



# OPERATORS MANUAL

## INDIRECT FIRED FORCED AIR HEATER

### MODELS ES700B, ES700B-E & ES700B-ED



**NOTE: This is a pre-release edition of the ES700B operator's manual for sales and agency approval only. Contact ESI for the latest released manual edition.**

pending cETL<sub>us</sub>  
agency listing

#### General Specifications

Dry weight:	..... 4000 LB [2540 KG]
w/skid 101590 .....	4430 LB [2010 KG]
w/trailer 101159.....	5600 LB [2540 KG]
Firing Rate:	Standard.....4.3 GPH [16.3 LPH]
	Maximum.....6.4 GPH [24.2 LPH]
Fuel Type:	ES700B & ES700B-E.....ULSD
	ES700B-ED..... ULSD/Heating Oil
Fuel Capacity:	..... 240 GAL [910 L]
Generator:	Engine ..... Kubota D1105
	Generator..... Mecc Alte
	Continuous power ..... 10.1 kW
	Main breaker rating.....30A
	Voltage ..... 208Y/120V
	Aux power receptacle ....20A, 120V, 60Hz
Heater:	Heat exch material..... 309S Stainless
	Burner ..... Carlin 301CRD
	Fan motor .....3hp, 208V
	Fan capacity ..... 3000 CFM @ 3"

Copyright © 2012 Equipment Source, Inc.

Equipment Source, Inc.

1010 SW 41<sup>st</sup>  
Ph (877) 496-6119

Renton, WA 98057  
equipmentsourceinc.com

# 1 Introduction

## WARNING

Read and understand this manual before attempting to operate this machine.

### 1.1 General Description

The ES700B is an indirect oil-fired forced-air heater with a maximum firing rate of approximately 700,000 BTUs/hour [200kW]. The heater is intended for outdoor use and can be mounted on a trailer or skid mounted for jobsite portability. The heater has an integral 240-gallon [910 L] fuel storage tank with secondary containment. The heater is designed to operate reliably at extremely low temperatures and has been proven on Alaska's North Slope oil fields. Large doors on all sides of the heater allow easy and safe service access in industrial environments. All heat exchanger surfaces are constructed from ANSI 309S stainless steel for extended life.

### 1.2 Manual Applicability

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

Model	ESI No.	Description
ES700B	101160-01	Standard Heater
ES700B-E	101160-02	Extended Service
ES700B-ED	101160-03	Extended Service/Dual Fuel

This manual should be kept with the machine at all times. Immediately contact Equipment Source Incorporated (manufacture) or an authorize dealer to obtain a copy of this manual if missing or damaged. Refer to [www.equipmentsourceinc.com](http://www.equipmentsourceinc.com) for current contact information.

### 1.3 Manual Scope

This manual contains basic operating and maintenance instructions for the above listed heater products. Specific information concerning 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 an authorized service provider.

# Table of Contents

- 1 Introduction..... 2**
  - 1.1 General Description ..... 2
  - 1.2 Manual Applicability ..... 2
  - 1.3 Manual Scope..... 2
- 2 Safety Guidelines..... 4**
  - 2.1 Training ..... 4
  - 2.2 Operating ..... 4
  - 2.3 Service ..... 4
- 3 Transporting and Storage ..... 5**
  - 3.1 Dimensions and Weights ..... 5
  - 3.2 Lifting ..... 7
  - 3.3 Transporting on a Flatbed Truck ..... 7
  - 3.4 Storage ..... 8
  - 3.5 Preparing the Machine for Seasonal Operation ..... 9
- 4 Operation.....10**
  - 4.1 Duct Selection ..... 10
  - 4.2 Recommended Fuels and Fueling Instructions ..... 11
  - 4.3 Access and Clearance ..... 11
  - 4.4 Leveling ..... 11
  - 4.5 Pre-Startup Checklist..... 12
  - 4.6 Startup ..... 12
  - 4.7 Monitoring and Operation ..... 12
  - 4.8 Shutdown ..... 13
  - 4.9 Adjusting the Firing Rate..... 13
  - 4.10 Auxiliary Power Connection..... 14
- 5 Maintenance .....15**
  - 5.1 Maintenance Schedule ..... 15
  - 5.2 Engine Service ..... 15
  - 5.3 Fan Service ..... 15
  - 5.4 Burner Maintenance ..... 16
- 6 Basic Trouble Shooting.....17**
  - 6.1 Burner Trouble Shooting..... 17
  - 6.2 Fan Trouble Shooting ..... 19
  - 6.3 Engine Trouble Shooting..... 19
- 7 Electrical Schematics .....21**
- 8 Maintenance Records .....23**

## 2 Safety Guidelines

### **WARNING (RISK OF DEATH OR SERIOUS INJURY)**

- Never attempt to operate this machine indoors. Exhaust fumes from the engine and heater can kill.
- Read and understand the operating instructions in this manual before attempting to operate this machine

#### **2.1 Training**

- Never allow untrained personnel to operate or service the machine. Take time to read the manual and discuss safe practices with jobsite personnel.
- 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 Equipment Source if additional training is necessary.

#### **2.2 Operating**

- Some components are hot while in operation. Keep children, clothing and combustibles away.
- Wear protective clothing appropriate to the jobsite. Always wear safety glasses.
- Observe changes in the operating environment and respond accordingly.

