



## IDD Flame Detector Heads

Standard Models: IDD-II, IDD-IIL, IDD-IIU, and IDD-Ultra

Publication 372000-05 Rev K

● BURNERS ● IGNITERS ● DAMPERS ● CONTROLS

[www.forneycorp.com](http://www.forneycorp.com)

# INTRODUCTION

This manual contains information for the IDD Flame Detector Heads from Forney Corporation, 16479 N. Dallas Parkway, Suite 213, Addison, Texas.

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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Additional copies of this publication may be purchased from Forney. When ordering or requesting cost information, refer to the publication number appearing on the title page. Address to the attention of the Sales Department, Forney Corporation, 16479 N. Dallas Parkway, Suite 213, Addison, Texas 75001.

## REVISIONS

REVISIONS	DATE	COMMENTS
A		Initial Release
B		
C	4/2003	
D	6/2004	
E	6/2004	
F	10/2006	
G	07/2013	Add CEX and Ultra versions of detector heads, update graphics.
H	08/2013	Correct graphics with cable support brackets.
J	09/2015	Update logo and address. Remove IDD-UV and IDD-UltraCEX
K	12/2020	

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# SECTION 1

## DESCRIPTION

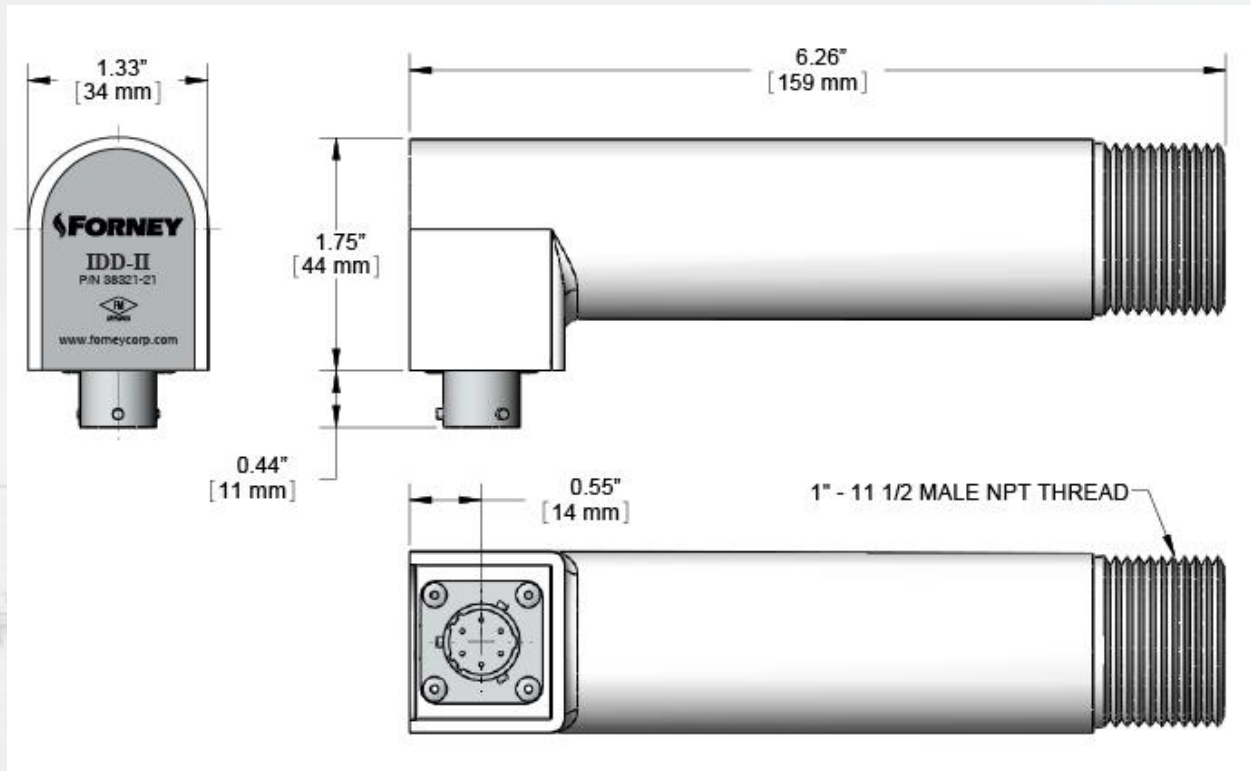
The Forney IDD flame detector heads are non-repairable devices that generate an AC signal of variable amplitude and frequency proportional to a burner's flame intensity. The detector head transmits the signal through a four-conductor cable to an applicable Forney flame amplifier.

The IDD family of products offers a range of flame detector heads for a variety of fuels / applications.

