



## Q-87 Oil Gun Manual

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BURNERS • IGNITERS • DAMPERS • CONTROLS

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## **Introduction**

This manual contains information for the Q87 Oil Gun from Forney Corporation, 16479 North Dallas Parkway, Suite 600 Addison, Texas. [www.forneycorp.com](http://www.forneycorp.com)

All personnel should become thoroughly familiar with the contents of this manual before attempting to install, operate or maintain the system. Because it is virtually impossible to cover every situation that might occur during operation and maintenance of the equipment described in this publication, personnel are expected to use good engineering judgment when confronted with situations that are not specifically mentioned herein.

The user should update this manual whenever significant changes are made to the system. To be of value, the manual must always reflect the latest configuration of the equipment. It should be noted, however, that Forney Corporation will furnish updated pages only if Forney authorizes a modification and accomplished under Forney supervision.

## **Proprietary Notice**

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## Section 1 Description

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The Forney Q87 Igniter (Figure 1) is a versatile and reliable source of ignition energy and support for coal, oil, or gas burners. The Q87 Igniter features repeatable fuel ignition and stable flame front. The Q87 Igniter is NFPA-rated as a Class 1, 2, or 3 Igniter, depending on the application: Class 1 (Continuous Igniter) is used for light-up and support under all conditions; Class 2 (Intermittent Igniter) is used for light-up and support under prescribed light off conditions; and class 3 (Interrupted Igniter) is not intended for warm-up or support. A heat input range from 8.0 to 30.0 MBtu/hr makes the Q87 Igniter well suited for boiler warm-up or main flame ignition and stabilization.

The Q87 Igniter is provided with a durable High Energy Spark Igniter (HESI) for repeatable light-off. Refer to the HESI Service Manual (publication No. 384077-02) for detailed HESI information.

The major components of the Q87 Igniter are a mounting tube, guide tube assembly, fuel gun, and HESI. A factory-mounted junction box is standard, with all onboard electrical devices wired to the terminals. Figure 1 shows a typical oil-fired Q87 assembly with retraction. Figure 2 shows a Q-87 assembly without retraction.

### 1.1 Mounting Tube

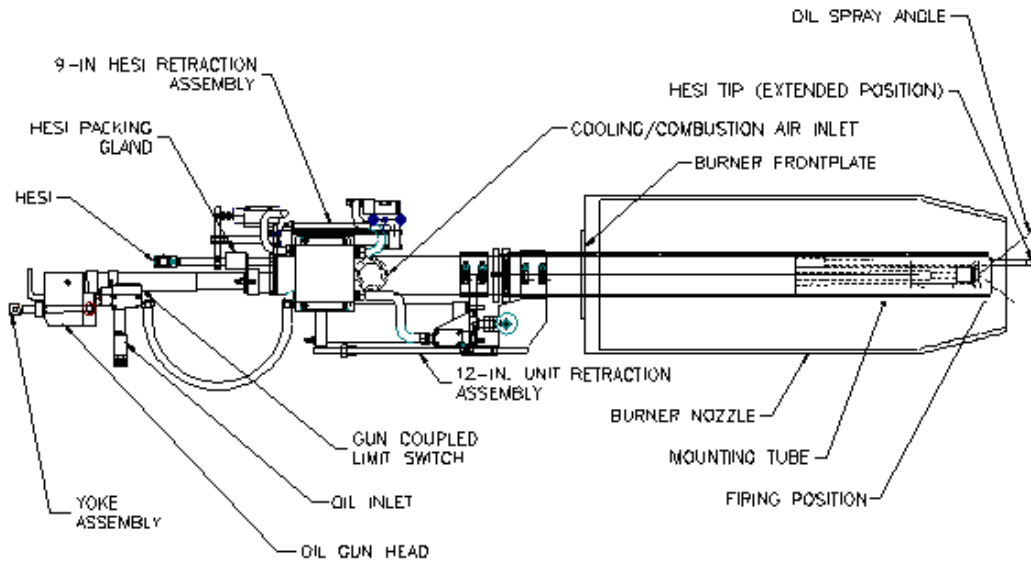
The mounting tube is welded to the burner front plate, in most cases, and provides support for the igniter assembly. The igniter guide tube slides into the mounting tube and is secured in place by a split clamping ring (squeeze collar), which is bolted to the mounting tube. The squeeze collar also acts as a packing gland follower. The packing gland prevents windbox pressure from leaking between the mounting tube and guide tube.