#### **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 the safety devices
- Never modify the machine

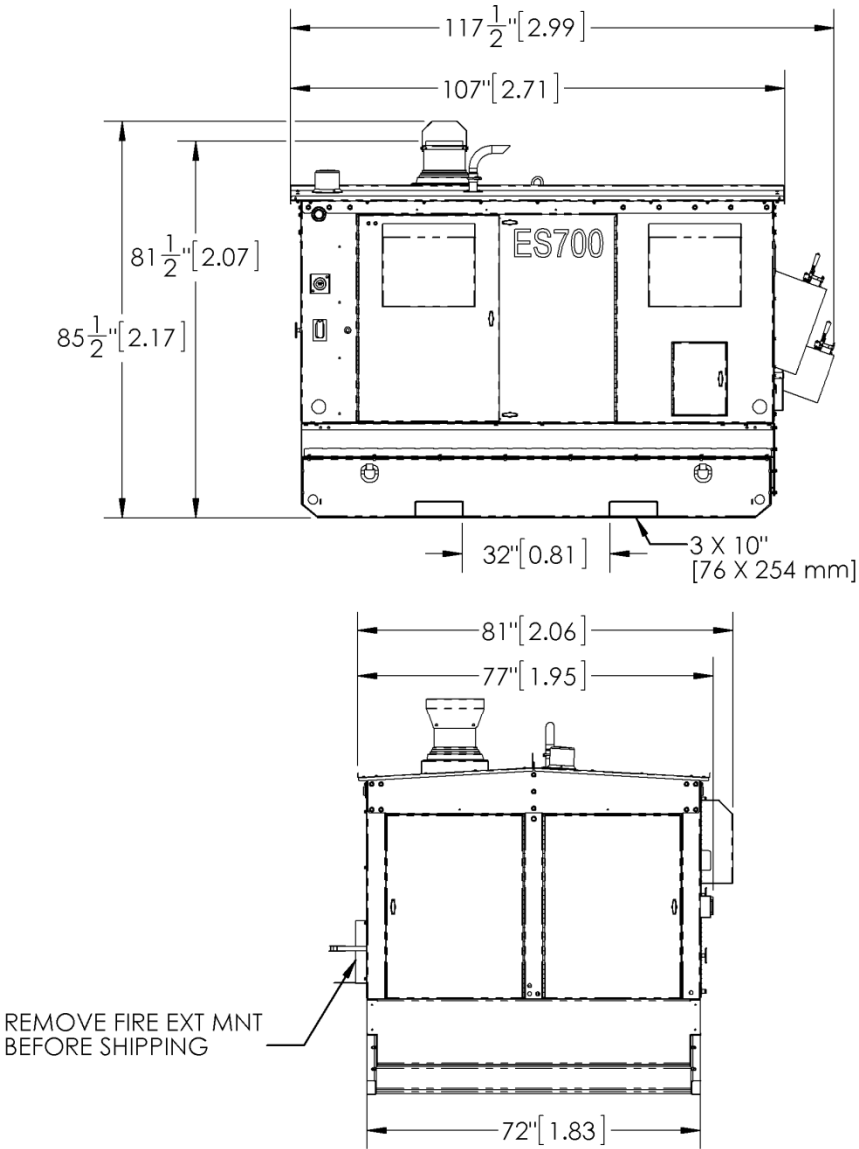
### 3 Transporting and Storage

#### 3.1 Dimensions and Weights

Machine Weights \*:

Dry.....	4000 LB [1815 KG]
With skid 101590 .....	4430 [2010]
With trailer 101159.....	5600 [2540]
Trailer 101159 GVW.....	7400 [3360]
Trailer 101159 Max Tongue .....	600 [270]

\*All weights are approximate



**Figure 1. Machine dimensions mounted on Skid PN 101590. Dimensions are in inches [meters] unless noted.**

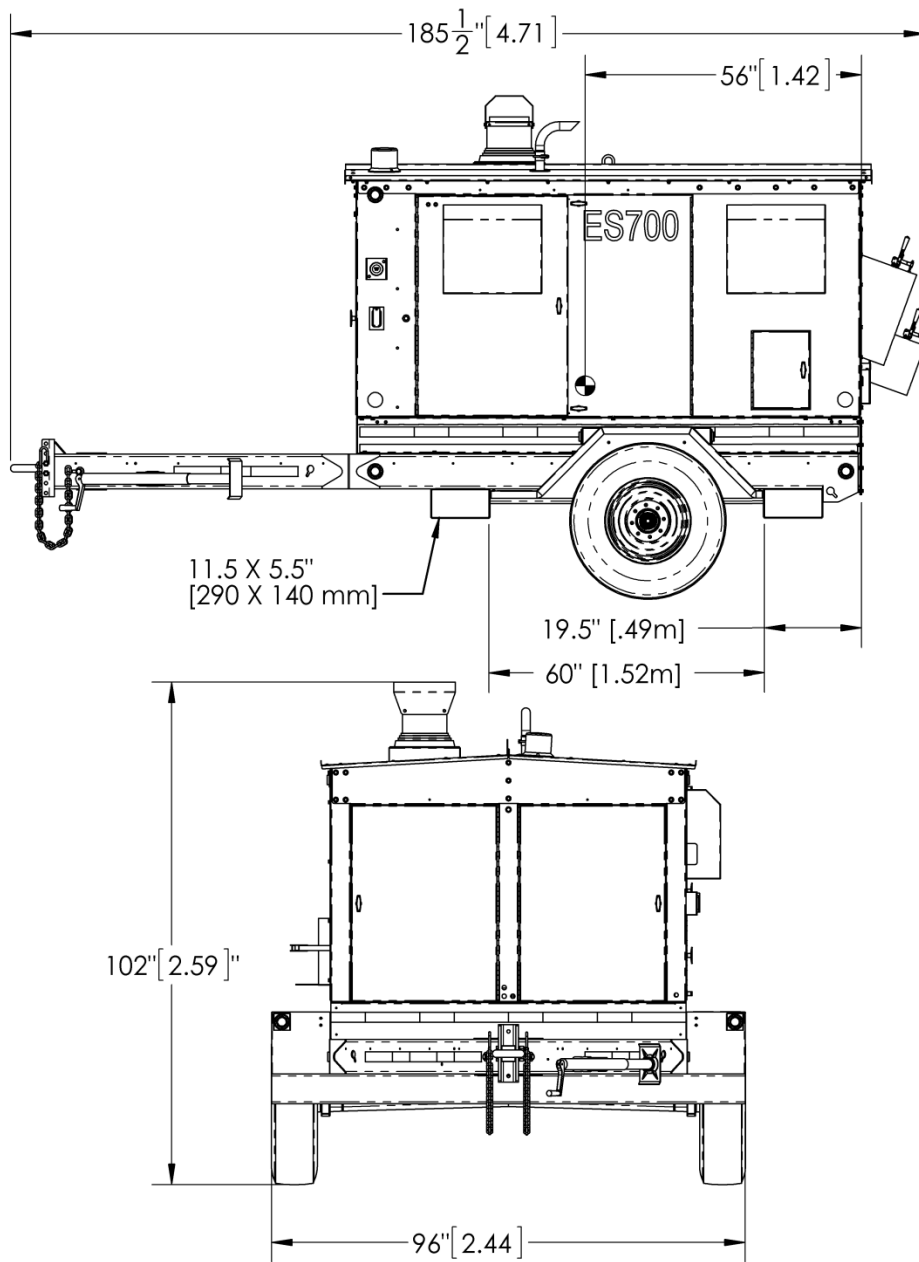


Figure 2. Machine dimensions mounted on Trailer PN 101159. Dimensions are in inches [meters] unless noted.

### 3.2 Lifting

**WARNING**

This heater product is not equipped with below-the-hook lifting provisions. Never attach a crane hook, chain or sling to any point on the enclosure. Lifting eyes are included on some skid and trailer frame attachments. Consult the operator's manual provided with the skid or trailer product for further information.