Detector Head	Typical Application	Spectral Response	Sensor	Housing
IDD-II	Oil and Coal	IR 700 to 3300 nm	Lead sulfide	Standard
IDD-IIL	Lignite	IR 700 to 3300 nm	Lead sulfide	Standard
IDD-IIU	Unfiltered for Oil & Coal	IR 400 to 3300 nm	Lead sulfide	Standard
IDD-Ultra	Natural Gas	UV 200 to 425 nm	Silicon carbide	Standard

The major components of the IDD flame detector heads are a metal housing containing a photocell and a printed circuit board that provides power and amplifies the cell's output signal. The IR series of detector heads (-II, -IIU, -IIL) contain a lead sulfide photocell and the UV detector-ULTRA) heads utilize a silicon carbide cell. The complete assembly is potted with non-repairable epoxy.

Figure 1 Dimensional drawing – IDD Standard housing



# 1.1 MECHANICAL SPECIFICATIONS

ATTRIBUTE	STANDARD MODELS
Models	IDD-II, IDD-IIL, IDD-IIU, IDD-Ultra
Approvals	Factory Mutual (FM)
Housing Rating	NEMA4
MECHANICAL	
Size	1.75 x 6.25 inches (44.5 x 158.8 mm)
Weight	1.3 lbs (0.59kg)
Mounting	1.0 inch NPT male pipe
Viewing Angle (non-restricted)	120 degrees
Recommended Viewing Angle	3 to 5 degrees

Temperature Rating	<b>Operating:</b> IDD-II, IDD-IIL and IDD-IIU 32oF to 140oF (0oC to 60oC) IDD-Ultra 32oF to 250oF (0oC to 121oC)  <b>Storage:</b> -25oF to 140oF (-32oC to 60oC)
Cooling / Sealing Air	Front Mount: 10 scfm @ 6-inches w.c. (16m3/hr @ 152Kg/m2)  Fiber Optic: 15 scfm @ 6-inches w.c. (25m3/hr @ 152Kg/m2)
Maximum Cooling Air Temp	IDD-II, IDD-IIL and IDD-IIU 120oF (49oC) IDD-Ultra 170oF (77oC)
<b>ELECTRICAL</b>	
Input Voltage	+50Vdc for cell bias +12 to +15Vdc logic
Output Voltage	0.1 to 0.8 Vac peak to peak
Power Consumption	0.12 VA maximum
Cable Rating	4 conductor, shielded, 20-gauge stranded wire
Maximum Cable Length	1320 feet (402.3 meters)
Connector	MS3112E10-6P

## 1.2 SAFETY

The IDD model flame detector heads' voltage point is not accessible under normal operating conditions. However, users should follow appropriate electrical safety procedure when installing the flame detector.

Electrical power should always be removed from the flame detector amplifier before installing or replacing a flame detector head assembly. In addition, if a flame detector head must be replaced while the furnace is in operation, maintenance personnel should exercise caution to avoid exposure to flying particles and hot furnace gas.





**WARNING:** Do Not Open When Energized



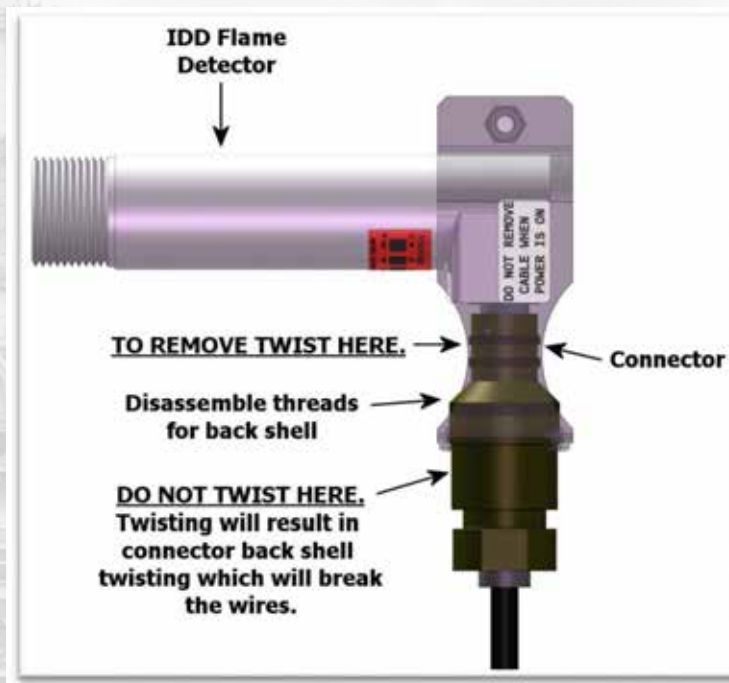
**WARNING:** When installing and/or removing the IDD model flame detectors, wear safety glasses to prevent eye injury caused by airborne particles in cooling/seal-air supply or wind box.