### 1.2 Guide Tube Assembly

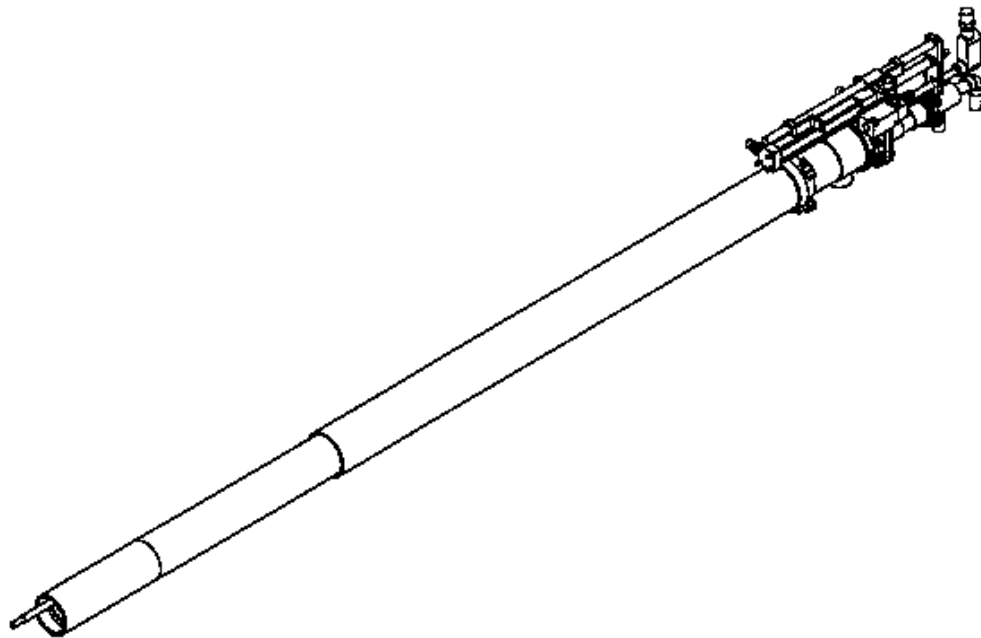
The guide tube assembly contains the working parts of the igniter and houses the oil fuel gun and HESI spark rod. The guide tube outside diameter is 4 inches. A 3.6-inch diameter diffuser cone is located at the tip to provide a stable flame (Figure 3). The guide tube transports cooling air from a low pressure (6 in. w.c.) air supply system to the igniter tip where it enters the furnace keeping the diffuser cool and sweeping foreign material away from the tip.

### 1.3 Fuel Gun

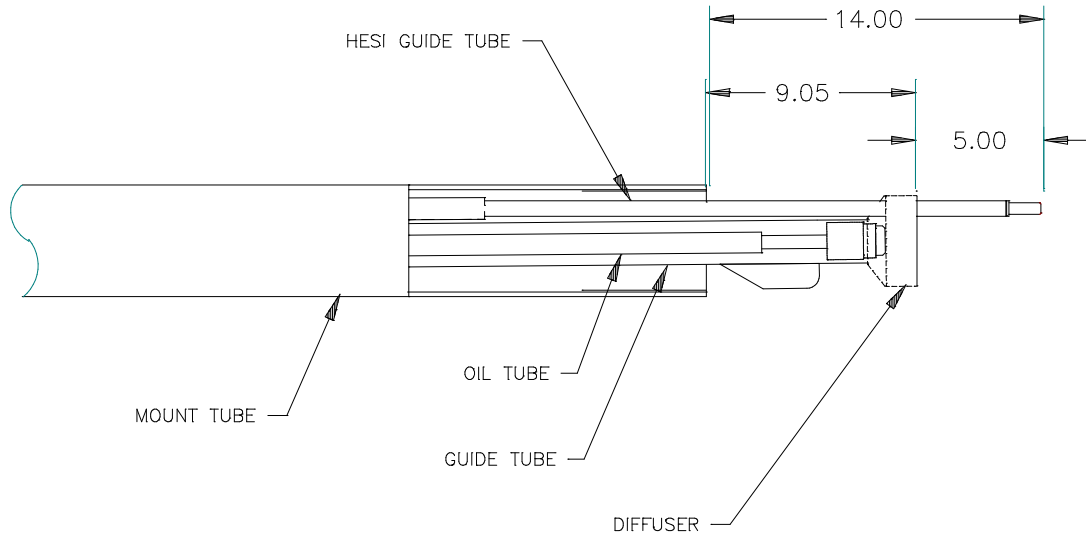
The Q87 igniter uses a fuel oil gun equipped with a mechanical atomizer tip. Because of the quick-disconnect coupling, the fuel gun can be removed easily to perform maintenance on the gun.



