FORNEY

PM IDD9000 FLAME AMPLIFIER

Part# 408100-00 Dual Channel
Part# 408100-50 Single Channel
Publication 372001-02 Rev M

• BURNERS • IGNITERS • DAMPERS • CONTROLS

www.forneycorp.com

INTRODUCTION

This manual contains information for the PM IDD 9000 Flame Amplifier from Forney Corporation, 16479 North Dallas Parkway, Suite 213 Addison, TX 75001.

All personnel should become thoroughly familiar with the contents of this manual before attempting to install, operate or maintain the PM IDD 9000 Flame Amplifier 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

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

REVISIONS	DATE	COMMENTS
A	02/2009	Initial Release
B	11/2010	Updated details
C	06/2011	Correct Time-out references for tuning
D	07/2011	Add Table 2-13
E	10/2011	Remove Flame By-pass mode - Add TES
F	03/2012	Blind Input - J8 section 2.6.1, add single channel model, correct Alarm relay function & wiring
G	09/2013	Add Section 2.5.2 Wiring for one IDD head to both channels
H	04/2014	Dual channel amplifiers synchronization
J	02/2015	Update Grounding sections and wiring diagrams
K	01/2017	Add certificate information and general updates
L	5/26/2020	Firmware 7.2 Updates & minor general updates
M	7/28/2022	Corrections to Fig 2-4, 2-5, 2-6, 2-7

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GENERAL DESCRIPTION

The Forney PM IDD 9000 amplifier assembly is a panel-mounted flame detector amplifier available as single or dual-channel. It is a stand-alone intelligent controller contained in a covered chassis composed of two or three printed circuit board (PCB) assemblies depending on model. The dual channel IDD 9000 is comprised of two independent motherboards and one LED board with interface handshaking. The single channel IDD 9000 contains one motherboard and one interface/LED board. All inputs and outputs are completely independent, including separate fused power feeds on each card. A ribbon cable connects each motherboard to the interface/LED board. The LED board has two sets of status LEDs (one set for each channel) and facilitates synchronization of channels with each other. Each motherboard has two universal power supplies that produce two output voltages, 15Vdc and 12Vdc. The 15Vdc supply powers the detector heads directly, including the 50Vdc bias for the IDD detectors, the 50Vdc shutter activation voltage drive, as well as the 4-20mA and 0-10Vdc signals. The 12Vdc powers the 4 signal relays and the logic.

The amplifier is to be located in a controlled environment such as a separate equipment cabinet. Electrical connection with external equipment is accomplished by means of screw terminal lugs on plug-in connectors for ease of maintenance.

The amplifier provides power control, signal conversion, and processing control for Infrared Dynamic Detectors (IDD) series and UV-4 detectors. The IDD 9000 can support any of the following Forney flame detector head combinations:

Dual Channel	Single Channel
One or two IDD heads	One IDD head
One or two UV-4 heads	One UV-4 head
One IDD head and one UV-4 head	

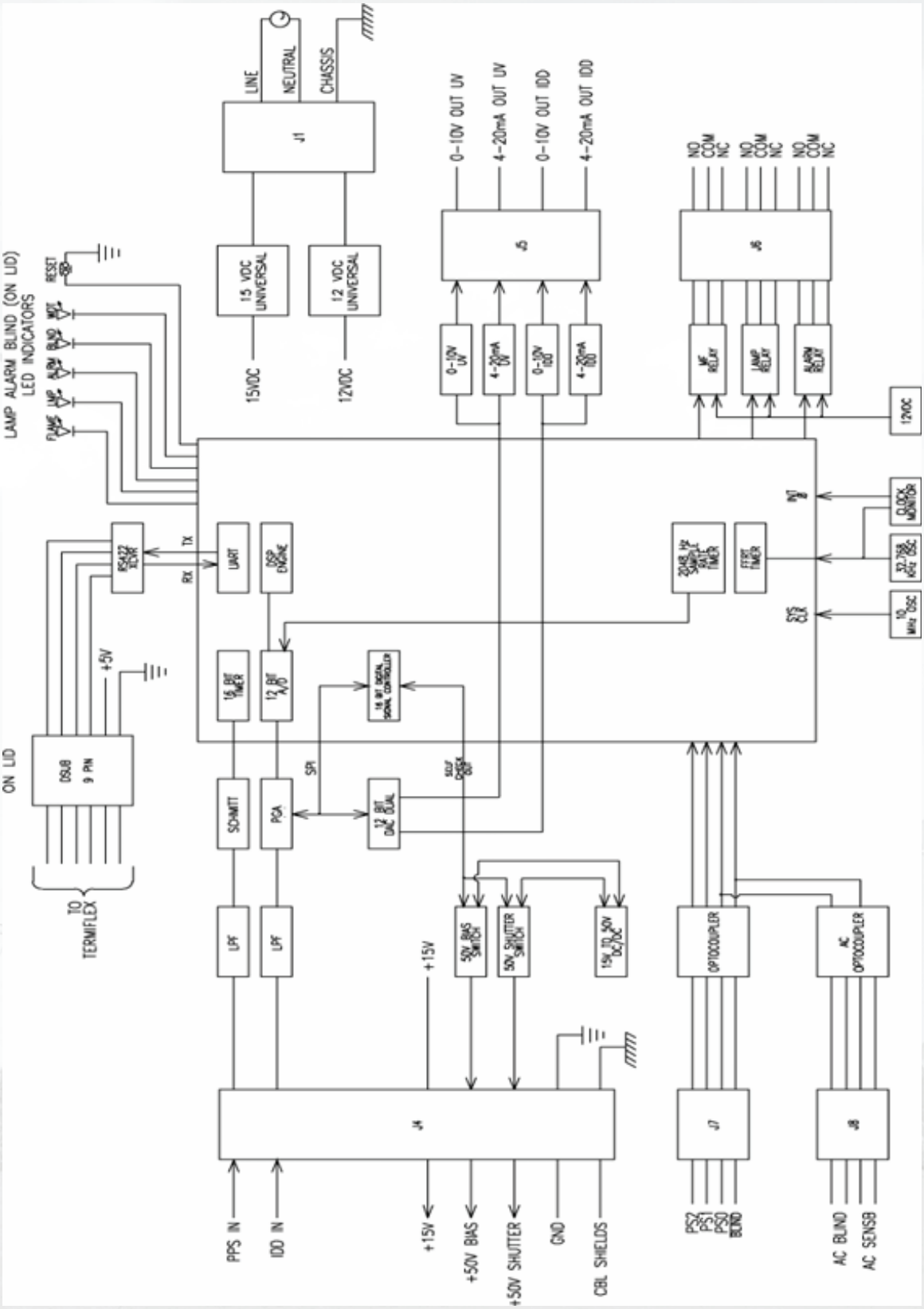
The IDD 9000 amplifier provides different signal-processing circuitry depending on the flame detector inputs. For example, the UV-4 flame detector head produces a digital pulse train whose frequency varies with light intensity whereas, the IDD flame detector head produces an analog data signal whose amplitude and frequency vary with light intensity. Signal processing for the UV-4 input merely blocks low amplitude noise and then routes the pulses to the input of a digital counter. In contrast, signal processing for the IDD signal amplifies the input, generates an averaged dc voltage level, and converts it into a digital pulse train output. This pulse train then serves as the input to the microprocessor.

At regular intervals, the microprocessor reads the value of the pulse counter(s) and compares those values with tuning parameters from memory. When the count value exceeds the corresponding value from memory, the microprocessor sets a flag to indicate flame presence. These count values also provide a direct measure of infrared or ultraviolet light intensity striking the respective sensors. Accordingly, the PCB uses the two count values to generate separate analog output signals that can be used to drive flame intensity meters.

A serial communication port for each channel is located on the front of the PM IDD 9000. These ports enable communication between the microprocessors on the board and a hand-held Termiflex/ SmartDisplay® via RS422/RS485 communication protocols. Forney also offers a Windows based software package, Terminal Emulator Software (TES), that supports diagnostics and tuning of the flame detection system. If the firmware in the amplifier detects an internal failure, it generates a corresponding error message that can be downloaded to the Termiflex/ SmartDisplay®. Any failure will be continually broadcast until a reset pushbutton is pressed.

Upon completion of installation, the user must connect the Termiflex/SmartDisplay® to the amplifier and revise the tuning parameters suitable to detect the presence and absence of target flame. User-supplied tuning parameters are stored and remain unchanged until overwritten with new tuning parameters.

Figure 1-1 IDD 9000 Block Diagram



1.1 SPECIFICATIONS

Table 1-1

Models:	Part# 408100-00 Dual Channel Part# 408100-50 Single Channel
Environmental Extremes	
Temperature:	0° to 60° C (32° to 140° F)
Humidity:	5% to 95% non-condensing
Power Requirements	
Supply:	120/240 Vac at 50/60 Hz
Logic power:	+12 Vdc
Analog power:	+15 Vdc
Operational Characteristics	
Output relay rating (SPDT):	3 A at 125 Vac, 250 Vac & 30 Vdc *3 relays are available for each channel (Lamp, Main Flame & Alarm*)*
Dimensions:	7 7/8 x 10½ x 3 7/8 inches (20 x 26.6 x 9.8 cm)
Flame Strength:	4-20 mA or 0-10 Vdc (Resistive load up to 600Ω)
Flame Failure Response Time (FFRT):	1.0, 2.0, 3.0 or 3.8 seconds
Flame Pickup Time:	less than 2 seconds
Nonvolatile RAM:	8 complete operating profiles
Compatible Flame Detector Heads:	IDD-II Filtered IR Detector (700nm - 3300nm) IDD-IIL Low Frequency IR Detector (700nm - 3300nm) IDD-IIU Unfiltered IR Detector (400nm - 3300nm) IDD-Ultra UV Detector (200nm - 425nm) UV-4 UV Detector (190nm - 260nm)

* Alarm Relay is energized under 'No Alarm' condition.

1.2 CERTIFICATIONS

- FM Approved
- CE

Compliant Standards:

FM 7610 -1997	Combustion Safeguards and Flame Sensing Systems
EN 298 - 2012	Automatic burner control systems for burners and appliances burning gaseous or liquid fuels *
EN61000-4-2 Ed. 2.0; 2008	Testing and measurement techniques - Electrostatic discharge immunity test
EN61000-4-3 Ed. 3.2; 2010	Testing and measurement techniques. Radiated, radio-frequency, electromagnetic field immunity test
EN61000-4-4 Ed. 2.0; 2010	Testing and measurement techniques - Electrical fast transient/burst immunity test
EN61000-4-5; 2005	Testing and measurement techniques - Surge immunity test
EN61000-4-6 Ed. 3.0; 2009	Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
2014/34/EU	EU Directives

* Complies to performance specification requirements of flame detector with EMC/Electrical assessment criteria II in EN-298; 20122
- FFRT must be set to 1 sec to comply with EN-298;2012

SECTION 2
INSTALLATION

This section provides instructions and requirements for installing the Forney PM IDD 9000 assembly.

CAUTION: This board contains "STATIC SENSITIVE" components. Use standard electrostatic-discharge (ESD) procedures whenever handling the PCB.

WARNING: Ensure all Flame Detector amplifiers, detectors, and cables are installed properly, and the amplifier is programmed exactly as described in this manual. DEVIATION IN ANY CASE MAY RESULT IN CATASTROPHIC FAILURES AND SEVERE DAMAGE TO EQUIPMENT AND/OR INJURY TO PERSONNEL.

2.1 RECOMMENDED TEST/TUNING EQUIPMENT AND INSTRUCTIONS

Table 2-1 lists recommended equipment and instructions for testing and tuning the PM IDD 9000. The PM IDD 9000 can be tuned either via the Termiflex / SmartDisplay® terminal or the Terminal Emulator Software (TES). Refer to Section 2.8 to program the Termiflex / SmartDisplay® terminal and Section 3 to tune the flame detection system.