**CAUTION:** The detector head contains sensitive electrical components. Ensure that all power is removed from the external amplifier assembly before connecting or disconnecting the I/O cable.



**CAUTION:** Disconnect the cable from the detector by hand, but do NOT twist the connector barrel. Twisting could cause the wires to become disconnected from solder connections inside the connector barrel.



# SECTION 2

## INSTALLATION

The IDD flame detectors determine the presence or absence of flame by monitoring the amplitude of the flame across a flicker frequency spectrum. The detector should initially be mounted so that the primary combustion zone is within the detector's line of sight.

The IDD detectors are usually located on the boiler in a position that minimizes radiant or conducted heat to the detector. In some cases, supplementary cooling chambers may be required. Typical installations will have either a single union ball valve (front mount) or a "Quick Disconnect" Hansen-type fitting (fiber-optic) for ease of maintenance and a support bracket for the four-conductor cable. Cable support brackets are not used with supplemental cooling chambers or CEX versions.

Two typical IDD detector installations are "front mount" or direct-view sighting and fiber-optic sighting used when direct-view sighting is difficult. The detectors systems are shipped with appropriate mounting equipment from Forney Corporation.

**Note:** For fiber optic installations refer to Forney Publication 372000-73, Fiber Optic Installations manual.

The location and sighting instructions listed in the following sections are general guidelines for the location of the detector. Consult Forney for application specific guidance on installation. The detector provides feedback to a Forney Flame Amplifier which goes onto the burner management system (BMS).

**Note:** An acceptable detector location must ensure:

- Reliable main flame and/or igniter flame detection at all air flow and furnace loads (ranges of fuel firing).
- Rejection of the igniter flame if too short or in the wrong position to ignite the main flame reliably.

When installing a detector head for the first time, ensure the following requirements are satisfied:

- The physical mounts are adequate to support the weight of the detector head in the position required for operation.
- The ball valve lever of the cooling-air line moves through its entire operating range without obstruction from any structure, cable, or hose.
- The cooling-air hose and I/O cable do not interfere with the operation of any moving components at the boiler front. The I/O cable does not contact hot surfaces capable of melting its insulation.
- The cable must not run close to any cable or equipment carrying high voltage to keep interference to minimum.

# 2.1 INSTALLATION PROCEDURE

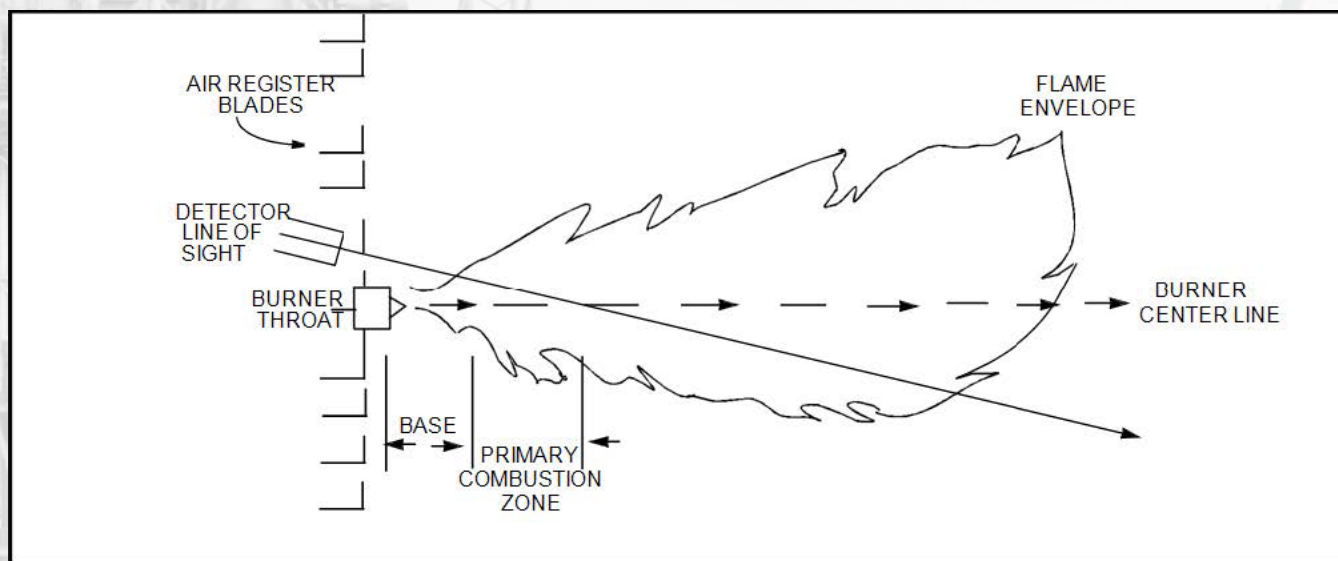


**WARNING:** Protective filtered lenses should be worn when viewing flame; infrared and ultraviolet energy from the flame can be damaging to the eyes.

