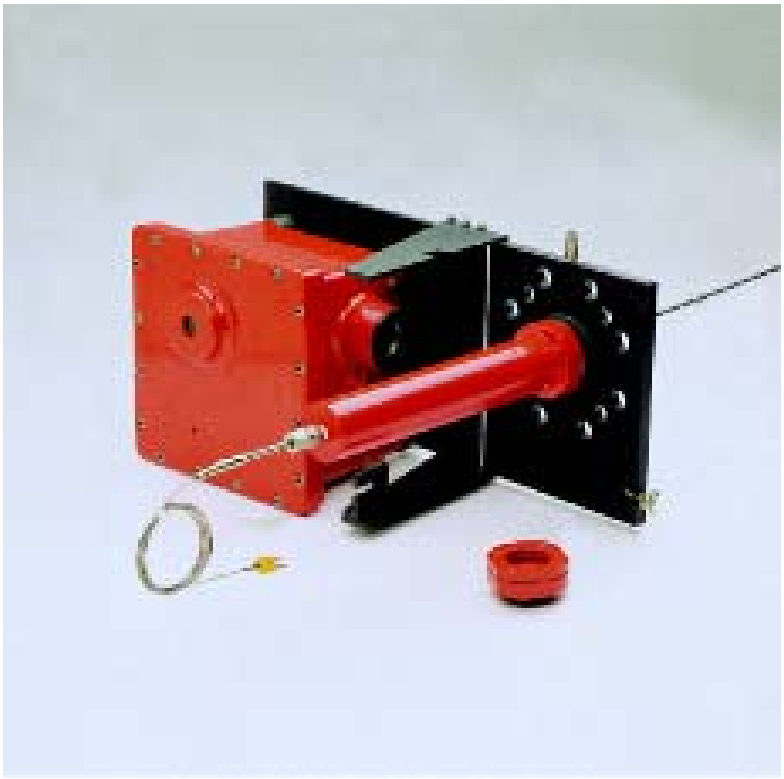
Mikron Infrared/E^2T PULSAR

M7000 -EXP

Operations Manual



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MIKRON/E2T's PULSAR II

Model 7000SR-EXP

Operation & Maintenance Manual

FOREWORD

This document is designed for use by the client personnel responsible for installing, operating, maintaining, aligning and/or troubleshooting MIKRON/E2T's M7000-EXP Temperature Measurement System.

For those customers already familiar with this equipment, see section 1.4, *Quick Installation Procedure.*

As necessary, this document will be updated with changed pages or reissues. Clients are encouraged to recommend and submit changes, additions, and/or corrections to make this document more useful.

The Explosion Proof Housing
Designed to meet the explosion-proof requirements of the National Fire Protection Association (NFPA) Article 500 for hazardous locations. This Instrument holds both CSA International and European (ATEX) certifications.
To ensure safe operating conditions it is recommended to review certification and area classifications.

Reference:
Appendix B Area Classification and Protection concepts
Appendix C certificate Declaration of Conformity (DoC)

Hazardous location Safety minder

Service personnel shall be qualified to install and service electrical equipment design for areas classified as hazardous.
At no time should the cover be removed unless power is switch-off first. When it is necessary to service instrument with the power applied ensure proper safe environmental conditions exists and that such maintenance is authorized and pursuant to safe conditions.

Reference: Section 7 Safety Assurances and Precaution

TABLE OF CONTENTS

OPERATIONS MANUAL
PULSAR II Model 7000SR-EXP

Symbols:

Protective Earth Ground connection: 

Indicates caution must be followed, reference supplied documents: 

Indicates electric shock hazard, disconnect service before opening: 

Voltage Alternating current (Vac): ~
Voltage direct current (Vdc) : ⎓

1. INTRODUCTION

1.1 Description

This unique Temperature Measurement System is designed specifically for continuous-duty monitoring of high temperature reactors of all kinds. The heart of the System is the PULSAR II wide range non-contact thermometer. The most common limitation of the typical infrared thermometer is its narrow single scale limits. The PULSAR II has been designed to replace narrow scale pyrometers and contact probes where thermocouples (T/C) and resistance temperature device performance is marginal, unreliable or impractical. Through computer calibration and advanced electronics, Mikron/E2T has produced a non-contact thermometer exceeding T/C temperature ranges in a single, linear and continuous scale of 400 to 3000°F (205 to 1650°C), or higher with special calibration.

The PULSAR II is a compact, single unit, electro-optical instrument with 1 mV/° and 4-20 mA linear outputs. Even after dedicating a viewport on a reactor to the installation of the PULSAR II Model 7000SR-EXP System, the operator can still look into the reactor via the "sight-through" aiming optics.

Features of the PULSAR II Model 7000SR-EXP System are as follows:
Reference: Appendix A and B for details

a. An explosion-proof housing - **CSA** Class 1, Division 1, Groups C & D and Class 1, Division 2, Groups A through D; **CENELEC** EExd IIB T4, ATEX certified

b. Acceptance by the EPA as an accurate and reliable temperature measurement tool

c. Wide temperature range - Ambient (with BUP-10) to 3,000°F

d. One mV/° and 4-20 mA linear outputs; 120/220VAC. 24VDC

e. An emissivity adjustment from 0.99 to 0.01

f. An optional on-board setpoint with a normally open and a normally closed mechanical relay

g. A choice of three infrared spectral ranges to provide average, gas, or refractory temperatures.

h. An Electro-optical Package which is easily removed from the explosion-proof housing, minimizing downtime and increasing reliability (Reference: Figure 1-1)

i. An internal heater and water/air cooling cavity for internal instrument temperature stability

j. High quality sight-through optics

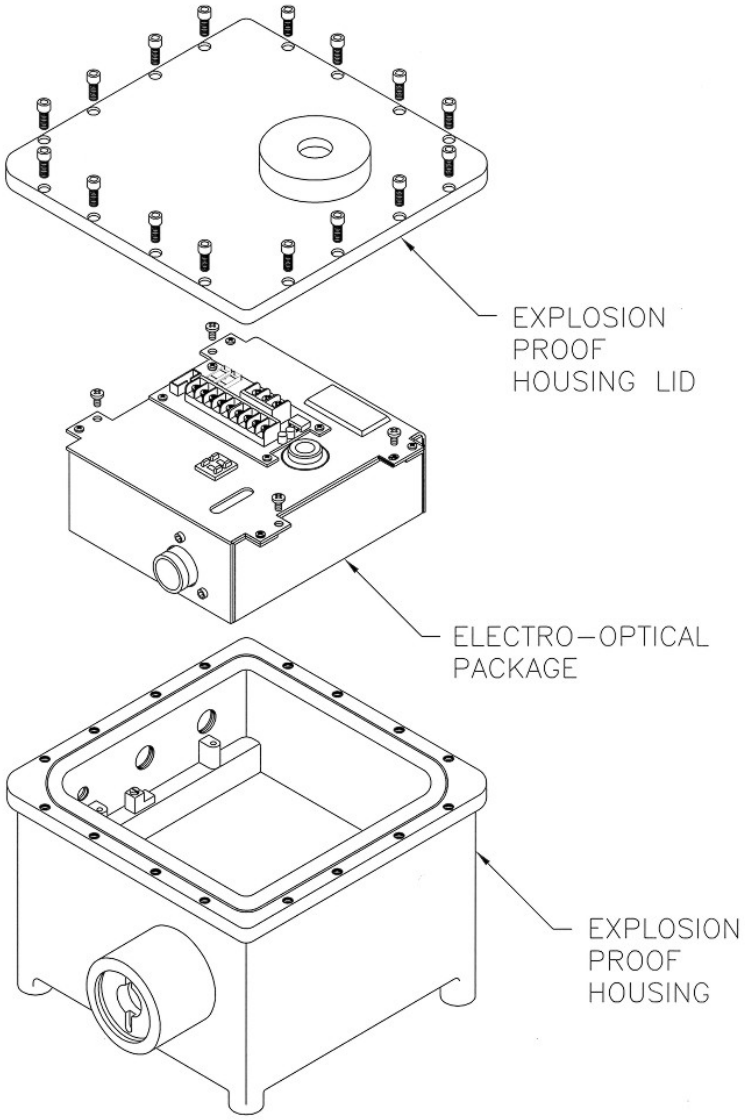

EXPLOSION
PROOF
HOUSING LID
ELECTRO–OPTICAL
PACKAGE
EXPLOSION
PROOF
HOUSING
M7000

Figure 1-1

1.2 Principle of Operation

All objects above absolute zero emit infrared energy. The amount of energy emitted is proportional to the body temperature. The PULSAR II collects this energy by means of a focusing optical system concentrating the energy from a body onto a sensitive infrared detector. Specialized amplification circuitry converts the signal generated by the detector into linear output signals corresponding to 1 mV/° and 4-20mA.

The efficiency of energy emission from different objects varies significantly. A perfect energy emitter is known as a blackbody radiator and is assigned an emissivity value of one. Any object that emits with less than perfect efficiency is assigned an emissivity value between zero and one, with a perfect reflector assigned an emissivity value of zero.

The PULSAR II is calibrated against nearly perfect blackbody radiators in the laboratory. However, the emissivity of objects and processes which you are measuring will typically fall somewhere between zero and one. This results in the need for an adjustment of the PULSAR II's emissivity setting to obtain a match against a known reference temperature. Once the emissivity setting has been adjusted for a particular installation, the PULSAR II will accurately track temperatures as they rise and fall. A reference temperature can be easily obtained through the uses of MIKRON/E2T's BUP-10 Backup Probe.

1.3 Expected Performance

The outputs of the PULSAR II are accurate to within ±1% of reading, or ±5°C whichever is greater. At 400°C, the output would be within ±5°C, and at 1000°C the output would be within ±10°C, and so on.

As with any precision instrument, the PULSAR II requires periodic calibration. The PULSAR II's electronic calibration check can be accomplished in the field by putting a short across TB2 Terminal 'A_GND' and Terminal 'CAL' (See Section 1.4 ,*Quick Installation Procedure*). Circuitry inside the unit replaces the signal from the detector with a standard signal equivalent to 1832°F (1000°C). By confirming the proper output signal of 1.832 VDC (1832°F) or 1.000 VDC (1000°C) ±1% of reading, you are assured of an accurately functioning instrument. If the output falls outside the ±1% limits, contact the factory for instructions. Yearly re-calibration against an external standard radiation source is required to maintain NIST traceability.

1.4 Quick Installation Procedure

The quick installation procedure may be used as a checklist if the installer is familiar with the equipment. For complete instruction and safety precautions refer to the appropriate sections of this manual:

Reference: Figure 1-2
Reference: Appendix D drawing 613-800, Service Connections

Section 2: **Mechanical Installation**

Section 3: **Electrical Installation**

Section 7: **Safety Assurances and Precautions**

Hazardous location Safety minder
Explosion proof performance integrity must not be compromised during and after servicing.
At any time when the Explosion Proof Enclosure is exposed, i.e. Purge plug removed, power shall be switched off to ensure safe operation.

a) Mounting the Instrument

Reference Appendix F, 613-227, Mechanical Connection

PULSAR II Model 7000SR-EXP is designed to be mounted directly to a 3-inch 150 or 300 lb RF ball valve. A gasket is required between the valve and bulkhead plate of the Swing-away Fixture.

1. Verify the location is within instruments design capabilities
2. Refer to Section 2: Mechanical Installation
3. Confirms instrument's input power and signal output configuration is as expected

b) Mechanical

Reference Appendix F, 613-227, Mechanical Connection

Connect Air requirements:

No airpurge is required to maintain explosion proof rating

1. VeiwPort Purge

   One (1) SCFM flow from 20 psig air is required for the viewport airpurge fitting just downstream from the viewport Model VP-10. Instrument air is recommended.

2. Combustion Purge

   Ten (10) SCFM or greater combustion airpurge is recommended between the valve and the reactor to keep the sight path clear. A 1/2" line from the combustion air supply is adequate.

3. Optional Housing Purge (Instrument housing purge is **not** required for Explosion proof ratings)

Quick Installation Procedure continued

c) Electrical

Reference Appendix F, 613-800 Service Connections
Review: Section 7.2 Electrical Service protection:

1. Connect Instrument Power

Power service type is marked on Terminal Output PC Board, verify that it corresponds to the service type being installed. Separate power wires from Signal wires by routing through separate ¾" NTP conduit ports. Service power is connected to TB1 on Terminal Output PC Board.

Note:
Secure power input lines together after connection to Terminal block to prevent accidental hazardous live condition in the unlikely event a terminal screw becomes loose. Sleeve or tie wrapping is acceptable.

