Wingguard
User Manual

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Chapter 1: Wingguard System at a Glance

Introduction

Many aircraft suffer unnecessary damage on the ground while being towed and maneuvered in and around the airport environment. This includes being towed in and out of aircraft hangars as well as being towed in the proximity of ground equipment that supports aircraft operations. When the damage does occur, this is commonly known as "hangar rash" or ground incident occurrences. These incidences unfortunately happen too often. The result of the damage can be very costly to fix as well as costly due to the time of the equipment being unusable. The purpose of the Wingguard System is to provide an innovative aide that can be used to help limit the occurrence of such incidents.

Summary of Wingguard System

The Wingguard System consists of eight wireless Distance Measuring Sensors, one Control Panel, a portable case with built in charger, and an extension pole. Seven wireless Distance Measuring Sensors are placed on the aircraft, one is placed on the back of the tow vehicle, and the Control Panel is placed on the tow vehicle for the operator to view.

Technical Specifications

-Wireless communication range of 400' between the Distance Measuring Sensors and the Control panel.

-Range may vary due to environmental conditions.

- 11 hour estimated battery life after fully charged lithium-ion cell.

- Normal operating temperature range -4°F to +104°F

Warnings

-The Wingguard System is to be used as an aide to further enhance aircraft towing safety and are not substitutes for the safe, proper towing of aircraft in compliance with all relevant laws, regulations and guidelines.

-The Wingguard System should only be used as an additional tool to reduce the risks associated with the towing of aircraft and should not be substituted for people walking the wing tips and tail of the aircraft or other prudent, necessary and/or required safety measures while being towed.

-Some objects may not be detected by the Wingguard System due to shape, size, density, material, reflection, or other unforeseen reasons.

-Some inclement weather and atmospheric conditions may affect the accuracy of the Distance Measuring Sensors detection ability.

-The maintenance and operation of the aircraft tow vehicles shall fully comply with all relevant laws, regulations and guidelines, including but not limited to those promulgated by the Federal Aviation

Administration and the National Business Aviation Association. In no event shall Wingguard LLC be liable for any damage or injuries sustained as result of improper maintenance or operation of tow vehicles.

-Do not use the Wingguard System before reading the User Manual.

-Always use the Wingguard System in accordance with the User Manual.

-Do not disassemble, modify or tamper with the Wingguard System. Doing so may cause the Wingguard System to malfunction.

-The speed of the tow vehicle should always be at a slow, controllable speed while towing the aircraft.

-The operator of the tow vehicle must always be aware of surrounding environment of the aircraft under tow.

-Use caution when placing and removing the Distance Measuring Sensors on the aircraft.

-Remove all Distance Measuring Sensors from the aircraft before operating the aircraft engines.

-Make sure all suction cups on both the Distance Measuring Sensor cases as well as extension pole are firmly secure to avoid bodily injury.

Buttons

On the Control Panel there is a row of buttons below the LCD display, use these to navigate the unit.
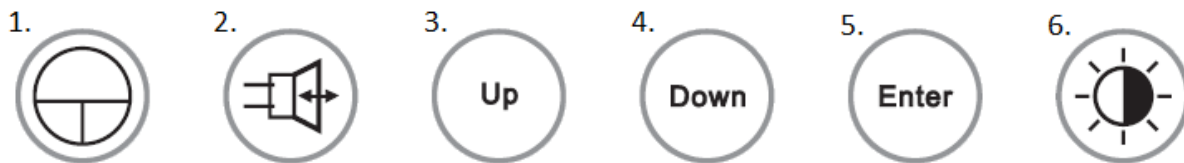
1. This is the power button, press to turn the Control Panel on/off
2. This is the ultrasonic button, press to enable the Distance Measuring Sensors
3. Go to **Parameter Setup** section to see function
4. Go to **Parameter Setup** section to see function
5. Go to **Parameter Setup** section to see function
6. This is the backlight button, press to turn on the LCD backlight

