MAXFire™ 375 Gas Igniter

INSTALLATION AND SETUP GUIDE

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INTRODUCTION

This manual contains information for the MAXFire™ 375 Gas Igniter, designed and manufactured by Forney Corporation, 3405 Wiley Post Road, Carrollton, Texas.

All personnel should become thoroughly familiar with the contents of this manual before attempting to 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 judgement 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 a modification is authorized by Forney and accomplished under Forney supervision.
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1.1 DESCRIPTION

The MAXFire™ 375 gas igniter (Figure 1) is a versatile and reliable source of ignition energy for oil, coal, or natural gas burners. It is a self-contained unit that features a stable and clean-burning flame, repeatable fuel ignition, low maintenance (no moving parts), and low combustion/cooling air requirements.

![MAXFire™ Gas Igniter Assembly Diagram]

Figure 1. MAXFire™ Gas Igniter Assembly

The MAXFire™ 375 gas igniter is NFPA-rated as a Class 1, 2, or 3 igniter, depending on the application. Class 1 igniters are used for burner lightoff and support under any credible operating condition. Class 2 igniters are used for lightoff and support under prescribed conditions. Class 3 igniters are used for lightoff only and are not intended for warmup or support.

These igniters are available in a variety of hardware configurations to fit the customer’s specific installation requirements and operating preferences:

- Guide tube lengths are available from 14 to 180 inches in increments of 2 inches.
- Forney offers standard assemblies that are available in sizes from 5 MBtu/hr to 25 Mbtu/hr in 5 Mbtu/hr increments; and other capacities can be provided on request.
- The igniter port of MAXFire™ 375 igniter can be fitted with the standard Forney high-energy spark igniter (HESI), the European-approved version of the HESI, a high-tension spark igniter (HTSI) for igniter lightoff, or a HTSI and flame rod (FR) combination for both igniter lightoff and subsequent flame detection.
• The standard igniter includes a view port. This view port can be fitted with a solid plug, a sight window with lens, or a flame rod. Optical flame detectors can be sighted through the view port as a customer option.

• Standard igniter configurations use either silicone or Viton seals.

• The igniter gas gun is secured to the guide tube with a clamp assembly. The customer can select either a hand-actuated clamp or a two-bolt clamp assembly.

In most applications, the self-contained MAXFire™ 375 igniter is mounted in a burner through a mount tube. The major components of the igniter assembly are a guide tube assembly, ignition source (HESI Series 90, HESI Series 90EC, HTSI, or HTSI-FR), and flame detector (optional). Figure 1 illustrates a typical arrangement of the MAXFire™ 375 igniter assembly.

1.1.1 MOUNT TUBE

In most cases, the mount tube (Figure 2) is welded to the burner frontplate and supports the igniter assembly. The igniter guide tube slides into the mount tube and is secured in place by a split clamping ring (squeeze collar) that is welded to the mount tube. The squeeze collar also serves as a packing gland follower.

![Figure 2. Mount Tube Assembly, 4 1/2-Inch Outside Diameter (By Others)](image)

1.1.2 GUIDE TUBE ASSEMBLY

The guide tube assembly houses the following major parts of the igniter:

• Gas tube
• Selected spark rod electrode
• Orifice tube weldment.
Gas is transported down the gas tube to the orifice tube, which controls the rate of gas flow into the primary combustion zone (Figure 3). The orifice tube is machined with two orifices. One small orifice is drilled through the tube wall just behind the location of the baffle plate; the second larger orifice is drilled along the axis of the tube. The orifice through the side of the tube releases a small flow of gas into the combustion/cooling air passing along the guide tube. The majority of the gas flows through the axial orifice and exits from the end of the orifice tube.

![Figure 3. Igniter Tip Arrangement](image)

The igniter requires a continuous flow of combustion air through the guide tube. When the igniter is out of service, this air flow protects the igniter hardware from hot gases in the furnace environment and prevents ash/soot from migrating into the end of the guide tube. During igniter lightoff, the air mixes with the gas flowing from the orifice behind the baffle plate to produce a combustible mixture. This mixture of gas and air flows around the side of the baffle plate to the location of the spark rod tip. Ignition first occurs at the tip of the spark rod, propagates down the guide tube to the end of the orifice tube into the primary flow of gas. Combustion is completed 2 to 6 feet into the furnace.
1.1.3 IGNITION SOURCE

Any of three options can be selected as the ignition source for the MAXFire 375 igniter: the standard Forney HESI Series 90, the HESI Series 90EC, or the HTSI-FR. The standard HESI and the European-approved HESI are both Class 3 igniters consisting of a capacitive-discharge power unit, a cable assembly, and a spark rod. When the power unit is energized, the unit produces three 12-joule sparks per second. This energy permits reliable ignition of the gas-air mixture passing around the edges of the baffle plate. (Refer to the service manual for the HESI Series 90 or for the HESI Series 90EC for more detailed information).