1. The best results are obtained when the detector is aimed so that the detector's line of sight intersects the burner center at a slight angle (e.g. 5 degrees) and sees a maximum of the primary combustion zone, as shown in Figure 3. If only one detector is used per burner, the line of sight should also intersect the igniting flame.
2. For installations where separate detectors are used to monitor main and igniter flames, the main flame detector should be sighted so it does not detect the igniter flame.
3. The detector should have an unrestricted view of flame as far as possible. Physical obstructions such as air register blades, interfering vanes, or other hardware should be cut away or notched so they do not fall within the detector's line of sight as shown in Figure 3.

**Note:** Always check with the burner manufacturer before you trim the register blades.

**Figure 2 Detector Sighting**

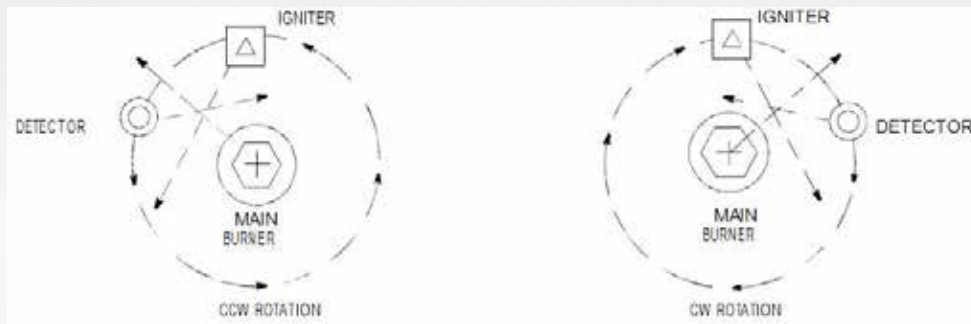


4. AN ACCEPTABLE DETECTOR LOCATION MUST ENSURE THE FOLLOWING:

- Reliable target flame detection.
- Rejection if target flame is too short or in the wrong position

**Note:** Reliable signals must be obtained throughout the range of air flows and furnace loads (ranges of fuel firing) and to meet the requirements of flame failure logics of the burner management system

**Figure 3 Detector Location VS. Secondary air rotation**



5. If combustion air enters the furnace with a rotational movement of sufficient velocity to deflect pilot flame in direction of rotation, position the detector 0 to 30 degrees downstream of the pilot burner and close to the periphery of the throat where the ultraviolet radiation is at a maximum. (See Figures 3 and 4)

Having determined an appropriate location for the sight tube, cut a clearance hole for a 2 inch pipe through the burner plate. If register vanes interfere with the desired line of sight, the interfering vane(s) should be trimmed to assure an unobstructed viewing path at all firing levels, see example shown below.

**Note:** Always check with the burner manufacturer before you trim register vanes.

**FLAME MUST COMPLETELY COVER SIGHT OPENING**



6. The preferred method for mounting surface mounted detectors requires the use of a swivel mount, shown in Figures 6, 8, 10 and 12. Center the swivel mount over the two inch hole in the burner plate and secure using three hexed cap screws (not provided). Install the sight pipe on the swivel mount. If a swivel is not used, insert the end of the sight pipe into the hole, align the hole to the desired viewing angle and tack weld (welding must be adequate to temporarily support the weight of the installed detector). The sight pipe should be arranged to slant downward so that dirt and dust will not collect inside.



**CAUTION:** Use no more than one foot of one inch diameter sight pipe. Increase the sight pipe diameter one inch for every additional foot of sight pipe length used to avoid restricting the detector's field of view.

7. When a satisfactory sighting has been confirmed by operational testing, secure the swivel mount's ball position in place by tightening the three hex head cap screws located on the swivel mount ring.

8. The detector lens must be kept free of contaminants (oil, ash, soot, dirt) and the detector housing temperature must not exceed its maximum heat rating. Excessive temperatures will shorten detector life. Both requirements will be satisfied by a continuous injection of purge air at either the 3/8" inlet at the flange housing or the 1" wye connection ahead of the swivel mount as shown in Arrangement Drawings.