Table 2-1 Tuning Equipment

Description	Manufacturer	Forney Part Number
Termiflex / SmartDisplay® terminal with 9-pin connector*	Termiflex, Inc.	408106-01
Terminal Emulator Software (TES) Kit, includes CD, cable, and DB9 to 25 adapter	Forney	92567-50
IDD and/or UV-4 flame detectors	Forney	Consult factory
Flame Simulator (simulated flame source)	Forney	FS-01

*If using an older Termiflex / SmartDisplay® terminal with a 25-pin connector (Part #364839-02) a DB25-pin to DB9-pin adapter (Part #408107-01) is required.

2.2 MOUNTING CONSIDERATIONS

The PM IDD 9000 amplifier assembly should be installed in an equipment cabinet. If the amplifier is installed in a location where exposure to the elements is likely, a NEMA 4 cabinet should be used. The cabinet shall be located where the amplifier assembly is protected from direct exposure to water, dust and sunlight where the temperature/humidity remain within the ranges listed in the specification section of this manual.

2.3 ELECTRICAL CONNECTIONS

The PM IDD 9000 PCB motherboards are identical; the single channel model simply has one board while the dual channel has two boards, one for each channel. On the dual channel, the bottom board is for Channel 1 and the upper motherboard is Channel 2. Each board contains six external connectors on the side panels (see Figure 2-1 showing J8, J7, J4, J5, J6 and J1). Table 2-2 provides a detailed list of pin-outs for these connectors.

CAUTION: Ensure amplifier is de-energized before wiring connectors. ***Never*** connect or disconnect the connectors with the power "ON".

NOTICE: When using one dual channel PM IDD 9000 to replace a PM DR6101E or two IDD IIIA amplifiers, the power feeds to each card need to be wired independently or jumpered from card to card. Connecting/wiring a UV-4 detector head to the IDD detector terminals will damage the associated channel board.

Figure 2-1 PM IDD 9000 External Connectors

Table 2-2 PM IDD 9000 Pin-out Summary

PIN	LABEL/SIGNAL NAME		FUNCTION
J8 - Vac Opto Isolator Inputs Top of Left side panel (External connector Part # 9235311)			
1	AC Blind	Hot	AC Blind, 100 Vac -240 Vac
2		Neutral	Neutral Return
3	Shield		Cable Shield / Chassis Ground
4	AC Sense B (PS0)	Hot	AC Sense B, 100 Vac -240 Vac
5		Neutral	Neutral Return
J7 - Profile Select and Blind Inputs Middle of Left side panel (External connector Part #9235313)			
1	Profile Select 2		Binary 4, Add all for 0-7 Profile Select
2	Profile Select 1		Binary 2, Add all for 0-7 Profile Select
3	Profile Select 0		Binary 1, Add all for 0-7 Profile Select
4	Ground		Electrical ground return for Dry Relay Contacts for J7 pins 1, 2 and 3
5	Shield		Cable Shield / Chassis Ground
6	Blind		Blind initiated by Dry Relay Contacts
7	Ground		Electrical ground return for Dry Relay Contacts for J7 pin 6
J4 - Control Inputs and Flame Detectors Bottom of Left side panel (External connector Part #9235314)			
1	IDD Detector	15 Vdc ()	+15 Vdc IDD detector
2		Signal	IDD flicker signal input (Approx. 7Vdc for IDD's & 5Vdc for Ultra's)
3		50 Vdc Bias	+50 Vdc Bias
4		Ground	Electrical ground return for detector
5	Shield		Chassis (cable shield)
6	UV-4 Scanner	15 Vdc (fused)	+15 Vdc PPS detector
7		Signal	UV-4 pulse signal input, 0-5Vdc
8		Shutter out	Shutter power, 50Vdc pulse, 15Vdc @ 400mA hold
9		Ground	Shutter return / Electrical ground return

Pin	Label / Signal Name	Function	
J5 - Detector Analog Signal Outputs Top of Right side panel (External connector Part #9235312)			
1	UV-4 Detector	15 Vdc (fused)	+15 Vdc UV-4 4-20mA
2		4-20 mA Return	UV-4 Pulse Signal, 4-20mA return PPS
3		0-10 Vdc	UV-4 Pulse Signal, 0-10V analog output
4		Ground	Electrical Ground return for detector
5		Shield	Shield
6	IDD Detector	15 Vdc (fused)	+15 Vdc IDD 4-20mA
7		4-20 mA Return	IDD flicker signal, 4-20mA return PPS
8		0-10 Vdc	IDD flicker signal, 0-10V PPS analog output
9		Ground	Electrical Ground return for detector
10		Shield	Cable Shield / Chassis Ground
J6 - Relay Contact Outputs - shown under no power condition Middle of Right side panel (External connector Part #9235310)			
1	Flame*	Normally Open	
2		Common	
3		Normally Closed	
4	Lamp*	Normally Open	
5		Common	
6		Normally Closed	
7	Alarm**	Normally Open	
8		Common	
9		Normally Closed	
J1 - Power Supply Bottom of Right side panel (External connector Part #9235309)			
1	120/240 Vac	Line voltage input	
2	Neutral	Neutral / Return	
3	Chassis Ground	Electrical Ground	

J2 and J3 are internal interface connectors on the motherboard. J2 is a 26-pin connector on the rear edge of the PCB. This connector mates with a heavy-duty multi-conductor ribbon cable that serves as the communication for the board. J3 is a 6-pin connector for the programming.

* Relay energizes and normally open contacts close on stated condition.

** Alarm relay energizes and normally open contact closes when power is applied to IDD 9000, if no alarm condition exists. When alarm condition exists, the alarm relay de-energizes.

2.3.1 AMPLIFIER UPGRADE WIRING TABLES

Upgrading from an IDD-IIIA

The IDD-IIIA amplifier is a single channel amplifier that only supports and connects to a single IDD type flame detector. Only one channel of the PM IDD 9000 is needed to replace one IDD-IIIA amplifier. (If a dual channel PM IDD 9000 is used, the bottom board is Channel 1(CH1) and the top board is Channel 2 (CH2).

Before removing the IDD-IIIA, label each wire that is connected to the IDD-IIIA with its terminal number. The wires will not reconnect to the same terminal numbers. Disconnect the wires and remove the IDD-IIIA; install the PM IDD 9000, which has the same footprint.

The PM IDD 9000 has 6 external connectors that then connect to the amplifier. Connect wires to the appropriate IDD 9000 external connector by using the table and/or diagrams.

NOTICE: Connecting/wiring a UV-4 detector head to the IDD detector terminals will damage the associated channel board.

Table 2-3 IDD-IIIA to IDD 9000

IDD-IIIA Pin and Label on Amplifier Cover		PM-IDD 9000 Connector / Pin and Label	
Left Terminal Block			
F	4-20 ma INPUT (Not Used)	Not Used	
E	4-20 ma OUTPUT	J5 Pin 6	15 Vdc (fused)
D	4-20 ma COM.	J5 Pin 7	4-20 mA Return
C	0-10 Vdc	J5 Pin 8	0-10 Vdc
B	SENS B SENS B is now Set 1 on the Termiflex.	J7 Pin 3*	Profile Select 0
A	Fx4 Fx4 is now Set 2 on the Termiflex.	J7 Pin 2*	Profile Select 1
12	Not Used	N/A	
11	Not Used	N/A	
10	120 Vac BLIND	J8, Pin 1	AC Blind Hot
For AC Blinding you must also jumper J8 pin 2 (AC Blind Neutral) to J1 pin 2 (Neutral).			
9	Not Used	N/A	
8	Not Used	N/A	
7	DET. GROUND (Black wire)	J4 Pin 4	IDD Detector Ground
6	DET. SHIELD	J4 Pin 5	Shield
5	DET +15 Vdc (Red wire)	J4 Pin 1	IDD Detector 15 Vdc (fused)

IDD-IIIA Pin and Label on Amplifier Cover		PM-IDD 9000 Connector / Pin and Label	
4	DET +50 Vdc (green wire)	J4 Pin 3	IDD Detector 50 Vdc Bias
3	Not Used	N/A	
2	DET. SIGNAL (White wire)	J4 Pin 2	IDD Detector Signal
1	METER (-)	N/A	
Right Terminal Block			
G	Not Used	N/A	
H	SENS B 115 Vac	J8 Pin 4	AC Sense B (PS0) Hot
I	MAIN FLAME LIGHT N.C.	J6 Pin 6	Lamp Normally Closed
J	MAIN FLAME 2 N.C.	N/A	*Note 1
K	MAIN FLAME 1 N.C.	J6 Pin 3	Flame Normally Closed
L	CHECK ALARM N.C.	J6 Pin 7	Alarm Normally Open**
13	CHECK ALARM N.O.	J6 Pin 9	Alarm Normally Closed **
14	CHECK ALARM COM.	J6 Pin 8	Alarm Common**
15	MAIN FLAME 1 COM.	J6 Pin 2	Flame Common
16	MAIN FLAME 1 N.O.	J6 Pin 1	Flame Normally Open
17	MAIN FLAME 2 COM.	N/A	*Note 1
18	MAIN FLAME 2 N.O.	N/A	*Note 1
19	AC INPUT 240 V	J1 Pin 1	120/240 VAC
20	AC INPUT 120 V	J1 Pin 1	120/240 VAC
21	AC INPUT NEUT	J1 Pin 2	Neutral
22	MAIN FLAME LIGHT N.O.	J6 Pin 4	Lamp Normally Open
23	MAIN FLAME LIGHT COM	J6 Pin 5	Lamp Common
24	METER (+)	N/A	*Note 2

* If your existing application uses SENS B or Fx4 you must wire as described in table and program Set 1 or 2 with the Termiflex. Dry Relay Contacts connect to ground (J7 pin 4) to activate.

*Note 1: If Main Flame 2 on your IDD IIIA was wired as a seriesed safety relay, this is no longer necessary as it is wired internally on the IDD 9000.

*Note 2: The IDD 9000 does NOT support ±500 micro amp meter.

** Unlike the IDD-IIIA amplifier, 'ALARM' Relay on the PM-IDD 9000 amplifier is energized on 'NO ALARM' condition.

Upgrading from a PM DR6101E

The PM DR6101E and the dual channel PM IDD9000 amplifiers are both dual channel amplifiers with each channel capable of supporting an IDD series or a UV-4 flame detector head. First determine the type of flame detector to be connected to the channels, either an IDD series or a UV-4 flame detector. Jumpers in the PM-DR6101E select the type of flame detector, and the Termiflex is used to select detector type for the PM IDD9000 channels. The bottom board of the PM IDD9000 is Channel 1 (CH 1) and the top board is Channel 2 (CH 2).

Once the type of flame detector has been determined, remove the left and right terminal strips from the PM DR-6101E; remove the PM-DR6101E; install the dual channel PM IDD9000 which has the same footprint. Reconnect the wires one at a time from the PM-DR6101E terminal strips to the PM IDD9000 connectors. The dual channel PM IDD 9000 has 6 External connectors per channel (12 total) that then connect to the amplifier. Connect wires to the appropriate IDD 9000 External connector by using the following four tables. (Table 2-4, 2-5, 2-6, and 2-7).

CAUTION: Connecting/wiring a UV-4 detector head to the IDD detector terminals will damage the associated channel board.