The HTSI-FR ignition system consists of an electrode, cable assembly, and high-voltage step-up transformer. During the lightoff trial for the igniter, operating power is applied to the transformer primary, and the resulting voltage peaks from the transformer secondary exceeds the breakdown potential at the tip of the electrode, producing the necessary ignition sparks.

1.1.4 FLAME DETECTOR

The standard MAXFire™ 375 igniter includes an integral sight port through the igniter head assembly. One of the following flame detectors can be mounted at this sight port.

- A direct-sighted optical flame detector can be mounted at the sight port.
- A lens-view port can be installed to permit direct inspection of the igniter flame.
- The HTSI-FR rod can be used for electrical flame scanning.
# 2.1 SPECIFICATIONS

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</tr>
<tr>
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<tr>
<td>Guide tube OD</td>
<td>3.75 inches</td>
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<tr>
<td>Capacity rating</td>
<td>5, 10, and 15 MBtu/hr @ 15 psig</td>
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<tr>
<td></td>
<td>20 and 25 MBtu/hr @ 25 psig</td>
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<tr>
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3.1 SAFETY

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 MAXFire™ 375 igniter.

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

**WARNING**

Hazardous voltage is applied to the HESI or HTSI-FR during igniter operation. Contact with the electrode or failure to ground the igniter properly can result in serious injury to personnel.

1. Use this equipment for its intended purpose only.
2. Follow only the installation, operation, and maintenance procedure discussed in this publication and on appropriate drawings.
3. Ensure that all electrical equipment used to perform work on this equipment is in good working condition and has been calibrated correctly.
4. Do not lift or disconnect grounding cables/wires while equipment is energized.
5. Do not perform modification to the equipment.
6. Before opening the HESI power unit’s hinged cover, disconnect the electrical supply from the power source. 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 HESI equipment.
7. Ensure that no voltage is present prior to disconnecting any terminations.
8. Adhere to all safety-related information on all Forney drawings.
9. Close the manual fuel shutoff valves before performing maintenance or troubleshooting procedures.
10. Test all fuel pipe connections for leaks.
11. Ensure that the igniter assembly and the HESI power unit or the HTSI-FR transformer are connected to a common ground.
12. Removal of the igniter assembly from an operating furnace is not recommended. If it is necessary to remove the igniter from an operating furnace, however, take measures to ensure the furnace gases cannot escape. Wear protective clothing and insulated gloves.

13. While observing the igniter flame through an open observation port, wear a face shield and protective clothing.

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

The following subsections provide a detailed description of installation requirements for the MAXFire™ 375 gas igniter. For job-specific installation instructions, refer to the appropriate arrangement and installation drawings.

Use of a mount tube is the recommended procedure for installing the MAXFire igniter. However, the design of the MAXFire™ 375 igniter allows the user to weld the guide tube directly to the burner frontplate. Welding the guide tube directly to the front plate does not allow for future adjustment. (With this configuration, no mount tube is required.)

As a general rule when locating the igniter relative to the burner, position the tip of the MAXFire™ 375 igniter as follows:

- For narrow-flame versions: 3 to 6 inches behind a vertical plane through the position of the main burner fuel nozzle and within the normal flame diameter of the main burner, as a general rule.

- For wide-flame versions: 0 to 3 inches behind a vertical plane through the position of the main burner fuel nozzle and within the normal flame diameter of the main burner, as a general rule. The wide-flame version must be inserted far enough to prevent flame impingement on the burner parts.

**CAUTION**

The wall of the guide tube is thin. If the guide tube is welded directly to the boiler front, care must be exercised to avoid burn-through or distortion of this tube.

4.1.1 MOUNT TUBE

Typically, the mount tube is fixed permanently to the burner frontplate and supports the igniter assembly. If a suitable mount tube is not available, one must be installed. However, many retrofit installations have a suitable mount tube already in place. The inside diameter of an existing mount tube must provide adequate sliding clearance for the outside diameter of the igniter guide tube to prevent binding. When a mount tube will be installed, perform the following steps.

