

ESI Flameless Heater (ES-FLS) Introductory Operator's Manual



1 Introduction

⚠ WARNING Read and understand this manual before operating the machine to avoid serious injury or death.

1.1 General Description

The ES-FLS is a portable diesel flameless heater which has a maximum energy output of 690,000 BTU/hour. Unlike a traditional indirect fired heater, the ES-FLS harvests heat from three different Heat exchanger sources: engine coolant, engine exhaust, and Engine power. Cool air is then forced through the ESI Flameless heat box, heated to over 190 degrees delta, before exiting out of the rear of the machine. The heater system is intended for outdoor use and is trailer mounted for jobsite portability. It has an integrated 145 gallon [548 L] fuel storage tank with secondary containment. The heater is also designed to operate reliably at extremely low temperatures. Large doors on the enclosure allow easy and safe service access in industrial environments.

1.2 Manual Applicability

This introductory operator's manual is applicable to the following Equipment Source Incorporated (ESI) machine models:

Model	ESI No.	Description
ES-FLS	200400	Flameless heater trailer system

This manual should be kept with the machine at all times. Immediately contact Equipment Source Incorporated (manufacturer), or an authorized dealer to obtain a copy of this manual, if missing or damaged. Refer to www.equipmentsourceinc.com for current contact information.

1.2 Manual Scope

This manual contains basic operating instructions for the above listed products. Specific information concerning maintenance, trailers, skid frames or other transport provisions are not included in this manual. Refer to the manual provided with the transport accessory. For detailed service instructions concerning specific electrical or mechanical components, refer to the operation and maintenance manual provided by the manufacture of the component or contact ESI or any authorized service provider.

2 Important Safety Instructions

WARNING

- Never attempt to operate this machine indoors. Exhaust fumes from the engine and heater can kill.
- **SAVE THESE INSTRUCTIONS.** This manual contains important instructions that should be followed during the operation and maintenance of the heater.

2.1 General Description

- Never allow untrained personnel to operate or service the machine. Take time to read the manual and discuss safe practices with jobsite personnel, seek training as needed.
- Read and understand the operating section of this manual.
- Take time to familiarize yourself with the controls and instructional placards before operating or servicing.
- Contact your dealer or rental service provider if additional training is necessary.

2.2 Operating

- Some components are hot while in operation. Keep all non-essential personnel away.
- Wear protective clothing appropriate to the jobsite.
- Observe changes in the operating environment and respond accordingly.
- Review and comply with all local, state and or provincial codes for the operation of this machine.
- Operational conditions can affect machine vibration, periodic inspections for damage resulting from vibration is recommended. Have damaged items repaired or replaced as necessary. Do not use plugs or cords that show signs of damage such as broken or cracked insulation or damaged terminals.
- Keep doors closed during machine operation.
- Do not transport or move the machine while it is running.

2.3 Service

- Only trained service technicians should attempt to service the machine.
- Properly shutdown the machine and let cool completely before attempting to service any component.
- Never defeat any safety devices.
- Never modify the machine.

3 Transporting and Storage

3.1 Transporting by towing

CAUTION The transport vehicle and hitch adapters must be rated to tow a trailer GVW of 8000 LB (3630 KG) minimum.

NOTICE Ensure that the trailer is registered with an applicable transport authority before towing.

Use the following procedure to prepare the machine for towing:

1. Connect trailer to the vehicle and secure hitch. The trailer should be nearly parallel to the ground; use the adjustable lunette ring or change the vehicle's hitch to level if necessary.
2. Connect trailer lights and safety chains. Always check trailer lights for proper operation.
3. Lock doors. This prevents them from inadvertently opening during transport.
4. Walk around the machine to check for wheel chocks, verify tire pressure and ensure the jack stand is fully retracted.

3.2 Storage

NOTICE Failure to follow the shutdown procedure can cause serious damage to the engine and heat box.

