



Flame Rod Manual

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BURNERS • IGNITERS • DAMPERS • CONTROLS

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INTRODUCTION




This manual contains information for the Flame Rod Flame Detection system from Forney Corporation, 16479 North Dallas Parkway, Suite 600 Addison, TX 75001.

All personnel should become thoroughly familiar with the contents of this manual before attempting to install, operate or maintain the FlameHawk® Flame Detection 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.

PROPRIETARY NOTICE

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SAFETY ICON DEFINITIONS

 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates unsafe practices that can result in property damage only.

Revisions

Revision	Date	Comments
A	9-25-2018	Initial Release

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Section 1 Description

1.1 Introduction

The Forney Flame Rod is a reliable and cost-effective method of providing a solid-state flame detection system. The three components of the system are (1) the flame sensing rod, (2) the electronic module and (3) the cable. The rod and the electronic module are connected with a single conductor cable.

At the time of ignition, if the flame rod is in the flame zone, the electronic module provides a “flame on” output.

The flame sensor modules provide visual indication and electrical outputs that signal the user regarding flame presence in a combustion chamber. The module uses the flame rods to sense flame presence independently or as components in a burner management system.

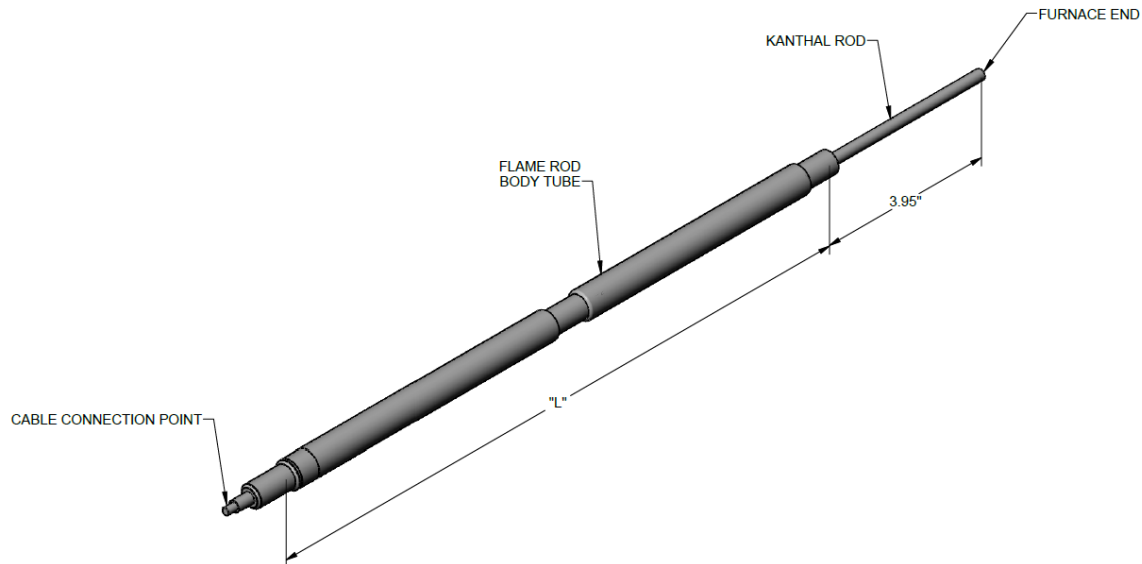


Figure 1 Flame Rod

1.2 Operational Overview

The Flame Detection system provides positive verification of flame presence based on the ionization of the gas within the flame. When the flame is present, the excitation on the valence electrons results in the escape of some of them, resulting in ions being formed within the flame. This means that when the flame is present, the ionized gas becomes an electrical conductor.

The flame rod is an electrode extending directly into the flame. It is used to measure the resistance of the gas between the electrodes. When the flame is present, at immediate contact with the electrodes, the resistance decreases. Increasing the current flow through the flame rod is used to indicate the presence of flame.

1.3 Specifications

Operating Temperature	-10 to 60°C (14 to 140°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Humidity	75%RH @ 40°C (104°F)
Input Voltage	110/230 VAC, 50/60 Hz
Module Output Voltage	350 VDC
Approvals	CE Approved, Hazardous Area Available
Flame Rod Diameter	0.625 in (1.6 cm)
Flame Rod Tip Material	Kanthal®
Flame Rod Length	As Required

1.4 Component Descriptions

Flame Rod –Solid-state flame detection rod which will be in physical contact with the flame.