The detector mounting may be made with provision for purge air through only the 3/8" inlet or the 1" wye connection. Normally purge air is provided through the 1" wye and the 3/8" inlet is plugged.

It is good practice to use the sealing coupling (P/N 9114793 NPT, 9114782 BSP) on all installations to insure against unwanted furnace pressures from damaging the detector lens. When a sealing coupling is used, the 1" wye connection is used for the purge air and the 3/8" opening is plugged. The sealing coupling is located in front of the detector, behind the 1" wye/valve.

Under normal conditions, with clean burning fuels and moderate ambient temperature conditions, purge air flow of approximately 10 SCFM (283 l/min) is generally adequate. Up to 15 SCFM (425 l/min) may be required for fuels that produce high levels of ash or soot, or for hot environments to maintain the detector's internal temperature within specification.

**Note:** If freezing temperatures are expected at the detector head, Forney recommends heat tracing the detector sight tube. Contact Forney for additional details.

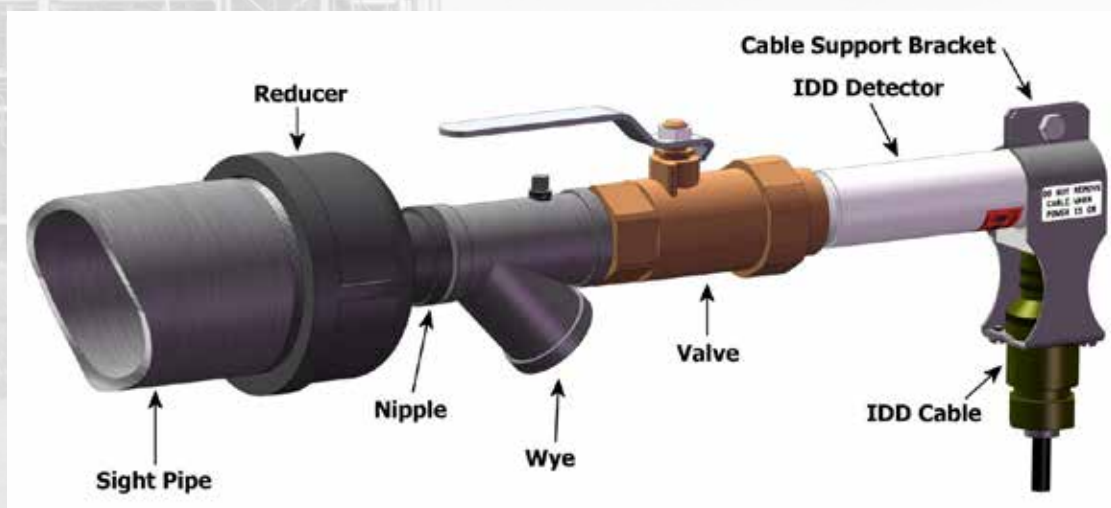


**CAUTION:** To ensure safe and reliable detection it is the responsibility of the commissioning engineer to carry out flame failure testing after programming the detector.

Ensure that the detector correctly detects the target flame (Flame On condition) and recognizes the target flame off (Flame Off condition).

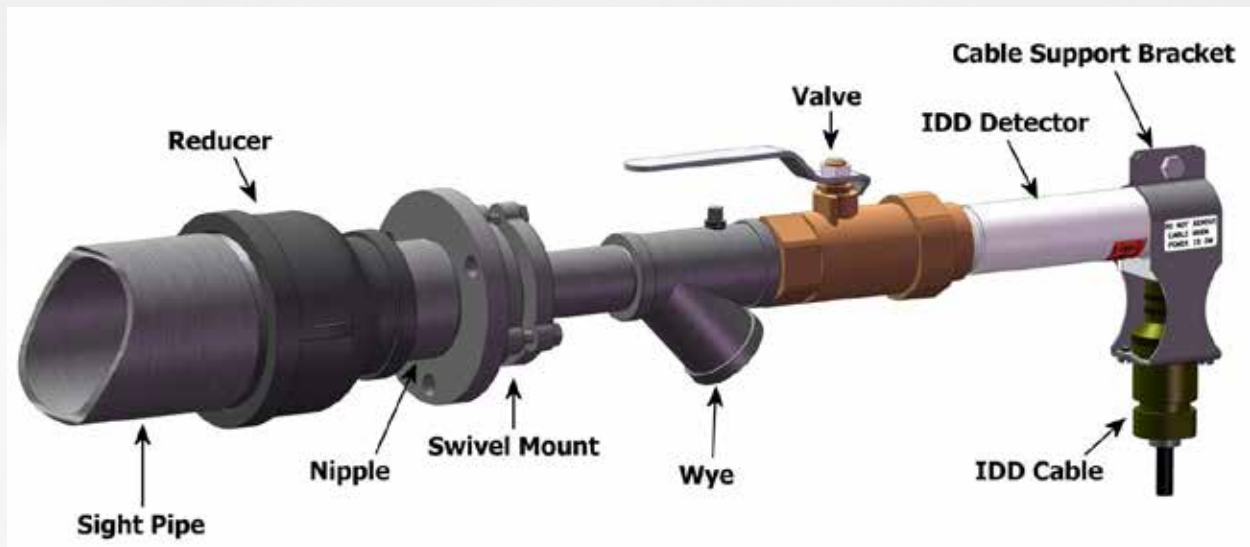
Refer to Parts section at the end of this manual for applicable part numbers of items shown in arrangement drawings.