3.2.1 Short-Term Storage (less than 90 days)

1. Shutdown the machine using the shutdown procedure (Section 4.10 Shutdown).
2. Verify that main battery disconnect and control switches are in the OFF position.
3. Close and latch doors, stow loose accessories.
4. Chock tires.
5. Fuel tank should be full to prevent water accumulation due to condensation

3.2.2 Long-Term Storage (greater than 90 days)

1. Shutdown the machine using the shutdown procedure (Section 4.10 Shutdown).
2. Verify that the main battery disconnect and control switches are in the OFF position.
3. Drain water from fuel filters.
4. Ensure the machine is positioned on thaw-stable ground if applicable. Add blocks to support the tongue as necessary.
5. Chock tires.
6. Trickle charge the battery at least once every 30 days
7. Move unit to rotate tires every 60 days

3.3 Preparing the Machine for Seasonal Operation

Follow this procedure to prepare the machine for seasonal operation or any time the machine is removed from long-term storage:

1. Remove any protective coverings from the exhaust outlets
2. Clean the inside of the enclosure to remove any debris

3. Check containment for accumulation of liquids
4. Inspect electrical system and controls for damage
5. Inspect fuel system for wear or damage and water accumulation
6. Repack wheel bearings
7. Replace all filters Engine and Hydraulic oil, fuel and Glycol.
8. Check all lights and replace as necessary
9. Check tire pressure (if applicable)
10. Run heater for 1 hour to verify operation of all components

4 Operation

WARNING For any enclosed industrial environment air quality should be monitored for the safety of all personnel equipment such as a CO gas monitor may be needed

NOTICE Failure to follow the shutdown procedure can cause serious damage to the engine and heat box.



Figure 1: ES-FLS control panel

4.1 Duct Selection


4.1.1 General Guidelines

The ES-FLS heater is an outdoor heater designed to safely heat enclosures using flexible duct connections. For efficient operation, keep duct lengths as short as possible. Excessive duct lengths will reduce system air flow and heat delivery. System efficiency can be improved by reducing duct lengths and or increasing the duct diameter. An inlet recirculation duct is not required for normal operation. It can be used to circulate warm air back from a heated air space to further aid in heating efficiency.

4.1.2 Duct Sizes

- Minimum inlet duct size (inches)20
- Minimum outlet duct size12
- Available outlet duct sizes..... 2x12, 1x16, 1 x 20"

4.2 Recommended Fuels and Fueling Instructions

 **CAUTION** Do not overfill fuel tank. Tank should be filled to 90% of the full volume to allow thermal expansion.

Use ULSD No.1 for all Flameless heater models. For continuous duty operation, a daily refilling schedule should be established. The yellow beacon light (see section 4.13) will turn on if the fuel level goes below 20%.

4.3 Access and Clearance

Ensure all sides of the machine are easily accessible. All parts of the machine should be more than 3ft [1m] from any structure. Heater is correctly placed when the operator can easily walk around the perimeter of the heater with minimal obstruction. Check the placement and accessibility of the fire extinguisher.

4.4 Leveling

Ensure machine is placed on firm ground and the wheels are chocked. Heater should be close to level across the width ($\pm 3^\circ$). From front to back. The machine should be slightly lower in the front (Drawbar end) to maximize fuel tank capacity. Use the tongue jack to level the heater front to rear and then lower the tongue jack 1 to 2 inches (2.5 to 5cm). If the machine is placed on frozen ground or ice, frequently check for shifting and reposition/level as necessary.

4.5 Engine Heat – 120V Power Input

When operating the machine in cold weather, use the 120V engine pre-heat circuit to warm the engine block and engine oil prior to starting. The engine should be pre-heated for approximately 4-hours if the ambient temperature is below -7°C (20°F). Longer preheat cycles may become necessary in extremely cold conditions. 0°F – 6 Hours, -20°F – 8 Hours. Use a grounded flexible extension cord rated at 15A minimum to connect the machine to a 120V power supply. The electrical heater receptacle is located on the exterior of the machine directly below the Emergency Stop button.