1. Cut a hole through the burner frontplate 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 mount tube.

2. Insert the mount tube through the frontplate and into the burner area. Support the mount tube at the position and penetration angle indicated on the installation drawing.

3. Seal-weld the mount tube to the burner frontplate using a 6011 weld rod (carbon steel to carbon steel). 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 mount tube can be welded to that flange or plate. When installing the guide tube, avoid contact with internal burner parts, such as air vanes or burner sleeves. Occasionally, air vanes may have to be trimmed in order to provide clearance for the mount tube.

4. On the mount tube, loosen packing and clamping nuts, so that the guide tube slides easily into the mount tube.

4.1.2 GUIDE TUBE ASSEMBLY

The following procedure describes the installation steps necessary for the correct positioning of the igniter.

1. Before inserting the guide tube into the mount tube, inspect the primary combustion region for cleanliness and check the position of the spark rod tip. The position of the spark rod is set at the factory and should not require adjustment. Figure 3 illustrates the correct position of the spark rod tip.

2. After inspecting the igniter, slide the guide tube into the mount tube. If necessary, apply a thin coat of high-temperature-resistant lubricant to the outside surface of the guide tube to facilitate passage through the squeeze collar.

3. Position the MAXFire™ 375 igniter to the depth indicated on the burner installation drawing. During retrofit or replacement applications, insert the MAXFire™ 375 igniter to the same location as the previous igniter. As a general rule, the tip of the igniter should be 3 inches behind a vertical plane through the position of the main burner fuel nozzle.

4.1.3 FUEL AND AIR PIPING

Forney recommends using the following general guidelines regarding fuel and air piping.

NOTE

In applications for boilers with multiple igniters and burners, equal gas flow and pressure distribution to each igniter are important for reliable and efficient operation. Care should be exercised in the design of fuel and air headers to obtain uniform distribution under all flow conditions. Good engineering practice recommends limiting line velocities of gas fuel to a maximum of 9000 ft/min.

1. To prevent contamination of the igniter during commissioning, ensure that all fuel and air hoses have been blown free of debris and moisture. During installation, tapping off the gas header from the top or side also helps prevent contamination.
2. Install gas pressure regulators in the gas headers to ensure that the specified pressure is maintained at the igniter. Ensure that the selected regulator has the required turndown capacity and response time capability needed for this application.

CAUTION

Install flexible hoses between the rigid supply headers to the igniter that allow adequate length for maximum thermal expansion of the boiler.

3. Before tightening the mount tube squeeze collar, rotate the guide tube to accept flexible hose connection for cooling/combustion air. Tighten the nuts of the squeeze collar to hold the guide tube securely in position.

4. Release the clamp securing the igniter gas tube to the mount tube, and rotate the gas tube as needed to accept the flexible hose from the flexible gas supply tube. Engage the clamp, and then connect the flexible gas hose from the supply piping to the inlet in the head of the MAXFire™ 375 igniter. Ensure that all bends in the flexible hose are in the same plane. The hose cannot withstand twisting or kinking. If necessary, install an additional union. Figure 4 illustrates a typical piping arrangement.
5.1 COMMISSIONING

Before commissioning the MAXFire™ 375 igniter, complete all steps of the Installation procedure. Use the following Installation checklist to ensure that the MAXFire™ 375 igniter is ready for initial operation.

- The fuel and air-piping configuration is correct, and dampers, valves, strainers, and instrumentation are installed properly.

- The gas and air supply hoses are connected to the appropriate inlet ports of the igniter.

**Figure 4. Typical Fuel Piping Arrangement**

- All electrical components are wired properly and have been tested for normal operation. (Refer to the installation drawing for specific wiring requirements.)
To commission the MAXFire™ 375 igniter, complete the Installation checklist, and then proceed as follows:

1. Connect a manometer to the observation port in the igniter head.

2. Place the cooling/combustion air system into service by starting the cooling/combustion air fan(s) and opening the isolation air valves.

3. Adjust the cooling/combustion air manual valve to approximately 6 inches W.C. above the burner windbox pressure, as indicated by the manometer. Alternatively, use an airflow-meter and adjust airflow through the mount tube to 60 scfm.

4. When cooling/combustion-air flow is set, remove the manometer and replace the flame detector or observation port.

5. Adjust the pressure regulator on the igniter gas header to obtain the necessary typical pressure at the igniter inlet. (Installing a temporary test gage at the igniter facilitates this adjustment.