- Use an appropriately sized forklift to lift the machine using the provided fork pockets.
- A crane can be used to lift the machine if the trailer or skid has dedicated lifting eyes or an engineered load spreader is used to lift the machine from the fork pockets. Use the operator's manual provided with the skid or trailer for further instructions.

### 3.3 Transporting on a Flatbed Truck

1. Lift the machine following the guidelines presented in Section 3.2 *Lifting*.
2. Stow trailer jack stand before securing on a flatbed trailer. The trailer can be tilted to rest directly on the hitch.
3. Secure the machine using the chain slot tie-downs and the axle if equipped.
4. Ensure all doors are closed and latched.

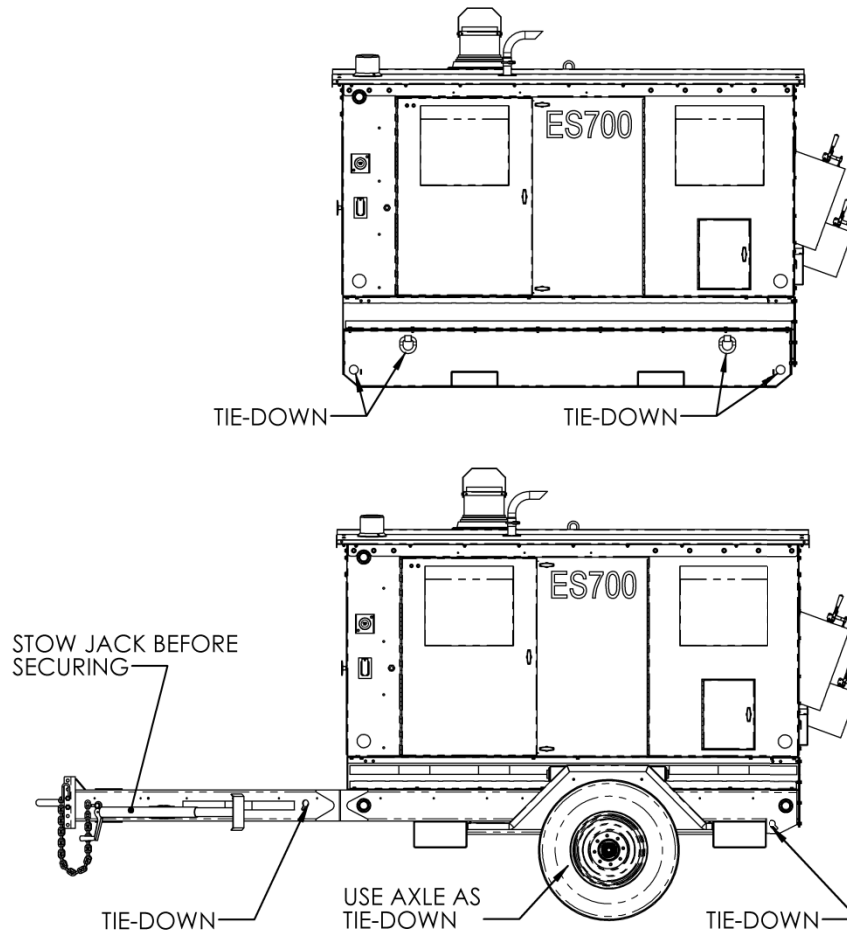


Figure 3. Machine tie-downs for shipping (Typical)

### 3.4 Storage

#### CAUTION

Failure to follow the shutdown procedure can cause serious damage to the burner assembly.

#### 3.4.1 Short-Term Storage (less than 90 days)

1. Shutdown the machine using the shutdown procedure (Section 4.8 *Shutdown*)
2. Verify that main breaker and control switches are in the off position
3. Close and latch doors, stow loose accessories
4. Chock tires

#### 3.4.2 Long-Term Storage (greater than 90 days)

1. Shutdown the machine using the shutdown procedure (Section 4.8 *Shutdown*)
2. Verify that the main breaker and control switches are in the off position
3. Disconnect the battery using the master disconnect switch
4. Drain water from fuel filters



5. After the heater has cooled sufficiently, cover the chimney with a durable material to prevent animal intrusion.
6. Ensure the heater is positioned on thaw-stable ground if applicable. Add blocks to support the tongue as necessary.
7. Chock tires

### **3.5 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. Replace the burner nozzle
5. Inspect electrical system and controls for damage
6. Inspect fuel system for wear or damage
7. Repack wheel bearings
8. Replace fuel filters
9. Verify burner electrode position
10. Verify fuel pump pressure
11. Verify combustion quality
12. Check all lights and replace as necessary
13. Check tire pressure (if applicable)
14. Run heater for 1 hour to verify operation of all components

## 4 Operation

### WARNING

Always install a CO gas monitor in enclosed environments that are heated with oil burning force air heaters.

### CAUTION

The correct shutdown procedure must be followed to prevent damage to the burner assembly.

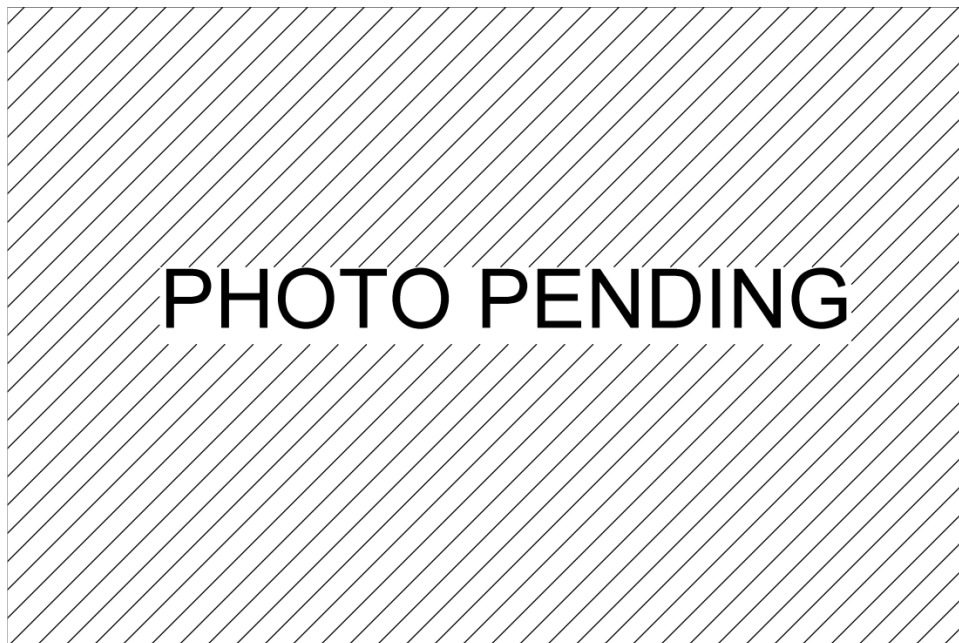


Figure 4. Control panel

### 4.1 Duct Selection

#### 4.1.1 General Guidelines

The ES700B 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 air flow in the heat exchanger and cause the burner to cycle to control the outlet temperature. Excessive burner cycling shortens the life of the heat exchanger and should be avoided. Burner cycling can be controlled by reducing duct length, increasing the duct diameter, or adjusting the burn rate (see Section 4.9).