4.6 Murphy MPC-20 Controller

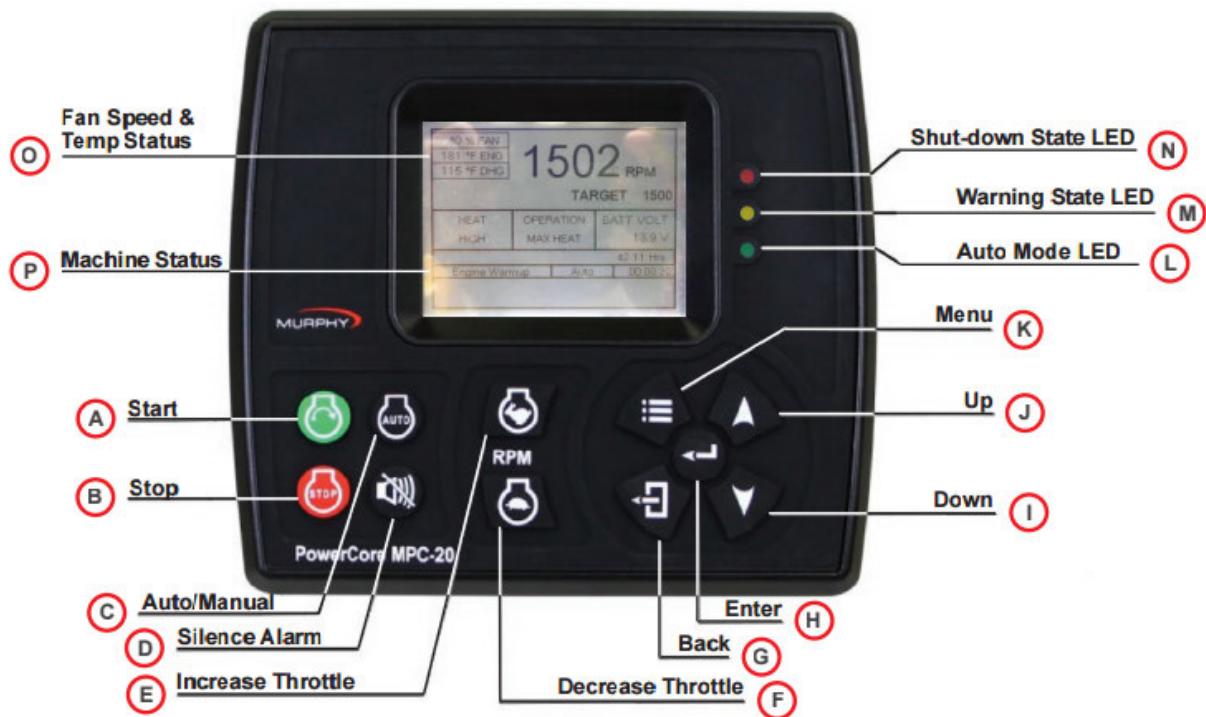


Figure 2: Illustration of the Murphy MPC-20 controller.

Items of note on the controller are:

- A. **Start Key** – Starts up the engine
- B. **Stop Key** – Stops the engine. Press once (while in auto) to cool down the engine and then shutdown automatically.
- C. **Auto/Manual Key** – Switches the controller between “Manual” mode and “Auto” mode. However, the button is disabled on the ES-FLS, since the machine must always run in “Auto” mode.
- D. **Alarm Silence Key** – Silences the beeping noise on the MPC-20.
- E. **Manual Throttle Inc. Key** – Used in manual mode to speed up engine. However, the button is disabled on the ES-FLS, since the machine must always run in “Auto” mode.
- F. **Manual Throttle Dec. Key** – Used in manual mode to slow down engine. However, the button is disabled on the ES-FLS, since the machine must always run in “Auto” mode.
- G. **Back Key** – Used in order to go backwards through the software directory (while in the Menu). Also used in order to enter the “Heat” and “Operation” running mode selection menu (while on the home page).
- H. **Enter Key** – Confirms any changes made to the controller menu settings.
- I. **Down Key** – Scroll down through the current selection.
- J. **Up Key** – scroll up through the current selection.
- K. **Menu Key** – Allows the user to change the controller’s software settings. Password protected.
- L. **Auto Mode Indicator LED (Green)** – Light will be on when the controller is in “Auto” mode.
- M. **Warning State LED (Amber)** – Light will turn on whenever any error occurs which does or doesn’t turn off the machine (i.e. low fuel level, low DHG fluid level 2, critically low DHG fluid level 1, etc.).
- N. **Shut-down State LED (Red)** – Light will turn on whenever any error occurs which does turn off the machine (i.e. critically low DHG fluid level 1, critically low hydraulic oil level, low engine oil pressure, etc.).
- O. **Fan Speed & Temperature** – Displays the machine’s fan speed (0-100%), plus engine and heat pump temperatures.
- P. **Machine Status** – Indicates whether the machine is off, warming up, running loaded, or cooling down.

4.7 Pre-Startup Checklist

Use the following checklist to determine whether the machine can be safely started and operated:

1. **Machine is level and on stable ground (per Section 4.4)**
2. **Wheels are chocked**
3. **Exhaust vents are free of obstruction**
4. **3ft [1m] clearance from permanent structures on all sides**
5. **Fire extinguisher is accessible**
6. **Water is drained from fuel filters**
7. **Engine oil and coolant levels normal**
8. **Heat Pump fluid and hydraulic oil levels are normal**
9. **Fuel tank filled with recommended fuel type**
10. **Inlet and outlet ducts are open and free of obstruction**
11. **Machine safeguards are connected and functioning**

4.8 Startup

Use the following checklist to start and operate the machine. Open the front door, closest to the E-stop button, to access all required controls.

1. **Turn the master battery disconnect switch to the ON position**
2. **Allow the Murphy MPC-20 controller time to boot up and enter “Auto” mode**
3. **Make sure that the “Heat” and “Operation” settings are correct (per Section 4.11)**
4. **If they’re not, press the Back Key and change them to the desired settings, then press the Back Key again to confirm the settings and get back to the home page**
5. **Press the Start Key**
6. **The controller will automatically: prime the fuel pump, pre-heat the air intake, start the heater and warm up for five min, before entering the “Running Loaded” mode.**

4.9 Monitoring and Operation

4.9.1 Daily Inspection

- Listen for abnormal sounds
- Check fluid levels
- Check hoses for any damage observe for any drips and or leaks
- Check containment for accumulation of liquids. Drain if necessary.
- Check condensate tank for any accumulation. The valve which drains the tank can be found under the hydraulic fan intake. It can be accessed by opening the front door closest to the 20” intake duct.
- Check if level and secure

- Check vents for icing or other obstructions
- Check fire extinguisher access.
- Observe recommended maintenance schedule

4.10 Shutdown

NOTICE

Failure to follow the shutdown procedure can cause serious damage to the engine and heat box.

Shutdown procedure:

- 1. Press the Stop Key on the controller (only once).**
- 2. The engine will exit “Running Loaded” mode and automatically cool down for five min, before turning off**
- 3. Turn the main battery disconnect switch to the OFF position**

WARNING

The RED EMERGENCY STOP SWITCH is for emergency only. Repeated use of the Emergency Stop Switch for non-emergency heater shutdown will lead to product damage

4.11 Adjusting the Heat and Operation Settings

The Heat and Operation settings determine system output. They can be adjusted by:

- First going to the home page.
- Pressing the Back Key to reach the Heat and Operation settings page.
- Use the Up, Down and Enter keys to change between Max Heat and Max Volume setting.
- Use the Up, Down and Enter keys to change between Low, Med, and High heat setting.
- Back Keys are used to scroll through and confirm the various options.

