



OPERATIONS MANUAL

ST4500MA

GAS CONSTRUCTION HEATER

CERTIFIED FOR USE IN CANADA AND USA
PER FOLLOWING STANDARDS:
ANSI Z83.7 / CSA 2.14 3RD EDITION



IMPORTANT SAFETY NOTICE:

FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS HEATER CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE EXPLOSION BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK. ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS HEATER. IF YOU NEED ASSISTANCE OR HEATER INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABEL, ETC. CONTACT THE MANUFACTURER.

WARNING:

THIS HEATER IS DESIGNED PRIMARILY FOR TEMPORARY HEATING PURPOSES DURING BUILDING CONSTRUCTION, ALTERATION, REPAIR, OR EMERGENCIES. THIS HEATER IS NOT INTENDED FOR HOME OR RECREATIONAL VEHICLE USE. ENSURE SUFFICIENT VENTILATION AT ALL TIMES. PROVIDE 1 SQUARE INCH OF FRESH AIR SUPPLY FOR EVERY 1000 BTU_h OF HEAT GENERATED.

INSTALL THE HEATER IN A LOCATION WHERE IT IS PROTECTED FROM DIRECT EXPOSURE TO WATER SPRAY, RAIN, AND DRIPPING WATER.

WARNING:

WARNING: FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER, OR CARDBOARD A SAFE DISTANCE AWAY FROM THE HEATERS. RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE HEATER IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

WARNING:

NOT FOR HOME OR RECREATIONAL VEHICLE USE

NOTICE:

THIS HEATER IS SPECIFICALLY DESIGNED AND APPROVED FOR USE AS A CONSTRUCTION HEATER IN ACCORDANCE WITH ANSI Z83.7 2011 AND CSA 2.14 2011 GAS FIRED CONSTRUCTION HEATERS STANDARDS. HOWEVER, AS IT IS NOT POSSIBLE TO ANTICIPATE EVERY POSSIBLE USE OF OUR HEATERS, WE RECOMMEND CONSULTING WITH YOUR LOCAL FIRE SAFETY AUTHORITY FOR ANY QUESTIONS OR CONCERNS REGARDING SPECIFIC APPLICATIONS.

IT'S IMPORTANT TO NOTE THAT THERE ARE OTHER STANDARDS THAT GOVERN THE USE OF FUEL GASES AND HEAT-PRODUCING PRODUCTS IN VARIOUS APPLICATIONS. YOUR LOCAL AUTHORITY IS THE BEST SOURCE OF INFORMATION TO PROVIDE GUIDANCE AND ADVICE REGARDING THESE STANDARDS.

WARNING:

FIRE, BURN, INHALATION, AND EXPLOSION HAZARD.
DO NOT PLACE OVER COMBUSTIBLE MATERIALS SUCH AS BUILDING MATERIALS, WOOD, PAPER OR CARDBOARD OR MATERIALS SUBJECT TO DISINTEGRATION DUE TO EXPANSION, SUCH AS CONCRETE.

WARNING: FOR OUTDOOR USE ONLY.

Table of Contents:

Introduction

- 1.1. Product Overview
- 1.2. Technical Specifications

Installation

- 2.1. Unpacking
- 2.2. Location Selection
- 2.3. Installation Instructions
- 2.4. Gas Supply Connection
- 2.5. Electrical Connection

Operation

- 3.1. Control Panel Overview
- 3.2. Operating Instructions

Maintenance

- 4.1. Regular Maintenance
- 4.2. Annual Inspection
- 4.3. Component Replacement
- 4.4. Electrical Schematic

Warranty

- 5.1. Warranty Coverage
- 5.2. Contact Information

1 - INTRODUCTION

1.1. Product Overview:

The 4.5 Million BTU Direct-Fired Makeup Air Heater is a high-capacity heating system designed to provide large-scale heating for commercial and industrial applications. It ensures efficient heating of fresh air and maintains comfortable indoor conditions in areas with high ventilation requirements.