An inlet duct is not required for normal operation. It can be used to circulate warm air back from an enclosure for re-heating.

#### 4.1.2 Duct Sizes

Minimum inlet duct size .....20"

Minimum outlet duct size .....12"

Available outlet duct sizes ..... 2x12", 1x16"

## 4.2 Recommended Fuels and Fueling Instructions

### CAUTION

Do not overfill tanks. Tanks should be filled to only 90% of the full volume to allow thermal expansion.

Use ULSD No.1 or ULSD No.2 for all heater models except the ES700B-ED. For continuous duty operation, a daily refilling schedule should be established.

### 4.2.1 ES700B-ED (aux tank equipped machine) Refueling Instructions

The ES700B-ED model has an auxiliary fuel tank for the engine. This allows locally approved heating oil to be used in the burner and ULSD fuel for the engine. Observe machine placards for fuel types and placement.

### CAUTION

ES700B-ED Model: Always refill the auxiliary ULSD tank when filling the main heating oil tank to prevent engine failure while the heater is operating. Premature generator shutdown can damage burner.

## 4.3 Access and Clearance

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

## 4.4 Leveling

Ensure heater is placed on firm ground and wheels (if equipped) are chocked. Heater should be close to level across the width ( $\pm 1^\circ$ ). The heaters should be slightly lower in the front to maximize fuel tank capacity. For trailer mounted heaters, use the tongue jack to level the heater and then lower the tongue jack 1 to 2 inches (2.5 to 5cm).

If the heater is placed on frozen ground or ice, frequently check the heater for shifting and reposition/level as necessary.

#### 4.5 Pre-Startup Checklist

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

1. **Heater 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. **Fuel tank filled with recommended fuel type**
9. **Inlet and outlet ducts are free of obstruction**
10. **Machine safeguards are connected and functioning**

#### 4.6 Startup

Use the following checklist to start and operate the machine. Open the door labeled “Machine Controls” to access all required controls.

1. **Turn off the master disconnect breaker and the burner control switch**
2. **Turn the key switch to position I for 15 seconds**
3. **Turn the key switch to position II to engage starter**
4. **Let generator engine warm for at least 1 minute**
5. **Turn on Fan**
6. **Cycle the Burner Control Switch to provide heat as necessary**

#### 4.7 Monitoring and Operation

##### 4.7.1 Daily Inspection

- Listen for abnormal sounds
- Check fluid levels
- Observe burn quality (no smoke should be visible)
- Check if level and secure
- Check vents for icing or other obstructions
- Check fire extinguisher access.
- Observe recommended maintenance schedule

##### 4.7.2 Adjusting Heat Output

- Connect an external thermostat (see wiring diagram) to control building heat.

- Increase the outlet temperature by constricting the outlet airflow or changing the fan belt pulleys. The outlet temperature is limited to 220F and undesirable burner cycling will occur if the ducts are excessively restricted. Increasing the outlet temperature by reducing the air flow will never increase the heat output.
- Increase or decrease the outlet temperature and heat output by adjusting the firing rate (refer to Section *Adjusting the Firing Rate*)

#### 4.8 Shutdown

##### CAUTION

The following shutdown procedure must be observed to prevent damage to the burner.

Shutdown procedure:

1. **Shutdown burner using the control switch**
2. **Let the generator and fan run for 5 minutes**
3. **Turn off fan**
4. **Turn off generator**

#### 4.9 Adjusting the Firing Rate

The firing rate can be adjusted by changing the nozzle size or adjusting the fuel pressure. Refer to the instruction manual supplied for the Carlin 301CRD oil burner the following Nozzle Capacity Chart when making adjustments to the firing rate and airflow. Changing the firing rate may require adjustments to the air flow.

##### 4.9.1 Standard Firing Rate

A new ES700B series heater comes equipped with a 3.5 GPH nozzle. The fuel pressure on a new machine is tuned to 150 PSI resulting in a 4.3 GPH firing rate.

##### 4.9.2 Maximum Firing Rate

Nozzles rated up to 4.5 GPH @ 100 PSI and pressures up to 200 PSI can be safely used if additional heat is required or the outlet air temperature is low. Low outlet air temperature can also be increased by constricting the airflow in the outlet ducts or changing the belt pulleys to reduce the fan speed.

##### 4.9.3 When to Reduce the Firing Rate

The firing rate should be reduced if the burner cycles during normal operation as a result of excessive outlet temperature. Excessive burner cycling will shorten the life of the heat exchanger. The firing rate can be reduced by adjusting the fuel pressure or using a smaller nozzle. The minimum nozzle size is 3.0 GPH.

Consider shortening the duct length or increasing the size of the ducts before reducing the firing rate.

Table 1. Nozzle Capacity Chart

Rate GPM @ 100 PSI	Operating Pressure (PSI)				
	125	140	150	175	200
3.0	3.35	3.55	3.67	3.97	4.24
3.5	3.91	4.14	4.29	4.63	4.95
4.0	4.47	4.73	4.90	5.29	5.66
4.5	5.04	5.32	5.51	5.95	6.36