LCD Display
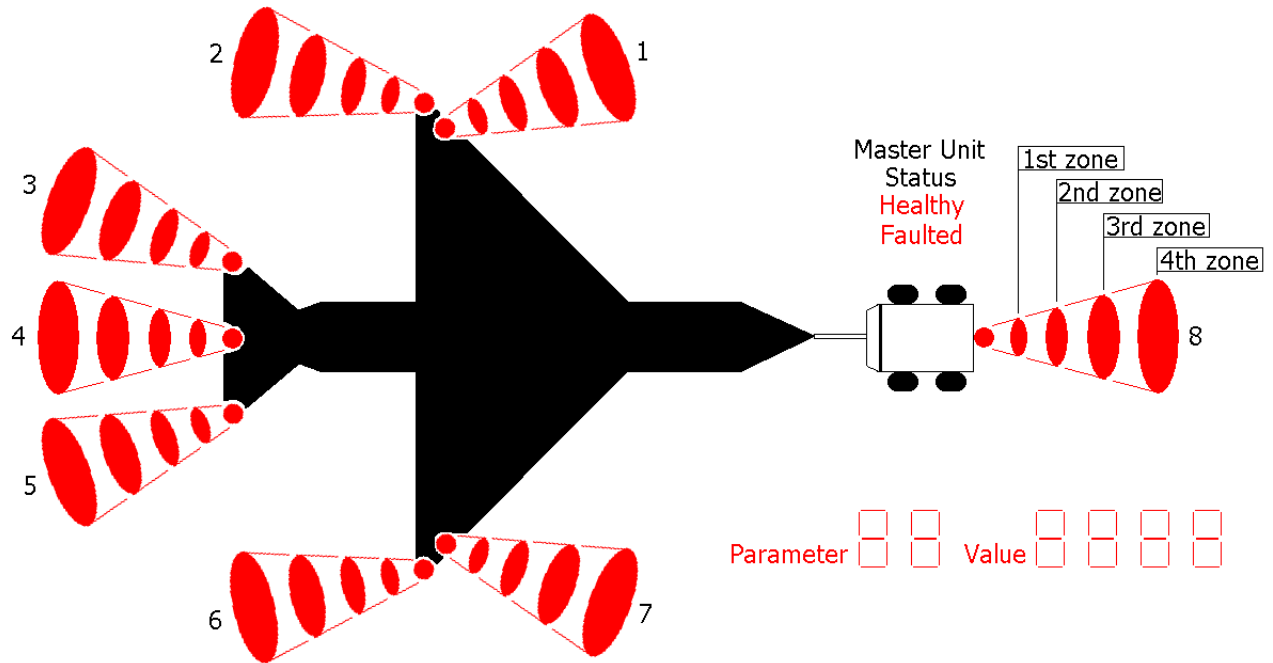
-Numbers and red circles indicate the necessary position of each Distance Measuring Sensor, as well as the direction in which each one should transmit for proper use.
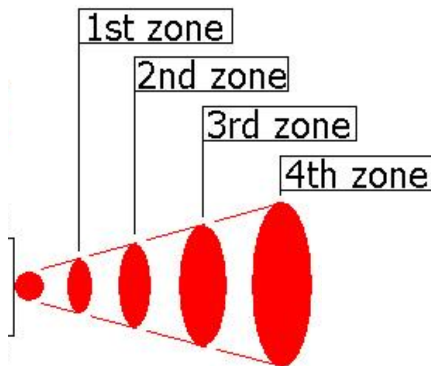
-Zones distinguish distance intervals between the Distance Measuring Sensor and an obstruction. Zone numbers decrease as the distance between the Distance Measuring Sensor and an obstruction decreases. Audible tones accompany Zone breaching with increased frequency as Zone level decreases.

Chapter 2: Basic Operation

Distance Measuring Sensor Attachment

-As you are facing the front of the aircraft, start placing the Distance Measuring Sensors in a counter clockwise motion around the aircraft.

-Place sensor #1 on the left front side wing with the arrow pointing out.

-Place sensor #2 on the left back side wing with the arrow pointing out.

-Place sensor #3 on the left back side horizontal stabilizer with the arrow pointing out.

-Place sensor #4 on either side of the vertical stabilizer with the arrow pointing out.

-Place sensor #5 on the right back side horizontal stabilizer with the arrow pointing out.

-Place sensor #6 on the right back side wing with the arrow pointing out.

-Place sensor #7 on the right front side wing with the arrow pointing out

-Place sensor #8 on the back of the tow vehicle with the arrow pointing out.

- For aircraft with taller vertical stabilizer (tail), place sensor case with extension pole.

Extension Pole Operation

-Extend extension pole to desired height.

-Secure pole suction cup to the flat side of the Sensor Case.

-Push sensor case against the aircraft with the extension pole so that the suction cup on the Sensor Case attaches to aircraft.

-Pull the string attached to the Extension Pole suction cup in order to detach the Extension Pole from Sensor Case.

-To remove sensor case: place pole suction cup firmly on bottom of Sensor Case.

-Pull on the "remove before flight" flag to break suction of cup on Sensor Case.

-Make sure suction cup of the Extension Pole is firmly secured to Sensor Case to help prevent injury to yourself or others, or damage the aircraft.

Control Panel Attachment

-The Control Panel can either be mounted temporarily or permanently with the brackets provided.