**Figure 1** Q87 Igniter Assembly (with retraction)



**Figure 2** Q87 Igniter Assembly (without retraction)



**Figure 3 Oil Gun, Diffuser, and HESI Spark Tip Settings**

Separate limit switches are provided to generate gun coupled and gun extended status signals for the burner management system (BMS). During the light-off sequence for the igniter, the BMS verifies that the oil gun is coupled and then causes a pneumatic cylinder to extend the gun to its firing position. When the gun is in position, the BMS extends and energizes the HESI and opens the igniter fuel valve. If igniter light-off is successful, the BMS permits the oil gun to remain in its firing position until it is removed from service. Extension and retraction of the oil gun is controlled by a pneumatic cylinder. The retraction assembly includes a limit switch whose contacts close when the oil gun is in its firing position. When the igniter is not in service, the retraction assembly pulls the oil gun back inside the mount tube to protect the atomizer tip from heat and debris in the boiler.

#### **1.4 High Energy Spark Igniter**

The HESI spark rod provides a 12-joule spark that ignites the fuel/air mixture. The HESI consists of a fouling-resistant, surface-gap spark tip connected to a positioning rod, power unit, and cable. When the HESI is not required for igniter light-off or oil gun purge, a separate HESI retraction cylinder holds the spark tip inside the mount tube. See the HESI Service Manual for details.

#### **1.5 Flame Detector**

The Forney Q87 Igniter requires proof of ignition from an outside mount detector. For more information on the Forney flame detectors, please refer to the appropriate flame detector service manual.

## Section 2 Specifications

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Specifications for the Q87 assembly are listed on the assembly drawings.

## Section 3 Safety

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Safety is the responsibility of each individual who installs, operates, or maintains Forney equipment. Forney includes personnel safety as a basic design element of the Q87 Igniter.

Observe the following safety instructions prior to performing installation, operation, or maintenance instructions:

**WARNING:** Hazardous voltage is present and serious injury to personnel can occur. See HESI Service Manual.

1. Use this equipment only for its intended purpose.
2. Follow only the installation, operation, and maintenance procedures discussed in this publication and on appropriate drawings.
3. Ensure that all electrical apparatus used to perform work on this equipment is in good working order and has been calibrated correctly.
4. Do not lift or disconnect grounding cables/wires while equipment is energized.
5. Do not perform modifications on this equipment.
6. The HESI power unit enclosure and the igniter guide tube should be grounded. See HESI Service Manual for details.
7. Before opening the HESI power unit's hinged cover, disconnect the electrical supply from the box. Allow at least 2 minutes for the capacitor to discharge. Exercise extreme care when the power unit cover is open. Refer to the HESI Service Manual for complete safety instructions for the HESI equipment.
8. Ensure that no voltage is present prior to disconnecting terminations.
9. Adhere to safety-related information on all drawings.
10. Close the manual fuel shutoff valves before performing maintenance or troubleshooting procedures.
11. When removing the igniter assembly from an operating furnace, wear protective clothing and insulated gloves. While observing the igniter flame through an open



observations port, wear a face shield and protective clothing.

12. Collect in drip pans all spilled oil caused by oil gun removal or other sources. Clean up or remove spilled oil from the burner front.
13. Replace the coupling assembly copper gaskets after each oil gun disassembly.
14. If the igniter is equipped with automatic retraction devices, maintain at least a 12-inch distance behind the oil gun to avoid injury from sudden oil gun retraction.

**Warning:** Only knowledgeable and qualified technicians should be allowed access to this system or to its components. The installation, maintenance, and operation of electronic equipment entail several elements of danger. Carelessness can result in serious injury or death from electrical shock, falls, or improper use of tools and test equipment.

## Section 4 Installation

A detailed description of the Q87 Igniter installation follows. To obtain job-specific installation instructions, request the appropriate arrangement and installation drawings from Forney Corporation. During installation, protect terminal boxes, spark rods, surfaces, round tubes, or any protruding devices from accidental bumps or bending forces.

Installation of the Q87 Igniter assembly includes five major tasks: affixing the mounting tube to the burner front plate, inserting and positioning the guide tube assembly, installing fuel piping, installing cooling/combustion air piping, and connecting all wiring.

### 4.1 Mounting Tube

The mounting tube is affixed permanently to the burner front plate and supports the igniter assembly. Many retrofit installations may have an existing mounting tube that can be reused. To reuse an existing mounting tube, adequate sliding clearance must exist between the inside diameter of the mounting tube and the outside diameter of the guide tube. If a suitable mounting tube is not available, one must be installed. In cases where a mounting tube must be installed, perform the following steps:

1. Cut a hole in the front plate in the location desired or as indicated on the installation drawing. The diameter of the hole should be slightly larger than the outside diameter of the mounting tube.