2. Instrument loops and Alarm Outputs:

a) Connect lines as needed for Normal Open (N.O.) or Normal Closed (N.C.) relay to corresponding locations on TB2.

b) Connect 4-20mA out lines to corresponding (MA-) and (MA+) outputs on TB2. Cable shield if present, is NOT recommended to connected to Instrument.

c) Connected voltage output to (mV+) , connect reference ground to (A_Gnd)

Quick Installation Procedure continued

d) Calibration Check

The instrument is supplied with an electronic circuit check system that can be used to verify long term accuracy, but does not qualify as an National Institute of Standards Technology (NIST) trace source. This check will be called Electronic Calibration (CAL) from this point on. If the user requires NIST trace certification, we recommend a yearly calibration schedule be followed by returning the equipment to Mikron Infrared for this service.

MIKRON/E2T recommends the electronic calibration be checked on the bench prior to installation. Instrument power and a 4 digit voltmeter are required to check this signal.

The electronic calibration reading obtained from the PULSAR II is dependent on the instrument's emissivity setting. Lower emissivity settings will give higher CAL readings. Therefore, **it is required that you set the emissivity to 0.99 when checking to see if the CAL reading is 1832°F (or 1000°C)**. After an initial check to verify that CAL is within specification at an emissivity of 0.99, you can set the emissivity to the value required for proper readings on the process or object being measured and note the CAL value for the emissivity setting. This new reading can be used as your new CAL value for later checks performed at the process emissivity setting.

Hazardous location Safety minder
At no time should the cover be removed unless power is switch-off first. When it is necessary to service instrument with the power applied ensure proper safe environmental conditions exists and that such maintenance is authorized and pursuant to safe conditions.

Review: Section 7 Safety Assurances and Precautions

a. Power should be applied to unit at least 30 minutes before checking electronic calibration.

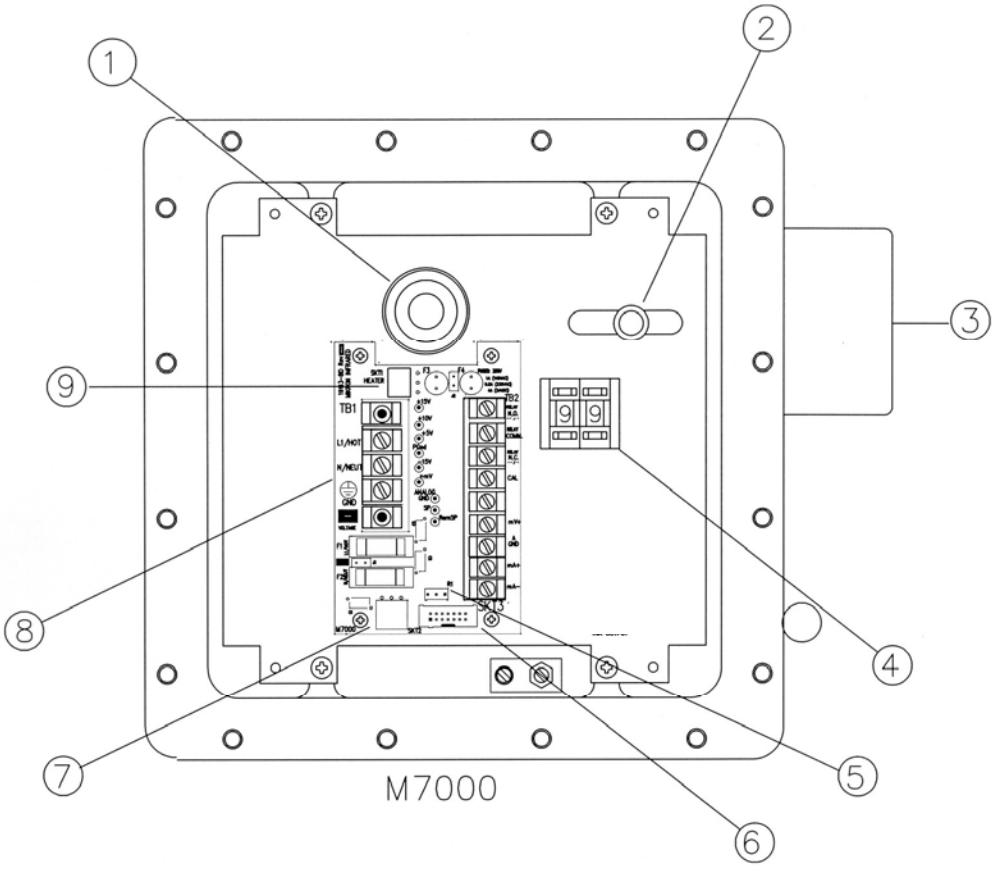
b. Connect voltmeter across +mV and A_GND on terminal strip under lid.

c. Connect short across TB2 terminal A_GND and CAL located on the Terminal Output board (Reference Figure 1-2) connections to verify a reading of 1832°F (or 1000°C), whichever scale unit was ordered.

If signal does not read within ±18°F or ±10°C of the above-given temperatures, contact Customer Service Department for troubleshooting help

e) **Focus the instrument (Adjust Lens)**

f) **Aim the instrument to the Target**



1. Eyepiece Lens with Reticle
2. Focus adjust and Lens Locking screw
3. Objective Lens
4. Digital Emissivity
5. Set–point Adjust, R1
6. Signal I/O to Electronics
7. Mains Supply connector to Electronics
8. Output PCB
9. Heater connection

Figure 1-2

2. MECHANICAL INSTALLATION

2.1 Unpacking the Instrument

Before unpacking the instrument, check the packing invoice on the outside of the carton. It lists every item included. As you remove the contents, check them against the packing slip. If you do not receive everything you ordered, call the factory immediately. Visually inspect M7000 –EXP for possible damage incurred during shipping.

Instrument's serial number:
Each Mikron/E^{2}T's M7000 -EXP instrument is configured as per customer's request. The packing slip order number matches that of the instrument's serial number. It is recommended to confirm that the instrument's configuration meets expectation, by reviewing packing slip details.

Once you have determined the unit you received is the unit you ordered and it is in acceptable condition, the unit is ready for installation. It would be a good idea to spend a few minutes "getting to know" your PULSAR M7000-EXP.

Reference: Section 7 Safety Assurances and Precautions

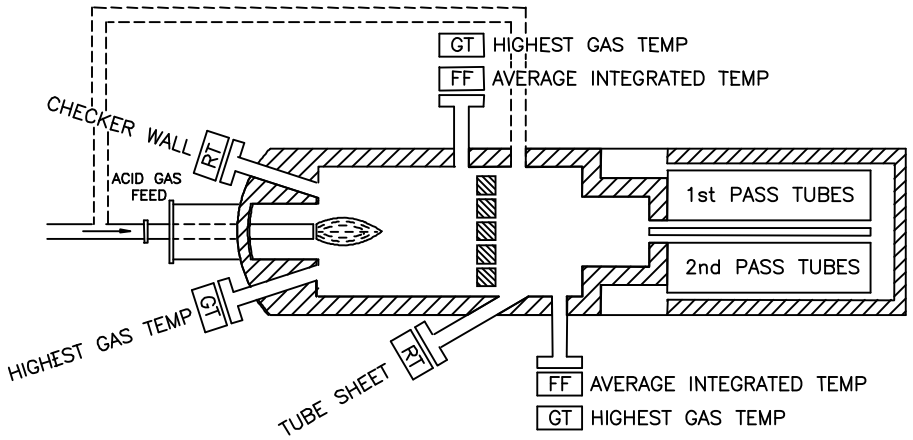
2.2 Furnace Location

2.2.1 Choice of Temperature Measurements

The PULSAR II, Model 7000SR-EXP comes in three spectral ranges:

a. The FF measures average integrated temperature in its field of view across the furnace.
b. The GT measures the hottest gas temperature in it's field of view across the furnace.
c. The RT measures the refractory, checker work, or tube sheet temperatures in it's field of view.

2.2.2 Choice of Locations



2.3 Mechanical Installation

The PULSAR II Model 7000SR-EXP includes a Swing-away Fixture incorporating features which facilitate mounting and alignment. Figure 2-1

Reference: Appendix E drawing 613-227

1. **VALVE FLANGE MOUNTING**:
   The Swing-away Fixture mounts directly to a 3-inch 150 or 300 lb. RF (Raised Face) flange of ball valve using bolts with a gasket between the bulkhead plate flange and the valve. Mount the PULSAR II assembly in such a way to allow easy access to the instrument controls and allow the instrument to be swung away at least 55° (see Drawing # 613-227, for swing-away feature). It should also be possible to conveniently sight through the eyepiece to periodically check the alignment and viewport cleanliness.

2. **VIEWPORT**:
   The Swing-away Fixture incorporates a heavy duty Viewport window which may be easily removed by unscrewing the viewport assembly from the bulkhead plate when the ball valve is closed and the entrapped pressure vented off. Caution: Do not damage or lose silicon O-ring.

3. **FOCUSING ON THE TARGET**:
   The objective lens locking and focusing screw and eyepiece are both located on the top of the infrared electro-optical package inside the explosion-proof enclosure (Reference **Figure 1-2**).

   To focus, first rotate the eyepiece lens (Figure 1-2, item 1) in or out until the reticle is clear and sharp. Next, slowly loosen the lens locking and focusing screw (Figure 1-2, item 2). Move the objective lens in or out with the focusing screw until the target is clear and sharp. Tighten the screw; the focus is now set.

4. **AIMING (SIGHTING) ADJUSTMENTS**:
   An advantage of the PULSAR II System is, if the target is in a closed chamber such as a kiln or furnace, the PULSAR II can be aimed through a viewport at the target. The viewport can still be used by simply looking through the eyepiece of the instrument. It is possible to look at the object being measured and measure its temperature at the same time. Aiming adjustments for accurately sighting the PULSAR II down the port into the reactor are provided on the Swing-out Fixture and on the Electro-optical Package. **A clear unobstructed sight-path is critical**.

AIMING (SIGHTING) ADJUSTMENTS, continued

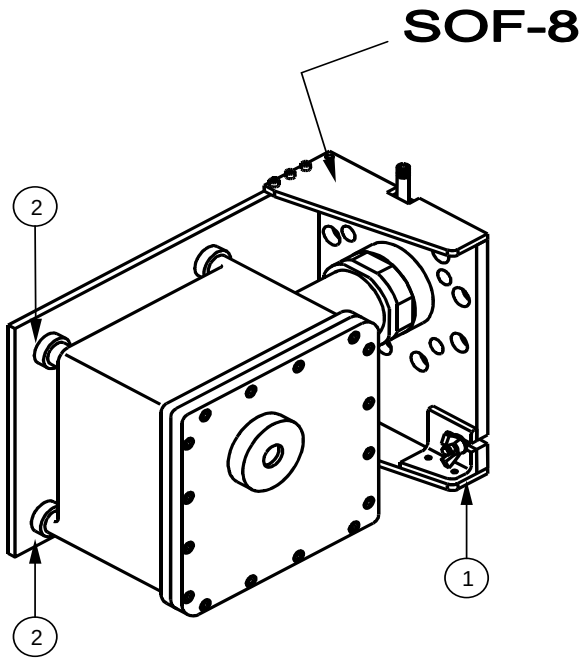
When sighting though the PULSAR II's optics, the circular RETICLE should be centered down the middle of the port. Three adjustments are available to achieve proper alignment.

a. Right sighting adjustment made with washer in between bulkhead plate and wing nut plate as shown in Figure 2-1, Item 1.

b. Left sighting adjustment made with washers between legs of Explosion-proof Housing and back plate as shown in Figure 2-1, Item 2.

c. Up / Down sighting adjustment made by loosening the four screws holding the Infrared Electro-optical Package in the explosion-proof enclosure. Move the entire Infrared Electro-optical Package. There should be enough play to center the RETICLE down the port. Tighten the screws, repeating the first step if necessary.

If required, loosen the four 1/4-20 socket cap bolts holding the Explosion-proof Enclosure to the Swing-out Fixture, re-position the Enclosure on the Fixture and re-tighten the bolts.



AIMING SIGHJTING ADJUSTMENTS

Figure 2-1

2.4 Ambient Temperature Limits

The internal operating temperature limits of the PULSAR II are +40°F (4°C) to +120°F (50°C). When the internal temperature drops below +40°F (4°C) an internal electric heater activates and keeps the internal temperature at or above +40°F (4°C). If the windchill is expected to be below -40°F (-40°C), additional heating or protection for the instrument is required. If the internal temperature is expected to be above 120°F (50°C), use of the built-in cooling base is required.