System Use

-CAUTION: Always confirm proper operation and function of the Wingguard System by use in a controlled environment before attempting to operate the Wingguard System on the aircraft.

-Turn the Control Panel on by pressing the on/off button.

-Caution, before operating the Wingguard System, make sure the communication address displayed on the Control Panel's LCD during power up matches the communication address printed on each Distance Measuring Sensor. If this number does not match, immediately stop operating the Wingguard System and see the **Parameter Setup** chapter.

-Enable all of the Distance Measuring Sensors by pressing the ultrasonic button.

-The Control Panel sounds a continuous tone until each Distance Measuring Sensor has communicated its first measurement with the Control Panel. When all zones are clear of obstructions, the Control Panel will be silent and all zone indicators will be visible on the LCD. Audible tones will begin when Zone 4 is breached with increased frequency as distances decreases and more zones are breached. When Zone 1 is breached the tone will sound continuous again.

-When all zones are clear, proceed to drive tow vehicle slowly until aircraft is in desired parking spot.

-While the Distance Measuring Sensors are enabled, if the Zone designated to trigger an engine kill is breached, the tow vehicle's engine will stall.

-To avoid personal injury and aircraft damage, always drive the tow vehicle at a slow, controllable speed and always be aware of surrounding environment.

-To turn the Wingguard system off, press the ultrasonic button to disable the Distance Measuring Sensors and then press the power button to turn off the Control Panel.

-Place the Control Panel and all eight Distance Measuring Sensors into the case to charge before using again. Each device has its own charging LED to indicate the charging action. If the LED is on, the lithium-ion cell is charging. If the LED is off, the lithium-ion cell is fully charged.

Distance Measuring Sensor Removal

-All Distance Measuring Sensor cases must be removed from the aircraft before the start of the aircraft engines.

-Remove each Distance Measuring Sensor case by pulling on "remove before flight" flag to break suction of the suction cup.

Chapter 3: Parameter Setup

-Press the Up and Down button simultaneously to enter the parameter programming mode. Parameter one is displayed.

-Press the Enter button to accept changes and move to next parameter.

Setting Zone Distances

-Distance, in feet, appears in the "value" area on the LCD display, see page 4. Use this value to set at what proximity the zone is indicated as breached.

-Go to parameter 1 to adjust zone 1 proximity distance. Default value 2 feet.

-Use "Up"/"Down" buttons to adjust zone to desired distance within the range of 1 to 4 feet.

-Go to parameter 2 to adjust zone 2 proximity distance. Default value 6 feet.

-Use "Up"/"Down" buttons to adjust zone to desired distance within the range of 4 to 8 feet.

-Go to parameter 3 to adjust zone 3 proximity distance. Default value 10 feet.

-Use "Up"/"Down" buttons to adjust zone to desired distance within the range of 8 to 12 feet.

-Go to parameter 4 to adjust zone 4 proximity distance. Default value 14 feet.

-Use "Up"/"Down" buttons to adjust zone to desired distance within the range of 12 to 16 feet.

Multiple Wingguard System Use

-When multiple Wingguard Systems are used within the same airport, each Control Panel's communication address must match the Distance Measuring Sensors assigned to it.

-Locate the communication address printed on the Distance Measuring Sensors before adjusting this parameter. All eight Distance Measuring Sensor's communication address must match the Control Panel's communication address for the Wingguard system to work properly.

-Go to parameter 5 to adjust the Control Panel's communication address. Default value 7.

-Use "Up"/"Down" buttons to adjust the communication address within the range of 1 to 9.

Engine Kill

-Go to parameter 6 to specify and/or adjust the Zone breach that activates the engine kill output. Default value 2.

-Use "Up"/"Down" buttons to adjust the engine kill zone within the range of 1 to 4.

WARNING: The engine kill capability is discussed as an added convenience for User, which User may utilize at User's option. However, Wingguard is not responsible for providing mechanical and/or wiring instructions to ensure engine kill capabilities function as intended. User undertakes the engine kill option at User's own risk. In no event shall Wingguard be liable for any damages resulting from User's decision to initiate engine kill capabilities.

Disabling Distance Measuring Sensors

-The Wingguard system offers the flexibility of using only the amount of Distance Measuring Sensors needed for your application. To disable any of the unneeded Distance Measuring Sensors, go to Parameters 7-14.

-Go to parameter 7 to disable or enable Distance Measuring Sensor #1. Default value 1.

-Use "Up"/"Down" buttons to enable "1" or disable "0" the sensor.

-Go to parameter 8 to disable or enable Distance Measuring Sensor #2. Default value 1.