**NOTE:** Occasionally, air vanes or other parts of the burner have to be trimmed in order to provide clearance for the mounting tube and igniter guide tube.

2. Insert the mounting tube through the front plate and into the burner area. Position the mounting tube to the correct distance and angle shown on the installation drawing.



3. Seal-weld the mounting tube to the burner front plate using a full penetration weld. (For carbon steel, a 6011 welding rod may be used). On some older installations where cast iron plates must be penetrated, a steel flange or cover plate can be bolted to the cast iron, so that the mounting tube can be welded to that flange or plate.

## 4.2 Guide Tube Assembly

The following procedure describes the installation steps necessary for the correct positioning of the guide tube assembly.

1. Inspect the diffuser area for damage, cleanliness, and proper HESI spark rod position. The HESI spark rod is factory set and should not need adjustment. If necessary, refer to Figure 2 for HESI spark rod tip settings.
2. Loosen the packing and clamping nuts on the mounting tube.
3. Apply a thin coat of high-temperature lubricant to the outside surface of the guide tube, and slide the guide tube through the squeeze collar. Avoid contact with internal burner parts, such as air vanes or burner sleeves. Guiding the igniter into place from inside the windbox may assist in this procedure.
4. Position the guide tube assembly to the depth shown on the burner installation drawing. For replacement applications, insert the furnace end of the guide tube assembly to the same location as the previous igniter. The critical dimension is the Q87 igniter tip relative to the burner throat or the waterwall surface. As a general rule, when in the extended position, locate the Q87 igniter tip 3 inches behind the burner tip vertical plane or, in the case of wall firing, 2 inches back from the center line of the waterwall tube surface.

## 4.3 Tack-Welding of Components

Four devices on the assembly are locked in position by setscrew fasteners. These fasteners are used for shop assembly and can assist in field adjustment. Tack-welding of these components is done at the factory. However, each of the following points should be field-checked for these welds.

- Coupling assembly mounting ring
- Retractor barrel clamp
- Fuel gun coupled limit switch clamp
- Retract/extend limit switch strikers

**Do not** tack-weld the HESI retractor rod clamp. Correct any missing or damaged welds before startup.

## 4.4 Fuel Piping

If fuel piping is part of Forney's supply, Forney provides a site-specific drawing to assist with piping installation. Forney recommends using the following general guidelines when installing the piping:

- To prevent the transportation of foreign particles to the fuel tip during commissioning, ensure that all fuel piping and flexible hoses have been blown free of debris and moisture.

- Tapping off a fuel header from the top or side reduces the possibility of contamination during operation.
- Ensure that oil line accumulators, if supplied, are in place, and accumulators are pressurized with nitrogen set to 60% of design igniter operating oil pressure.
- Install strainers with the strainer elements oriented in the correct directions.
- Install flexible hoses to accommodate retraction/extension of fuel guns and boiler vertical expansion.
- Install the flexible hoses with all of the bends in one plane. The hoses cannot withstand twisting or kinking; if necessary, install an additional union.

#### 4.5 Cooling/Combustion Air

1. To prevent contamination of the igniter during commissioning, ensure that all cooling/combustion air piping is blown free of debris and moisture.
2. Before tightening the mounting tube clamping ring, it may be necessary to rotate the guide tube to orient the air connection to the desired position (90° increments) so that the guide tube easily accepts the cooling/combustion air flexible hose. In order to maintain proper orientation of the oil gun and HESI, remove the four bolts on the rear flange of the guide tube. While maintaining the HESI and oil gun in the same location, rotate the guide tube until the cooling/combustion air connection accepts the flexible air hose, and reconnect the four bolts.
3. Connect the flexible air hose to the cooling/combustion air inlet on the guide tube. Install the flexible air hoses so as to allow for maximum boiler expansion. Install the flexible air hoses with all bends in one plane; the hoses cannot withstand twisting or kinking. If necessary, install an additional union.

#### 4.6 Wiring

Consult the control system wiring diagram for site-specific wiring connections. The standard Q87 Igniter is furnished with a factory-mounted-and-wired junction box, in which all control wire connections are made to terminal strips.

A typical I/O list for the Q87 Igniters includes the following:

##### 4.6.1 Control Outputs

- HESI power unit
- HESI extend solenoid
- Unit extend/retract solenoid
- Fuel valve open/close solenoid
- Purge valve open/close solenoid.

#### 4.6.2 Control Inputs

- Fuel gun coupled limit switch
- HESI extend limit switch
- Unit extend/retract limit switches
- Fuel valve open/close limit switches.

Before commissioning the equipment, test all electrical components for proper operation by energizing the component while it is isolated from the system.