2.5 Cooling Requirements (Optional)

If ambient temperatures in excess of 120°F (50°C) are anticipated in the operation of the PULSAR II, cooling will be required by one of two methods:

Reference: Appendix E: 613-227 Mechanical Installation
613-800 Service Connections

2.5.1 WATER COOLING

Provide cooling water at 60°F (15°C) maximum from a filtered source with a flow rate capable of sustaining at least 10 gallons per hour (gph) to the water cooling cavity built into the underside of the Explosion-proof Enclosure. This method allows ambient temperatures of up to 200°F (93°C). If the available cooling water is above 60°F, then some trial-and-error testing will have to be performed to ensure that the electronics inside the Explosion-proof Enclosure do not rise above 120°F (50°C).

2.5.2 AIR COOLING

Install a Model V208-15-L Vortex Air Cooler (available from MIKRON/E2T) to the cooling cavity of the Explosion-proof Enclosure. Provide filtered dry compressed air from a minimum 90 psig source with a sustained flow rate capability of at least 15 SCFM to the vortex air cooler. This will result in a temperature reduction of up to 27°F (15°C) lower than the supply air. Control the enclosure temperature by adjusting the upstream air pressure to the Vortex Cooler. It is not necessary to over-cool the instrument. If over-cooling does occur, the heater built into the system will activate to keep the electronics within limits.

Vortex Air Note: Cooling cavity is isolated from internal surface of explosion-proof enclosure

2.5 Air Requirements 

Reference: Appendix E: 613-227 Mechanical Installation
613-800 Service Connections

1. **VIEWPORT PURGE** - A source of sustained dry instrument air or nitrogen with a flow rate through a regulator or needle valve capable of sustaining 1 SCFM flow rate from a 20 psig or greater supply (see Note # 7, Drawing 613-227)

2. **COMBUSTION PURGE** - MIKRON/E2T recommends the airpurge between the valve and the combustion chamber be supplied through a 1/2" valved line at approximately 10 SCFM.

3. **INSTRUMENT HOUSING PURGE (OPTIONAL)** - A source of regulated nitrogen with a flow rate capable of sustaining 0.5 SCFH from a 1 psig (minimum) supply for pressurization of the housing (See Drawing 613-227). Instrument housing purge is **not** required for Explosion proof ratings:

Note:
Instrument housing purge with NITROGEN is only recommended when the M7000-EXP will be used in high humidity tropical environments. Exposure of the electronic components to high humidity can significantly reduce component life.

Hazardous location Safety minder
Explosion proof performance integrity must not be compromised during and after servicing.
At any time when the Explosion Proof Enclosure is exposed, i.e. Purge plug removed, power shall be switched off to ensure safe operation.
If purge is installed ensure proper conduit usage and minimum thread dept. is maintained

Reference: Section 7 Safety Assurances and Precautions

4. **VORTEX COOLER (If Required)**- Vortex Cooler air supply refer to Section 2.4.2.

3 ELECTRICAL INSTALLATION

3.1 Electrical Installation – Guidelines

Reference: Appendix E drawing 613-800, Service Connections.

Conduit / Connections:
Power and signal wires are fed through the 3/4 inch NPT conduit holes in the side of the environmental housing. All wires exiting the enclosure must run through properly installed explosion-proof seal fittings to maintain explosion-proof rating. Only a qualified service person should perform operations on this instrument.

Mikron/E2T does not provide the sealing fittings required for installations since client standards vary as to the brand or type of sealing fittings required for installations. Additionally, states and countries have different standards making it very difficult for Mikron/E2T to stock the proper fittings.

Flexible conduit of sufficient length must be used from the housing sealing fittings to the hard conduit or junction box to enable movement of the unit on the mounting fixture.

All power and signal connections are made on the Terminal Output board mounted on the infrared electro-optical package inside the explosion-proof enclosure. Power is connected to terminal block TB1. Output signals are connected to terminal block TB2.

Review: Section: 7.2 Safety Assurances and Precautions, Electrical Service protection.

Over-current protection / service switch: It is necessary to incorporate an external over-current protection device appropriate to the instrument's service and to include a disconnect switch located near the instrument. The service disconnect should be clearly marked as pertaining to this instrument.

Power connections:
Connect input power as described in this section. Confirm service type and check that Instrument service markings correspond to expectations. When wiring follow local code regulations. Secure power input conductors together after connection to terminal block to prevent an accidental hazardous live condition in the event a terminal screw becomes loose. Sleeve or tie wrapping is acceptable. Check to ensure power is not accidentally connected to low voltage I/O terminal block TB2.

Service markings:
Input Power service (i.e.120Vac, 220Vac, 24Vdc) and Fusing type is factory set and marked on Terminal Output PCB. (Reference Figure 3.1)

Protective Ground connection:
Connect protective Earth conductors to terminal lug located inside the housing as indicated by symbol:

Cover attachment:

Review: Section 7 Safety Assurances and Precautions

Hazardous location Safety minder
At no time should the cover be removed unless power is switch-off first. When it is necessary to service instrument with the power applied ensure proper safe environmental conditions exists and that such maintenance is authorized and pursuant to safe conditions.

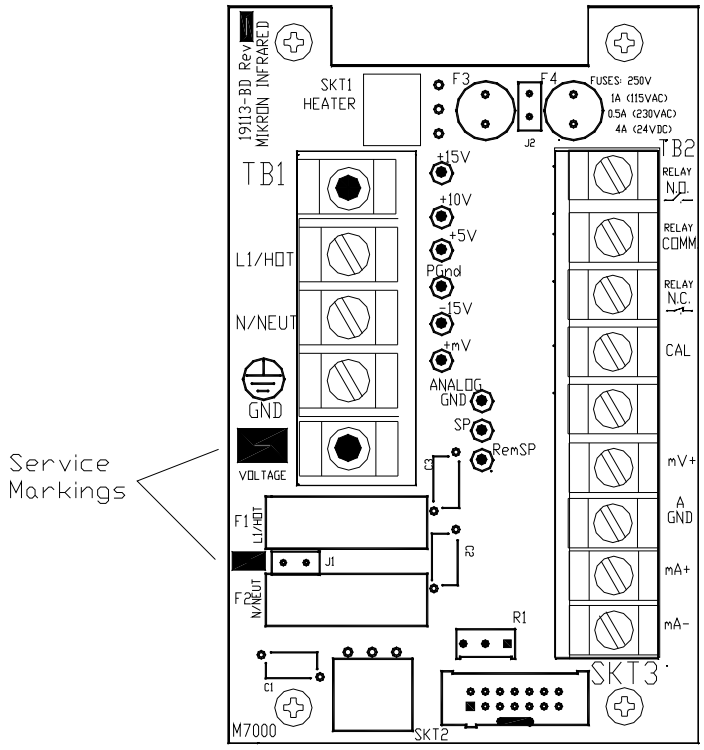

Service
Markings
19113-BD Rev I
MIKRON INFRARED
SKT1
HEATER
F3
F4
FUSES: 250V
1A (115VAC)
0.5A (230VAC)
4A (24VDC)
J2
TB2
TB1
+15V
+10V
+5V
PGnd
-15V
+mV
ANALOG
GND
SP
RemSP
L1/HOT
N/NEUT
GND
VOLTAGE
F1
F2
J1
C3
R3
R1
C1
RELAY
N.O.
RELAY
COMM
RELAY
N.C.
CAL
mV+
A
GND
mA+
mA-
SKT3
M7000
SKT2

Figure 3-1

3.2 Powering with 115 Volts AC ∼

Note:
Use wire gauge appropriate to service installation.
Voltage/fusing is factory set. Reference: Appendix A, for Power and Fuse requirements
Appendix E drawing 613-800, Service Connections.

Connect 115 VAC to Terminal TB1, as follows

- AC Hot to terminal labeled L1/HOT
- AC Neutral to terminal labeled N/NEUT
- AC Ground to Safety Ground stud

3.3 Powering with 220/230 Volts AC∼

Note:
Use wire gauge appropriate to service installation.
Voltage/fusing is factory set. Reference: Appendix A, for Power and Fuse requirements
Appendix E drawing 613-800, Service Connections.

North American Connection, as follows to TB1

- AC Hot1 to terminal labeled L1/HOT
- AC Hot2 to terminal labeled N/NEUT
- AC Ground to Safety Ground stud

European Connection, as follows to TB1

- AC L1 to terminal labeled L1/HOT
- AC N to terminal labeled N/NEUT
- AC Ground to Safety Ground stud

3.4 Powering with 24 Volts DC ⎓

Note:
Use wire gauge appropriate to service installation.
Voltage/fusing is factory set. Reference: Appendix A, for Power and Fuse requirements
Appendix E drawing 613-800, Service Connections.

Connect 24Vdc to Terminal TB1, as follows

- +24Vdc to terminal labeled 24Vdc
- 24V Return to terminal labeled RTN
- Ground to Safety Ground stud

3.5 Fusing

Mains:
Two fuses: F1 and F2 each are mounted within fuse holders on Terminal Output PC Board located directly under TB1

F1 is used for all power configurations.
F2 is used only in 220/230VAC applications.

Note: Factory installed F2 bypass jumper **J1,** is hardwired for 110VAC and 24Vdc systems

Heater:
Two fuses: F3 and F4 each are mounted within fuse holders on Terminal Output PC Board located near Heater connector SKT1.

F3 is used for all power configurations.
F4 is used only in 220/230VAC applications.

Note: Factory installed F2 bypass jumper **J2,** is hardwired for 110VAC and 24Vdc systems

Reference: Appendix A, for Power and Fuse requirements
Appendix drawing 613-800, Service Connections

3.6 Connection for Reading a Temperature Using mV Output

Outputs are linear 1 millivolt (mV) per degree over the calibrated temperature range. For example, 1256 mV's equals 1256°

NOTE: *When either in °F or °C the output is 1 mV/°. The mV output wiring should not be longer then fifteen feet; longer distances will put the output operational amplifier into self-oscillation resulting in errors in the milliamp output.*

Connections are made to terminal TB2 on the input/output board. Connect the positive wire to mV+ and negative wire to ANA GND. For bench testing use a standard voltmeter set to read at least 5 volts.

Connect millivolts to Terminal TB2 as follows

- Positive mV to mV+
- Negative mV to A_GND

3.7 Connection for Reading a Temperature Using mA Output

The 4-20mA current loop is a self-powered linear output for recorders or controllers requiring current loop feedback. The PULSAR II supplies its own 4-20mA current to a load. The 4-20mA is isolated from the AC ground. Loads up to 300 ohms maximum may be connected in SERIES. A signal of 4mA corresponds to the bottom-end temperature and 20mA corresponds to the top-end temperature, with points in between falling on a linear scale.

Connect 4-20mA loop to Terminal TB2 as follows

- Positive mA to mA+
- Negative mA to mA-

3.8 Calibration Check Circuit

The instrument is supplied with an electronic circuit check system that can be used to verify long term accuracy and as a troubleshooting tool during installation. Please note that the system does not qualify as an National Institute of Standards and Technology (NIST) traceable source. This check will be called CAL from this point on. If NIST certification is required, a yearly calibration schedule needs to be followed. Call Mikron for this service.

MIKRON/E2T recommends checking the electronic calibration on the bench. This procedure will build familiarity with the equipment and also reassure the operator that the system is working properly prior to installation.

The CAL control is a logic level signal (5 volts) going to ground when active. Do not use the CAL as a voltage source. To use the CAL system, a normally open switch is wired into the circuit. The switch is typically installed in the control room. MIKRON/E2T recommends a momentary switch to eliminate the possibility of the switch being left in the CAL position. Connections are made to terminal TB2 on the input/output board. Connect a wire to CAL and another wire to A_GND with the switch wired in the circuit. For bench testing a jumper wire is adequate.

For installation and troubleshooting, the CAL signal is an excellent source. It produces a known mA signal proportional to 1832°F (or 1000°C). This signal may be used in verifying the signal transmitted from the infrared thermometer. It is the same as is being received in the control room. The signal may also be used to confirm the scaling of the Programmable Logic Controller (PLC).

> **NOTE:** The CAL reading obtained from the PULSAR II is dependent on the instrument's emissivity setting. Lower emissivity settings will give higher CAL readings. Therefore, **it is required that you set the emissivity to 0.99 when checking to see if the CAL reading is 1832°F (or 1000°C**). After an initial check to verify that CAL is within specification at an emissivity of 0.99, you can set the emissivity to the value required for proper readings on the process or object being measured and note the CAL value for the emissivity setting. This new reading can be used as your new CAL value for later checks performed at the process emissivity setting.