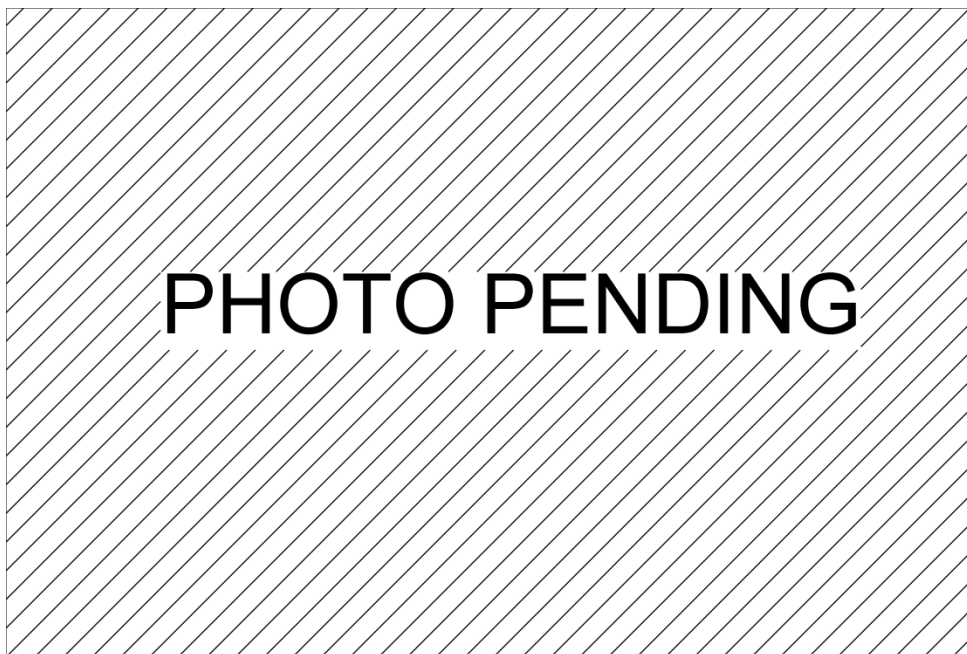


Figure 5. Burner pressure control

**4.10 Auxiliary Power Connection**

All machine models are equipped with a 120V, 20A, 60Hz auxiliary (AUX) GFCI receptacle. The AUX power connection can be used to run work lights and tools as needed on a construction site while the heater is operating. The primary purpose of this product is not a jobsite generator; avoid using the AUX power connection for extended periods while the heater is not operating to prevent under-loading or “wet stacking” the engine.

## 5 Maintenance

### WARNING

Some of the following trouble shooting operations should only be completed by a trained technician. Do not attempt to open electrical panels or service the burner unless you are a trained technician.

### 5.1 Maintenance Schedule

**Table 2. Maintenance Schedule**

Interval (Hours)	Maintenance Instruction	Notes
Daily	<ul style="list-style-type: none"> <li>▪ Check primary fuel filters for water and drain as necessary</li> </ul>	<ul style="list-style-type: none"> <li>▪ Applies to both burner and engine filters</li> </ul>
Every 200 hours Or 12 months	<ul style="list-style-type: none"> <li>▪ Change oil and oil filter (ES700B only)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Engine Oil: SAE30, SAE10W-30 or 15-40 Must be API Spec: CF, CF-4, CG-4, CH-4 or CI-4</li> <li>▪ Oil Capacity: 1.35 GAL [5.1 L] (ES700B only)</li> </ul>
Every 1000 hours Or 12 months	<ul style="list-style-type: none"> <li>▪ Change all fuel filters</li> <li>▪ Check air filter</li> <li>▪ Check engine fan belt and heater fan belt(s)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use Racor R60S Primary Filter</li> <li>▪ Check air filter every 500 hours if operating in a dusty environment</li> </ul>
Every 3000 hours Or 12 months	<ul style="list-style-type: none"> <li>▪ Change oil and oil filters (ES700B-E_ models)</li> <li>▪ Change Fuel Filters</li> <li>▪ Change fan belt</li> <li>▪ Change heater fan belt(s)</li> <li>▪ Lubricate blower</li> <li>▪ Replace burner nozzle and adjust electrodes</li> </ul>	<ul style="list-style-type: none"> <li>▪ Engine oil: SAE30, SAE10W-30 or 15-40 Engine oil must meet API Spec: CF, CF-4, CG-4, CH-4 or CI-4</li> <li>▪ Oil Capacity: 12 GAL [45 L] (ES700B-E_)</li> <li>▪ Use Lithium NGLI Grade 2 for blower bearings</li> <li>▪ Use Racor R60S primary filters for both engine and burner</li> <li>▪ Set blower belt deflection to 3/16"</li> </ul>
Every 6000 hours Or 3 years	<ul style="list-style-type: none"> <li>▪ Change coolant</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use Rottella ELC or equivalent</li> </ul>
Every 9000 hours	<ul style="list-style-type: none"> <li>▪ Injection pump service</li> <li>▪ Valve clearance service</li> </ul>	<ul style="list-style-type: none"> <li>▪ Contact Kubota service rep. for valve and fuel injection service</li> </ul>

### 5.2 Engine Service

Use engine operator's or service manual provided for further instruction on how to complete routine service or trouble shooting.

### 5.3 Fan Service

For additional maintenance information, refer to the blower manufacture's manual.

### 5.3.1 Belt tensioning and replacement

Belts tend to stretch and should be periodically checked for tension and wear. The belt is properly tensioned when the belt deflects approximately 3/16 in [5 mm] with moderate thumb pressure. Use the belt tensioning screws on the motor mounting plate to adjust the belt tension.

Replace belts if cracking or fraying is observed. Abnormal belt wear or rapid wear rates may be the result of pulley misalignment. Refer to the maintenance manual provided by the blower manufacture for additional adjustment information.

### 5.3.2 Lubrication

Use a high quality lithium based grease conforming to NGLI Grade 2 to lubricate the billow block bearings and motor bearings every 3000 hours of operation.

### 5.3.3 Cleaning/Deicing Inlet Screen

## WARNING

Do not attempt to open blower inlet access unless the machine is completely shut down and cooled

The blower fan inlet should be periodically checked for icing when operated in winter conditions. If necessary, remove the four (4) bolts (A) required to access the blower inlet to clear ice. Do not attempt to open the blower access door unless the machine heater is shutdown using the shutdown procedure.

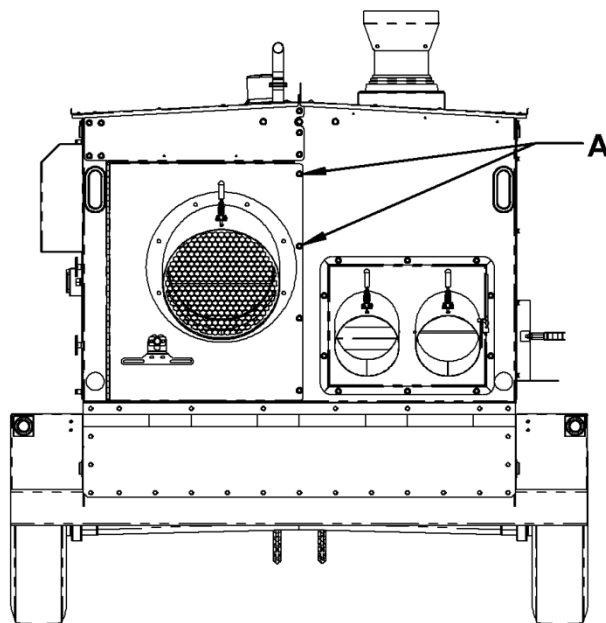


Figure 6. Blower Inlet Access

## 5.4 Burner Maintenance

Refer to the Carlin 301CRD Instruction Manual for further instruction on how to complete routine service or trouble shooting. Only qualified technicians should attempt to service the burner.