-Go to parameter 9 to disable or enable Distance Measuring Sensor #3. Default value 1.

-Go to parameter 10 to disable or enable Distance Measuring Sensor #4. Default value 1.

-Go to parameter 11 to disable or enable Distance Measuring Sensor #5. Default value 1.

-Go to parameter 12 to disable or enable Distance Measuring Sensor #6. Default value 1.

-Go to parameter 13 to disable or enable Distance Measuring Sensor #7. Default value 1.

-Go to parameter 14 to disable or enable Distance Measuring Sensor #8. Default value 1.

Chapter 4: Error Codes

-When the Control Panel's status indicates "Faulted", use the error number displayed in the "Value" area, see pg 4, to troubleshoot the system.

Error 0001(Distance Measuring Sensor Communication Error)

-Number displayed in the "Parameter" area, see graphic on pg 4, indicates which Distance Measuring Sensor lost communication with the Control Panel.

-Reset the Distance Measuring Sensor by placing a magnet over the reset marker located on the side of the case.

-Cycle power on the Control Panel to reset the "Faulted" state and test the entire Wingguard system in a controlled environment before putting the system back into use on an aircraft.

-If error is still present after enabling ultrasonic measuring, the Distance Measuring Sensor may be out of communication range or may need repair.

Error 0002(Distance Measuring Sensor Battery Error)

-Number displayed in the "Parameter" area, see graphic on pg 4, indicates which Distance Measuring Sensor has a low battery.

-Power off and charge the Control panel and all Distance Measuring Sensors. Once batteries are fully charged, test the entire Wingguard system in a controlled environment before putting the system back into use on an aircraft.

-If error is still present after enabling ultrasonic measuring, the Distance Measuring Sensor may have a defective lithium-ion battery.

Error 0003(Control Panel Battery Error)

-Power off and charge the Control panel and all Distance Measuring Sensors. Once batteries are fully charged, test the entire Wingguard system in a controlled environment before putting the system back into use on an aircraft.

-If error is still present, the Control Panel may have a defective lithium-ion battery.

Error 0004(Engine kill option)

-This error only appears when the engine kill preset zone is breached.

-To clear the error, power down the Control Panel, move the obstruction and try again.

Chapter 5: Wiring

Engine Kill

-At User's option, the engine kill option can be wired into the ignition circuit on your tow vehicle. Purchase a DC relay that matches your vehicle battery voltage and wire according to this diagram:
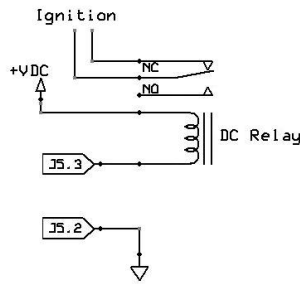
-The Control Panel uses an open collector N-channel FET capable of driving a 50v 220mA relay load.

WARNING: Wingguard is neither responsible for providing mechanical and/or wiring instructions to enable the engine kill option nor liable for any damages or injuries caused by the failure of engine kill capability to function properly. The instructions regarding wiring for the engine kill option are provided in this user manual solely for convenience and are not to be relied upon exclusively. User is advised to consult a licensed mechanic and/or electrician in order to ensure adequate configuration of the tow vehicle wiring. User hereby acknowledges that User's decision to wire the engine kill option is undertaken at User's own risk.

Chapter 6: Legal Information

FCC Regulations

-This Wingguard System and its component parts ("Equipment") have been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

WARNING: IN NO EVENT SHALL WINGGUARD BE LIABLE FOR ANY DAMAGES FROM RADIO INTERFERENCE CAUSED OR ALLEGED TO HAVE BEEN CAUSED BY THE WINGGUARD SYSTEM.

Lithium Battery Replacement and Disposal

-Contact Wingguard for Battery Replacement.

-All batteries must be properly disposed of in approved containers. To locate a center near you, you can call 1-800-8-BATTERY or 1-877-2-RECYCLE.

Warranty Disclaimer

-Wingguard System and its component parts are warranted to be free from manufacturing defects for a period of (1) year after shipment to the original customer. This is solely limited to the repair or replacement of defective products. This limited warranty does not cover the following items:

1. Parts required for normal maintenance.

2. Parts covered by a component manufacturers' warranty.

3. Any product that has been altered or modified from its original design.

4. Any product that has been damaged due to misuse, shipping, accident, improper installation, neglect, fire, water, fuel, or any other liquids.