Use the following procedure for bench testing with the CAL feature:

a. Apply power to the unit at least 30 minutes before checking the calibration.
b. Connect the voltmeter across mV+ and A_GND.
c. Short CAL and A_GND with a jumper wire. Verify a reading of 1832°F (or 1000°C) ±1% with the voltmeter.
d. If signal does not read within ±1% (±18°F (10°C)) of the CAL temperature, contact Customer Service.

3.9 Connecting the Setpoint

The setpoint provides a dry contact relay with a normally open or normally closed output for a high or low temperature alarm. The contact relay is rated .5A amp resistive at 120 VAC and 1 amp resistive at 24 VDC.

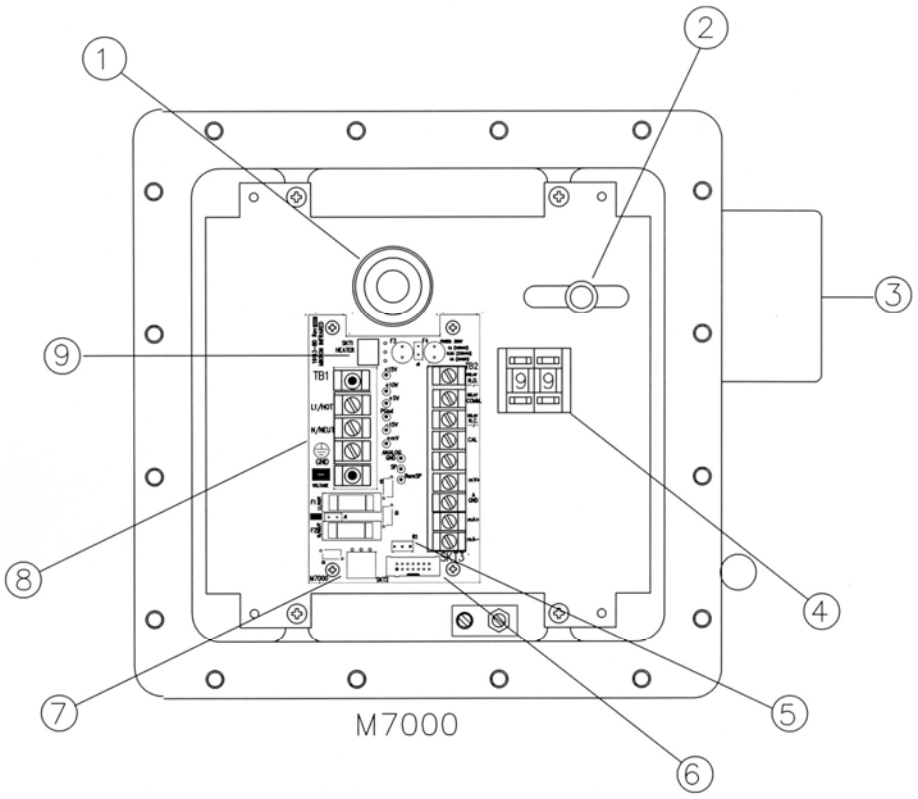
Connect relay to terminal TB2 as follows

- Relay COMMON to COM
- Relay NORMALLY OPEN to N.O.
- Relay NORMALLY CLOSED to N.C.

4. OPERATIONS

4.1 General Operations

This section covers the start-up procedures for operating the infrared thermometer after the unit has been installed in accordance with Sections 2 and 3. Included is the installation/start-up checklist, setpoint adjustment, backup and clean out probe.



1. Eyepiece Lens with Reticle
2. Focus adjust and Lens Locking screw
3. Objective Lens
4. Digital Emissivity
5. Set–point Adjust, R1
6. Signal I/O to Electronics
7. Mains Supply connector to Electronics
8. Output PCB
9. Heater connection

Figure 4.1

4.1.1 Installation/Start-up Checklist

Hazardous location Safety minder
At no time should the cover be removed unless power is switch-off first. When it is necessary to service instrument with the power applied ensure proper safe environmental conditions exists and that such maintenance is authorized and pursuant to safe conditions.

a. Remove top cover, sixteen M8 x 1.25 socket head screws.

b. Be sure the sight-path is clear.

c. Check that the optics are properly focused (See Section 2.3).

d. Connect AC power as described in Section 3, ELECTRICAL INSTALLATION. Allow at least 30 minutes warm-up before proceeding.

e. Connect short across TB2 (A_GND and CAL) located on the Output Terminal Board (see Figure 3.1) connections to verify a reading of 1000°C or 1832°F, whichever scale unit was ordered (See Section 3.6). If the reading is more than 1% above or below this reading, contact Customer Service. Since all detectors tend to slightly change performance with age, it is recommended the instrument be returned to Mikron for an annual calibration against a standard BLACKBODY Infrared Radiation Source.

f. Aim the PULSAR II at the object or process to be measured. Observe the output of the PULSAR II on the installed temperature display (optional) or with a voltmeter connected across the +mV and A_GND terminals. If the PULSAR II output does not seem to match the actual temperature, then an emissivity adjustment is necessary. Use the BUP-10 (See Section 4.5) to obtain the proper emissivity calibration temperature. Adjust the digital emissivity until the PULSAR II reads the correct temperature. See note in section 3.6 regarding affect of emissivity change on future calibration checks.

g. Replace the top cover and the sixteen M8 x 1.25 socket head screws.
Torque specification (50in-lbs, 5.5n-m).

h. Check for positive air flow and pressure to air connections if installed.

i. Verify temperature of PULSAR II housing is not above 120°F (50°C).

4.2 Three Spectral Ranges

The PULSAR II, Model 7000SR-EXP comes in three spectral ranges. The client must specify one of the following selections when ordering.

a. The FF measures average temperature in it's field of view.
b. The GT measures the hottest gas temperature in its field of view.
c. The RT measures the refractory, checker wall or tube sheet temperatures in its field of view.

4.3 Emissivity Adjustment

The PULSAR II Model 7000SR-EXP requires an efficiency adjustment (field calibration) to the furnace's full operating conditions. This is especially important with the introduction of O_2 enrichment and varying gas stocks to the process. The FF and GT spectral range models incorporate a digital emissivity adjustment mounted on top of the Electro-optical Package to compensate for these losses in combustion efficiency.

The field calibration is carried out by measuring the furnace temperature under normal operating conditions using MIKRON/E2T BUP-10. The BUP-10 consists of a sacrificial K-type thermocouple inserted through the BACKUP PROBE (BUP) adapter mounted in place of the viewport (VP-10) in the SWING-OUT FIXTURE (SOF-8). Recommended procedure for this measurement follows in section 4.5. The combustion temperatures of the infrared instrument and the thermocouple (T/C) are then compared. In most cases of infrared radiation efficiency loss, the PULSAR II will read less than the T/C. To compensate for this temperature difference, the emissivity value is changed on the digital emissivity adjustment to make the two temperatures agree. Once the emissivity is set, the PULSAR II will accurately track temperatures in the furnace. Introduction or removal of major furnace gas constituents may require a re-adjustment of the emissivity.

The RT spectral range can only be field calibrated with a dedicated refractory thermocouple installed in close proximity to the infrared thermometer's field of view. A process control adjustment can increase the thermometer's temperature reading if required by the thermocouple.

4.4 Setpoint Adjustment (Optional)

To set the setpoint temperature (voltage = 1mV/°) attach a voltmeter to +mV test point on the Output Terminal board (Refer Figure 3-1) Connect the positive side to (+mV) and the negative side to A_GND test point. Verify a reading and adjust R1 (trim pot) on the input/output board to the desired temperature.

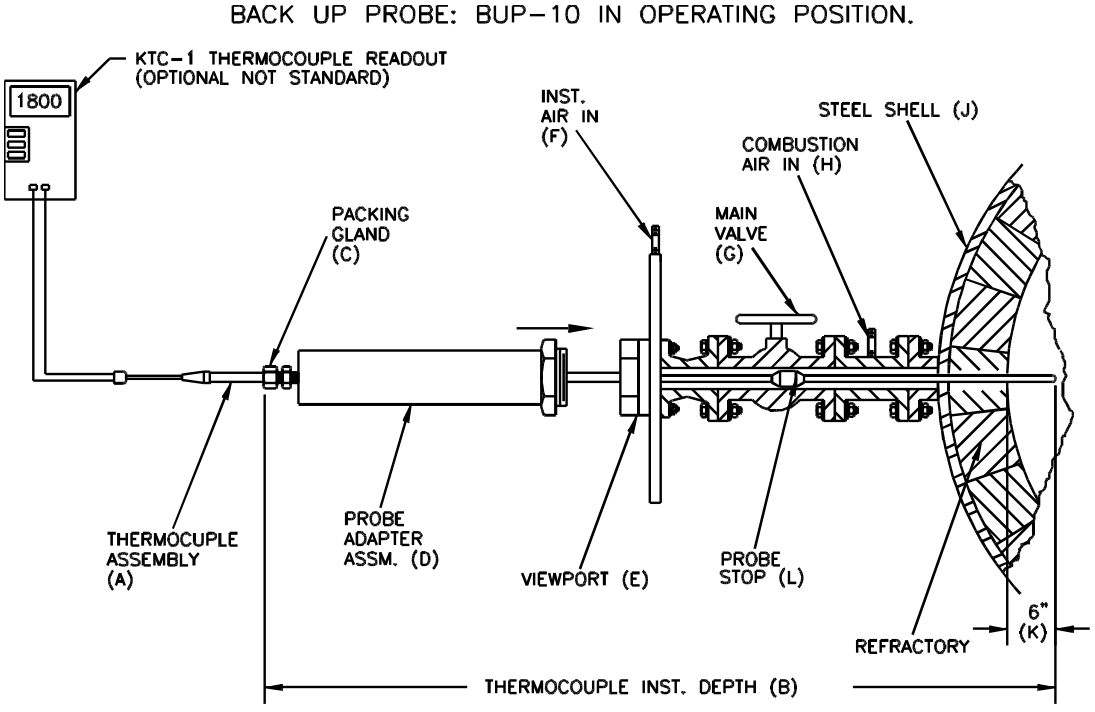


Figure 4-1

4.5 Operation of Backup Probe (BUP-10) Assembly

CAUTION: Always wear gloves when performing the following operation, the equipment may be very hot.

Reference: Figure 4-1

1. Swing infrared thermometer out of the line of path.
2. Close valve (G).
3. Turn off instrument airpurge (F). Ensure there is no "T" connection between combustion air in (H) and instrument air in (F). A line connecting (F) and (H) would bypass the valve and allow combustion gases to vent out when the viewport is removed.
4. Disconnect instrument air line to ensure there is no pressure between the valve (G) and the viewport (E).
5. Check for leakage of combustion gases. The gases leak past the valve seat and out through the instrument air in port (F).
6. If no flow is detected through port (F), remove the viewport Model VP-10 and unscrew the entire assembly with a large pipe wrench if necessary. WATCH FOR O-RING.
7. Screw Backup Probe Assembly Model BUP-10 into the seat where the Viewport Assembly was removed. Check the condition of the O-ring before installing the BUP. The same O-ring is required with the BUP.
8. Compute the length of (T/C) to be inserted through the BUP the following way:
   A. Measure the distance from the packing gland (C) to the outside surface of the reactor shell. To this distance add the shell thickness (usually a half to one inch), add the thickness of the refractory (usually 8 to 12 inches), then add six inches (k) for the distance the T/C should project beyond the inner surface of the refractory.
   B. Measure this total distance on the thermocouple beginning at the tip to be inserted and make a mark on the T/C sheath at this value.
   C. A probe stop must be installed. Insert the T/C into the assembly and then install the probe stop. Withdraw the probe stop 6 inches from the end of the T/C. The stopper is used to prevent accidental withdrawal of the T/C from the packing gland (C) prior to closing the main valve (G).
9. Push the T/C through the packing gland in the BUP-10 Assembly until the T/C stops against the closed valve. Back away from the valve about an inch and tighten the packing gland BY HAND until it is snug.
10. Reconnect the airpurge line (F) and open the instrument air valve. Ensure the pressure in the airpurge line is greater than in the reactor. Purge air should be felt discharging around the sheath of the T/C at the packing gland.
11. Open the main valve (G) slowly while determining combustion gases are not discharging around the sheath at the packing gland. If combustion gas is detected, close the main valve (G) IMMEDIATELY.
12. Insert the T/C farther into the reactor until the mark just disappears into the packing gland.
13. Observe the T/C output until the reading plateaus and changes less than 5° in15 seconds. This is considered steady state and will be a representative temperature of the combustion process.
14. Loosen the packing gland nut sufficiently to withdraw the T/C. Withdraw the T/C until the main valve (G) can be closed.
15. Close the main valve (G).
16. Turn off the instrument air (F) to the Swing-away Fixture (SOF) and remove the instrument air fitting to ensure ambient pressure in the adapter cavity.
17. Unscrew the BUP Assembly and T/C and remove from the SOF.
18. Replace the cleaned Viewport Assembly ensuring the O-ring is in good condition.
19. Reconnect the instrument air line (F) and apply instrument air pressure.
20. Open the main valve (G) and check system for any leaks.
21. Swing the infrared thermometer back into alignment and observe the temperature reading of the IR thermometer. The IR reading and the T/C reading should agree to within the accumulated accuracy of the two instruments. If not, adjust emissivity as described in section 4.3.