Table 2-4 PM DR6101E to IDD 9000 Channel 1 for UV-4 Applications

PM DR-6101E Pin and Label on Amplifier Cover		IDD 9000 Connection / Pin and Label	
Left-side			
P1-1	SHIELD	J4, Pin 5	Shield
P1-3	CH 1 SIG (White wire)	J4, Pin 7	UV-4 Detector - Signal
P1-4	POWER (15 Vdc) (Red wire)	J4, Pin 6	UV-4 Detector - 15 Vdc (fused)
P1-5	UV SHTR HI (Green wire)	J4, Pin 8	UV-4 Detector - Shutter Out
P1-6	UV SHTR RTN (Black wire)	J4, Pin 9	UV-4 Detector - Ground
P1-11	CH 1 SENS B - 115/230V N	J8, Pin 5	AC Sense B (PS0) - Neutral
P1-12	CH 1 SENS B - 115/230V H	J8, Pin 4	AC Sense B (PS0) - Hot
P1-13	CH 1 BLD - 115/230V N	J8, Pin 2	AC Blind - Neutral
P1-14	CH 1 BLD - 115/230V H	J8, Pin 1	AC Blind - Hot
Right-side			
P3-1	GROUND	J1, Pin 3	Chassis Ground
P3-2	115/230V IN-H	J1, Pin 1	120/240 Vac
P3-3	115/230V IN-N	J1, Pin 2	Neutral
P3-4	CH 1 LIGHT MFL - N.C.	J6, Pin 6	Lamp - Normally Closed
P3-5	CH 1 LIGHT MFL - COM	J6, Pin 5	Lamp - Common
P3-6	CH 1 LIGHT MFL - N.O.	J6, Pin 4	Lamp - Normally Open
P3-7	CH 1 FLAME MF - N.C.	J6, Pin 3	Flame - Normally Closed
P3-8	CH 1 FLAME MF - COM	J6, Pin 2	Flame - Common
P3-9	CH 1 FLAME MF - N.O.	J6, Pin 1	Flame - Normally Open
P3-10	CH 1 ALARM ALM - N.C.	J6, Pin 7	Alarm - Normally Open*
P3-11	CH 1 ALARM ALM - COM	J6, Pin 8	Alarm - Common*
P3-12	CH 1 ALARM ALM - N.O.	J6, Pin 9	Alarm - Normally Closed*
P3-26	CH 1/ 0-10VDC OUT - H	J5, Pin 3	UV-4 Detector - 0-10 Vdc
P3-27	CH 1/ 0-10VDC OUT - L	J5, Pin 4	UV-4 Detector - Ground
P3-28	CH 1/ 4-20mA OUT - H	J5, Pin 1	UV-4 Detector - 15 Vdc (fused)
P3-29	CH 1/ 4-20mA OUT - L	J5, Pin 2	UV-4 Detector - 4-20 mA Return

* Unlike the PM DR6101E amplifier, 'ALARM' Relay on the PM-IDD 9000 amplifier is energized on 'NO ALARM' condition.

Table 2-5 PM DR6101E to PM IDD 9000 Channel 1 for IDD Applications

PM DR-6101E Pin and Label on Amplifier Cover		IDD 9000 Connection / Pin and Label	
Left-side			
P1-1	SHIELD	J4, Pin 5	Shield
P1-3	CH 1 SIG (White wire)	J4, Pin 2	IDD Detector - Signal
P1-4	POWER (15 Vdc) (Red wire)	J4, Pin 1	IDD Detector - 15 Vdc (fused)
P1-7	GOUND Black wire)	J4, Pin 4	IDD Detector - Ground
P1-8	IDD BIAS (50 Vdc) (Green wire)	J4, Pin 3	IDD Detector - 50 Vdc Bias
P1-11	CH 1 SENS B - 115/230V N	J8, Pin 5	AC Sense B (PS0) - Neutral
P1-12	CH 1 SENS B - 115/230V H	J8, Pin 4	AC Sense B (PS0) - Hot
P1-13	CH 1 BLD - 115/230V N	J8, Pin 2	AC Blind - Neutral
P1-14	CH 1 BLD - 115/2+6230V H	J8, Pin 1	AC Blind - Hot
Right-side			
P3-1	GROUND	J1, Pin 3	Chassis Ground
P3-2	115/230V IN-H	J1, Pin 1	120/240 Vac
P3-3	115/230V IN-N	J1, Pin 2	Neutral
P3-4	CH 1 LIGHT MFL - N.C.	J6, Pin 6	Lamp - Normally Closed
P3-5	CH 1 LIGHT MFL - COM	J6, Pin 5	Lamp - Common
P3-6	CH 1 LIGHT MFL - N.O.	J6, Pin 4	Lamp - Normally Open
P3-7	CH 1 FLAME MF - N.C.	J6, Pin 3	Flame - Normally Closed
P3-8	CH 1 FLAME MF - COM	J6, Pin 2	Flame - Common
P3-9	CH 1 FLAME MF - N.O.	J6, Pin 1	Flame - Normally Open
P3-10	CH 1 ALARM ALM - N.C.	J6, Pin 7	Alarm - Normally Open*
P3-11	CH 1 ALARM ALM - COM	J6, Pin 8	Alarm - Common*
P3-12	CH 1 ALARM ALM - N.O.	J6, Pin 9	Alarm - Normally Closed*
P3-26	CH 1/ 0-10Vdc OUT - H	J5, Pin 8	IDD Detector - 0-10 Vdc
P3-27	CH 1/ 0-10Vdc OUT - L	J5, Pin 9	IDD Detector - Ground
P3-28	CH 1/ 4-20mA OUT - H	J5, Pin 6	IDD Detector - 15 Vdc (fused)
P3-29	CH 1/ 4-20mA OUT - L	J5, Pin 7	IDD Detector - 4-20 mA Return

* Unlike the PM-DR6101E amplifier, 'ALARM' Relay on the PM IDD 9000 amplifier is energized on 'NO ALARM' condition.

Table 2-6 PM-DR6101E to IDD 9000 Channel 2 for UV-4 Applications

PM DR-6101E Pin and Label on Amplifier Cover		IDD 9000 Connection / Pin and Label	
Left-side			
P1-1	SHIELD	J4, Pin 5	Shield
P1-2	CH 1 SIG (White wire)	J4, Pin 7	UV-4 Detector - Signal
P1-4	POWER (15 Vdc) (Red wire)	J4, Pin 6	UV-4 Detector - 15 Vdc (fused)
P1-5	UV SHTR HI (Green wire)	J4, Pin 8	UV-4 Detector - Shutter Out
P1-6	UV SHTR RTN (Black wire)	J4, Pin 9	UV-4 Detector - Ground
P1-15	CH 2 SENS B - 115/230V N	J8, Pin 5	AC Sense B (PS0) - Neutral
P1-16	CH 2 SENS B - 115/230V H	J8, Pin 4	AC Sense B (PS0) - Hot
P1-17	CH 2 BLD - 115/230V N	J8, Pin 2	AC Blind - Neutral
P1-18	CH 2 BLD - 115/230V H	J8, Pin 1	AC Blind - Hot
Right-side			
P3-1	GROUND	J1, Pin 3	Chassis Ground
P3-2	115/230V IN-H	J1, Pin 1	120/240 Vac
P3-3	115/230V IN-N	J1, Pin 2	Neutral
P3-13	CH 2 LIGHT MFL - N.C.	J6, Pin 6	Lamp - Normally Closed
P3-14	CH 2 LIGHT MFL - COM	J6, Pin 5	Lamp - Common
P3-15	CH 2 LIGHT MFL - N.O.	J6, Pin 4	Lamp - Normally Open
P3-16	CH 2 FLAME MF - N.C.	J6, Pin 3	Flame - Normally Closed
P3-17	CH 2 FLAME MF - COM	J6, Pin 2	Flame - Common
P3-18	CH 2 FLAME MF - N.O.	J6, Pin 1	Flame - Normally Open
P3-19	CH 2 ALARM ALM - N.C.	J6, Pin 7	Alarm - Normally Open*
P3-20	CH 2 ALARM ALM - COM	J6, Pin 8	Alarm - Common*
P3-21	CH 2 ALARM ALM - N.O.	J6, Pin 9	Alarm - Normally Closed*
P3-22	CH 2/ 0-10VDC OUT - H	J5, Pin 3	UV-4 Detector - 0-10 Vdc
P3-23	CH 2/ 0-10VDC OUT - L	J5, Pin 4	UV-4 Detector - Ground
P3-24	CH 2/ 4-20mA OUT - H	J5, Pin 1	UV-4 Detector - 15 Vdc (fused)
P3-25	CH 2/ 4-20mA OUT - L	J5, Pin 2	UV-4 Detector - 4-20 mA Return

* Unlike the PM DR6101E amplifier, 'ALARM' Relay on the PM-IDD 9000 amplifier is energized on 'NO ALARM' condition.

Table 2-7 PM DR6101E to IDD 9000 Channel 2 for IDD Applications

PM DR-6101E Pin and Label on Amplifier Cover		IDD 9000 Connection / Pin and Label	
Left-side			
P1-1	SHIELD	J4, Pin 5	Shield
P1-2	CH 2 SIG (White wire)	J4, Pin 2	IDD Detector - Signal
P1-4	POWER (15 Vdc) (Red wire)	J4, Pin 1	IDD Detector - 15 Vdc (fused)
P1-7	GOUND Black wire)	J4, Pin 4	IDD Detector - Ground
P1-8	IDD BIAS (50 Vdc) (Green wire)	J4, Pin 3	IDD Detector - 50 Vdc Bias
P1-15	CH 2 SENS B - 115/230V N	J8, Pin 5	AC Sense B (PS0) - Neutral
P1-16	CH 2 SENS B - 115/230V H	J8, Pin 4	AC Sense B (PS0) - Hot
P1-17	CH 2 BLD - 115/230V N	J8, Pin 2	AC Blind - Neutral
P1-18	CH 2 BLD - 115/230V H	J8, Pin 1	AC Blind - Hot
Right-side			
P3-1	GROUND	J1, Pin 3	Chassis Ground
P3-2	115/230V IN-H	J1, Pin 1	120/240 Vac
P3-3	115/230V IN-N	J1, Pin 2	Neutral
P3-13	CH 2 LIGHT MFL - N.C.	J6, Pin 6	Lamp - Normally Closed
P3-14	CH 2 LIGHT MFL - COM	J6, Pin 5	Lamp - Common
P3-15	CH 2 LIGHT MFL - N.O.	J6, Pin 4	Lamp - Normally Open
P3-16	CH 2 FLAME MF - N.C.	J6, Pin 3	Flame - Normally Closed
P3-17	CH 2 FLAME MF - COM	J6, Pin 2	Flame - Common
P3-18	CH 2 FLAME MF - N.O.	J6, Pin 1	Flame - Normally Open
P3-19	CH 2 ALARM ALM - N.C.	J6, Pin 7	Alarm - Normally Open*
P3-20	CH 2 ALARM ALM - COM	J6, Pin 8	Alarm - Common*
P3-21	CH 2 ALARM ALM - N.O.	J6, Pin 9	Alarm - Normally Closed*
P3-22	CH 2/ 0-10Vdc OUT - H	J5, Pin 8	IDD Detector - 0-10 Vdc
P3-23	CH 2/ 0-10VdcOUT - L	J5, Pin 9	IDD Detector - Ground
P3-24	CH 2/ 4-20mA OUT - H	J5, Pin 6	IDD Detector - 15 Vdc (fused)
P3-25	CH 2/ 4-20mA OUT - L	J5, Pin 7	IDD Detector - 4-20 mA Return

* Unlike the PM DR6101E amplifier, 'ALARM' Relay on the PM-IDD 9000 amplifier is energized on 'NO ALARM' condition.

2.3.2 GROUNDING THE PM IDD 9000

Proper grounding assures proper operation and is **THE MOST IMPORTANT STEP** in wiring the IDD 9000 Amplifier.

NOTICE: Improper grounding will cause check failures even when wiring and tuning is correct.

2.3.2.1 GROUNDING NEW APPLICATIONS

New applications have the shield connected to the detector head in the cable connector which ensures proper grounding of the PM-IDD 9000. Do NOT ground the shield on both ends.