1.2 TECHNICAL SPECIFICATIONS

MAX BTU/HR: 4,500,000 BTU (British Thermal Units)

MIN BTU/HR: 180,000 BTU (British Thermal Units)

Fuel Type: HD5 Propane or Utility Grade Natural Gas

Gas Inlet Pressure: 10-14 inches of water column, 25-35 millibar

Outlet Duct Configuration: 30.25" Wide x 37.0" Tall

Maximum Recommended Duct Length: 50 Feet

Power Supply: Variable Voltage, 208-240/480 Three Phase

Airflow: 24,700 CFM @ 2" System Back Pressure

Control System: ST4500MA control panel certified to UL 508A/CSA22.2 Standards

Dimensions: L 126.25" x W 68.25" x H 66.75"

Weight: 2750 Lbs (Pending Configuration - see rating plate on unit)

Approval: cETLus listed

2 - INSTALLATION

2.1. Unpacking:

Upon receiving the heater, carefully inspect the packaging for any signs of damage. If any damage is found, report it to the shipping carrier and the supplier immediately. Remove all packaging materials and ensure that all components are included.

2.2. Location Selection:

Select a suitable location for the heater that meets the following criteria:

- Adequate space for installation, operation, and maintenance
- Level surface with proper clearance to combustible material per requirements
- Proper ventilation to prevent the buildup of combustion byproduct, as well as to keep intake and discharge clear of obstruction/debris
- Compliance with local regulations and codes
- Access to fuel and power source with protection for fuel and electrical connections from source to the heater

Installations of this appliance at altitudes above 2000 ft shall be in accordance with local codes, or in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or National Standard of Canada, Natural Gas and Propane Installation Code, CSA B149.1.

2.3. Installation Instructions:

To ensure compliance during the installation of this natural gas heater, adherence to relevant local regulations is necessary. In the absence of such regulations, the installation should align with the National Fuel Gas Code ANSI Z223.1/NFPA 54 and the Natural Gas and Propane Installation Code, CSA B149.1.

For the installation of this heater intended for use with propane tanks or cylinders, adherence to local codes is required. In cases where local codes are absent, the installation must comply with the Standard for the Storage and Handling of Liquefied Petroleum Gases, ANSI/NFPA 58, and the Natural Gas and Propane Installation Code, CSA B149.

It is imperative that this heater is positioned at a minimum distance of 10ft (3m) from any propane gas cylinder. Additionally, it should not be directed towards any propane gas container within a 20ft (6m) radius.

2.4. Gas Supply Connection:

The heater should be positioned at a distance of at least 6 ft (1.83m) in the USA or 10 ft (3m) in Canada, away from any propane gas container.

If propane cylinders are used to supply the heater, it is important to ensure that no cylinders smaller than 500 GAL. capacity are utilized. The cylinders must solely provide vapor withdrawal.

Here are the guidelines for cylinder connections:

- Tighten fittings using a wrench for all cylinder connections
- When connecting or disconnecting the cylinder(s), ensure that the cylinder(s) valve(s) are closed securely
- Apply a leak-detecting solution to all connection points to verify that the system integrity is not compromised in any way

When the heater is not in use, it is essential to turn off the gas at the propane supply cylinder(s). If the heater is to be stored indoors, disconnect the connection between the propane supply cylinder(s) and the heater. The cylinders must be removed from the heater and stored in accordance with the standards outlined in the Standard for the Storage and Handling of Liquefied Petroleum Gases, ANSI/NFPA 58, and CSA B149.1, the Natural Gas and Propane Installation Code.

To ensure proper installation, a qualified gas technician must be responsible for installing this heater in accordance with the local codes set by the relevant authority. The sizing of the supply piping should be determined based on the length of the pipe run and the total BTUh rating of the appliance(s). The appropriate piping tables must be consulted to determine the required size of the supply piping based on the length of the run from the source.

A first stage regulator will need to be installed to reduce inlet pressure to within the units minimum and maximum pressure ratings. A regulator assembly may be purchased with the unit, or the components may be provided by the end user. The ST4500MA is equipped with a floor mounted flange in front of the burner assembly for storage of a regulator assembly during transportation.

Inlet Gas Pressure

- MIN: 10" WC / 25 mBar / 2.5 kPa
- MAX: 14" WC / 35 mBar / 3.5 kPa

Manifold Gas Pressure

- NG: 4.2"-8" W.C.
- MAX: 1.6"-3" W.C.