**Figure 4 IDD Direct Mount Arrangement**



Cable support bracket is required on Standard IDD when a cooling chamber is not used.

Figure 5 IDD Swivel Mount Arrangement



Cable support bracket is required on Standard IDD when a cooling chamber is not used.

Figure 6 IDD Direct Mount with Cooling Chamber

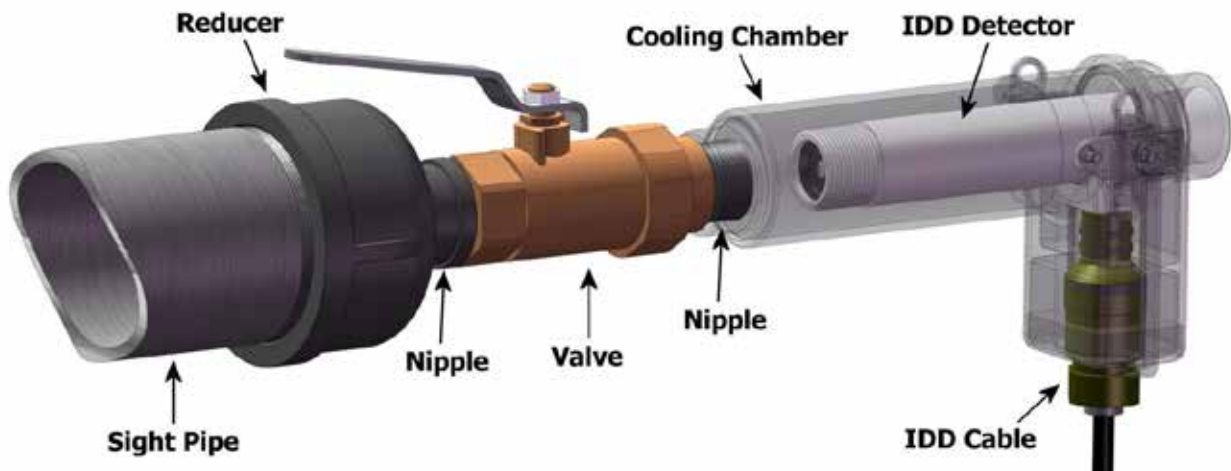
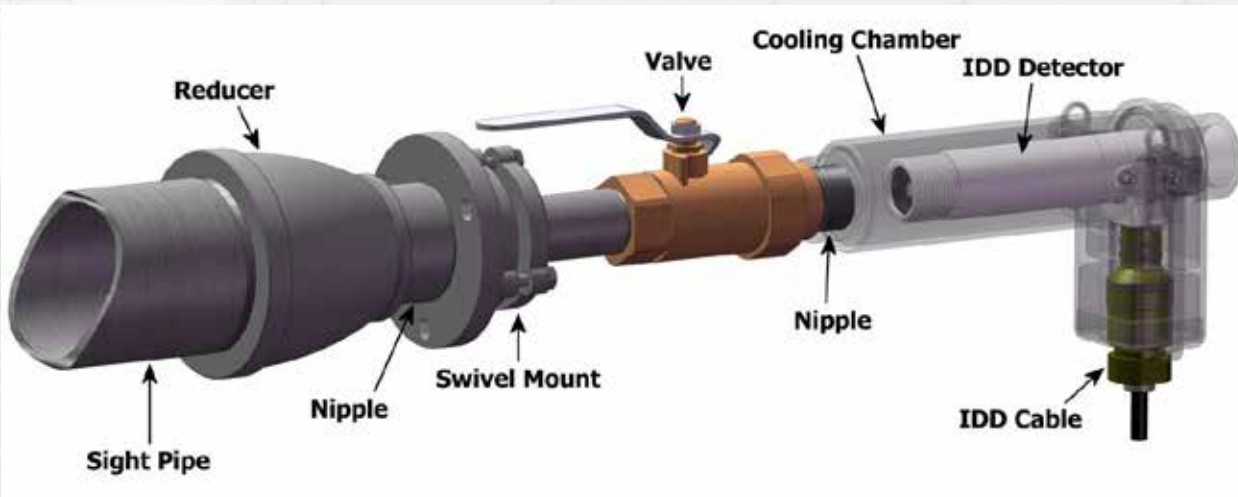