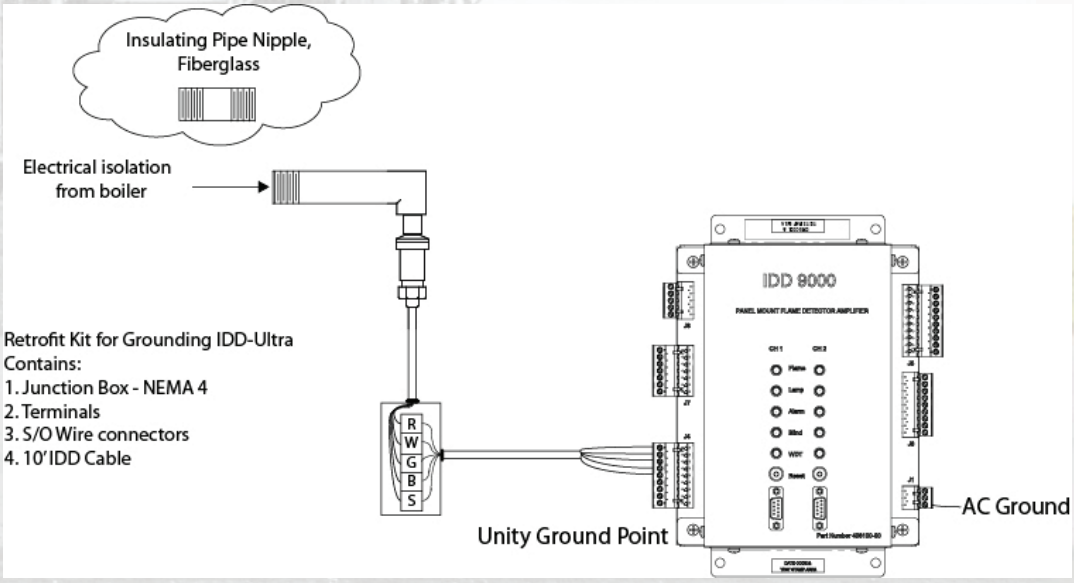
2.3.2.2 RETROFITTING PM IDD 9000 WITH IDD-II, IDD-IIU, OR UV4 DETECTORS

It is recommended to have a fiberglass nipple that the detector mounts onto. This is for heat and electrical isolation. Do NOT ground the shield on both ends.

2.3.2.3 RETROFITTING PM IDD 9000 WITH AN IDD-ULTRA DETECTOR

To eliminate any grounding problems with the IDD-Ultra, ground is **broken between the detector head and the boiler**. Any non-conducting phenolic, nylon or insulating material will shield the detector head from the boiler. The **detector head casing must then be connected to the cable shield**, which is connected back to the IDD 9000 Amplifier.

Figure 2-2 Grounding PM IDD 9000



**If the flame detector is directly installed on the sight pipe (without electrical insulating nipple), remove the shield connection to the ground on the amplifier end. Do NOT ground on both ends.*

The IDD 9000 has a Point of UNITY GROUND where all grounds converge. The hex standoff at the lower left corner of the IDD 9000 is the UNITY GROUND Point. They are then connected to the AC Ground, (a.k.a. the Green Wire Ground) at the Bottom Pin on J1. A safety ground symbol is visible on the board. This **MUST** be connected to the incoming AC Ground. The entire chassis, safety and electrical grounds are all connected together.

2.4 LED STATUS DISPLAYS

The PM IDD 9000 controls both local and remote status displays. The remote displays are driven through relay contacts on the board; local displays are provided by five LEDs on the front edge of the amplifier (reference Figure 2-1). Table 2 8 provides a complete list of these LEDs and their functions.

Table 2-8 PM IDD 9000 LED Indicators

Indicator	LED	Function
Flame	Yellow	Shows the status of the flame relay at all times
Lamp	Yellow	Shows the flame detection status (flame on/off) at all times
Alarm	Red	LED lights up if a flame detector fails self-check and other failures
Blind	Green	The Blind LED is turned on during a system self-check or if the hardware BLIND input is asserted.
WDT	Green	The WDT (Watch Dog Timer) LED toggles at a half-second rate except when the system is being tuned. It indicates that the firmware program is functioning normally.

2.5 FLAME DETECTOR CONNECTIONS

Connect the cable from the flame detector head to the J4 terminal along the left side of the amplifier chassis as indicated below in Table 2-9 and Figures 2-4 thru 2-7.

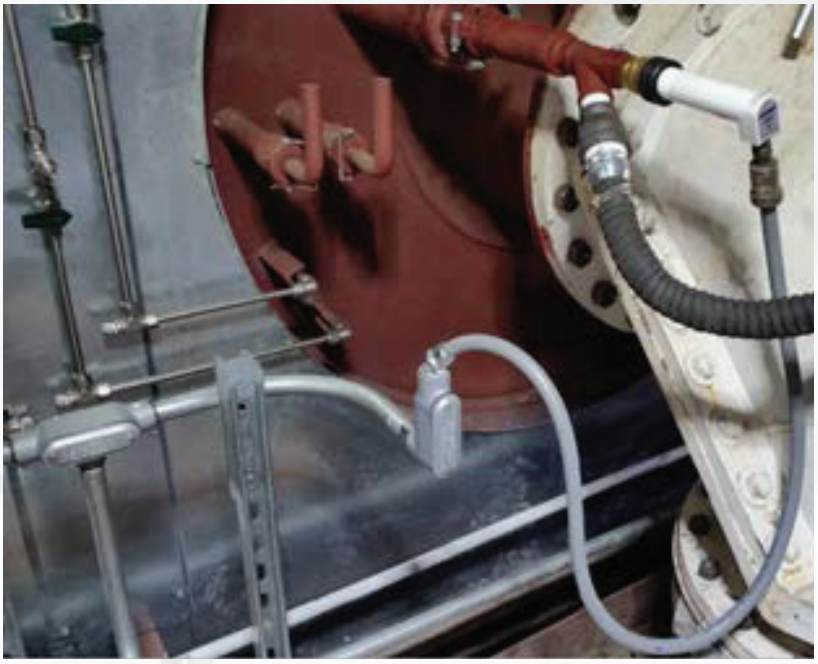
NOTICE: Connecting/wiring a UV-4 detector head to the IDD detector terminals will damage the associated channel board. Detector cable must in sealtight (or equivalent) conduit to avoid ingress of moisture or corrosive atmosphere to the connector.

Table 2-9 Control Inputs and Flame Detectors (bottom left side panel)

Amplifier Pin	Label / Signal Name		Wire Color	Flame Detector PIN
1	IDD Detector	15 Vdc (fused)	Red	C
2		Signal	White	D
3		50 Vdc Bias	Green	A
4		Ground	Black	B
5	Shield		Shield	E
6	UV-4 Detector	15 Vdc (fused)	Red	C
7		Signal	White	D
8		Shutter out	Green	A
9		Ground	Black	B

The detector cable must be in sealtight (or equivalent) conduit to avoid ingress of moisture or corrosive atmosphere to the connector. See Figure 2-3 for example.

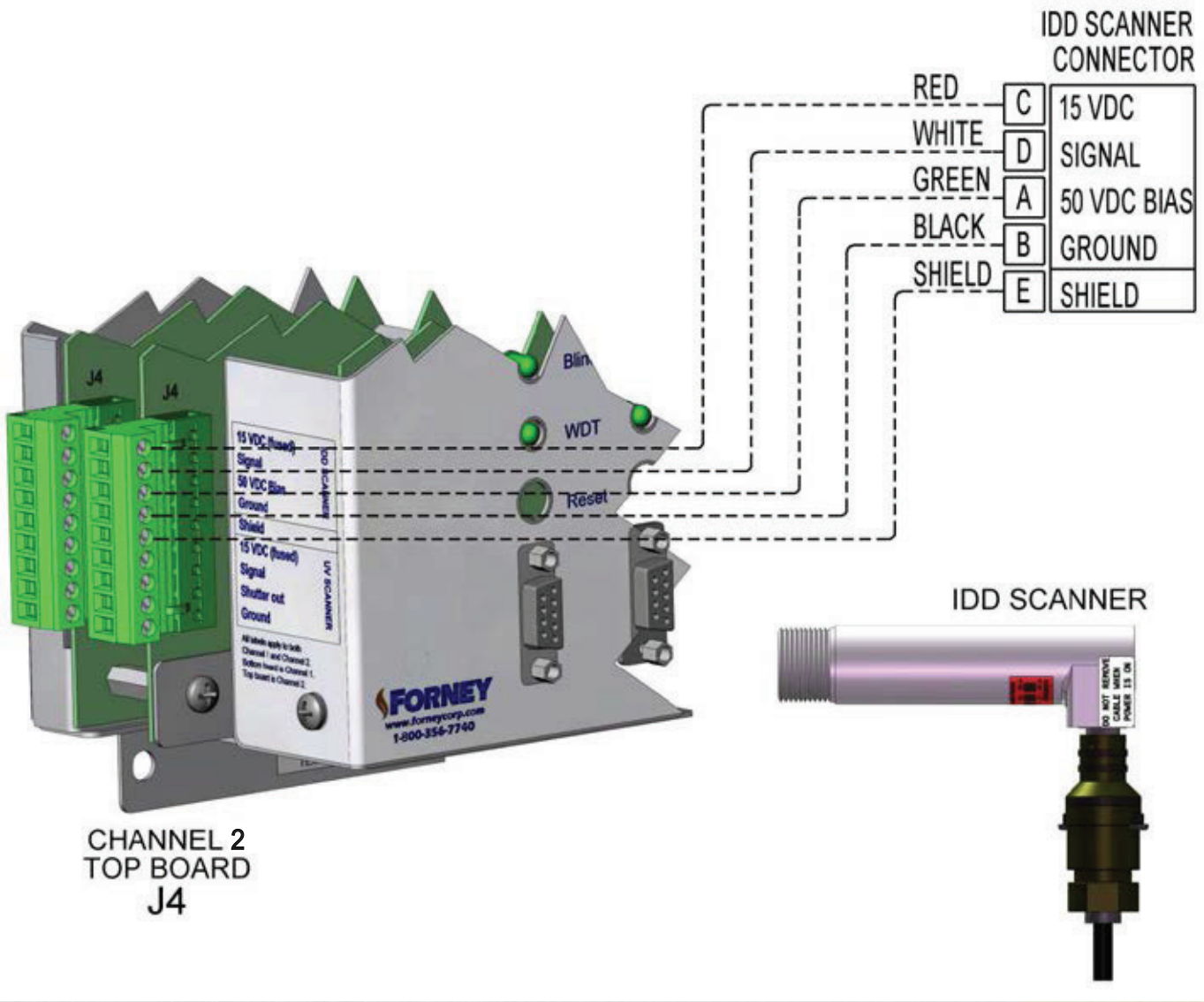
Figure 2-3 Typical Installation with Sealtight Fitted



2.5.1 CONNECTING IDD DETECTOR HEADS

The IDD 9000 supports the IDD-II, IDD-IIL, IDD-IIU, IDD-J, IDD-UV, IDD-Ultra or an IDD-K. Wire each channel accordingly per IDD Detector Head as shown.