## 6 Basic Trouble Shooting

### WARNING

Some of the following trouble shooting operations should only be completed by a trained technician. Do not attempt to open electrical panels or service the burner unless you are a trained technician.

Use the following troubleshooting guidelines to resolve problems that may encountered while operating the ES700B heater. Contact your service representative or refer to the attached operations manual specific to the burner, engine or fan if the problem cannot be resolved using this guide.

### 6.1 Burner Trouble Shooting

ES700s use Carlin 301CRD burners with the 60200 controller. The controller has a pre-purge of 30 seconds and a post-purge of 5 minutes. There is a low voltage continuity loop through the burner safeties to the thermostat terminals on the controller (the "TT" terminals on the burner controller). If any one of the safeties breaks continuity, the burner will not start. This greatly simplifies trouble shooting the burner.

**Table 3. Burner Safeties/Controls**

Safety	Purpose
Heat exchanger over temperature NOTE: This safety must be manually reset.	Air blockage safety: shuts down burner if the heat exchanger working air temperature exceeds 350F [180C].
Pressure safety	Shuts down burner if the main blower fan is not running
Enclosure over temperature	Shuts down burner if the enclosure air temperature exceeds 120F [50C]
Outlet air temperature control	Maintains output temperature between 160 to 220F [70 to 105C]

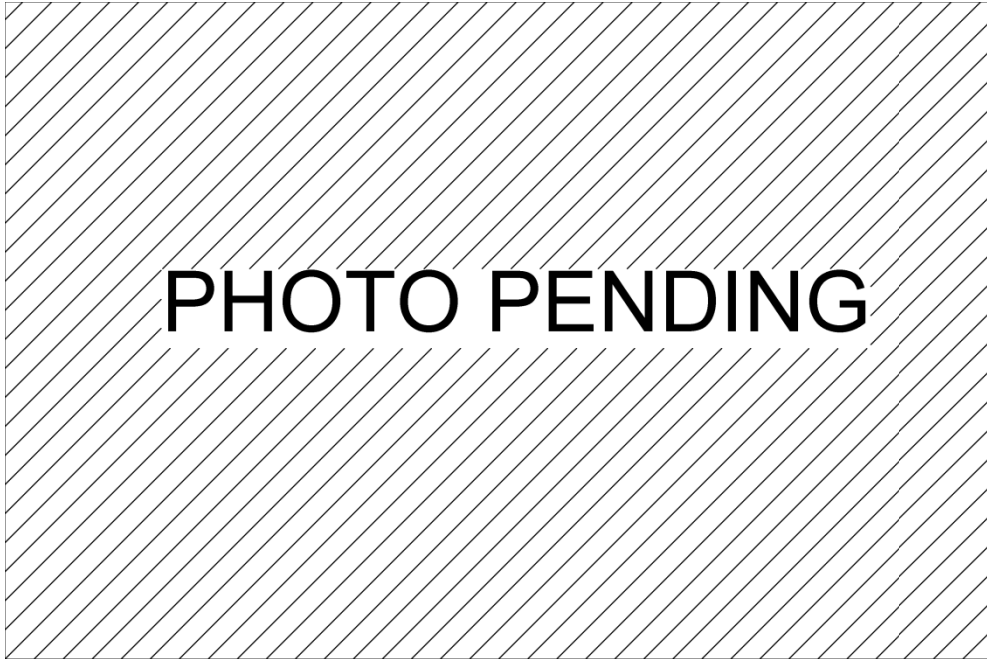


Figure 7. Burner and Safety Controls

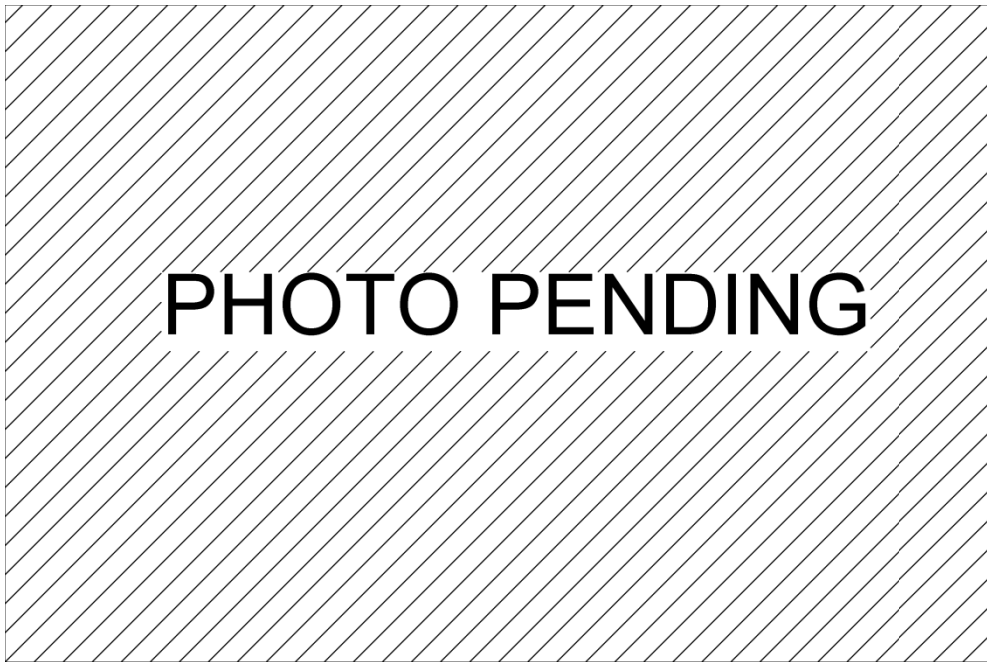


Figure 8. Outlet Air Temperature Control

Table 4. Burner Trouble Shooting Guide

Problem	Solution
Burner cycling (frequently starting and stopping during normal operation)	<ul style="list-style-type: none"> <li>▪ Check for flow restrictions in the inlet or outlet ducts</li> <li>▪ Reduce duct lengths or increase duct diameters</li> <li>▪ Reduce the firing rate</li> </ul>