#### 4.7 Flame Detector for Q87 Igniter

Flame detection of the Q87 Igniter is through an externally mounted detector. Consult the appropriate flame detector drawing and service manual for installation details.

### Section 5 Commissioning

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Before commissioning the Q87 Igniter, complete all of the steps listed in the Installation section of this service manual. Use the following checklist to ensure that the Q87 Igniter is ready for initial operation.

- The fuel and air piping configuration is correct, and dampers, valves, strainers, and instrumentation are installed properly.
- The cooling/combustion air connections to the guide tube are installed according to the preceding instructions or the installation drawings (if provided).
- All retract cylinder piston rods are clean and free of paint or debris; retract cylinder exhaust vents are clean undamaged.
- The fuel oil accumulator is precharged properly. Refer to the installation section.
- All electrical components are wired properly and tested, including the HESI power unit and spark rod assembly.
- Fuel oil lines are connected properly at the header and at the fuel gun.
- Valves and strainers are installed oriented correctly.

To commission the Q87 Igniter, complete the above checklist, and then perform the following steps.

1. Remove the fuel gun from the igniter assembly to clean and inspect the oil gun tip.
  - a. Refer to the Oil Gun Removal subsection in the Maintenance section for disassembly procedures.
  - b. Remove any rust or scale that formed in the tubes and tip during storage. Do not clean orifices with steel wires or other steel tools.

- c. Remove the lubricant coating (applied before shipping) from the tip.
  - d. Reassemble the fuel gun using the same precautions as noted in the disassembly instructions. Refer to the Maintenance section for assembly instructions.
  - e. Install new copper ring gaskets on the coupling body.
2. Replace the fuel gun into the igniter and secure in place, with the coupled limit switch made, by tightening the yoke against the head of the gun.
  3. Place the cooling/combustion air system into service by starting the cooling/combustion air fan(s) and opening the manual isolation valves.
  4. Adjust the manual isolation valve to set the cooling/combustion air pressure to approximately 6 inches w. c. above furnace pressure, as measured at the ½-inch connection.
  5. Prepare to place the Q87 Igniter into service by completing the following steps:

**NOTE:** Before proceeding, all light-off permissives must be met.

- a. Start oil pumps.
  - b. Open the manual oil valve at each igniter.
  - c. Set the igniter oil header pressure regulator to obtain the required supply pressure at the igniter inlet.
5. Initiate a START command to the Q87 igniter while observing the fuel pressure.
  6. If the Q87 Igniter fails to ignite, refer to the Troubleshooting section.
  7. When the igniter is in service, the ignition point should be just off the tip of the oil gun. A properly burning oil flame is bright yellow at its base and more orange as the flame travels into the furnace. The very tip of the flame has a small amount of dark tails, but as the furnace warms up, the dark tails diminish. If these conditions exist, no adjustments are necessary. If the flame is not burning according to these descriptions, refer to the Troubleshooting section.
  8. Initiate a shutdown command to the igniter. Ensure that the fuel valve fully closes. The gun should go through a purge cycle before it is retracted.
  9. Repeat the start and shutdown procedures in steps 7 and 10 to demonstrate light-off repeatability.
  10. Ensure that the oil gun purge sequence duration is long enough to remove all of the oil from the gun. A duration of 2 minutes is recommended.
  11. After the Q87 Igniter has been commissioned and adjustments have been optimized, practice normal maintenance procedures, as outlined in the Maintenance section.

## Section 6 Operation

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The Q87 Igniter is ready for normal operation after the installation and commissioning procedures have been completed.

Place the Q87 Igniter into service from a cold state as follows:

1. Prepare the boiler for light-off by satisfying all light-off permissives.
2. Pressurize the igniter oil distribution header by performing the following instructions:
  - a. Start the oil pumps.
  - b. Open the header trip valve.
3. Start the cooling/combustion air fan(s) or open an air path from other air sources. The fans must remain in service while the boiler is in operation, unless an alternate means of cooling the igniter tip is provided.
4. Initiate an igniter START command. The following sequence of events occurs as the Q87 Igniter goes into service (the following information is *typical*; individual systems may vary):
  - a. An ignition time trial begins (usually 15 seconds).
  - b. The oil gun will move to the extended position if not already there.
  - c. The HESI power pack is energized, and the HESI spark rod begins sparking.
  - d. The igniter oil valve opens to admit fuel to the oil gun.
  - e. Ignition occurs within a few seconds of the fuel admission.
  - f. The flame detector detects the flame when ignition occurs.