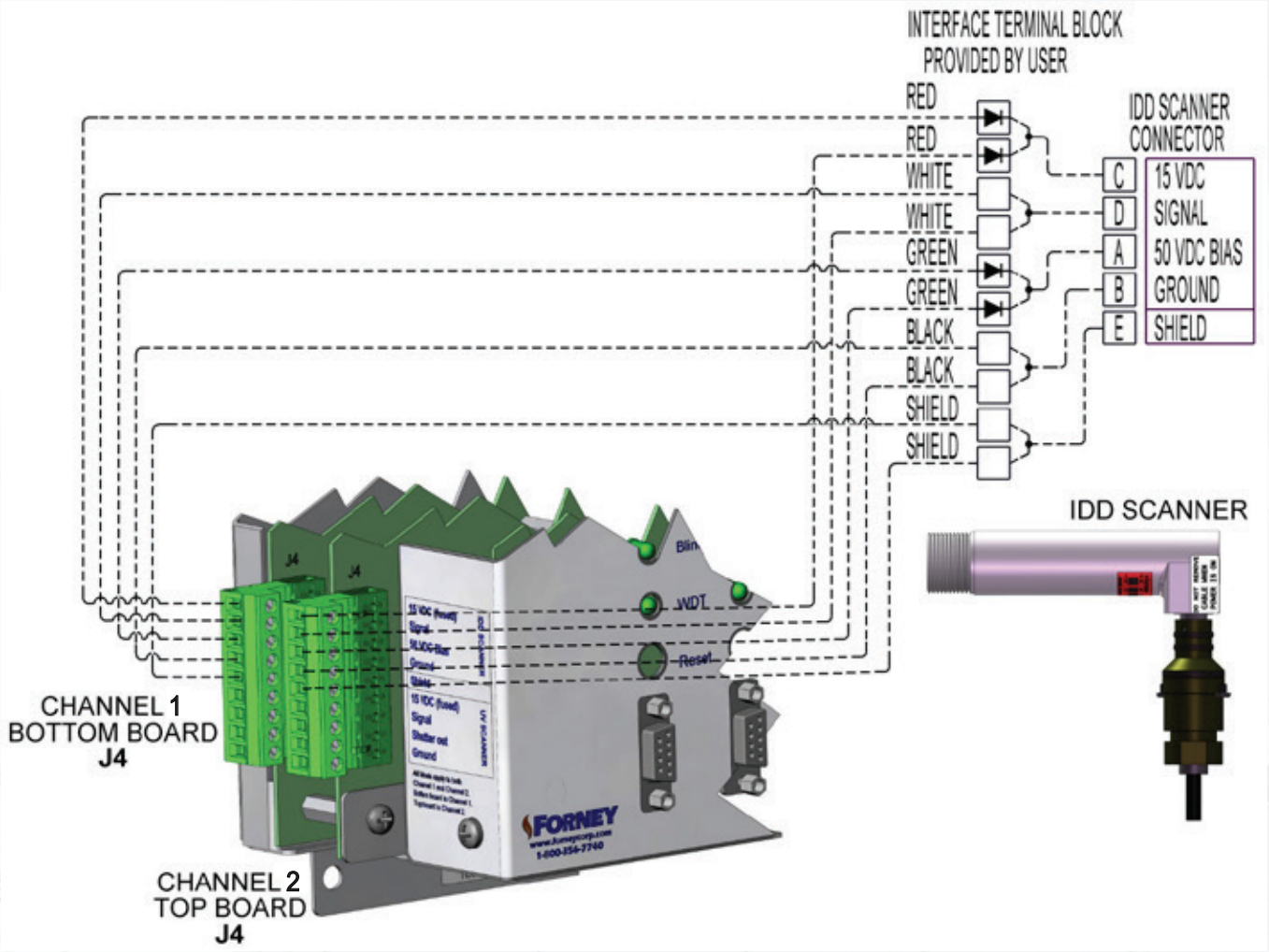
Figure 2-4 IDD Detector Head Wiring



2.5.2 CONNECTING ONE IDD DETECTOR HEAD TO BOTH IDD 9000 CHANNELS

One IDD Detector head can be wired as shown below to facilitate independent setting up a flame relay on each channel.

Figure 2-5 Wiring one IDD Detector Head to both IDD 9000 Channels



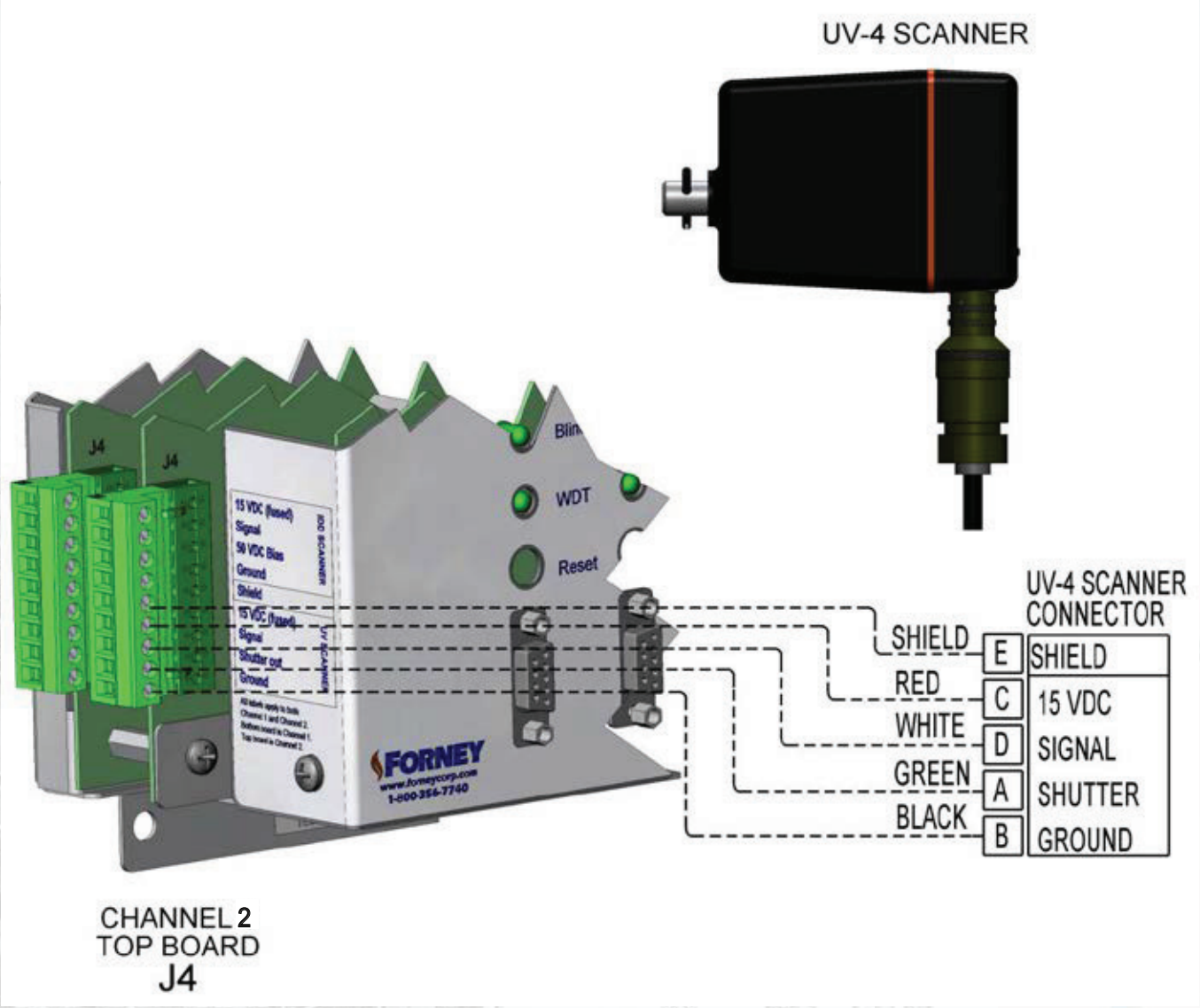
Diode Recommendation: 1N4002 to 1N4007. Axial Leaded Diodes with a 1 Amp rating, and 100V reverse bias.

NOTICE: If one IDD detector is wired to both channels as shown above, both channels must be powered up together through a common switch in AC input power line.

2.5.3 CONNECTING UV-4 DETECTOR HEAD

Wire each channel to a UV-4 on the IDD 9000 as shown.

Figure 2-6 UV-4 Detector Head Wiring

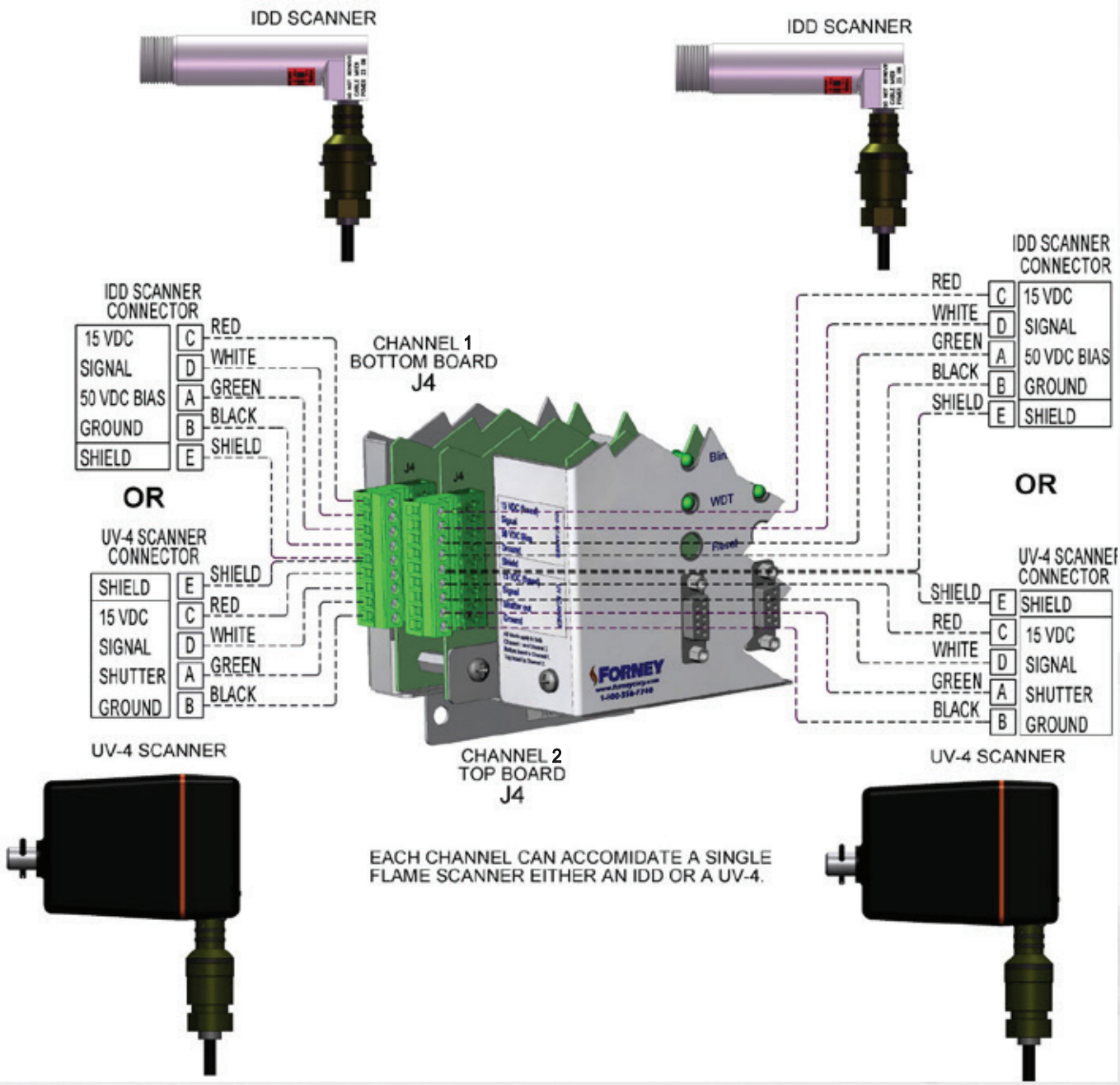


NOTICE: Connecting/wiring a UV-4 detector head to the IDD detector terminals will damage the associated channel board.