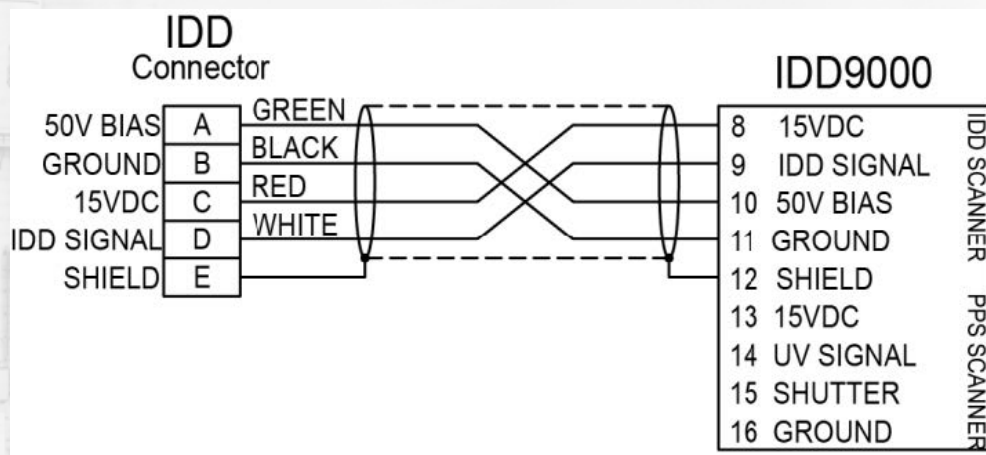
Figure 7 IDD Swivel Mount Arrangement with Cooling Chamber



# 2.2 DETECTOR WIRING

Quick disconnect on the cable is suitable for installation of a flexible / rigid conduit. Cable must be installed in a conduit to protect it from damage and to prevent moisture ingress. Take precautions to keep the detector cable away from any high inductive wiring associated with high inductive loads or high voltage, or high energy spark ignition systems.

**Figure 8 Sample Wiring Diagram for IDD Detector Head to Amplifier**



Refer to specific Forney Amplifier manual for specific wiring instructions for other amplifiers.

# SECTION 3

## COMMISSIONING

Before commissioning, complete all of the installation instructions.

## 3.1 INITIAL CHECKOUT

Verify the interconnection between detector head and the amplifier; confirm to applicable wiring diagram for the specific amplifier.

1. Verify the operation of the detector head as follows:
  - a) Remove mounted IDD detector head.
  - b) Connect it to the four-conductor cable.
  - c) Place a light source 1 to 4 feet from the surface of the detector. Use a Tungsten light source for IR detector heads and a UV light source for the IDD-Ultra.
  - d) At the signal input terminal of the detector amplifier, measure the signal with either a digital voltmeter (DVM) or oscilloscope to be 0.1 to 8.0 vac, peak to peak.
  - e) Remove all light supplied to the detector cell, and verify loss of signal.
2. After checkout, return the system to normal configuration.

### 3.1.1 Operational Checkout

1. With burner in service, verify signal input to the detector amplifier.
2. Adjust the amplifier per the applicable Forney Corporation service manual.
3. Amplifier gain / frequency adjustments must be made by cycling target flame on/ off and changing the target burner firing rate from minimum to maximum. Settings must be verified during burner operation at different boiler loads to ensure discrimination requirements are met.



# SECTION 4

## OPERATION

The IDD detector head is sighted at the first 1/3 of the flame or the primary combustion zone of the burner. The radiant energy from the flame is viewed either directly through a straight piece of pipe or transmitted to the surface of the detector cell through a fiber-optic assembly. The cell in the detector on which the radiant energy falls is biased with a +50 vdc source. As the intensity of the flame's radiation increases and decreases, it causes a change in resistance of the cell substrate. This resistance change in turn creates a varying ac voltage output that is proportional to the amount rate of change of the radiant flame energy.

**IMPORTANT:** The detector must be sighted properly to sense sufficient flame radiation. Improper sighting may cause detector failure due to a weak or non-existent signal.

The signal is transmitted to the applicable flame detector amplifier through a four-conductor shielded cable. The output signal from the IDD detector head is totally dependent on the flame radiation from the burner and the sighting of the primary combustion zone.