If you have a problem that may require service, contact Wingguard immediately. Do not attempt to repair or disassemble a product without first contacting Wingguard, as any action may affect warranty coverage. When you contact Wingguard be prepared to provide the following information:

1. Product Model Number.
2. Product Serial Number.
3. Description of the problem.

If warranty coverage is approved, either replacement parts will be sent or the product will have to be returned to Wingguard for repairs. If the product is to be returned, a Return Material Authorization (RMA) number will be issued for reference purposes on any shipping documents. Failure to obtain a RMA in advance of returning an item will result in a service fee. A decision on the extent of the warranty coverage on returned products is reserved pending inspection at Wingguard. Any shipments to Wingguard must be shipped freight prepaid. Freight costs on shipments to customers will be paid by Wingguard on any warranty claims only.

Any unauthorized modification or improper repair of the Wingguard System or any component parts or use of same outside the design limits or in violation of cautions and warnings in any manual, as updated, or safety bulletins published or delivered by Wingguard will immediately void any warranty, express or implied.

THE OBLIGATIONS OF WINGGUARD EXPRESSLY STATED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS EXPRESSED OR IMPLIED. WITHOUT LIMITATION, TO THE FULLEST EXTENT ALLOWABLE BY LAW, THIS EXCLUSION OF ALL OTHER WARRANTIES AND CONDITIONS EXTENDS TO IMPLIED WARRANTIES AND CONDITIONS OF SATISFACTORY QUALITY, MERCHANTABLE QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND THOSE ARISING BY STATUTE OR OTHERWISE IN LAW, OR FROM A COURSE DEALING OR USAGE OF TRADE, SAID WARRANTIES BEING EXPRESSLY DISCLAIMED.

Limitation Remedies

BUYERS AGREES THAT ITS SOLE AND EXCLUSIVE REMEDY AGAINST WINGGUARD WILL BE LIMITED TO THE REPAIR AND THE REPLACEMENT OF NONCONFORMINGOR DEFECTIVE PRODUCTS, PROVIDED WINGGUARD IS PROMPTLY NOTIFIED IN WRITING OF ANY DEFECT. THIS EXCLUSIVE REMEDY SHALL NOT BE DEEMED TO HAVE FAILED OF ITS ESSENTIAL PURPOSE SO LONG AS WINGGUARD IS WILLING TO REPAIR OR REPLACE THE DEFECTIVE PRODUCTS.

Limitation of Liability

IN NO EVENT SHALL WINGGUARD BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES INCLUDING, WITHOUT LIMITATION LOST REVENUES AND PROFITS. THE RIGHT TO RECOVER DAMAGES WITHIN THE LIMITATIONS SET FORTH HEREIN IS BUYER'S EXCLUSIVE ALTERNATIVE REMEDY IF THE LIMITED REMEDY OF REPAIR OR REPLACEMENT FAILS OF ITS ESSENTIAL PURPOSE. THE PARTIES AGREE THAT THIS EXCLUSIVE ALTERNATIVE REMEDY WILL BE ENFORCEABLE IF THE LIMITED REMEDY OF REPAIR OR REPLACEMENT FAILS OF ITS ESSENTIAL PURPOSE.

Instructions Disclaimer

Wingguard is pleased to offer instructions on the use of its products. However, Wingguard neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by Wingguard, either verbal or written.

Usage Agreement

CAUTION: Use the Wingguard system at your own risk. When misused, the Winguard System can be unsafe. To reduce the risk of unsafe operation, carefully review and understand all aspects of this User Manual.

CAUTION: It is the user's responsibility to use the Wingguard System prudently. The Wingguard System is intended to be used only as an innovative aide in helping prevent collision occurrences from happening and must not be used for any purpose requiring precise measurement of direction, distance, separation or other. All other necessary and required safety precautions must be taken before towing the aircraft.

USER SHALL INDEMNIFY AND HOLD WINGGUARD HARMLESS FOR ANY DAMAGES OR INJURIES SUSTAINED AS A RESULT OF USER'S FAILURE TO COMPLY WITH THE TERMS AND CONDITIONS OF THIS USER MANUAL.

BY USE OF THE WINGGAURD SYTEM, USER EXPRESSLY ACKNOWLEDGES THAT IT HAS READ THE USER MANUAL AND AGREES TO BE BOUND BY THE TERMS AND CONDITIONS OF THE SAME.

Confidential Information

-User acknowledges that the Wingguard system Hardware and Software design is the property of Wingguard, LLC and is protected under United States of America copyright laws and international copyright treaties. User further acknowledges that the structure, organization, and code of the Software are valuable trade secrets of Wingguard, LLC and that the Software in source code form remains a valuable trade secret of Wingguard, LLC. User further agrees not to decompile, disassemble, modify, reverse assemble, reverse engineer, or reduce to human readable form the Software or any part thereof or create any derivative works based on the Software.