Fuel Type

This heater is compatible with both propane and natural gas for operation. The approval label specifies the manifold pressures required, and they are listed above as well. It is essential to achieve the correct pressure settings depending on the fuel being supplied.

A fuel selector valve is situated on the heater's manifold. It is crucial to ensure that the valve is positioned correctly according to the fuel being used, as indicated by the label on the valve. In the standard “closed” position, the valve is set for propane. In the standard “open” position, the valve is set for natural gas. Operating the heater with the valve in the incorrect position is strictly prohibited. All units ship from the factory set up for use with propane.

When connecting the heater to the fuel supply, it is essential to use Type 1 approved hose assemblies specifically designed for propane or natural gas. Using hoses that meet these specifications ensures safe and proper fuel connection for the heater.

Adjusting Manifold Pressure

After startup, if manifold pressure needs to be adjusted at the low end, the following procedure can be followed to adjust a different Minimum Setting Position on the modulating RTC valve. Execute the following steps:

Before pressing the adaption button be prepared to remove power to the actuator.

1. Once power is applied to the actuator, press the adaption button – This will first send the valve/indicator to the “Zero” position and then toward the “Fully Open” position. When the valve/indicator stalls at the “Fully Open” position, remove power from the actuator. – This will stop the valve/indicator in its current position.
2. Remove the minimum setting clip by applying leverage against the clip with a flathead screwdriver to pop it loose (See Fig. C).
3. Once the minimum setting clip is removed, move it one notch toward the open position at a time to adjust the minimum setting (See Fig. D).
4. Reapply power to the actuator. – The indicator will first move to the “Zero” position, stall, and then to the “Fully Open” position, stall, and lastly to the commanded position of the control signal. If no control signal is connected the indicator will move to absolute zero.
5. Once the Minimum Setting Position is adjusted, press the adaption button again to obtain the new scale for the control signal.

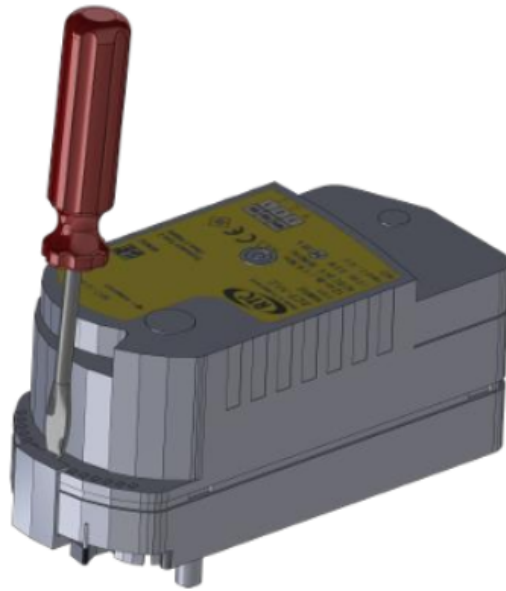
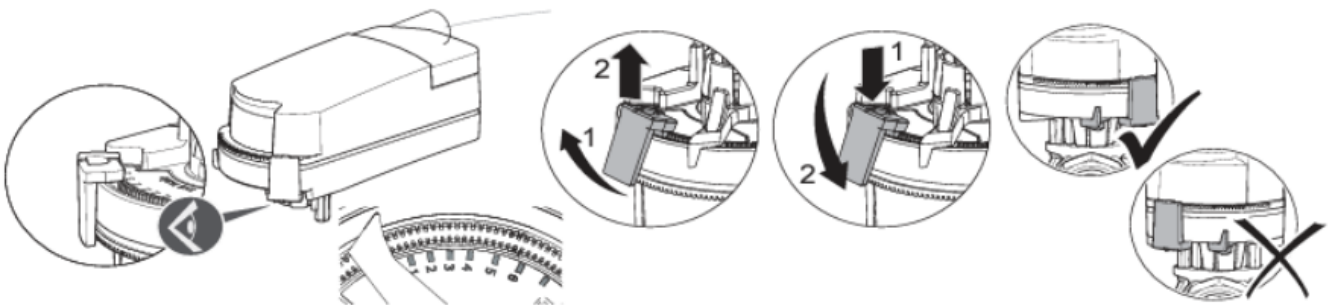


Figure C



2.5. Electrical Connection:

The heater is capable of multiple supply voltages with the use of a variable voltage switch, and may be connected to power via the camlock electrical connectors or wired directly to the inlet power distribution blocks. To switch voltage, simply adjust the rotary switch at the electrical inlet panel to the correct position for the desired voltage. NOTE: If using 208V 3 Φ , an adjustment to the phase monitoring device is required as noted below.