Red LED is on	<ul style="list-style-type: none"> <li>▪ The controller has been locked out because of a flame, fuel or controller failure. Press the reset button for one second to reset controller.</li> <li>▪ If the burner begins running again but the fuel pressure gauge fluctuates, check fuel level and/or check for vacuum leaks in the pickup tubes.</li> <li>▪ If the LED immediately returns to red, the controller may have failed. Replace with a Carlin 60200 controller.</li> </ul>
Amber LED is blinking	<ul style="list-style-type: none"> <li>▪ Momentarily disconnect one of the yellow wires connected to the “FF” terminals on the controller.</li> <li>▪ If the amber light stays on, replace the controller.</li> </ul>
Red and Amber LEDs are off but the burner fails to start NOTE: Fan must be running for burner to start	<ul style="list-style-type: none"> <li>▪ Reset the reset the heat exchanger over-temperature safety.</li> <li>▪ If resetting fails, test the control loop connected to the TT terminals by disconnecting one wire and testing with an Ohmmeter while the main fan is running and the burner switch is on.</li> <li>▪ If continuity in the circuit is broken, check sensors and wiring.</li> <li>▪ If continuity in the control circuit is OK, check the burner circuit breaker.</li> <li>▪ Check power wiring and voltage if necessary.</li> </ul>

**6.2 Fan Trouble Shooting**

**Table 5. Fan Trouble Shooting Guide**

Problem	Solution
Motor overload trips	<ul style="list-style-type: none"> <li>▪ Reset motor overload and continue operation</li> </ul>
Motor overload repeatedly trips	<ul style="list-style-type: none"> <li>▪ Check and grease motor and fan bearings. Replace bearings/motor if worn or seized</li> <li>▪ Check fan belt alignment</li> <li>▪ Replace motor overload heaters in the motor starter box</li> </ul>
Fan belt wears quickly	<ul style="list-style-type: none"> <li>▪ Check belt alignment and tension</li> </ul>

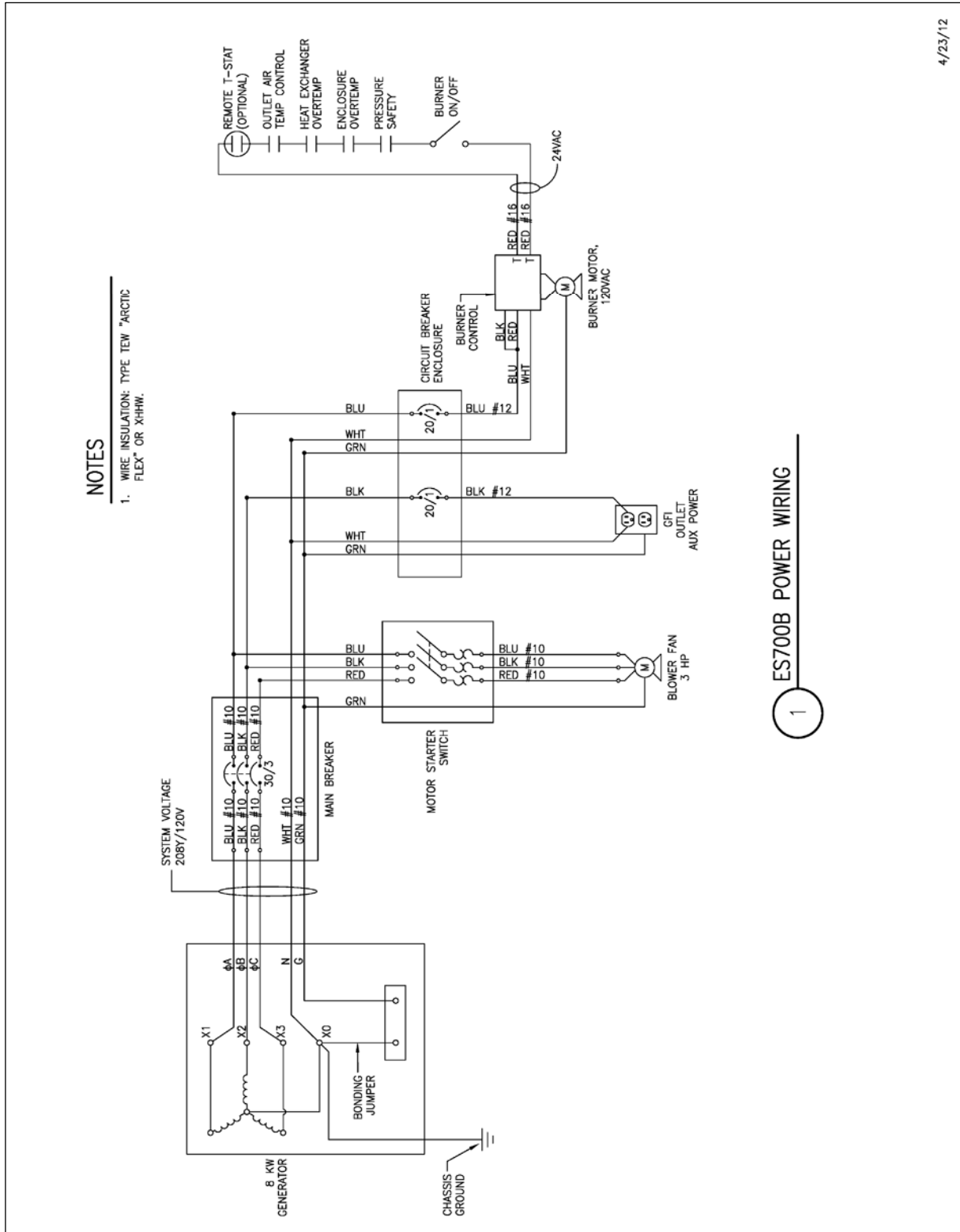
**6.3 Engine Trouble Shooting**

**Table 6. Engine Trouble Shooting Guide**

Problem	Solution
Engine controller fails (no low oil pressure light when the key switch is turned to position I)	<ul style="list-style-type: none"> <li>▪ Check position of battery main disconnect</li> <li>▪ Check condition of battery</li> <li>▪ Reset 15A breaker on controller panel. If repeatedly tripping, refer to 12V electrical schematics and check for a ground fault</li> <li>▪ Check 40A fuse near the starter terminal. Replace if necessary, and check for ground fault if repeatedly failing.</li> </ul>