# SECTION 5

## TROUBLESHOOTING

If the detector head malfunctions, ensure that the procedures described in the commissioning section have been performed successfully.

Refer to Table 1 for Troubleshooting information.

**TABLE 1: IDD Detector Head Troubleshooting**

Symptom	Probable Cause	Remedy
No signal output	Supply voltage to head not present.	Verify +50 vdc and +12 to +14.5 vdc to detector.
	Detector head assembly not functional.	Replace detector.
	Overheated detector head.	Verify surface of detector is less than 140° F (60°C). Correct high temperature as necessary.
	Detector not receiving sufficient signal.	Aim the detector at the base of the flame to be viewed. The detector must view flame flicker.
Check alarm	Noise on output signal.	Ensure amplifier chassis is grounded. Check for broken cable wire. Replace detector. Reroute cable if not in a shielded cable tray.
Weak detector (PPS) output	Detector not receiving sufficient signal	Aim the detector at the base of the flame to be viewed. The detector must view flame flicker.
	Target flame intensity is weak.	Consult engineering.

# SECTION 6

## MAINTENANCE

The IDD detector head is a non-repairable device and requires no maintenance other than periodically cleaning the cell surface. The appropriate cleaning schedule is determined by the quality and cleanliness of the cooling-/seal-air source. Forney recommends the use of a non-oily cleaning solution and a soft lint-free cloth for lens cleaning.

# SECTION 7

## STORAGE

Store the IDD detector head in its shipping box until used.

Refer to the Section 1.1 Mechanical Specifications for acceptable storage temperature ranges.

# SECTION 8

## 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 on receipt, but no later than 90 days from the date of shipment.

Prior to returning any material to Forney, obtain a Return Material Authorization (RMA) identification number from Forney. Clearly mark the RMA number on all shipping containers and accompanying documents. Forney accepts only material submitted in accordance with the 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 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 of the following methods may be used to obtain an RMA:

Phone	Fax	Web
(972) 458-6100, (972) 458-6142 or 24-hour direct line 1-800-356-7740	(972) 458-6600	Fill out the online form at <a href="http://www.forneycorp.com/return-material-authorizations-rma/">http://www.forneycorp.com/return-material-authorizations-rma/</a>

Forney Corporation is not responsible for materials returned without proper authorization and identification.

Exercise care in packing the materials to be returned. The shipper will be advised of any damage due to improper packing; no further action will be taken in connection with this material return until the shipper provides clearance for further disposition.

# SECTION 9

## PARTS

When ordering parts, furnish the following information:

- Contract number
- Customer purchase order number
- For each part ordered, provide the following information:
  - o Part Number
  - o Part Description
  - o Quantity Required

Phone	Fax	Mail
(972) 458-6100 or 458-6142 24-hour direct line 1-800-356-7740	(972) 458-6600	Attn: Spare Parts Department Forney Corporation 16479 N. Dallas Parkway, Suite 213 Addison, TX 75001

**TABLE 2: IDD Detector Head Assembly Parts**

Part Number	Part Description
38321-21	IDD-II IR Detector Filtered (700 to 3300 nanometers)
38321-22	IDD-IIL IR Detector (700 to 3300 nanometers; for lignite)
38321-23	IDD-IIL IR Detector (700 to 3300 nanometers; for lignite)
38321-29	IDD-Ultra UV Detector (200 to 425 nanometers)
399854-xx	Detector cable with connector (-xx consult Forney for available lengths)
364524-01	Cable support bracket
381071-01	Cooling air chamber (Standard IDD version)
354943-01	1" NPT Valve and wye assembly
311027-01	1" NPT Insulating nipple
74947-03	3" to 1" NPT Reducer
74947-05	3" to 2" NPT Reducer

Part Number	Part Description
75450-06	1" NPT Close nipple
75450-09	2" NPT Close nipple
92527-02	IDD-CEX Cooling chamber
91016-63	1" NPT Swivel
91147-93	1" NPT Sealing Coupling
91147-82	1" BSP Sealing Coupling
38321-25	IDD-IICEX IR Detector Filtered (700 to 3300 nanometers)
38321-26	IDD-IILCEX IR Detector (700 to 3300 nanometers; for lignite)
38321-27	IDD-IIUCEX IR Detector Unfiltered (400 to 3300 nanometers)
401116-50	1" NPT female pipe mount with 3/8" NPT female cooling air connection
401116-60	1" BSP female pipe mount with 3/8" BSP female cooling air connection
92437-02	3/8" NPT Purge air plug
92437-15	3/8" BSP Purge air plug
77923-50	Armored cable, 2 pair
77215-54	Cable gland & lock nut
77215-55	Cable gland