Power Supply Requirements

208V 3 Φ , 50 AMP FLA / 62.5 MCA

230V 3 Φ , 45 AMP FLA / 56.25 MCA

460V 3 Φ , 23 AMP FLA / 28.75 MCA

The unit is equipped with a phase monitoring device (pictured below) to prevent backwards phase connection and thus reverse motor direction. The voltage adjustment potentiometer will need to be adjusted if using 208V input power. After connecting power to the unit and closing the main disconnect, the device will power up and display an LED status. A red LED of any

kind will indicate an issue with the power supply, and an adjustment of some kind will need to be made. A solid green indicates the phasing is correct and the unit is ready to operate.

PHASE MONITOR LIGHT STATUS

- GREEN SOLID - PHASING IS CORRECT, UNIT IS READY TO RUN
- GREEN BLINKING - DEVICE IS RESETTING
- RED BLINKING RAPIDLY - REVERSE PHASE
- RED 2 BLINKS WITH A PAUSE - UNBALANCED/SINGLE PHASE
- RED SINGLE BLINK WITH PAUSE - HIGH VOLTAGE
- RED SOLID - LOW VOLTAGE



Grounding Instructions

For your safety and protection against electrical shock hazards, this appliance is equipped with connection points for properly grounding the electrical system. It is important to connect the heater to a proper ground connection via the camlock connector or the ground bar in the control panel. The electrical grounding of the heater must comply with the National Electrical Code, ANSI/NFPA 70, or the Canadian Electrical Code Part I, CSA C22.1. This ensures that the heater is properly grounded according to the applicable electrical standards.

3 - OPERATION

3.1. Control Panel Overview

Hybrid Light Solutions/Safety Thaw is certified to build controls panels to UL 508A/CSA C22.2 No. 286 standards and all control panels in ST4500MA units are listed under that program. This ensures all control panels are manufactured with the utmost safety, quality, and craftsmanship in mind. Any modification of the factory electrical system in the unit will render that certification null and void.

3.2. Operating Instructions

1. Follow procedures for electrical and fuel connections.
2. Ensure the voltage selector switch is in the proper position for the supply voltage being used.
3. Ensure the fuel selector valve is in the proper position for the fuel being used. The valve handle has a decal showing correct positioning.
4. Connect the remote thermostat and place it in the area you are trying to heat and set the thermostat to the desired temperature.
 - a. The heater will run at an output temperature of 180°F when the remote thermostat calls for heat. Once the remote thermostat area reaches the set temp,

the heater will adjust to low fire and run at an outlet temperature of 75°F until the remote thermostat calls for heat again.

5. Close main disconnect to energize the unit. Inspect phase monitor device to confirm phasing is correct.
6. Open fuel supply valve at source. Open fuel supply valve at exterior regulator if installed. Confirm inlet pressure into the regulator is appropriate. Confirm regulated pressure is correct.
7. Open internal fuel supply shutoff valve in the control cabinet.
 - a. NOTE: At initial startup machine may need to have fuel line bled to aid in faster startup. If bleeding air out is not an option, the unit can be cycled multiple times until solenoid valves allow all air to leave the system and proper ignition occurs.
8. Turn the HEAT ENABLE switch to the on position, this will begin the trial for ignition cycle. The status of stages can be observed in the panel window on the BMS unit.
 - a. **CAUTION: DO NOT ATTEMPT TO LIGHT THE HEATER MANUALLY.**
9. Machine will automatically modulate based on the remote thermostat temperature and run continually until shutdown is engaged. To shutdown the machine, turn the HEAT ENABLE switch to the off position. Machine will terminate the fuel supply, and go through a post purge cycle to clear and cool the combustion chamber.
10. If you wish to use the heater to move fresh air without any heating or combustion, the FAN OVERRIDE switch will activate the fan and allow fresh air to be circulated.