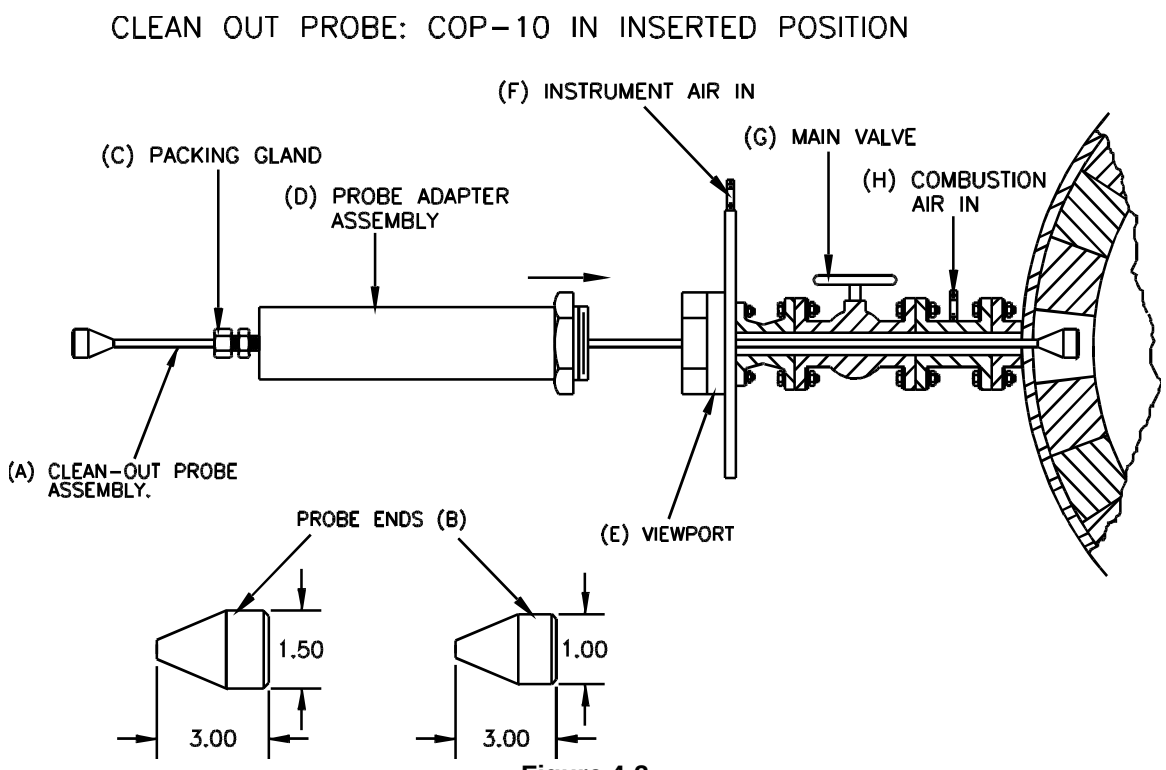


Figure 4-2

4.6 Operation of Clean-Out Probe (COP-10) Assembly ⚠

CAUTION: Always wear gloves when performing the following operation, the equipment may be very hot.

Reference: Figure 4-2

1. Swing infrared thermometer out of the line of path.
2. Close valve (G).
3. Turn off instrument airpurge (F). Ensure there is no "T" connection between combustion air in (H) and instrument air in (F). A line connecting (F) and (H) would bypass the valve and allow combustion gases to vent out when the viewport is removed.
4. Disconnect instrument air line to ensure there is no pressure between the valve (G) and the viewport.
5. Check for leakage of combustion gases. The gases leak past the valve seat and out through the instrument air in port (F).
6. If no flow is detected through port (F), remove the viewport Model VP-10 and unscrew the entire assembly with a large pipe wrench if necessary. WATCH FOR O-RING.
7. Remove the small probe end (B) from the ram rod and put it through the Probe Adapter Assembly (D). Reinstall the probe end onto the rod. Tighten the Packing Gland until it is snug and the COP-10 will slide in the packing gland.
8. Screw Clean-out Probe Assembly Model COP-10 into the seat where the Viewport Assembly was removed. Check the condition of the O-ring before installing the COP-10. The same O-ring is required with the COP-10.
9. Reconnect the airpurge line (F) and open the instrument air valve. Ensure the pressure in the airpurge line is greater than in the reactor. Purge air should be felt discharging around the sheath of the COP-10 at the packing gland.

10. Open the main valve (G) slowly while determining combustion gases are not discharging around the sheath at the packing gland. If combustion gas is detected, close the main valve (G) IMMEDIATELY.
11. Insert the COP-10 farther into the reactor pushing any debris out of the way.
12. Withdraw the COP-10 until the main valve (G) can be closed.
13. Close the main valve (G).
14. Turn off the instrument air (F) to the Swing-away Fixture (SOF) and remove the instrument air fitting to ensure ambient pressure in the adapter cavity.
15. Unscrew the BUP Assembly and COP-10, and remove from the SOF.
16. Reinstall the larger Probe end (B) and repeat steps 3-15.
17. Replace the cleaned Viewport Assembly ensuring the O-ring is in good condition.
18. Reconnect the instrument air line (F) and apply instrument air pressure.
19. Open the main valve (G) and check the system for any leaks.
20. Swing the infrared thermometer back into alignment and observe the temperature reading of the IR thermometer. The IR reading and the BUP-10 reading should agree to within the accumulated accuracy of the two instruments (See Section 4.5). If not, adjust emissivity as described in section 4.3.

5. TROUBLESHOOTING

5.1 Problem Isolation Checkout Procedure

This is an outline of what to do if the PULSAR II Model 7000SR-EXP is not working after the initial installation:

The following quick procedure should be performed before calling the factory.

5.1.1 Optical Alignment and Focus

The PULSAR II measures the temperature of the area inside the round reticle seen through the eyepiece. Check to see the reticle is actually centered on the desired target. To check the focus, move your eye back and forth across the eyepiece and verify that the target and the reticle in the eyepiece do not move relative to each other. Move the lens in or out to obtain correct focus.

5.1.2 Clear Sight Path and Clean Optics

Ensure that the PULSAR II is aligned properly by looking into the eyepiece. The round reticle in the center of the field of view should be sighting at the target. Look for any blockage in the sight path that would reduce the energy received by the PULSAR II.

Without a clear optical path the radiation from a target cannot reach the detector. If the viewport assembly, front window assembly, lens or mirror assembly become smeared, smudged or otherwise dirty, attenuation of the signal will occur; therefore abnormally low readings will result. Check the viewport, front window or lens by removing it and looking through it towards a light source. Look for dirt or heavy smudges. If the mirror assembly is dirty, clean according to the procedures in section 6.2. The internal mirror assembly under the eyepiece does not become dirty with normal use. Rarely will cleaning the internal optics be necessary. The lens should be cleaned whenever it becomes dirty. The frequency of this operation will depend on the environment.

5.1.3 Power Fuse

If Power input has been checked and +/- 15v is not measured on corresponding test point s (Reference **Figure 3-1** , Output Terminal PCB) then there is a possibility of a blown Fuse(s). This can easily be checked by inspection. Fuses marked F1 and F2 (if equipped) are located on the Output PCB just under TB1. Inspect and check for open condition.

5.1.4 Low-End Temperature Reading

With the PULSAR II swung away from looking into the reactor, check the low-end temperature reading on the +mV and ANA GND output. This is the bottom-end temperature of the unit.
It should be approximately 400°F (205°C) for RT and FF units
It should be approximately 600°F (315°C) for GT units

5.1.5 Electronic Calibration (CAL) Reading

Check the internal calibration (CAL) signal. The millivolt signal should read 1,832°F (or 1,000°C) ±1% (See Section 3.6).

5.1.6 Check Instrument Loops

Check the temperature display or recorder to ensure that the (CAL) signal is being transmitted through the loop to the control room display.

5.1.8 Broken Wire Harness

If the instrument appears to be working correctly, but the recording or control attachments are not receiving the proper signals, the problem may be due to a broken wire in the inter-connecting cables. Using field mA and mV calibrators or the ohm meter, check for continuity of all wiring.

5.1.9 Stopped Chopper Wheel

The signal reaching the detector is chopped to 500Hz AC by interrupting the signal with a multi-toothed wheel driven by a precision current motor. A large jolt such as dropping the instrument or banging it, could cause the wheel to stop. Indication of this problem is usually a non-rising low temperature reading even when looking at high temperatures. Inspect the wheel and motor for physical damage. When power is applied and the wheel will not rotate check to see if the wheel is hanging up on the detector bracket or the detector filter.

CAUTION: <u>DO NOT</u> try to bend the wheel or motor bracket. Instead, loosen the bracket mounting screws and re-adjust slightly until free movement is obtained.

5.1.10 Component Failure

Every PULSAR II is thermally cycled between 40°F (4°C) and 120°F (50°C) for a minimum of 48 hours during the pre-calibration procedure. Each detector is independently burned-in until a stable output is achieved. Inspection and quality control procedures assure the highest standards of component reliability. However, electronic components do fail randomly and may cause your instrument to function improperly.

Changing components in the field may require your unit to be re-calibrated by the factory. Other than fuses, replacement of PC board components is strongly discouraged and may compound the problem.

To perform the recalibration procedure requires the following laboratory equipment:

a. A standard instrument repair shop with the usual electronic diagnostic tools, such as scopes, voltmeters, power supplies and frequency generators.
b. A BLACKBODY standard radiator source traceable to NIST, covering the temperature range from 400°F (205°C) to 3000°F (1650°C).
c. An optical alignment bench with variable aperture and a constant temperature infrared source.
d. A computer capable of "burning" proms (programmable read only memory chips) compatible with the MIKRON/E2T program.

The factory will assist the client with detailed calibration procedures and procurement of necessary equipment should the client wish to establish an infrared thermometer calibration capability.

A two-day Technician Training Course complete with test fixtures and standard BLACKBODY radiator is available from the factory.

5.2 Client Service

Now that you have purchased your system, we want to do everything possible to keep it on line. Should a need for service or repair arise, follow these steps:

a. Call our factory direct at 1 201 405 0900 and ask for Customer Service

b. Explain the problem and we may be able to solve it over the phone. The person handling your call will ask for some pertinent information to try to determine the nature of the problem. Please have your Model and serial number handy.

c. If it appears the problem cannot be solved over the phone, you will be asked to return the unit to the factory. After issuing a P.O. for the fixed repair cost, obtain an RMA number from Mikron Infrared Inc

d. Package the instrument, including cables and accessories if possible, in a sturdy container that is appropriate for the method of shipment. Secure it with plenty of packing material. Please enclose a packing slip with a list of everything you are returning, the reason for the return, and the name and phone number of the person we should contact (preferably the user) if we need any more information.

e. Ship prepaid and ensured to:

Mikron Infrared, Inc.
RMA # _____
16 Thornton Road
Oakland, NJ, 07436, USA
Tel: 1 (201) 405-0900
Fax: 1 (201) 405-0090

6. MAINTENANCE

6.1 General Maintenance

Hazardous location Safety minder
At no time should the cover be removed unless power is switch-off first. When it is necessary to servicing instrument with the power applied insure proper safe environmental conditions exists and that such maintenance is authorized and pursuant to safe conditions.

Reference: Section 7 Safety Assurances and Precautions

The PULSAR II Model 7000SR-EXP is designed so that the instrument does not have to be returned to the factory for periodic recalibration if NIST traceability is not required. The built-in "electronic calibration" (CAL) system provides a known signal intensity to check the calibration (and performance) at any time or on a routine basis. If NIST traceability is required, an annual recalibration service is offered at the factory.

Repairs performed without affecting instrument performance are replacement of MOV components on the power supply and Terminal Output boards. Repairs to; Output terminal board, heater assemblies, switches, interconnecting cables, connectors, eyepiece and lens and Front Window Assembly.
Components in the "calibration" system may not be replaced.