<p>Starter fails to engage Note: Engine preheat (glow plug) timer prevents engagement of starter until the 15 second cycle is complete</p>	<ul style="list-style-type: none"> <li>▪ Check if engine controller is functioning (see “Engine controller fails”)</li> <li>▪ Check condition of battery</li> <li>▪ Reset the 30A breaker on the control panel. If tripping repeatedly, Check for ground fault in 12V system and check cooling fan current (should be &lt;20A).</li> <li>▪ Check the 40A relays in the control panel. All three relays must be working for the system to operate.</li> </ul>
<p>Starter engages, but engine fails to start</p>	<ul style="list-style-type: none"> <li>▪ Check fuel level</li> <li>▪ Check for water in fuel and drain completely if present.</li> <li>▪ Check electric fuel pump. The pump should audibly engage when the key switch is in position I.</li> <li>▪ If cold (less than 0F [-18C]), the engine block/oil pan heater should be plugged in for 4-hours prior to starting.</li> <li>▪ Check engine preheat (glow plug) circuit. Circuit should draw 15-25A for 15 seconds when the key switch is in the I position.</li> <li>▪ Check power supply to fuel solenoid on the engine fuel pump</li> </ul>
<p>Engine stops after 20 seconds</p>	<ul style="list-style-type: none"> <li>▪ Check engine oil pressure switch</li> <li>▪ Extreme cold may cause the engine oil pressure switch to temporarily malfunction. Plug in engine block/oil pan heater for at least 4-hours if temperature is lower than 0F [-18C].</li> <li>▪ Check indicator lights for high temperature alarm. Check sensor for ground fault if the sensor is active when the engine is cold.</li> </ul>
<p>Engine fails from over temp sensor</p>	<ul style="list-style-type: none"> <li>▪ Check 12V cooling fan for correct operation. See below “12V cooling fan failed” if fan has failed.</li> <li>▪ Check coolant level - CAUTION: Wait until engine has cooled completely</li> <li>▪ Check coolant condition</li> <li>▪ Check fan belt</li> <li>▪ Check sensor for ground fault</li> </ul>
<p>12V cooling fan failed (Fan fails to engage when the enclosure temperature is over 70F [20C])</p>	<ul style="list-style-type: none"> <li>▪ If control panel is functioning, check 30A breaker on the engine control panel.</li> <li>▪ If the engine control panel fails to start, see “Engine controller fails”</li> <li>▪ Check fan thermostat circuit</li> <li>▪ The fan should draw approximately 17-20A if operating correctly.</li> <li>▪ Check/replace the three 40A Bosch style relays in the engine control panel. All three relays must be working for the fan to operate.</li> <li>▪ Replace fan</li> </ul>

# 7 Electrical Schematics



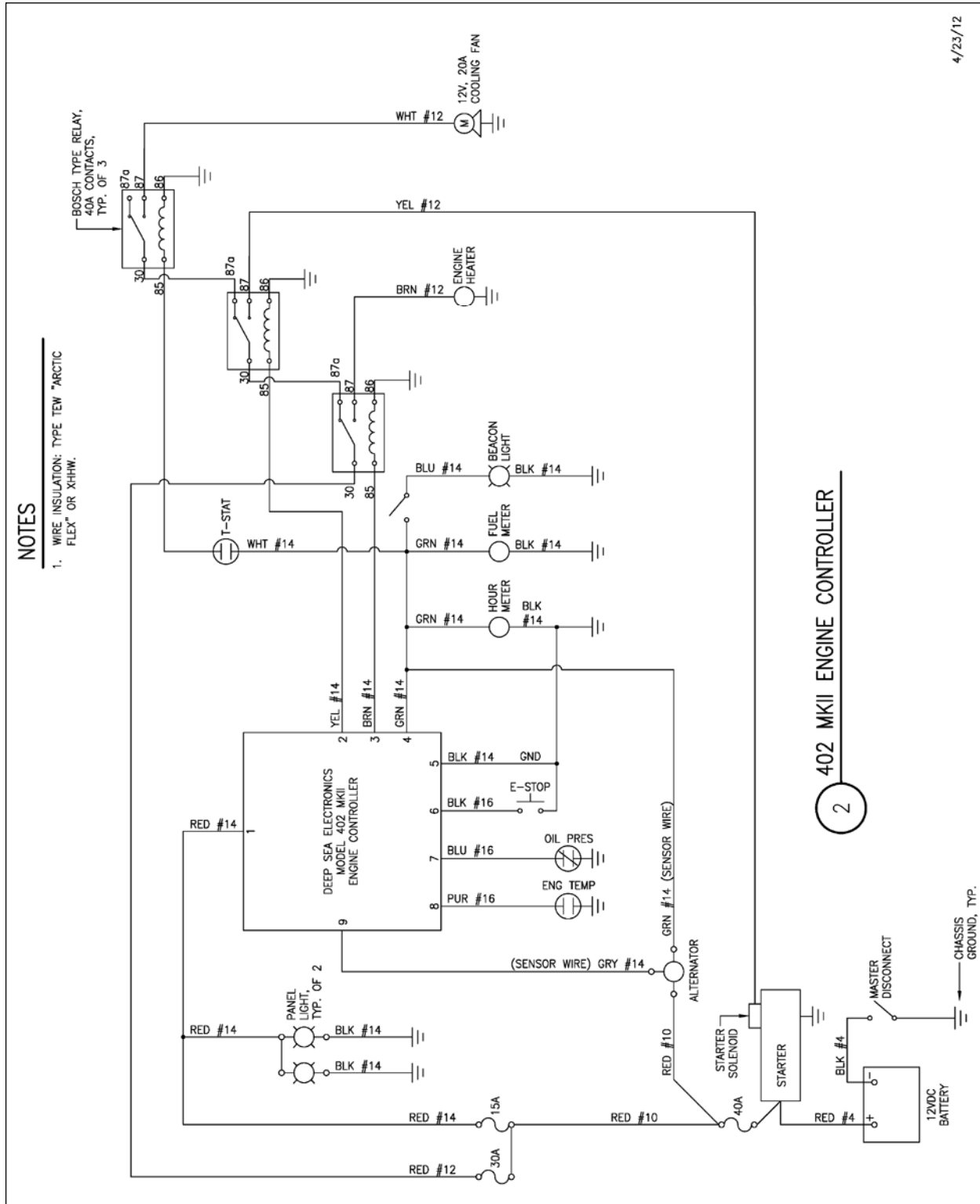
**NOTES**

1. WIRE INSULATION: TYPE TEW "ARCTIC FLEX" OR XHHW.

**1 ES700B POWER WIRING**

4/23/12

Figure 9. ES700B Power Wiring



4/23/12

Figure 10. 12V Engine Control Schematic

# 8 Maintenance Records

**Table 7. Machine Data**

<b>Machine Serial Number</b>	
<b>Engine Serial Number</b>	
<b>Generator Serial Number</b>	
<b>Trailer Serial Number</b>	

**Table 8. Maintenance Records**

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