4 - MAINTENANCE

4.1 Regular Maintenance

- It is important to inspect every construction heater before each use, as well as have it inspected at least annually by a qualified service person.
- Before operating the heater, visually inspect the hose assembly. If there are signs of excessive abrasion, wear, cuts, or other damage, the hose must be replaced.
- Ensure that the appliance is kept clear and free from any debris or combustible materials, including gasoline, flammable vapors, and liquids.
- The flow of combustion and ventilation air must not be obstructed. Regularly check the fan assembly, motor, and blades to ensure proper operation.
- Use compressed air to remove dust and dirt build-up from components. Note that compressed air should not be used inside any piping or regulator components.
- **Note that due to the high operating temperature of the heater, it is recommended to lubricate the bearings every 2-4 weeks. Use high-quality lithium complex grease (NLGI#2) and synthetic hydrocarbon oil with ISO 220 viscosity, such as MYSTIKJT6 HI-TEMP or equivalent. If possible, lubricate the bearings while they are in rotation until grease purge is observed from the seals. This can be done with the fan override switch on the control panel which will spin the fan manually outside of an ignition cycle.**

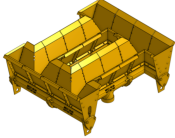

















- **EXTREME CAUTION** should be used when doing this as the doors can be drawn in by the vacuum the fan creates and the moving components of the fan and motor assembly are very dangerous.

4.2. Annual Inspection

1. Follow procedures for electrical and fuel connections. Inspect the burner and use compressed air to remove any dirt or debris. The air flow holes should be free of debris and can be cleaned using a size 42 drill bit. If needed, remove the burner and manually clean the burner ports using a 1/8" drill bit. Note: Do not use a drill for this task.
2. Use a stiff wire brush to clean the burner plates. All holes must be clean so air can pass through. Inspect for cracking. Cracks between two holes are common and acceptable, but more severe cracking may warrant replacing burner plates.
3. Examine the Flame Rod and spark rod on the burner. Check for any cracks in the ceramic. If the ceramic is cracked, it must be replaced. If necessary, use an abrasive scrub pad to clean the flame rod.
4. Remove and inspect the stainless steel air pressure tubes. Use compressed air to clear any blockages in these tubes. Note: Do not attempt to clean them while they are still connected to the air pressure switch as damage to the switch could occur.
5. Inspect the Motor, Belt, and Pulleys. Ensure that the belts do not show excessive wear and are properly tensioned. Confirm that the pulley set screws are securely tightened on the motor and fan shafts.
6. Clean the pillow block bearings to remove dirt and debris. Apply MYSTIKJT6 HI-TEMP or equivalent. Check for wear, damage, and proper alignment. Monitor performance for any abnormalities and address issues promptly.
7. Examine the blower wheel, ensuring that it is positioned centrally within the housing and is free of dirt buildup and debris. Verify that the blower moves freely on the shaft. Note that any debris accumulation on the fan blade will reduce airflow and can lead to overheating.
8. Inspect all wire connections, ensuring that none are loose and that there is no corrosion present on any of the connections.
9. Check the function of all locking mechanisms and safety devices to ensure the unit is ready to operate safely for the duration of the season.
10. Test fire the unit and confirm proper operation of all components. Perform a full system leak test to ensure fuel pipeline integrity is not compromised in any way.

4.3. Parts List

Replacement parts for the ST4500MA are listed below. To inquire about purchasing replacement parts, please call 218-568-1188, or email support@hybridlightsolutions.com

 4.5 Burner Assembly A1022	 Pilot/Flame Sensor Assy. H1087	 2" POC Valve Actuator H1081
 2" Modulating Valve H1026	 2" Solenoid Valve H1082	 2" POC Valve Body H1083
 1/8" Pilot Regulator H1086	 Pilot Solenoid H1049	 High Pressure Switch H1084
 Fuel Selector Valve H1074	 High Limit Switch H1090	 Air Pressure Switch H5539
 Heater Controller H5540	 Burner Management System H5549	 Discharge Air Tube H1023
 Phase Monitor H5542	 480V Contactor H5543	 230V/208V Contactor H5545