Chopper Motor repair:
The primary failure mode of Chopper motor is bearing failure. It is noticeable by an excessive whining noise as it runs. Replacement is recommended

Any damage to the instrument affecting the optical alignment or critical electronic components usually requires the instrument to be returned to the factory for repair. The turnaround time including shipping from a USA client is usually 2-3 weeks, from an international client is 4-6 weeks.

It is recommended that a spare or backup unit be procured with the acquisition of your **original equipment** if the PULSAR II is to be used in a critical control installation.

Only the Electro-optical Package is required as a spare unit.

6.2 Cleaning the Optics

The optics of the PULSAR II consist of a lens, an eyepiece and a specially coated front surface mirror mounted on a special bracket. These components are located within the Electro-optical Package and will remain clean under normal conditions, provided the enclosure remains sealed at all times with O-rings in place. MIKRON/E2T does not recommend cleaning the optics other than the objective lens. A complete cleaning requires disassembly of the optical train and will destroy the calibration.

To clean the objective lens, remove the Electro-optical Package from the Explosion-proof Enclosure. Use facial tissue dipped in rubbing alcohol (Isopropyl 70%). If it is especially dirty, use a lens cleaning solution. Press softly or the lens may become loose or dislodged. Blow off lint, then replace the Electro-optical Package in the Explosion-proof Enclosure.

Hazardous location Safety minder

At no time should the cover be removed unless power is switch-off first. When it is necessary to service instrument with the power applied ensure proper safe environmental conditions exists and that such maintenance is authorized and pursuant to safe conditions.

6.3 Cleaning or Changing The Viewport Window (VP-10)

1. Close ball valve.
2. Loosen Swing-out Wing Nut Lock and rotate out of slot.
3. Swing Sensor Assembly sufficiently to have clear access to viewport. Turn off airpurge and disconnect line to bleed pressure (Drawing # 600-227, Appendix E).
4. Check for combustion gas leak
5. Unscrew the Viewport Assembly counterclockwise. Three-inch flats have been provided for a wrench. Do not damage or lose the O-ring.
6. Remove viewport and clean with a soft cloth. Alcohol, water or solvents may be used if applied carefully. DO NOT SOAK: damage to the O-rings may result. If the window is scratched or cracked, replace.
7. Replace O-rings in seat; substitute a new O-ring if old one is damaged.
8. Screw viewport back in place clockwise. Tighten with wrench to 6 ft. lbs.
9. Swing Sensor Assembly back to lock position.
10. Rotate wing nut into slot and tighten finger tight.
11. Turn on airpurge.
12. Open ball valve.
13. Verify that airpurge flow is at least 1 SCFM.
14. Check for leaks. If detected, close ball valve immediately.

6.4 Replacing Window In Viewport Assembly VP-10

1. Remove Viewport Assembly VP-10 from Swing-out Fixture according to steps 1 to 5 in section 4.5.
2. Remove 4 Allen Head 3/16" screws from retaining cover.
3. Separate retaining cover from rest of assembly.
4. Remove window. (Pyrex for FF and RT units, Sapphire for GT)
5. Replace damaged O-rings.
6. Install new window.
7. Replace retaining cover.
8. Install 4 Allen Head 3/16 screws. Tighten to 6 ft. lbs.
9. Replace VP-10 in Swing-out Fixture according to steps 6 to 13 in section 6.3.

6.5 Calibration: Traceability to NIST

All MIKRON/E2T infrared thermometers are calibrated to BLACKBODY RADIATION STANDARDS traceable to the NIST. Our calibration standards are recalibrated each year to ensure we maintain our equipment traceable to the Institute. Although our pyrometers are of the finest quality, they are subject to electrical and mechanical wear which may cause performance variation over time.
MIKRON/E2T recommends recalibration yearly.

7. Safety Assurances and Precautions 

7.1 Hazardous Environment Safety:

The M7000-EXP enclosure is designed to hold an explosion inside the housing and release the hot gases slowly enough to allow them to cool sufficiently as to not ignite the explosive gases outside the housing. It is important to take care of the mating surfaces between the housing and its lid. It is important to torque lid bolts to specification.

Factory inspections, assembly and test procedures are strictly followed to ensure highest; quality, integrity and functionality of the Explosion Proof Housing. Use care when reassembling to maintain gasket and surface integrity. Deep scratches or gouges could allow gases to be released at excessively high temperatures during an explosion.

- When servicing Instrument ensure Main Power is disconnected or switched off. Allow Instrument 20 minutes to cool down prior to opening.
- When connecting electrical wiring to circuit board ensure wires are properly secured to prevent accidental shorting or a hazardous live condition in the event screws loosen.
- Check and secure Safety Ground connections just prior to lid closure.
- When attaching utility conduit ensure at least 5 threads are engaged and appropriate seal fittings and practices are followed in accordance to manufacturer's Explosion Proof practices
- When replacing top cover, the sixteen M8 x 1.25 socket head screws must be torque to specification (50in-lbs, 5.5n-m).
- When air is used: ensure positive air flow and pressure to air connections. Refer to Appendix A for ratings.

  Note: air purge is not required to maintain Explosion proof rating.
- Ensure surface temperature of Explosion proof housing does not exceed 120F (50C). Cooling may be required.
- Hazardous Classifications

  Refer to Appendix B ' Area Classifications and Protection concepts ' for details

Safety Assurances and Precautions continued

7.2 Electrical Service protection:

Over-current protection / service switch: It is necessary to incorporate an external over-current protection device appropriate to the instrument's service and to include a disconnect switch located near the instrument. The service disconnect should be clearly marked as pertaining to this instrument.

Over-voltage protection:
Max applied voltage must not exceed limits indicated below:

260∽ Terminal Block 1 (TB1) between terminals or any terminal and GND ⏚.

120∽ Terminal Block 2 (TB2) terminals 2, 3, 4 between terminals or any terminal and GND ⏚ .

24Vdc⎓ Terminal Block 2 (TB2) terminal 1, 2 between terminals or any terminal and GND ⏚.

Transient Protection:
Transients must not exceed 2.5kV between any terminal or any terminal and GND. The electronics provide some protection against transient as per EN61326-1 EMC Immunity. However, if higher transients are expected it is recommend to include transient protection devices as part of service installation.

Wiring:
Confirm service type and check that Service markings correspond to expectations. When wiring, follow local code regulations. Secure power input lines together after connection to terminal block to prevent an accidental hazardous live condition in the event a terminal screw becomes loose. Sleeve or tie wrapping is acceptable. Check to ensure power is not accidentally connected to low voltage I/O terminal block TB2.

Reference: Section 3. Electrical Installation for power service installation details.

Protective Ground connection:
Connect protective Earth conductor as instructed in Section 3. Electrical Installation. Earth Ground connection is located on the inside surface of housing denoted by the following symbol.

APPENDIX A: SPECIFICATIONS

TEMPERATURE RANGE	
Single Continuous Scale Computer Calibrated Scale to your specification	400 - 3000°F 200 - 1650°C up to 5500°F up to 3000°C
ACCURACY	±1% Reading or ±5°C ±1 Digit, whichever is greater
RESPONSE TIME	Switchable internally from .5 sec to 5 sec; consult factory. Response times as fast as 30 milliseconds available; consult factory.
OUTPUT	1 mV/° and 4-20mA
RELAY CONTACTS	120Vac 0.5A , 24Vdc 1A , Resistive
EMISSIVITY ADJUSTMENT	0.01 to 0.99 digital
FOCUSING RANGE	20" to infinity - Standard As close as 7" with optional lenses
TARGET SIZE	$S = \frac{3+D}{150}$ Standard Resolution Where S = Target Size in Inches D = Distance to Target in Inches
POWER RATINGS	115 ~ ± 5%, 50/60 Hz (standard) 220 ~ ± 5%, 50/60 Hz (optional) 24V +/-20%, (optional) 95 Watts, 12Watts without Heater
FUSING	ELECTRONICS: 115 ~ .250A,'T' Time-Lag 5x20 Little fuse type 218.250 220 ~ .125A,'T' Time-Lag 5x20 Little fuse type 218.125 24Vdc 1A,'T' Time-Lag 5x20 Little fuse type 218.001 HEATER : 115 ~ 1A, Fast TR5, Wickman 370-1100 220 ~ 0.5A, Fast TR5, Wickman 370-0500 24Vdc—4A, Fast TR5, Wickman 370-1400
AMBIENT TEMPERATURE LIMITS	A. 40 to 120°F (4 to 50°C) with no cooling B. -40 to 200°F (-40 to 93°C) with cooling base & 10 GPH water flow at 60°F C. -40 to 175°F (-40 to 80°C) with vortex air cooler (optional) with 100 psig source and electric heater installed D. The water cooling method can accommodate higher ambient temperature by increasing flow rate; consult factory.

Appendix A, continued

HAZARD CLASSIFICATION Reference Appendix B: Area Classifications / Protection concepts	Explosion Proof, prevent flame propagation CSA Class 1, Division 1, Groups C and D Class 1, Division 2, Groups A through D Temp code – T4A Enclosure Type – 4X CENELEC/ATEX approved Zone 1 Type : EExd IIB T4
TORQUE SPEC, LID BOLTS	50in-lbs,+/-5 ; 5.5N-m
AIR	Housing Purge: 1 psig min. (10psig max) , .5 SCFM min. View port purge 20psig min., 1 SCFM
COOLING	WATER: 10 gph (37.8 lph) AIR: Vortex, V208-15-L, 10SCFM minimum Reference manufacture data for pressure specs.
WEIGHT / DIMENSIONS Explosion proof housing	48 Pounds (22 Kg) / 5x12.5x8.5in (127x318x217mm)
MODELS AVAILABLE	FF-Average Integrated Temperature. GT-Gas Temperature. RT-Refractory Temperature.

APPENDIX B: Area Classification / Protection concepts

Label Markings

European markings and classification for M7000-EXP

Equipment Group II and Equipment Category 2,

Equipment Group II: Above ground, High level, Single fault protection required
Equipment Category 2: Electrical in Hazardous areas , excluding Mining
Explosive atmosphere type G ; gas, vapor or mist. Area Classification: Zone 1


II 2 G, EEx d IIB T4

European Community **Ex**plosion protection standard and environment :
Ex d : "Flameproof Enclosure" Protection Type, CENELEC standard: EN 50018, 2002
By method of containing the explosion, prevents flame propagation in the event of a failure

IIB : Explosion proof Gas Grouping based on type testing

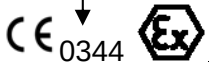
T4A: Temperature code: maximum surface temperature will not exceed 1358C (2758F)
Pertinent when considering gas ignition temperatures that may come in contact

CENELEC : European Committee Norms for Standardization ELECtrical equipment

CE declaration and Notified Body markings:

CE declaration mark, conformance to applicable Equipment Directives

Notified Body Identification number involved in quality of manufacturing systems


0344
II 2 G, EEx d IIB T4
KEMA 03ATEX2378

Identification of the Notified Body providing product certification, followed by the ATEX EC-Type examination certificate number.

APPENDIX B: Area Classification / Protection concepts

Label Markings continued

CSA markings and classification for M7000-EXP:

Contains the explosion, prevents flame propagation

Class 1, Division 1, Groups C and D; T4A
Class 1, Division 2, Groups A,B,C&D; T4A
Enclosure Type 4x

Defined by Article 500 NEC; Class, Division and Gas Groups:
Location Classification I (**Class 1**) : flammable gases or vapors

Hazard probability Division 1 (**Div 1**): Intermittent or High probability of explosive atmosphere present during normal operation
Division 2 (**Div2**) : abnormal conditions, low probability during operation

Gas/Vapor Groups: A through D

T4A:
Temperature code: maximum surface temperature will not exceed 120°C (248°F)

Enclosure Type 4X:
Indoor / Outdoor type; Protection from; corrosion, wind blown dust and rain, splashing water, hose directed water, external formation of ice.

Where a given location is classified as hazardous, it should not be difficult to determine in which of the three classes it belongs. Common sense and good judgment must prevail in classifying an area that is likely to become hazardous and in determining those portions of the premises to be classed Division 1 or Division 2.

Protection Concepts, Article 500

Sections 500-5, 500-6, and 500-7 recognize three classes of hazardous (classified) locations having varying degrees of hazard, and each class is subdivided into two divisions. The requirements for Division 1 of each class are more stringent than those for Division 2.

The hazards of the three classes are defined as follows:

Class I, flammable gases or vapors;
Class II, combustible dust;
Class III, combustible fibers or filings.

500-5. Class I Locations. Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Class I locations shall include those specified in (a) and (b) below.