Cable - Single wire shielded cable which connects the flame rod to the electronic module.

Electronic Module – Provides visual indication and electrical outputs that signal the user regarding flame presence in a combustion chamber.

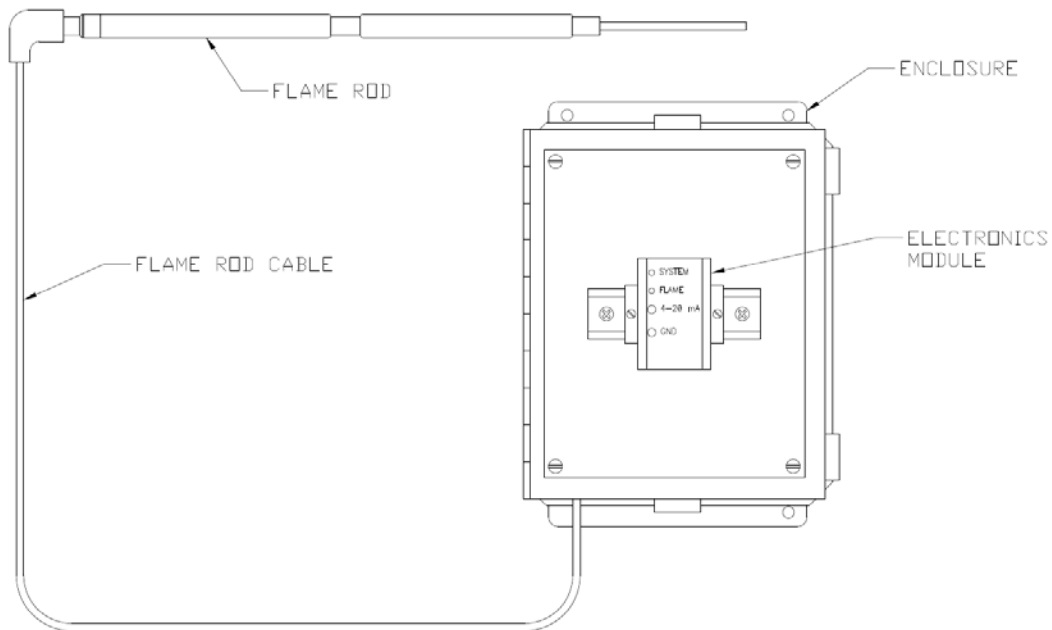


Figure 2 Flame Rod Components

1.5 Electronics Module

The electronic modules provide visual indication and electrical outputs that signal the user regarding flame presence in a combustion chamber. The module uses flame rods to sense flame presence independently or as components in burner management system. Many operational characteristics are provided including:

- CE approved
- Self-contained: 110 VAC/240, 50/60 Hz:
- Flame ON/OFF LED indicator
- 4-20mA permits direct reading of flame signal strength
- Uses CE approved 11-pin relay base
- Panel surface or DIN-rail mounting
- Self-check

The unit provides a cost effective, self-checking method of monitoring flames using the ionization principle.

Refer to separate instruction manual for detailed information on the electronic module.

Section 2 System Installation

The flame detection system is designed to be installed and operated without any special setup. Once the unit has been installed, as instructed below, the unit will provide a "flame on" signal (greater than 4 mA) when flame is present and a "no flame" signal (less than 4 mA) when flame is absent.

2.1 Installation

The flame detection system installation may be divided into three basic parts: flame sensing rod installation, electronic module mounting/installation and cable installation. In general, any of the three components may be installed separately, however,

2.2 Flame Rod Installation Procedure


In most applications, the flame rod fits into the guide tube of a gas or oil igniter. If using the flame rod in combination with gas or oil igniters (i.e. Forney's MaxFire® or DuraFire®), refer to your igniter manual for additional information. Observe the following steps for installing the flame rod assembly into a gas or oil igniter:

1. Carefully insert the flame rod tip into the guide tube until the flame rod extends into the primary ignition zone.
2. When a retraction assembly is supplied, exercise the retract cylinder, either manually or automatically, in the extend and retract positions to check for correct operation.
3. Once the tip penetration is set, attach and tighten the locking device to the flame rod into position.