2.5.4 CONNECTING AN IDD AND A UV-4

Either channel of the IDD 9000 can be wired for an IDD or UV-4 detector head. Wire according to the following diagram. Note: Each channel can only operate one detector at a time and should be wired to ***EITHER*** an IDD detector ***OR*** a UV-4 detector, not both on the same channel.

Figure 2-7 IDD and UV-4 Detector Head Wiring



2.6 HARDWARE CONTROL INPUTS

2.6.1 BLIND INPUT - J8

For compatibility with installed wiring when retrofitting legacy Forney flame amplifiers, two blind control inputs are provided, an AC power activated blind input and a ground activated input.
Either of these inputs can be used to activate the amplifier's blind function. The ground actuated blind input is provided with an internal pull-up resistor to hold it in the logic high (not blinded) condition, so it is only necessary to apply a ground connection to activate it. When the amplifier is blinded, the flame failure response time (FFRT) timer is not disabled and signal level comparisons to pick-up and dropout points continues, so loss of flame indication will occur following the FFRT delay.

Blind Verification Test

1. Disable the BLIND function, if used. Use an artificial light source (an incandescent lamp for infrared or a UV light source for UV), and verify that the appropriate FLAME LED lights.
2. Activate the BLIND function for the flame detector head(s) being used. Verify that the FLAME LED goes out.

NOTICE: The amplifier blind function does not close the flame detector shutters or switch off the photocell bias. Therefore, the blind function cannot be used to verify noisy flame detectors that are failing self-check. All flame detectors, noisy or not, will read zero signal when the amplifier blind function is used.

2.6.2 SENSE B INPUT - J8

The AC powered Sensitivity B, "Sense B", operated input is provided for compatibility with installed wiring when retrofitting legacy Forney flame amplifiers. Powering the Sense B input is equivalent to grounding the "Profile Select 0" (PS0) input. The amplifier will operate with Profile number 0 if the Sense B input is not powered and Profile 1 when the Sense B input is powered. Additional wiring will need to be connected to the PS1 and PS2 inputs if access to the remaining six operating profiles is desired. Activating Sense B will increase the Active Profile Number selected by one (1). Example: Active Profile 2 will advance to 3; Active Profile 4 will advance to 5, etc.

2.6.3 OPERATING PROFILE SELECT INPUTS - J7

The IDD 9000 Flame Amplifier has non-volatile memory storage for eight sets of operating profiles, numbered from 0 to 7. The stored profiles are intended to allow for easy switching between commonly used burner operating conditions without requiring manual re-tuning of the flame amplifier.
The active profile is selected by three 5-Volt logic level inputs, PS2, PS1, and PS0. These inputs are encoded in reverse binary. Refer to Table 2-10 for quick guide to which profile is active for each combination of profile select input. Each profile contains a full set of operating parameters see Table 2-11 Operating Profiles.

The amplifier constantly reads the profile selected by the Profile Select input code and displays the Active Profile number in the lower right corner of the Termiflex / SmartDisplay®. The Active Profile can be changed at any time other than while in the tuning loop by repositioning the Profile Select inputs. Any tuning parameter changes can be saved only to the Active Profile. Example: Active Profile 0 is displayed as “Set 0”.

NOTICE: It is only necessary to connect the hardwired inputs to the amplifier ground to select the desired profile.

Table 2-10 Profile Select Input Encoding

Profile Select 2 J7 pin 1	Profile Select 1 J7 pin 2	Profile Select 0 J7 pin 3	ACTIVE PROFILE
OPEN	OPEN	OPEN	Set 0
OPEN	OPEN	GROUND	Set 1
OPEN	GROUND	OPEN	Set 2
OPEN	GROUND	GROUND	Set 3
GROUND	OPEN	OPEN	Set 4
GROUND	OPEN	GROUND	Set 5
GROUND	GROUND	OPEN	Set 6
GROUND	GROUND	GROUND	Set 7

Ground is through system logic.

2.7 OPERATING MODES

NOTE: MODE 1: IDD PPS is for operating a single IDD series (flame flicker) type detector only.
MODE 2: UV-4 PPS is for operating a single output pulse detector only.

All operating profiles are initialized via a profile flag and with the default settings shown.

Table 2-11 Operating Profiles

Termiflex Display	Mode 1: IDD PPS only	Mode 2: UV-4 PPS only
IDD GAIN	0	-
SPECTRUM RANGES	1	-
CORNER 1	80 Hz	-
CORNER 2	200 Hz	-
WEIGHT 1	1	-
CORNER 3	1024 Hz	-
CORNER 4	1024 Hz	-
WEIGHT 2	1	-
IDD PICKUP-PPS	500	-
IDD DROPOUT-PPS	100	-
IDD ANALOG LOW- PPS	0	-
IDD ANALOG HIGH- PPS	3000	-
UV-4 MULTIPLIER	-	1
UV-4 PICKUP- PPS	-	500
UV-4 DROPOUT- PPS	-	100
UV-4 ANALOG LOW- PPS	-	0
UV-4 ANALOG HIGH- PPS	-	3000
FFRT	3.8 Seconds	
CHECK DELAY	120 Seconds	

2.8 CONFIGURING THE TERMIFLEX/ SMARTDISPLAY® TERMINAL WITH 25 PIN CONNECTOR

The PM IDD 9000 uses the same detachable Termiflex / SmartDisplay® unit for programming the amplifier as the previous Forney flame amplifiers, however the Termiflex / SmartDisplay® terminal with 25-pin must be reconfigured.

NOTICE: If the Termiflex / SmartDisplay® unit has a 9-pin connector, then the factory defaults are already set as required. Do NOT reconfigure.

1. Attach the 25 to 9- pin adapter to the Termiflex / SmartDisplay® terminal.
2. To enter the Termiflex / SmartDisplay® configuration menu, press and hold the **lower left blue** (┌) and **lower right red** (┐) keys while the unit is executing its power-on-self-test. Hold both keys down until MAIN MENU display comes up.
   a. Press F1 to enter COM Menu settings
   b. Press F2 (NXT) to scroll through settings until Baud Rate = 19.2K is displayed.
   c. Press F3 (CONT) to continue to Parity. Use F1 or F2 to scroll through settings until “even” is displayed.
   d. Press F3 to continue to DATA, STOP BITS = 8, 1,
   e. Press F3 to continue to DISP SERIAL ERRORS ? Press F1 for YES
   f. Press F3 to continue to AUD SERIAL ERRORS ? Press F1 for YES
   g. Pressing F3 will take you back to the Main Menu.
   h. Press F2 for DSP - DISP CTL CHARS ? will be displayed. Use F1 and F2 to scroll through the settings until “no” is displayed.
   i. Press F3 to continue to DISP ESC CHARS ? Use F1 and F2 to scroll through the settings until “no” is displayed.
   j. Press F3 to continue to CURSOR VISIBLE ? Press F1 for “yes”.

Table 2-12 Termiflex/SmartDisplay® Configuration Settings for IDD 9000 Programming (Factory Default for Termiflex with 9-pin Adapter)

COM:	DSP:	KBD:
Baud: 19.2K	Disp Ctl Chars: No	Local Echo: No
Parity: Even	Disp Esc Chars: No	Key Repeat: Slow
Data, Stop Bits: 8,1	Cursor Visible: Yes	Audible Keys: Yes
DSP Serial Errs: Yes	Auto Line Wrap: Yes	Simplified KBD: No
Aud Serial Errs: Yes	New Line on CR: No	PGM Function Keys: No
	Disp Self Test: Yes	
	Backlight Level: 0	
	Backlight On: No	

If you need to re-configure the Termiflex / SmartDisplay® for a PM-DR6101E reference the following table for appropriate settings.

Table 2-13 Termiflex / SmartDisplay® Configuration Settings for PM or RM DR6101E Programming (Factory Default for Termiflex with 25-pin adapter)

COM:	DSP:	KBD:
Baud: 4800	Disp Ctl Chars: No	Local Echo: No
Parity: Even	Disp Esc Chars: No	Key Repeat: Slow
Data, Stop Bits: 7,1	Cursor Visible: Yes	Audible Keys: No
DSP Serial Errs: No	Auto Line Wrap: No	Simplified KBD: No
Aud Serial Errs: No	New Line on CR: No	PGM Function Keys: No
	Disp Self Test: Yes	
	Backlight Level: 5	
	Backlight On: No	

SECTION 3
AMPLIFIER TUNING

The amplifier tuning mode can be reached using either the handheld Termiflex/SmartDisplay® or the Forney Terminal Emulator Software (TES) installed on a laptop computer. Table 3-1 Keypad Commands summarizes the keypad commands available in the IDD 9000 Flame Amplifier firmware program. Utilize the Commissioning Checklist at the end of this document to list tuning parameters used.

Table 3-1 Keypad Commands

Function	Termiflex / SmartDisplay® Key strokes	Terminal Emulator Software (TES) Button
Enter the tuning loop	/ 1 3 Slash one three	Config
Do self-check now (Enabled approx. every 15 secs)	? Question mark	Self Test

The three-key sequence "/13" (slash, one, three) is pressed to enter the tuning loop. The amplifier is tuned in the active mode only.

NOTE:

- During tuning, any changes that cause loss of flame indication will be transmitted to the main flame relay following the FFRT delay.
- While tuning, if the main flame relay drops, the system will not re-initiate Flame-on status until the user exits the tuning loop. If the flame lamp indicator is on when the tuning loop is exited, the system will then return to flame-on status.
- When one channel enters tuning mode, periodic self check is suspended on both channels. On exiting tuning mode, periodic self check operation resumes.
- The IDD 9000 Flame Amplifier allows a maximum of 10 minutes of use while in the tuning loop before a time-out will occur. At a time-out, the tuning loop is exited and the system returns to active operation, any unsaved changes that were entered will be lost.
- Upon time-out, completion of tuning or unplugging the Termiflex, the IDD 9000 returns to normal operating mode. This is indicated by the WDT LED starting to flash. Pressing the reset button ensures the IDD 9000 has returned to normal operation.

3.1 MODE

The first screen displayed in the tuning loop allows selection of the operating MODE. Each Channel of the amplifier can use a single IDD detector or a single output pulse detector (example UV-4). The numeric keys 1 or 2 are pressed to set that MODE. Press F4, “NXT” to continue.

NOTICE: Any flame detector connected to the unselected mode input will receive power but is not monitored for signal level or tested during self-check.

3.1.1 IDD Channel Tuning

If MODE 1 is selected, a sequence of IDD channel tuning screens will follow. If available, use the USB oscilloscope to facilitate IDD tuning. Any oscilloscope with an FFT function may be used, but Forney recommends using the Forney Tuning Kit which includes an oscilloscope with FFT. Reference Forney Publication 372001-10 for more details. While not required, an oscilloscope with FFT is more effective in determining the lower and upper corner frequencies; pick-up and dropout points; and analog output low and high points.

3.1.1.1 IDD Gain

The Gain setting should be a low as possible, however a minimum of 3 to 4 bars (>>>>) is recommended at a minimum firing rate. As flame strength & boiler load increases this signal will increase as indicated as raw intensity. Avoid maximum gain as much as possible. However, if not possible at high loads to bring signal down too as shown below, then normal operation is still viable. The key is not to totally saturate the signal if possible. Avoiding saturation, the gain should be set to midrange or below. If the flame signal is clipped by excessive amplification its spectrum can be corrupted, making flame discrimination difficult & unreliable.

Factory default is a gain value = “0”. Under most installations this should be sufficient gain for operation of the amplifier. The “weight factor” multiplier explained in the next section will also set output gain. If lack of gain is realized, then gain setting should be increased.