(a) Class I, Division 1. A Class I, Division 1 location is a location: (1) in which ignitable concentrations of flammable gases or vapors can exist under normal operating conditions; or (2) in which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or (3) in which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

(FPN): This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another; interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used; locations containing open tanks or vats of volatile flammable liquids; drying rooms or compartments for the evaporation of flammable solvents; locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where flammable liquids are used; gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers; and all other locations where ignitable concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

(b) Class I, Division 2. A Class I, Division 2 location is a location: (1) in which volatile flammable liquids or flammable gases are handled, processed or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or (2) in which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of the ventilating equipment; or (3) that is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

(FPN No. 1): This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used but which, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

(FPN No. 2): Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Locations used for the storage of flammable liquids or of liquefied or compressed gases in sealed containers would not normally be considered hazardous unless subject to other hazardous conditions also.

Electrical conduits and their associated enclosures separated from process fluids by a single seal or barrier shall be classed as a Division 2 location if the outside of the conduit and enclosures is an unclassified location.

500-6. Class II Locations. Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations shall include those specified in (a) and (b) below.

(a) Class II, Division 1. A Class II, Division 1 location is a location: (1) in which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures; or (2) where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes; or (3) in which combustible dusts of an electrically conductive nature may be present in hazardous quantities.

(FPN): Combustible dusts which are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and woodflour, oil meal from beans and seed, dried hay, and other organic materials which may produce combustible dusts when processed or handled. Electrically conductive dusts are dusts with a resistivity less than 10^5 ohm-centimeter. Dusts containing magnesium or aluminum are particularly hazardous and the use of extreme precaution will be necessary to avoid ignition and explosion.

(b) Class II, Division 2. A Class II, Division 2 location is a location where combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment and where combustible dust accumulations on, in, or in the vicinity of the electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or may be ignitable by abnormal operation or failure of electrical equipment.

(FPN No.1): The quantity of combustible dust that may be present and the adequacy of dust removal systems are factors that merit consideration in determining the classification and may result in an unclassified area.

(FPN No. 2): Where products such as seed are handled in a manner which produces low quantities of dust, the amount of dust deposited may not warrant classification.

500-7. Class III Locations. Class III locations are those that are hazardous because of the presence of easily ignitable fibers or filings, but in which such fibers or filings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures. Class III locations shall include those specified in (a) and (b) below.

(a) Class III, Division 1. A Class III, Division 1 location is a location in which easily ignitable fibers or materials producing combustible filings are handled, manufactured, or used.

(FPN No. 1): Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing

plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.

APPENDIX B: Protection Concepts, Article 500, continued

(FPN No. 2): Easily ignitable fibers and filings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(b) Class III, Division 2. A Class III, Division 2 location is a location in which easily ignitable fibers are stored or handled.

Definitions and Abbreviations

PULSAR II MODEL 7000SR-EXP MANUAL

Many terms in this manual may be unfamiliar to you. Also, the custom of using shortcuts in referring to products and systems creep into the manual from time to time. This section is included to help you identify the terms used and relate them to the references in the manual.

ADAPTER	That fixture through which a Thermocouple (T/C) may be inserted into the reactor while under full operating conditions.
BACKUP PROBE ASSEMBLY (MODEL BUP-10)	A sub-system consisting of an ADAPTER and a THERMO-COUPLE (including a T/C stop).
BULKHEAD PLATE	That portion of the SOF-8 which bolts to the client's Ball Valve.
CLEAN-OUT PROBE ASSEMBLY (MODEL COP-10)	A sub-system consisting of an ADAPTER (the same one used in the BUP-10) and a stainless steel rod onto which different size rams may be screwed. The function of the COP-10 is to clear clogged sight paths into the reactor during operations.
COOLING CAVITY	A cavity cast into the bottom of the Explosion-proof Enclosure through which either water or air can be pumped through for cooling. It is separate from the electronics cavity.
EXPLOSION-PROOF ENCLOSURE	The enclosure is designed to hold an explosion and release the hot gases slowly enough to allow them to cool sufficiently as to not ignite the explosive gases outside the enclosure.
IR	Abbreviation for INFRARED.
K TYPE	Denotes a thermocouple (T/C) in a 1/4" diameter stainless steel sheath capable of measuring temperatures through the BUP Adapter in the reactor. Maximum temperature is approximately 2500°F (1370°C).
NIST	NATIONAL INSTITUTE OF STANDARDS and TECHNOLOGY in the USA.

DEFINITIONS AND ABBREVIATIONS continued

PULSAR II MODEL 7000SR-EXP	The complete Sulfur Recovery Reactor (furnace) Temperature Measuring SYSTEM consisting of: 1. M7000 with Explosion-proof Enclosure. 2. Swing-out Fixture Model SOF-8. 3. Viewport Model VP-10 (incorporated in the SOF-8). The FF Model measures average integrated temperature. The GT Model measures gas temperature. The RT Model measures refractory temperature.
REACTOR	Reaction Furnace, Sulfur Reactor or Furnace.
SOF-8	A fixture which allows the operator to swing the PULSAR II away from the viewport for access.
SRU	Sulfur Recovery Unit.
T/C	Abbreviation for THERMOCOUPLE.
V-208-15-L	A VORTEX AIR-COOLING device used when water cooling is not available or convenient.
VP-10	A VIEWPORT ASSEMBLY consisting of a Pyrex or Sapphire window mounted in a housing which screws into the SOF-8 BULKHEAD PLATE.

APPENDIX C: Declaration of Conformity / Certificates

CSA INTERNATIONAL

Certificate of Compliance

Certificate: 1127146 ((LR102584)) **Master Contract:** 184781

Project: 2206483 **Date Issued:** 2009/10/20

Issued to: **Mikron Infrared Inc.**

16 Thornton Rd
Oakland, NJ 07436
USA
Attention: Michael MacBurney

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

C US

Mitchell Rushing

Issued by: Mitchell Rushing

PRODUCTS

CLASS 4868 01 - TEMPERATURE-INDICATING AND REGULATING EQUIPMENT - For Hazardous Locations

CLASS 4868 81 - TEMPERATURE-INDICATING AND REGULATING EQUIPMENT - For Use in Hazardous Locations - Certified to US Standards

4868 01 - TEMPERATURE INDICATING AND REGULATING EQUIPMENT - For Hazardous Locations

4868 81 - TEMPERATURE INDICATING AND REGULATING EQUIPMENT - For Hazardous Locations – Certified to US Standards

Class I, Division 1, Groups C and D.

Class I, Division 2, Groups A, B, C and D, Temperature Code T4A.

Model 7000-EXP Temperature Measurement System; Enclosure Type 4X

Supply Rated 120Vac/1A, 240Vac/0.5A, 50/60Hz; or 24Vdc/4A

Output: 4-20mA or mV/oC

Model 7000SR-EXP PULSAR III Temperature Measurement System; Enclosure Type 4X.

DQD 507 Rev. 2009-09-01

APPENDIX C: Declaration of Conformity / Certificates

CSA INTERNATIONAL

Certificate:	1127146 ((LR102584))	**Master Contract:**	184781
Project:	2206483	**Date Issued:**	2009/10/20

Supply Rated 24Vdc/5A.

Output: 4-20mA, 2 channels.

APPLICABLE REQUIREMENTS

CSA Standards:

C22.2 No. 0-M1991 - General Requirements - Canadian Electrical Code Part II.

C22.2 No.0.4-04 - Bonding of Electrical Equipment

C22.2 No.0.5-M1982 - Threaded Conduit Entries

C22.2 No.24-M1993 - Temperature Indicating and Regulating Equipment

C22.2 No.30-M1986 - Explosion-Proof Enclosures for Use in Class I Hazardous Locations.

C22.2 No. 94-M91 – Special Purpose Enclosures

C22.2 No.213-M1987 - Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations.

US Standards:

UL 50 Eleventh Edition – Enclosures for Electrical Equipment

UL873-Eleventh Edition, Temperature Indicating and Regulating Equipment

UL1203-Third Edition, Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations

UL1604-Third Edition, Electrical Equipment for Use in Class I and Class II, Division 2 and Class III Hazardous (Classified) Locations

DQD 507 Rev. 2009-09-01

KEMA

(1) **EC-TYPE EXAMINATION CERTIFICATE**

(2) Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC

(3) EC-Type Examination Certificate Number: **KEMA 03ATEX2378** Issue Number: **3**

(4) Equipment: **Temperature Measurement System Model 7000-EXP and 7000-EXP PULSAR III**

(5) Manufacturer: **Mikron Infrared, Inc**

(6) Address: **16 Thornton Road, Oakland, NJ 07436, USA**

(7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) KEMA Quality B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential test report number 213071100.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014 : 1997 + A1, A2 **EN 50018 : 2000**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment according to the Directive 94/9/EC. Further requirements of the directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

Ex **II 2 G EEx d IIB T4**

This certificate is issued on February 18, 2010 and, as far as applicable, shall be revised before the date of cessation of presumption of conformity of (one of) the standards mentioned above as communicated in the Official Journal of the European Union.

KEMA Quality B.V.

T. Pijpker
Certification Manager

Page 1/2

PRODUCTS RvA C 067

KEMA Quality B.V. Utrechtseweg 310, 6812 AR Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 26 3 56 20 00 F +31 26 3 52 58 00 customer@kema.com www.kema.com Registered Arnhem 09085396

Experience you can trust.

KEMA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate KEMA 03ATEX2378 Issue No. 3**

(15) **Description**

The temperature Measurement System Model 7000-EXP and 7000-EXP PULSAR III are designed for infrared measurement of the temperature of an object.

Ambient temperature range -40 °C to +60 °C.

Electrical data

Model 7000-EXP
Power supply : 120 Vac, 1 A; 240 Vac, 0.5 A: 50/60 Hz or 24 Vdc, 4 A.
Output signal : 4-20 mA

Model 7000-EXP PULSAR III
Power supply : 24 Vdc, 5 A
Output signal : 4-20 mA, 2 channels

Installation instructions

The instructions provided by the manufacturer shall be followed in detail in order to assure safe operation of the equipment.

(16) **Test Report**

KEMA No. 213071100.

(17) **Special conditions for safe use**

Model 7000/GT-EXP only: the front IR sensing window shall be protected by installation against impact energy levels of more than 1 J.

(18) **Essential Health and Safety Requirements**

Assured by compliance with the standards listed at (9).

(19) **Test documentation**

As listed in Test Report No. 213071100.

MEAN-P-Ex30 v2.1 Page 2/2

MIKRON INFRARED

Declaration of Conformity

According to EN45014

Manufacture:
Mikron Infrared Inc., 16 Thornton Rd, Oakland NJ 07436, USA

Product Type:
Non-Contact IR Temperature Pyrometer, for use in potentially explosive atmospheres

Model:
Mikron Infrared/E2T M7000 -EXP

Council Directives:
ATEX 94/9/EC Equipment / Protective systems for use in Potentially Explosive Atmospheres
89/336/EEC Electro-Magnetic Compatibility (EMC)
73/23/EEC Low Voltage Directive

Conformance to the foll owing CENELEC Standards:

EN 50014 : 1997,
Electrical apparatus for potentially explosive atmospheres – General requirements

EN 50018 : 2002,
Electrical apparatus for potentially explosive atmospheres - Flameproof enclosure 'd'

EN61326: 2001
Electrical equipment for measurement, control and laboratory use – EMC requirements. Classification: Industrial Locations

EN61010-1: 2001
Safety requirements for Electrical Equipment measurement, control and laboratory use, Part 1: General requirements.

Year of Conformity Assessment : 2003

Authority

Date of Issue: 8/15/03

K. Irani, CTO

APPENDIX D: Statement Of Limited Warranty, New Instruments

Mikron Infrared Corporation hereby warrants said instruments for a period of **twelve (12) months** from date of shipment from our facility in Oakland New Jersey. Further, Mikron Infrared Corporation warrants the temperature measurement instrument(s), components, subassemblies, described herein, shall be free from material defects and/or workmanship, provided the instrument is used in the prescribed manner under normal and established conditions as set forth in this manual and has not been subject to abuse. Further this warranty shall be declared null and void if this unit was modified or altered.

During operation of the instrument in the twelve (12) month aforementioned time period, should a defect be detected that causes the temperature measurement instrument(s) to fail, the customer shall contact Mikron to obtain a return authorization number prior to sending the unit to the Oakland New Jersey facility. Failure to display the proper RA (return authorization) number on the outside of the container, and on all internal return documents could result in the unit being returned to the customer in a non repaired state and additionally incur return shipping and freight charges.