4.11.1 Heat setting – Low, Medium, and High

The ES-FLS harvests heat energy from three different sources in order to provide heated air. There are three different heat levels/settings for the ES-FLS: “Low”, “Medium”, and “High”. These three settings relate a given heater output to a set of system parameters. Once a heat level is selected the ES-FLS logic will balance the system parameters to match and hold this setting. If the operator makes a change in the selected heat level the heater systems will adjust to deliver more or less heated air. Depending on the environmental conditions the operator may notice changes in exiting air temperatures and or a change air volume delivered. The ES-FLS logic responds to ambient temperatures, in operating conditions over 50 degrees F the operator may notice automatic adjustments that decreases the Delta T output of the machine. For warm weather conditions the MAX Volume setting is recommended

4.11.2 Operation Setting – Max Heat

There are two different operational modes on the ES-FLS. One is Max Heat (i.e. maximum BTU) mode. When the machine is in this mode, it functions to achieve the desired / selected heat level (Low, Medium, or High) as fast as possible. It will maintain the selected heat level with a delivery of heated air with the best delta T possible (highest heat gain). The logic of the machine while in this mode can be summarized by the following sequence of events:

1. After entering the “Running Loaded” mode, the controller gradually increases the system speed in order to produce heat
2. Once the machine exceeds the warm-up temperatures the red beacon light turns off and the “No Heat Yet” notification disappears from the control screen.

3. As system temperatures increases the fan speed will automatically increases as well.
4. As system fluids rise towards their operating temperatures (for the selected heat level), the fan speed setting gradually increases all the way to 100%, in order to deliver heat and hold the system at equilibrium.
5. If the fan speed setting is at 100% and any of the system fluids starts exceeding their operating temperatures (for the selected heat level), the system parameters will adjust to maintain operation.
6. The ES-FLS logic will find the appropriate system parameters to sustain the operating temperatures selected and continues to monitor and re-adjusts the parameters as necessary without operator adjustment.

4.11.3 Operation Setting – Max Volume

The second operation mode on the ES-FLS is Max Volume (i.e. maximum air flow). When the machine is in this mode, it will deliver the maximum amount of air flow output with the best possible heat gain for the existing ambient conditions. Through custom components and programing the ES-FLS can maintain full air volume over a wide operational range. In this mode the main focus is to deliver the maximum volume of dry warm air. Therefore, this operation mode will be most useful in drying applications. Where dry air flow is more of a priority than heat. The logic of the machine while in this mode can be summarized by the following sequence of events:

1. After entering the “Running Loaded” mode, the controller increases speed in order to heat the system.
2. Once the machine exceeds warm-up temperatures, the red beacon light turns off and the “No Heat Yet” notification disappears from the control screen.
3. The fan speed setting then increases to the maximum available speed. Note while the fan speed setting will remain at maximum other systems may still be increasing speed, overall outlet temperatures will continue to rise for some time in this mode. Overall outlet temperatures (Delta T) may be lower than output temperature in the Max Heat mode
4. Once system fluids start to exceed their operating temperatures (for the selected heat level), the system parameters will make adjustments. Thereby maintaining best possible system operation.
5. Once the ES-FLS logic finds the system speed for the present ambient conditions that sustain the selected operating temperatures it remains there. The System continues to monitor and re-adjusts parameters as necessary, systems will adjust as ambient conditions change.

4.12 Beacon Light

The ES-FLS is equipped with a three light beacon, which indicates the status of the heater. The green light turns on whenever the engine is running. The yellow light turns on whenever the fuel level dips below 20% or whenever there’s a fault which doesn’t shut down the machine. The red light turns off once system fluids exceed their warm-up temperatures. If there is a critical error, which shuts the heater down, the red beacon light will turn (or stay) on. The beacon light functions when both the battery disconnect and Murphy MPC-20 controller are turned on.

6 Maintenance Records

Table 1. Machine Data

Machine Serial Number	
Engine Serial Number	
Generator Serial Number	
Trailer Serial Number	

Table 2. Maintenance Records

<ul style="list-style-type: none">▪ Date▪ Engine Hours▪ Service Personnel▪ Service Location	Description of work completed