   **NOTE**

Before proceeding, all igniter lightoff permissive conditions for this boiler must be satisfied.

6. Initiate a START command to the MAXFire™ 375 igniter while observing the fuel pressure.

7. The MAXFire™ 375 igniter should light within 10 seconds after the igniter gas valve opens. The base of the flame should be blue and may change to bright yellow as it travels into the furnace.

8. If the MAXFire™ 375 igniter fails to light or if the flame does not appear as described in step 7, refer to the Troubleshooting section.

9. Initiate a STOP command for the igniter.

10. Initiate START and STOP commands several times to demonstrate repeatability.

After the MAXFire™ 375 igniter has been commissioned and adjustments have been optimized, the igniter provides trouble-free operation as long as normal maintenance procedures outlined in the Maintenance section are observed.
6.1 OPERATION

The MAXFire™ 375 igniter is ready for normal operation after the installation and commissioning procedures have been completed.

1.6.1 IGNITER STARTUP

To place the MAXFire™ 375 igniter into service from a cold state, proceed as follows:

1. Prepare the boiler for lightoff by satisfying all lightoff permissive conditions.

2. Start the cooling/combustion-air fan(s) or open the air path from another source. The flow of cooling/combustion air must be present continuously while the boiler is in operation.

3. Prepare the igniter gas supply and header system to allow pressure to the individual igniter block valves.

4. Set the igniter regulator to the specified pressure.

5. Initiate an igniter START command. The following sequence of events occurs as the MAXFire™ 375 igniter goes into service (the following information is typical; individual systems may vary):
   a. An ignition time trial begins (usually 10 seconds).
   b. The HESI or HTSI is energized and starts producing sparks.
   c. The gas double block valves open, admitting gas to the igniter, and the vent valve closes.
   d. Ignition occurs within approximately 5 seconds after admission of fuel to the gas tube.
   e. The flame detector detects flame presence within 10 seconds after the start signal is generated.
   f. The HESI or HTSI is de-energized and stops producing sparks.

6. If an igniter flame is not detected within 10 seconds, an igniter trip is initiated to close the igniter block valves and open the igniter vent valve.

NOTE

For a manually controlled igniter, the time limits described in step 5 still apply; however, the operator must initiate shutdown
of the fuel flow to the igniter if no flame is detected within 10 seconds.

**NOTE**

To place a MAXFire™ 375 igniter in service on an operating boiler, follow steps 3 through 5 of the preceding sequence.

### 1.6.2 IGNITER SHUTDOWN

To remove the MAXFire™ 375 igniter from service, proceed as follows:

1. **Initiate an igniter STOP command.** The following sequence should occur:
   a. The gas block valves close.
   b. If the igniter start sequence was in progress, the HESI or HTSI is de-energized.
   c. The igniter flame extinguishes as the residual gas vents from the igniter gas gun.
7.1 TROUBLESHOOTING

If the igniter fails to light, ensure that the following conditions exist.

1. If the igniter does not ignite, ensure that the following conditions exist.
   - All manual valves in line with this igniter are open.
   - All mechanically operated valves in line with this igniter are operating correctly.
   - The specified gas pressure is available at the inlet to the igniter gas tube.
   - The specified flow of cooling/combustion air is available at the inlet to this igniter.
   - The HESI or HTSI is installed in the correct position (Figure 3) and is producing sparks. If the HESI or HTSI fails to generate sparks, ensure that the electrode is not shorted to the igniter body. Refer to the HESI Service Manual for additional guidance on fault isolation.
   - Both the pilot orifice and the primary jet orifice are free of mechanical obstructions.

If the igniter lights but fails to stay on, ensure that the following Conditions exist:
   - The fuel supply pressure at the inlet to the igniter remains at the specified level following igniter lightoff.
   - The flow of cooling/combustion air is maintained at the specified level following igniter lightoff.
   - Airflow in the burner windbox is not blowing out the flame or not blowing the flame out of the flame detector sighting region.
   - The flame detector is operating correctly. (Refer to the flame detector service manual.)
   - The flame detector is sighted and calibrated correctly.
8.1 MAINTENANCE

The following paragraphs describe components of the MAXFire™ 375 igniter that require periodic maintenance. Proper care of these components ensures long and reliable service. On a periodic basis, complete preventive maintenance activities.

**WARNING**

Use protective clothing and gloves if removing the igniter from an operating furnace.

