by the case.

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WARRANTY

Illuminator MK3 is supplied with a full limited liability Warranty.

Please see attachment supplied with your product