If an igniter flame is not detected within the ignition time trial limit, an igniter trip is initiated, the fuel valve is closed, and the HESI is de-energized. The gun is purged prior to being retracted, unless a fuel safety trip or other safety condition prevents the purge cycle from running.

**NOTE:** On a manually controlled igniter system, use the time limits and event sequence discussed previously for guidance.

If the igniter flame is detected, the igniter remains in service until the operator initiates shutdown, or the burner management system trips the igniter out of service.

As the boiler starts to warm up, additional igniters can be placed in service. Heat input should be limited to the boiler manufacturer's recommended start-up rate.

To remove the Q87 Igniter from service, either manually or automatically, under normal boiler operating conditions, follow these steps (the following information is typical; individual systems may vary):

Initiate an igniter STOP command. The following oil gun purge sequence occurs:

1. The HESI power unit is energized and starts to spark.
2. The oil block valve closes.
3. The purge valve opens for 60 to 120 seconds to admit purge air to the oil gun.
4. After 60 seconds, the HESI is de-energized.
5. After the purge period of 60 to 120 seconds, the purge valve closes.
6. The oil gun retracts.

## Section 7 Troubleshooting

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If the igniter fails to ignite, several conditions may be at fault.

**NOTE:** Frequently, initial light-off requires several attempts to ensure that the fuel piping system is purged of air and full of fuel.

Also, ensure that the atomizing piping is free of water.

1. If the igniter does not ignite, ensure that the following conditions exist:
  - All manual valves in the fuel supply line to the igniter are open.
  - All control, trip, and block valves in the oil lines are functioning properly. Ensure that the block valves open smoothly and are fully open within 2 to 5 seconds after the START command.
  - Fuel pressure is regulated to within  $\pm 5$  psi of its set-point value during light-off. Any pressure deviation should be recovered to the set-point within 3 to 5 seconds.
  - The HESI cable is connected properly, and voltage is present at Terminals 1 and 2 in the HESI power unit.
  - Ensure that the HESI spark tip is firing. If the spark rod cannot be observed in place, mark the rod so that it can be repositioned to its previous location. Remove the spark rod from the guide tube, and place the rod in a safe location away from any personal contact. Observe the rod and the power unit's lens for visible emission of three sparks per second. If the spark rod assembly functions properly, reinsert the rod into the guide tube at the rod's

original position, which was marked previously. If the HESI spark rod does not function properly, refer to the HESI Service Manual (Manual No. 38407702).

- The HESI spark rod tip is positioned correctly, as shown previously in Figure 2, and is sparking during the ignition process.
- When fuel is available to the oil gun, and a spark is present but no oil spray is observed, or an erratic spray exists, remove the oil gun, and inspect the gun for tip fouling. Disassemble and clean or repair the gun, as required. Refer to the Maintenance section, Oil Gun Removal and Oil Gun Assembly subsections.

**NOTE:** Tip fouling and tip carbonization may occur due to an inadequate purge or a leaking shutoff valve. This condition can result in oil migrating to the hot tip. It may be necessary to increase the purge time or check for shutoff valve leakage. Check for this leakage by removing the igniter end of the flexible oil hose and allowing the oil to collect in a container. While oil pressure is available to the shutoff valve, observe the flexible oil hose for oil leaks. If leakage is evident, repair the shutoff valve. Fouling, failure to light, and erratic combustion also can be caused by contaminated or degraded oil. Oil stored for long periods of time can form paraffins and other solids that can plug orifices.

2. For an installation where remote or local automatic light-off sequencing and flame detection is involved, consult system operating logic and ensure that the following conditions exist:
  - The oil gun coupled limit switch contact is actuated, and the limit switch is closed; this prohibits any light-off sequence.
  - The unit retract limit switch contacts are actuated in either the retracted or extended position.
  - The speed control valves are adjusted to extend or retract the 6-inch stroke in 2 to 3 seconds.
  - The igniter time trial for ignition is adequate to allow the oil to reach the burner tip and stabilize.
3. If the igniter lights, but the flame fails to remain lit on, ensure that the following conditions exist:
  - The oil gun coupled limit switch contact is actuated, and the limit switch is closed; this prohibits any light-off sequence.
  - The unit retract limit switch contacts are actuated in either the retracted or extended position.
  - The speed control valves are adjusted to extend or retract the 6-inch stroke in 2 to 3 seconds.
  - The igniter time trial for ignition is adequate to allow the oil to reach the burner tip and stabilize.
4. If the igniter lights but an inadequate flame exists, (i.e., orange flame with dark tails, or the ignition point of the oil flame is more than 2 to 3 inches in front of the tip of the oil gun) ensure that the following conditions exist:



- The amount of combustion airflow directed behind the oil gun is adequate. Dark tails usually indicate insufficient mixing of the fuel with the combustion air.
- The oil gun atomizing tip is clean and free of any obstruction.