NOTICE: Gain setting should be as low as possible, typically 3 to 4 bars (>>>>), to ensure safety. As boiler load increases, raw signal strength will increase. If this signal strength is too high, then gain will need to be reduced. Figure 3-1 & 3-2 will apply so as not to saturate the amplifier. “<<” should be avoided if possible as this a high signal strength nears saturation.

For best tuning and operation, adjust the gain up or down, so the most **LEFT** arrows are showing and no **RIGHT** arrows are visible. Use the F1, “DEC” and F2, “INC” keys on the Termiflex to make adjustments. The correct GAIN setting has the signal strength indicator “>” extending from the left side to the approximate center of the display while the burner is operating. The GAIN value is stored as a number from 0 to 7, where 7 corresponds to the maximum GAIN of 32x. Gain setting should be as low as possible, typically 0, to ensure safety.

Figure 3-1 Correct Gain Setting

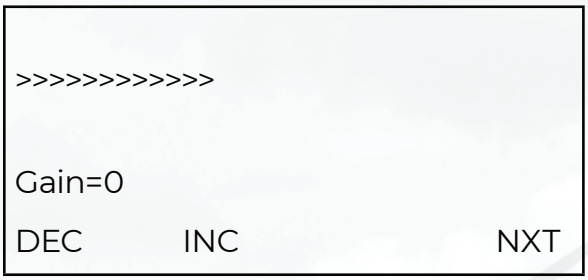
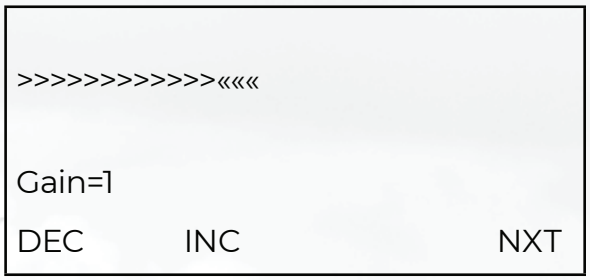


Figure 3-2 Incorrect Gain Setting



NOTICE: Because the IDD signal is monitored from the A/D converter output for the purpose of setting the GAIN, (ahead of the band-width filters and weights) any subsequent adjustments to the corner frequencies or weighting factors will not affect the GAIN setting. If the flame detector is adjusted or replaced, the GAIN setting will need to be rechecked.

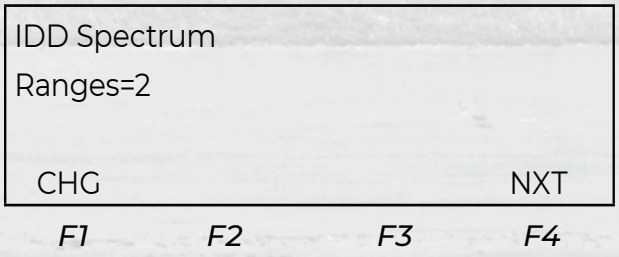
3.1.1.2 Frequency Ranges

The Frequency Ranges allow the user to specify one or two discrete frequency ranges for inclusion into the IDD output signal level for pick-up and dropout comparisons. Each frequency range is defined by its lower and upper corner frequencies. Weight factors are also available to allow an imbalanced ratio of signal energy to be included from two ranges if desired. A single range is adequate to produce the low-pass, high-pass, or band-pass filter functions.

Additionally, two frequency ranges can be used to do combinations of low-pass, high-pass, and band-pass filter functions. This feature is available to produce a notch filter function if a difficult application requires this option.

The incoming detector head signal may be tuned in 1 or 2 ranges. The ranges cover from 12Hz to 1024HZ. The system defaults to 1 range. If 2 ranges are chosen, adjust them both, upper and lower ends, but NO overlapping of frequencies is allowed.

Press F1 - CHG then type “2”
(to change from 1 range to 2 ranges)
Press F4 - NXT



The next tuning screen displays the lower and upper corner frequencies and weighting factors defined for the range. Press F1, “CHG” to make changes.

If two frequency ranges are selected, the display will show both frequency ranges’ corner frequencies and weighting factors.

Press F1 - CHG1 or F2 - CHG2 to edit the corner frequencies or weighting factors for range 1 or range 2 respectively.

Freq Range(s):			
80	-	200	x1
1024	-	1024	x1
CHG1	CHG2		NXT
F1	*F2*	*F3*	*F4*

NOTICE: No overlap of frequencies is allowed even if only 1 range is selected as the other range may limit the chosen range frequency selections.

The next screen will display the acceptable limits for the parameter to be changed and will not accept any values out-of-range (12-1024 Hz). The corner frequencies entered must be numbers evenly divisible by 4 or the system will reduce the value entered to the next smaller value that is evenly divisible by 4. For example, if the user enters 50Hz, the value will be automatically changed to 48Hz when it is accepted. Set the lower end first then the upper end.

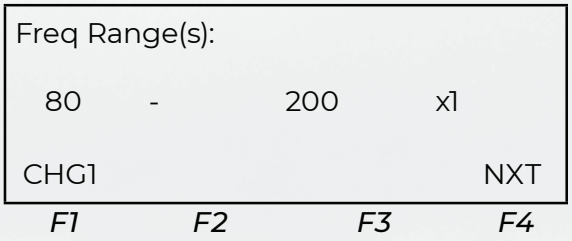
The Weight Factor is represented by WF on the Termiflex/ SmartDisplay® screen. This is the multiplier for each range. When it is felt insufficient counts exist, use this Weight Factor to improve dynamic range of PPS Counts. Weight factors are limited to integers between 1 and 9 and are permitted to be the same for each range if desired. Larger weight factors can be used as a “downstream gain” setting to increase the IDD signal value. If a narrow bandwidth is being used, the user must be careful to stay below the maximum signal value of 8190.

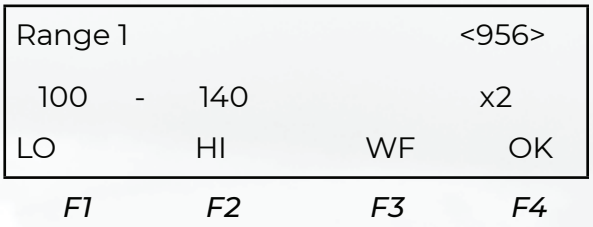
Ranges 6 through 9 are for finer gain adjustment with difficult applications:

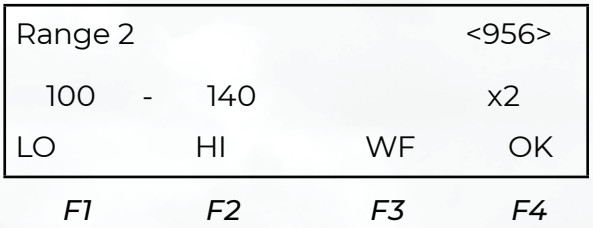
Weight Factors	Values
1	1
2	2
3	3
4	4
5	5
6	1.5
7	2.5
8	3.5
9	4.5

Press F1 - CHG

F1 - LO - type in lower corner frequency i.e. “100”
F4 - OK
F2 - HI - type in higher corner frequency i.e. “140”
F4 - OK
F3 - WF - type in “2”
F4 - OK
F4 - OK
F4 - NXT





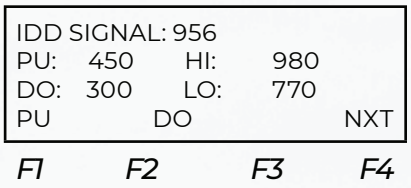


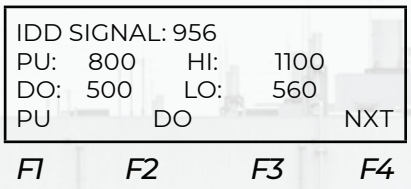
The second range, if used, must be located at higher frequencies than the first. No overlap between the two ranges is allowed. Therefore, the upper corner of the lower range cannot be specified to a frequency higher than the low corner of the upper range. Corners and WF for Range 2 are changed the same as Range 1.

3.1.1.3 IDD Pick-Up and Dropout Points

This screen displays:

- Average IDD signal level in pulses per second (PPS) using the configuration settings entered thus far (IDD SIGNAL),
- Programmed pick-up (PU),
- Dropout points (DO),
- Highest and lowest signal values seen since accessing this screen (HI and LO).





NOTE: Linger for several minutes on the IDD SIGNAL screen to gather some trend data. Remember, the SmartDisplay® /Termiflex times out after 10 minutes of activity. Notice how the high (HI) and low (LO) value range keeps expanding.

Pick-up and dropout points are limited to absolute minimum and maximum of 0 to 8190. The pick-up point should be less than the average signal value (i.e. IDD SIGNAL: 956) and greater than the minimum signal value (i.e. LO: 560). The dropout value should be less than the minimum signal value (i.e. LO: 560). The pick-up point must be greater than the dropout point.

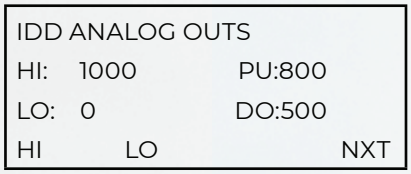
Press F1 - PU to change the pick-up value. i.e. 800 was selected for PU (560 < 800 > 956)
Press F2 - DO to change the dropout point. i.e. 500 (500<560).

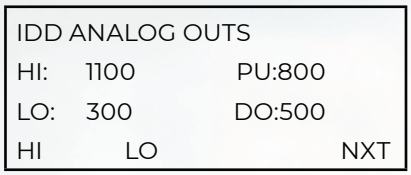
3.1.1.4 IDD Analog Output Low and High Points

The analog output value corresponds to the average of the last five instantaneous counts of signal intensity.

The IDD ANALOG OUTS screen shows the programmed values for the IDD analog output low and high points. Plus, it displays the pick-up and dropout points that were just programmed in the last section for reference.

The Analog Output HI and LO will set the 0-10V and 4-20mA outputs and can be set to yield the most information to almost nothing more than ON/OFF. To convey the most information, set the HI to the actual high displayed on the IDD Signal screen and the low to a value lower than the dropout (DO) value, which would be 1100 & 300.





To change the programmed values for IDD Analog Outputs on the Termiflex/SmartDisplay®:
Press F1 - HI – type in “1100”
F4 - OK
F2 - LO - type in “300”
F4 - OK
F4 – NXT

NOTE: The 4-20 output is not to be considered a calibrated output, to this end the output scale from the factory is set at a default value of 3000 well beyond the usable range. In order to acquire a reasonably linear output for display purposes, after the amplifier is properly set up and tested for proper flame discrimination adjust these ranges as described above.

3.1.2 UV-4 Channel Tuning

If operating Mode 2 is selected, the following screens will appear.