2.3 Cable Installation

Route flame rod cable enough distance from ignition and other high voltage or high current wiring to avoid electrical interference. Interference from ground currents, nearby conductors, radio-frequency emitters (wireless devices), and inverter drives can induce false flame signals. Shielded cables can help reduce interference with the shield connected to ground at the control end only. The wire type and its capacitance (picofarads or microfarads) to ground may cause low signal problems, so a grounded shield may decrease the signal due to the cable's internal capacitance.

For flame rod sensor runs approximately 100 feet (30 meters) or greater, use Forney P/N: 78706-04 coax cable. To achieve the maximum wiring distance, the shield should not be grounded (keep in mind that an underground shield provides less protection against electrical interference). Depending on field connections, sensor wiring can be up to 200 feet (61 meters).

 WARNING	Do not ground the shield to terminal GND .
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*Unshielded sensor wiring must **not** be run in common with other wires; it must be run in separate conduit. Multiple flame sensor wiring must not be run together in a common conduit or wireway. Use #14 to #18 AWG wire suitable for 90°C (194°F) and 600 volt insulation and run each pair of leads in its own shielded cable. Multiple shielded cables can be run in a common conduit.*

Reference cable manufacturers documentation to ensure acceptable conditions for installation and operation (temperature and voltage limits, bend radius limitations etc.), especially at lengths longer than 100 ft.

2.4 Electronics Installation

The electronics are housed within a sealed NEMA 3, 4, 4X, 7(B,C,D), 9(E,F,G) explosion and weather-proof cast aluminum enclosure. The enclosure has two mounting lugs that are compatible with 3/8" diameter bolts. The flame rod electronics module is connected to an 11-pin wiring base which will be mounted to the enclosure via DIN rail or a mounting screw connection.

Refer to separate instruction manual for detailed information on the electronic module


2.5 Enclosure Installation Procedure

1. The box should be mounted in a location that is within the temperature limits specified for the unit 14°F to 140°F (-10°C to 60°C).
2. Mount the enclosure with fasteners through the mounting holes. Ensure that the cable connectors are facing down to facilitate cable installation.

2.6 System Installation Wiring

Refer to electronic module documentation for detailed wiring information.

Section 3 Maintenance Procedures

 WARNING	Do NOT open cover of electronics module box when explosive atmosphere may be present.
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Forney recommends performing the following preventive maintenance every six months.

3.1 Flame Rod Inspection and Maintenance

Remove the flame rod and inspect the Kanthal® rod section for damage due to overheating, excessive use, and mishandling of equipment.

1. If Kanthal® rod is bent, use hand tools to re-straighten the Kanthal® rod
2. If excessive carbon or residue is built up on the Kanthal® rod use a wire brush and remove the residue by hand.

3.2 Electronic module Inspection and Maintenance.

The Electronic module generally does not need periodic maintenance other than cleaning the exterior of the enclosure and checking the hinged cover for proper closure and sealing.

3.3 Cable Inspection and Maintenance

Inspect the cable for fraying or loose connections. Replace frayed cable.

Section 4 Troubleshooting

If the flame rod assembly malfunctions, ensure that the procedures described in the Installation section have been performed successfully.

If problems continue to occur, refer to Table 1 for troubleshooting information.

Table 1 Troubleshooting

Symptom	Probable Cause	Remedy
Solid Red Light on Electronic Module	System Fault	Replace Electronic Module
No Flame Detected	1.Flame rod bent and is touching metal (grounded out)	Remove flame rod and re-straighten the Kanthal® Rod
	2.Flame rod is dirty (residual carbon build up)	Remove flame rod and clean
	3.Flame rod is internally grounded	Meggar test (see below)
	4.Flame rod cable damaged	Inspect and repair or replace the cable

Table 2 Meggar Test Instructions

Step	Instruction
1	Set Switch of the Meggar Tester to the 500 setting and remove cable from the flame rod.
2	Clip the black Lead Clamp of the Meggar Tester to the end of the Kanthal® Rod of the Spark/Flame Rod Assembly.
3	Touch the red probe of the Meggar Tester to the Body Tube within the confines of the Insulator located approximately 4 inches from the end of the Body Tube (Kanthal® Rod end). Press Button. The display readout must show an infinite resistance (“1”) in order for the Assembly to pass. Any other readout on the display is a fail.
4	Touch the red probe of the Meggar Tester to the Body Tube outside the confines of the Insulator, approximately 12 inches from the end of the Body Tube (Kanthal® Rod end). Press Button. Once again, the display readout must show an infinite resistance to pass the Assembly. Any other readout is a fail.

Section 5 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 6 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