8.1.1 GUIDE TUBE

Inspect the guide tube from the furnace side every 12 months or during a planned boiler outage. If evidence of overheating is present, the igniter may be inserted too far forward with respect to the main burner. Refer to the Commissioning section for instructions on igniter placement. If the problem persists, contact Forney for assistance.

8.1.2 GAS GUN

The gas gun should be removed from the guide tube every 12 months or during a scheduled boiler outage and examined as follows:

1. Close the manual gas shutoff valve in line with this igniter, and then disconnect the gas line from the inlet to the gas tube.
2. Disconnect the electrical cable from the HESI or HTSI-FR, and remove the electrode from the igniter assembly.
3. If a flame detector head or FR is mounted at the sight port, disconnect the electrical cable and remove the flame detector.
4. Remove the guide tube clamp from the rear flange.
5. Carefully remove the internal components of the igniter from the igniter guide tube. If evidence of heat distortion is observed, the flow of cooling air to the igniter may be impaired, or the igniter may be positioned too far forward. Refer to the Commissioning section and make the necessary adjustments to airflow or igniter positioning.
6. Unscrew the orifice tube assembly from the gas tube. Examine the orifices for evidence of clogging or accumulation of debris. Use a soft wire to clean the orifices as required.
7. Use compressed air to clean the igniter tip. Blow out all igniter gas lines both forward and backward.
8. After Cleaning, reassemble the igniter gas gun.
8.1.3  FLAME DETECTOR

If an optical detector is being used, clean the lens every 6 months or as required. After cleaning, repeat the sighting and calibration procedures recommended by the manufacturer.

If this installation used FR flame detection, inspect the electrode every 6 months, or more frequently in oil- or coal-fired furnaces. If any buildup of deposits is present, use sand blasting to clean the electrode.

8.1.4  HESI OR HTSI

Remove and inspect the HESI or HTSI electrode every 6 months or during planned boiler outage. If any buildup of deposits is present on the HTSI, use sand blasting to clean the electrode. Refer to the HESI Service Manual for maintenance requirements of the spark rod.

8.1.5  COMBUSTION AIR BLOWER

As a minimum, clean or replace the blower air filter every 6 months. Check airflow to the igniter to ensure that the cooling/combustion-air flow remains at the specified level.
9.1 STORAGE

Store the MAXFire™ 375 igniter in a clean, dry environment. When possible, store the igniter in its original shipping container until it is installed. If the MAXFire™ 375 igniter is removed from its shipping container, store it in a horizontal position supported at both ends of the guide tube. Protect the guide tube from damage due to inadvertent bumps or blows. Cover the MAXFire™ 375 igniter with plastic to keep it free from dust and dirt. Storage longer than 30 days requires relative humidity of less than 85% and ambient temperature of less than 120 degrees Fahrenheit.
10.1 RETURN OR REPAIR SERVICE

Forney Corporation warrants this product to be free of defective material and workmanship. Forney will repair or replace this equipment if it is found to be defective upon receipt, but not later than 90 days from the date of shipment.

Prior to returning any material to Forney, a Return Material Authorization (RMA) identification number must be obtained from Forney. Clearly mark the RMA number on all shipping containers and accompanying documents. Forney accepts only materials submitted in accordance with these RMA instructions.

To issue an RMA, Forney must have the following information:

- List of equipment to be returned by stock number/model number.
- Reason for return.
- Company name and address of the customer.
- Customer's requested mode for return shipping.
- Customer's purchase order number for repairs (if applicable).
- Customer's requested return date.
- Name and address to which Forney is to return-ship and any special container marking information that may be required.
- Name of individual (customer's representative) requesting the RMA.

Any one of the following methods may be used to obtain an RMA:

1. Phone: (972) 458-6100
   1-800-356-7740 (24-hour direct line)

2. Fax: (972) 458-6650

FORNEY CORPORATION IS NOT RESPONSIBLE FOR MATERIALS RETURNED WITHOUT PROPER AUTHORIZATION AND IDENTIFICATION.

Return the material to:

Attn: Return Material
Forney Corporation
3405 Wiley Post Road
Carrollton, Texas 75006-5185
Exercise care in packing the materials to be returned. The shipper will be advised of any damage due to improper packing, and no further action will be taken in connection with this material return until the shipper provides clearance for further disposition.

**11.1 SPARE PARTS**

When ordering spare parts, furnish the following information to:

Attn: Renewal Parts  
Forney Corporation  
3405 Wiley Post Road  
Carrollton, Texas 75006-5185

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