## Section 8 Maintenance

The Q87 Igniter components discussed below require periodic maintenance to ensure long and reliable service. On a periodic basis, complete preventive maintenance activities.

Use the following list as a guideline for the tools required to perform preventive maintenance:

Tool	Used On
9/16 Socket Wrench	Packing gland, mounting tube, guide tube rear flange; 3/8-inch nut
Large adjustable wrench	Fuel/atomizing union
Open-end wrench	Atomizing tip
Large adjustable pipe wrench	Gas lines, primary gas supply union
Allen wrenches	HESI spark rod retract limit switches
Screw drivers	HESI junction box and gas orifices
1/16-inch Soft copper wire	Gas orifice (for cleaning)

**CAUTION:** Use protective clothing and gloves if furnace is in operation.

### 8.1 Oil Gun

Remove the oil gun for maintenance every 3 months or after 100 hours of operation, whichever comes first. Remove the oil gun, clean the tip, and reassemble the gun, as follows:

#### 8.1.1 Oil Gun Removal

1. Close the manual isolation valves in the oil line that connects to the gun assembly. Tag the valve Out of Service.
2. Loosen the yoke bolt and move the yoke downward. As the connection is opened, take care any pressure is relieved and the isolation valves are holding tightly.

**CAUTION:** Do not place the hot tip of the oil gun assembly in solvent or drip pans that contain oil. Flash fires could result.

3. Slowly pull the handle on the oil gun, and carefully slide the oil gun assembly from the guide tube.
4. Set aside the oil gun, and allow it to cool slowly.

5. Inspect the oil port at the coupling assembly and ensure that the manual isolation valve is not leaking.
6. When the tip is cool, place the oil gun into a maintenance fixture. Use a smooth-sided wrench to unscrew the atomizing tip from the oil gun.

**CAUTION:** All oil passages must be free of foreign material that could alter the spray pattern of the oil.

7. After the tip has been removed, cover and protect the threads of the oil gun.
8. Clean the atomizing tip with a commercially approved hydrocarbon solvent and a soft copper wire to remove all deposits.

### 8.1.2 Oil Gun Reassembly

1. Apply a high-temperature-resistant lubricant to the threads of the atomizing tip. Install the atomizing tip on the end of the oil tube.

**CAUTION:** Do not apply excessive torque on the atomizing tip. Binding or galling of the tip can occur if disassembly is attempted while it is hot from service. Use of a pipe wrench or serrated jaw wrench could damage the atomizing tip and eventually cause it to fail.

2. Use an open-end wrench to tighten the atomizing tip to 60 ft-lb torque.
3. Remove and replace the two copper gaskets at the quick-disconnect coupling. Never reuse the copper gaskets.
4. Slide the oil gun assembly into the guide tube until the oil port is sealed against the coupling assembly.
5. Move the yoke upward, over the oil gun head and tighten the yoke screw to 30 ft-lb torque. If more torque is required to seal the quick-disconnect coupling, check the gasket seal surfaces for proper installation. Moving the yoke into position actuates the oil gun coupled limit switch.
6. Open the manual isolation valves in the oil line that connect to the gun assembly. Remove the Out of Service tags.
7. When the gun is placed in service, ensure that no leaks are present around the quick-disconnect coupling gaskets and hose connections. Correct any leaky joints.
8. Remove and clean the oil line strainer after 50 hours of oil gun operation.

## 8.2 Retract Assembly

Every 6 months ensure that the following conditions for preventive maintenance of the retract assembly exist:

- Compressed air pressure is maintained between 60 to 100 psig.
- Compressed air is moisture free, and the internals of the retract cylinder are dry.
- Piston rod surface is free of corrosion, deposits, or wear.
- The unit extends and retracts without jerking, binding, or slamming in either direction.
- Extend/retract limit switches are actuated at full stroke.
- Exhaust flow controls (speed control needle valves) are adjusted properly (2 to 3 seconds to extend or retract 6-inch stroke).

### 8.2.1 Retract Cylinder Adjustment

Use the following steps to adjust the retract cylinder speed control:

1. Unlock the exhaust flow control screw by turning the locking nut approximately one-half turn to the right.
2. Turn the exhaust flow control screw to the right and to its end-stop point before operating the retract/extend cylinder. This recommended start-up procedure will keep the cylinder stroke under control.
3. Operate the air control valve, and then adjust the exhaust flow speed by adjusting the exhaust flow control screw to the left.
4. While holding the screw, lock the exhaust flow control screw setting by turning the locking nut to the left.