**Remote Thermostat
H5547**



**480V Thermal Overload
H5544**



**230V/208V Thermal Overload
H5546**



**Gas Ignitor
H5548**



**Control Transformer
H5550**



**Main Disconnect
H5551**



**On/Off Switch
H5533**



**Switch Contact Block
H5534**



**Main Disconnect Handle
H5552**



**Red Indicator Light
H5535**



**Green Indicator Light
H5536**



**Reset Button
H5537**



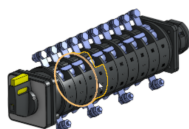
**1.5 Amp Single Pole Breaker
H5531**



**3 Amp Double Pole Breaker
H5532**



**Grounding Bar
H5513**



**Variable Voltage Selector
H5553**



**Field Wiring Terminals
H5562**



**Distribution Block
H5563**



**Black Camlock Connector
H5554**



**Red Camlock Connector
H5555**



**Blue Camlock Connector
H5556**



**Black Camlock Cover
H5558**



**Red Camlock Cover
H5559**



**Blue Camlock Cover
H5560**



**Green Camlock Connector
H5557**



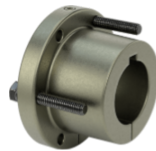
**Green Camlock Cover
H5561**



**20HP Motor
H5568**



**Fan Pulley
H5569**



**Fan Pulley Bushing
H5570**



**Auto-Tension Motor Base
H5567**



**Motor Pulley
H5571**



**Motor Pulley Bushing
H5572**



**Fan Belt (2 per unit)
H5573**



**Inlet Cord Grip
H5574**



**Door Latch
H5575**



**Rear Grate Latch
H5576**



**Door Hinge
H5577**



**Rear Grate Latch
H5578**



**High Temp Fan Bearing
H5579**



**Remote Tstat Receptacle
H5565**



**Remote Tstat Plug
H5566**



**Blower Assembly
H5580**

5 - WARRANTY

5.1. Warranty Coverage

Hybrid Light Solutions, LLC/Safety Thaw Limited Warranty Statement

Hybrid Light Solutions, LLC (HLS)/Safety Thaw will, at its discretion, repair or replace any part(s) that, upon examination, inspection and testing by HLS, is found to be defective under normal use and service during the original warranty period only. Any equipment or part thereof that the purchaser/owner claims to be defective must be examined by HLS before said claim is allowed.

Warranty Period: 1 year/unlimited hours

Warranty Guidelines:

- All warranty claims and expense allowances must be addressed and approved by HLS.
 - Damage caused by the use of non-OEM parts will not be covered by this warranty.
 - HLS may choose to repair or replace any parts or equipment covered by this warranty at its discretion.
 - Warranty labor rates are based on normal working hours. Additional costs for overtime, holiday or emergency labor costs will be the responsibility of the owner.
- ❖ **The following will not be covered by warranty:**
- Any failed components warranted by the OEM.
 - Costs of normal and regular maintenance.
 - Any failures caused by contaminated fuels.
 - Failures caused by any act of God or external cause such as collision, theft, vandalization, windstorm, hail, flood, tornado, terrorism, or any other matters beyond the manufacturer's control.
 - Failures due to normal wear and tear, accident or abuse.
 - Failure due to misapplication, or misrepresentation.
 - Rental equipment used while warranty repairs are being performed.
 - This warranty does not cover expenses or incidental costs related to shipping, lost rentals and any damage to other property or equipment.
 - Overnight or expedited freight costs for repair parts are not included.
 - Normal maintenance and/or wear items i.e. bearings, belts, hoses, bulbs, filters, etc. are not included.

This warranty supersedes all other warranties, expressed or implied. Any implied warranties which are allowed by law shall be limited in duration to the express warranty provided herein. HLS only liability shall be the repair or replacement of parts as stated above. In no event shall HLS be liable for any incidental or consequential damages, even if such damages are a direct result of HLS negligence.

5.2. Contact Information

Please call 218-568-1188 or email service@hybridlightsolutions.com for any questions or concerns regarding equipment warranty.

[illegible]