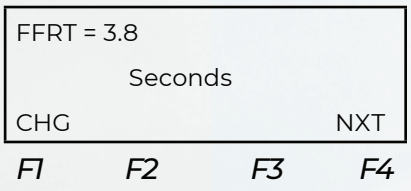
Screen	Values on Screen	To Make Changes	Notes
UV-4 Count Multiplier DO PU PPS 100 500 460 Multiplier = 1 DEC INC NXT F1 F2 F3 F4	Programmed Drop Out (DO) and Pick Up (PU) PPS value of the incoming signal Multiplier value	Press F1, "DEC" or F2, "INC" to change the Multiplier Press F4, "NXT" will accept the value.	Multiplier value goes from 1 to 5. It is a straight multiplier to the PPS, to boost a low count. For best tuning and operation, adjust the multiplier so the PPS Count average is at least 500.
UV-4 Channel Pick-Up and Dropout Points PPS SIGNAL: 860 PU: 500 HI: 880 DO: 100 LO: 840 PU DO NXT F1 F2 F3 F4	Active PPS signal level in Hz as an average Programmed pick-up points Dropout points Highest and lowest actual signal values seen	Press F1, "PU" or F2, "DO" Press F4, "NXT" will accept the value.	Pick-up and dropout points are limited to absolute minimum and maximum of 0 to 8190. The pick-up (PU) point should be less than the average signal value (i.e. PPS SIGNAL: 860). The dropout value should be less than the minimum signal. The pick-up point must be greater than the dropout point.
NOTE: Linger for several minutes on this screen to gather some trend data. Remember, the SmartDisplay®/Termiflex times out after 10 minutes. Notice how the high (HI) and low (LO) value range keeps expanding.			
UV-4 Analog Output Low and High Points PPS ANALOG OUT HI: 1000 PU: 700 LO: 0 DO: 200 HI LO NXT F1 F2 F3 F4	Programmed values for the PPS analog output low and high points. Programmed pick-up and dropout points being used	Press F1, "HI" or F2, "LO" Press F4, "NXT" will accept the value.	The Analog Output HI and LO will set the 0-10V and 4-20mA outputs and can be set to yield the most information to almost nothing more than ON/OFF. To convey the most information, set the HI to the actual high displayed on the PPS Signal screen and the low to a value lower than the dropout (DO) value.
CAUTION: The analog outputs are not intended for control of safety critical processes.			

3.2 Flame Failure Response Time Delay for Modes 1 and 2

The next screen shows:

- FFRT setting being used. There are three choices available for the FFRT delay: 1.0, 2.0, 3.0, and 3.8 seconds.

- Press F1, “CHG” and enter 1, 2, 3, or 4 (for 3.8) to change the setting.



If only one IDD detector is connected to both channels (refer section 2.5.2), both channels must be set for identical FFRT delay.

CAUTION: The maximum FFRT allowed to meet Factory Mutual (FM) standard 7610;1997 is 4.0 seconds. If the user enters 4, the system will display and use 3.8 seconds for the FFRT delay. This is done to keep the response time safely less than 4 seconds under all conditions.

The maximum FFRT allowed to meet standard EN298;2012 is 1.0 Sec.

During check cycle flame relay hold on for 2 sec regardless of FFRT (flame failure response time) settings.

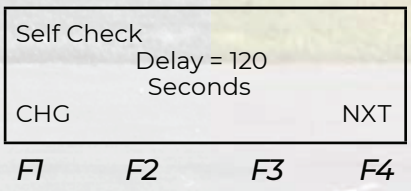
If one IDD Detector is connected to both channels of a Dual Channel Amplifier, it is recommended to set identical FFRT and Self-Check Cycle times on both channels.

Flame Failure:

- Flame failure occurs following the FFRT delay if the detector’s signal falls and stays below its programmed dropout point.
- Flame failure occurs immediately if the system fails a self-check. When a self-check is performed, the PPS count must fall below the Drop Out point, (DO) which is programmed into the amplifier during setup.
- On Flame Failure, the flame and lamp outputs turn off. The alarm output is not changed. Signal acquisition continues. Flame-on status can be re-established if the detector(s) meet the pick-up logic requirement.

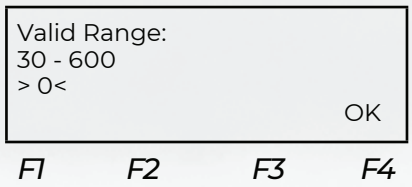
3.3 SELF-CHECK CYCLE TIME FOR MODES 1 AND 2

The next screen shows the self-check cycle time being used. This value is displayed and entered in seconds. For example, two minutes is entered as 120 seconds. The self-check cycle time is restricted to a minimum value of 30 seconds and a maximum value of 600 seconds (10 minutes).



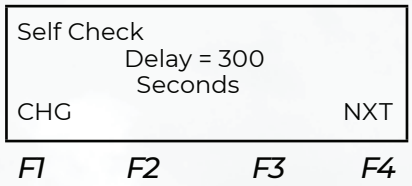
Regardless of the number of channels being used, both channels must be set to an equal Self-Check Cycle Time. If different self-check cycle times are set, the shorter of the two settings will be effective on both Channels.

During self-check the detectors are blinded for a brief interval. After a short delay, the signal levels are compared and self-check failure occurs if a detector's output is above its dropout point. The Blind function for an IDD detector head has the 50Vdc bias Voltage removed. The Blind function for a UV-4 has a 50Vdc shutter voltage fire to block the UV Tube. Both happen at the same time.



If one channel fails at any time, for any reason, the other channel will continue to operate.

Example set SELF CHECK Delay to 5 minutes.
F1 - CHG - type in 300
F4 - OK
F4 - NXT

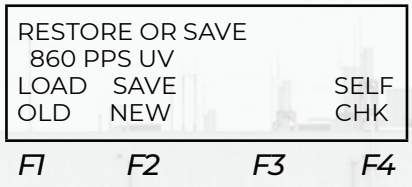


NOTICE: Timed self-check is inhibited if there is no flame indication or if the system is being tuned or blinded. System performs self-check 2 seconds after detection of flame. Any self-check failure will cause immediate flame failure. The Flame and Lamp LEDs will extinguish, and the Red Alarm LED will light. The display will show a repeating error message informing the user the flame detector failed.

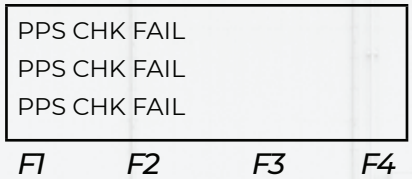
3.4 SAVING CONFIGURATION

The RESTORE OR SAVE screen gives you 3 options.

- TEST your setup using F4 to do a SELF CHECK.
- SAVE your setup using F2 to do a SAVE NEW.
- DISCARD your setup using F1 to reload the PREVIOUS SETTINGS.

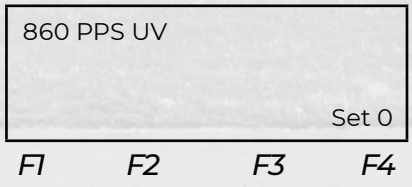


If the SELF CHECK fails, the unit does a lock out, to fail safe, as required. Press the RESET button on the front panel to restore the original settings, and start again.



If SELF CHECK passes, select SAVE NEW and you may want to sweep thru the settings again for further tweaking.

- F2 - SAVE NEW



NOTICE: If the system is left in tuning mode without saving, it will time out after 10 minutes to the previously SAVED parameters. However, if the Termiflex is removed without saving the new configurations, it will revert to the previously SAVED parameters after 2 seconds.

3.5 FUNCTIONS UNAVAILABLE WHILE TUNING

The following functions are not available when inside the tuning loop:

- The self-check cycle timer is not incremented while inside the tuning loop. The timer resumes counting and the amplifier self-checks when the tuning loop is exited.
- The profile select inputs are not checked while tuning. If the profile is changed while tuning, any changes made will be lost and the new profile loaded when the tuning loop is exited.
- The blind input is not checked while tuning. If this input is changed while tuning, the blind/un-blind will occur when the tuning loop is exited.
- The watchdog timer/code is active at all times, but the WDT LED stops toggling while in the tuning loop to serve as a visual reminder that tuning is still in progress.

3.6 ANALOG OUTPUTS

- The analog output value corresponds to the average of the last five instantaneous counts of signal intensity.
- The analog outputs (0-10V and 4-20mA) are linearly scaled between the programmed low and high points respectively. These will output minimum (0V and 4mA) if the input channel is off or the signal level is at or below the programmed low point and will read full scale (10V and 20mA) if the signal level is at or above the programmed high point.
- No hardware zero or span adjustments are provided.
- The 15 Volt outputs to the 4-20mA indicators are fused with 1/8-Ampere plug-in fuses accessible by removing the amplifier cover.
- The 0-10V outputs have a 1000-Ohm output resistance so these outputs can only be used with a high input-resistance indicating or logging device.

CAUTION: The analog outputs are not intended for control of safety critical processes.

3.7 AMPLIFIER SHUTDOWN/FAILURE

If the amplifier fails or is shutdown the main flame and lamp outputs are turned off. The alarm output is turned on. Signal acquisition stops. An error message repeatedly displays. Power off/on or a Reset is required to restart the system.

SECTION 4
MAINTENANCE

This section contains maintenance instructions for the PM IDD 9000.

CAUTION: This amplifier contains "STATIC SENSITIVE" components. Use standard electrostatic-discharge (ESD) procedures whenever handling the board.

WARNING: Ensure all Flame Detector amplifiers, detectors, and cables are installed properly, and the amplifier is programmed exactly as described in this manual. DEVIATION IN ANY CASE MAY RESULT IN CATASTROPHIC FAILURES AND SEVERE DAMAGE TO EQUIPMENT AND/OR INJURY TO PERSONNEL.

4.1 TUNING

The flame detection system should be tuned at initial installation in accordance with Section 3 of this manual. Following initial installation, the tuning parameters should be rechecked at periodic intervals to maintain optimum system performance.

4.2 TROUBLESHOOTING

If the flame detection system fails, isolate the fault to the flame detector head, the cable between the head or the amplifier. The following instructions provide general guideline for fault isolation.

1. Measure the power inputs at J1 of the PM IDD 9000 PCB. Ensure that all voltage inputs are at the correct level. (Refer to Table 2-2.)

2. If the PCB fails to respond correctly, the system program may be stalled. Press the Reset pushbutton switch to clear the CPU, and restart the program.

3. The PCB contains five clip-mounted fuses on the board. If restarting the program does not resolve the problem, remove power from the system and check for open fuses. Replace open fuses as required. (Refer to Table 6-1 for a list of fuses mounted on the PCB.) If any other component requires replacement, return the PCB to Forney for repair.

4. Use documentation supplied with the flame detector head to isolate a fault to the head or cable.

4.3 STORAGE AND HANDLING REQUIREMENTS

Store the PM IDD 9000 amplifier in its shipping box until used. See the specifications section of this manual for storage temperature and humidity ranges. Normal static precautions should be taken in handling parts sensitive to electrostatic discharge (ESD).

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.

Email	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

6.1 RECOMMENDED SPARE PARTS

The recommended spare parts list in the table below advises of replacement parts that should be in the customer's stock.

Table 6-1 Replacement Parts

Fuse	Value	Function	Part No.
F1	2.0A	Main AC Power	92708-12
F2	.125A	IDD Detector Power	92357-04
F3	.250A	UV-4 Detector Power	92357-03
F4	.125A	UV-4 4-20mA Output	92357-04
F5	.125A	IDD 4-20mA Output	92357-04
F6	62mA	IDD Bias	2820-55
		Insulating Pipe Nipple, Fiberglass	75168-01
		Kit for IDD-Ultra Retrofit - Grounding	370279-01

NOTE: Drawing number, stock number, and part number are interchangeable for Forney supplied items.

Commissioning Checklist

Forney Contract No: _____

Site: _____

Burner/Igniter No. _____

Tuning Parameter Settings

	Profile #____		Profile #____		Profile #____		Profile #____	
MODE 1	**Sense A**	**Sense B**	**Sense A**	**Sense B**	**Sense A**	**Sense B**	**Sense A**	**Sense B**
IDD GAIN								
FREQ RANGES								
CORNER 1								
CORNER 2								
CORNER 3								
CORNER 4								
WEIGHT 1								
WEIGHT 2								
IDD PICKUP- PPS								
IDD DROPOUT- PPS								
IDD ANALOG LOW- PPS								
IDD ANALOG HIGH- PPS								
MODE 2								
UV-4 MULTIPLIER								
UV-4 PICKUP- PPS								
UV-4 DROPOUT- PPS								
UV-4 ANALOG LOW- PPS								
UV-4 ANALOG HIGH- PPS								
MODES 1 & 2								
FFRT								
CHECK DELAY								

If using more than four profiles, copy this sheet to document settings for all profiles.