## 8.3 Flame Detector

Clean the ignition flame detector lens every 6 months or more often under extreme conditions. Refer to the flame detector's service manual for details.

## 8.4 High Energy Spark Igniter

Remove and inspect the spark rod assembly every 6 months or during planned boiler outage. Refer to the HESI Service Manual for details.

## 8.5 Air Tube and Diffuser

Every 12 months or planned boiler outage, inspect the air tube and diffuser cone from the furnace side. Remove the flex hose at the igniter and inspect for obstruction. Clean or blow out as necessary. On naturally aspirated models, the air entrance is located at the rear of the guide tubes. The entrance may plug during operation from fly ash or other objects and should be checked and cleaned out periodically to avoid problems from low cooling airflow.

## 8.6 Combustion Air Fan and Motor Set

Every 6 months, or more often under adverse conditions, clean or replace the air filters. If required, lubricate bearings and stroke control dampers/isolation valves, if provided.

## Section 9 Storage

Store the Q87 Igniter in a clean, dry atmosphere. When possible, store the assembly in its original shipping container until used. If the Q87 Igniter is removed from its shipping container, store it in a horizontal position supported at both ends of the guide tube. Protect both guide tube ends from damage due to inadvertent bumps or blows. Cover the Q87 Igniter with plastic to keep it free of dust and dirt. Storage longer than 30 days requires humidity less than 85% and temperature less than 120° F.

## Section 10 RMA / Warranty

Forney Corporation warrants this product to be free of defective material and workmanship. Forney will replace this equipment as long as it is being used for its intended use and is found to be defective upon receipt up to the expiration of the warranty period.

Prior to returning any material to Forney, please contact your Forney customer service representative and provide the contract number or the customer purchase order number.

## Section 11 Spare Parts

When ordering spare parts, contact Forney's Aftermarket Department via any one of the following methods and furnish the following information.

E-mail	Phone	Fax
spares@forneycorp.com	972-458-6100 or 972-458-6142 or 1-800-356-7740 (24-hour direct line)	972-458-6600

1. Contract number
2. Customer purchase order number
3. For each part ordered, provide the following information:
  - a. Part number
  - b. Part description
  - c. Quantity required

### 11.1 Recommended Spare Parts

The recommended spare parts list in Table 1 advises of the minimum stock level of replacement parts that should be in the customer's stock for system start-up and the first year of operation. Replacement parts should be ordered as necessary to maintain the suggested stock of spare parts at the recommended level.

**Table 1 Q87 Unitized Head Oil Gun Minimum Recommended Spare Parts**

Part Description	Quantity
Oil Gun Copper Coupling Gaskets	100 for every 5 igniters
HESI spark tip and cable	1 for every 5 igniters
HESI Power Unit	1 for every 10 igniters
Limit switch for oil gun advance/retract assembly	1 for every 5 igniters
Atomizer tip	1 tip for every 5 igniters

## Commissioning Checklist

After reading this service manual and following its instruction, complete the Commissioning Checklist while following the guidelines discussed in the Installation and Commissioning sections of this service manual. Return the completed form to Forney Corporation's Service Department.

Customer Name: \_\_\_\_\_

Contract Number: \_\_\_\_\_

Plant Location  
and Unit Number: \_\_\_\_\_

Number of Q87  
Igniters Supplied: \_\_\_\_\_

Capacity: \_\_\_\_\_

Check off the listed conditions that have been completed satisfactorily. If they have not been completed, please explain. Use this service manual's installation and commissioning guidelines while completing this checklist.

- A new mounting tube was installed.
- The mounting tube adequately supports the igniter assembly.
- The igniter assembly has been checked for clearance within the burner and does not interfere with dampers, vanes, or any other moving parts. (Explain corrections made if interferences were experienced.)

- 
- Adequate igniter assembly removal distance exists.
  - The HESI spark tip is in the correct location, per Figures 1 and 2 in this manual. (If the tip required relocation, note the tip's final position: \_\_\_\_\_ -inch in front of the swirler.
  - The HESI was tested independently and works properly.
  - All fuel and air piping has been blown clean and free of debris and moisture.
  - The fuel gun tip has been inspected and is free of dirt and debris.
  - All wiring and logic interlocks have been field-tested for proper operation.
  - The Q87 Igniter has ignited on a repeatable basis, as witnessed by the owner.

### OPERATING DATA:

Oil pressure to gun	_____	psi
Atomizing air/steam pressure at gun (at maximum capacity)	_____	psi
Gas pressure at igniter (at maximum capacity)	_____	psi
Cooling/combustion air pressure at igniter	_____	in. w. c.
Windbox-to-furnace differential	_____	in. w. c.