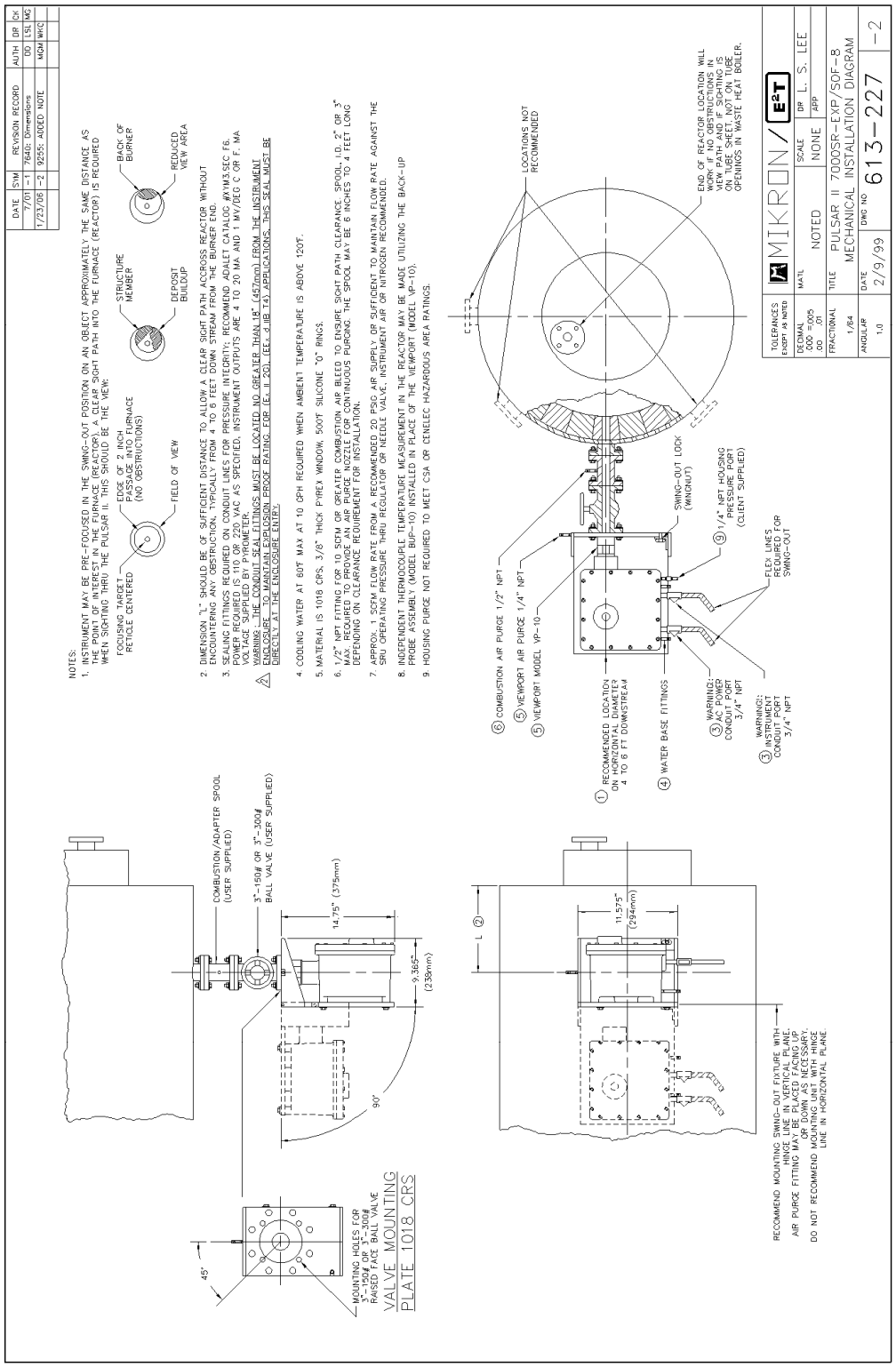
The customer's/end user's sole and exclusive remedy in the event of a perceived or real defect is herein and expressly limited to the correction of said defect(s), at Mikron Infrared Corporation's election and expense. There shall be no obligation on the part of Mikron Infrared Corporation to repair or replace items, components, and subassemblies, which by their nature and use are deemed expendable.

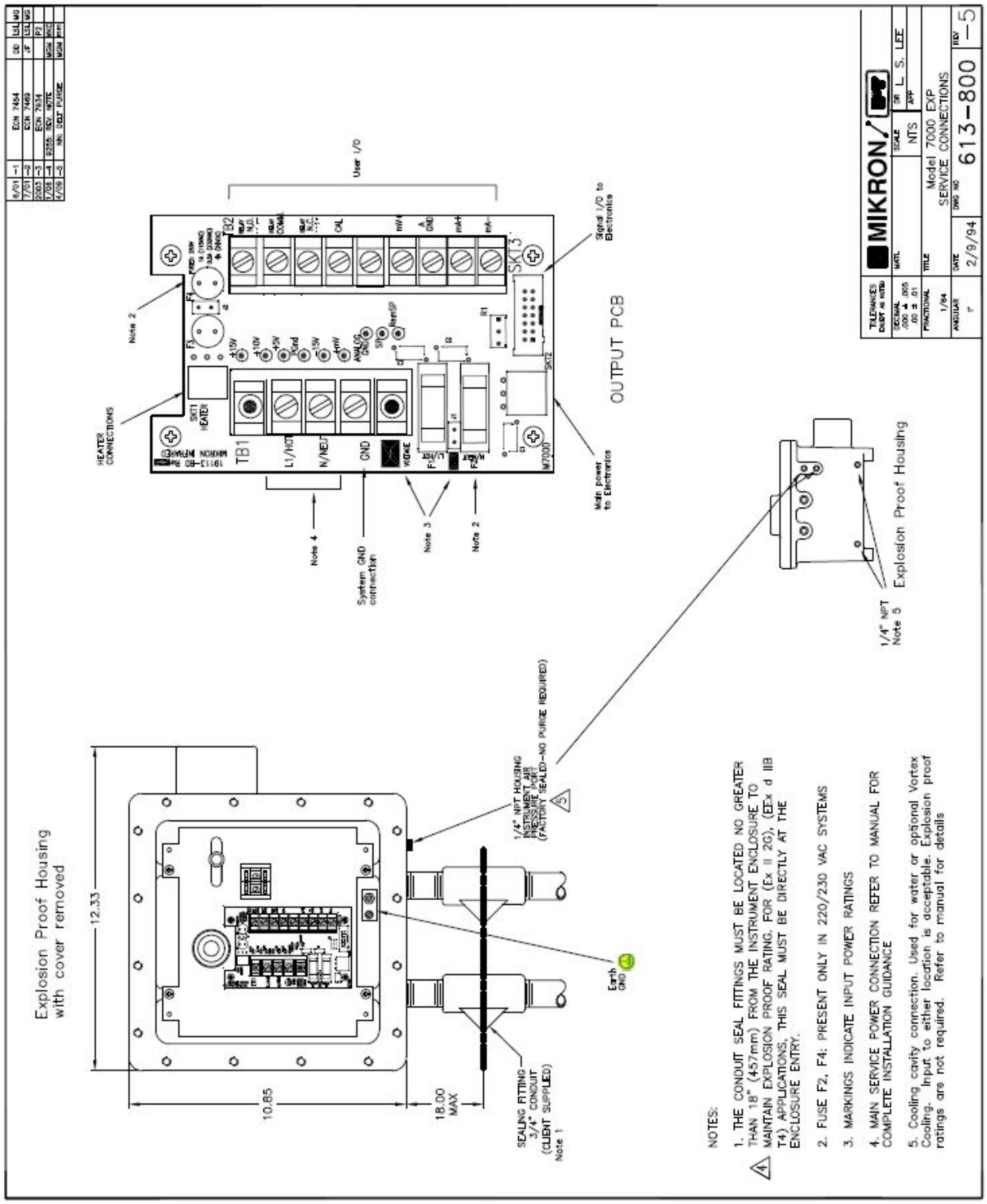
No further representation, or affirmation of fact, including, but not limited to, statements regarding capacity, suitability for use, or performance of, said equipment shall be or be deemed, to infer or be implied to be a warranty or representation by Mikron Infrared Corporation. No representative of Mikron Infrared Corporation has real or vested authority to change or modify this governing agreement.

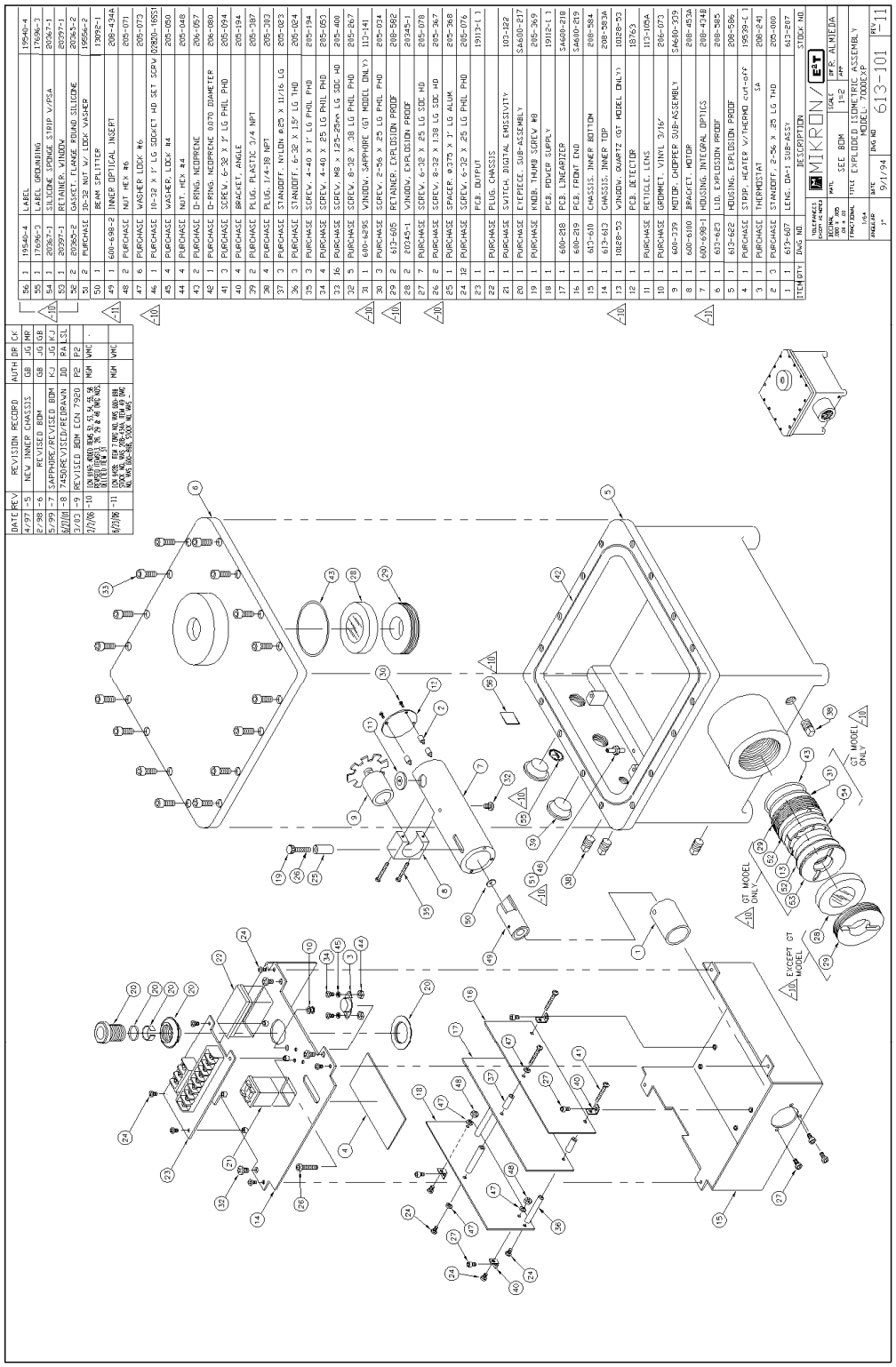
Except as specified and provided in the declaration and agreement, there are NO OTHER WARRANTIES, express or implied, including, but not limited to, any implied warranty, or merchantability, or fitness for a specific application or purpose. IN NO EVENT, shall Mikron Infrared Corporation be subject to, or be held liable for, loss of real or implied, materials, cash receipts/entries, benefits, and damages, (direct, indirect, special, consequential), or other similar related or non- related damages, that may arise out of any breach of this governing warranty or otherwise.

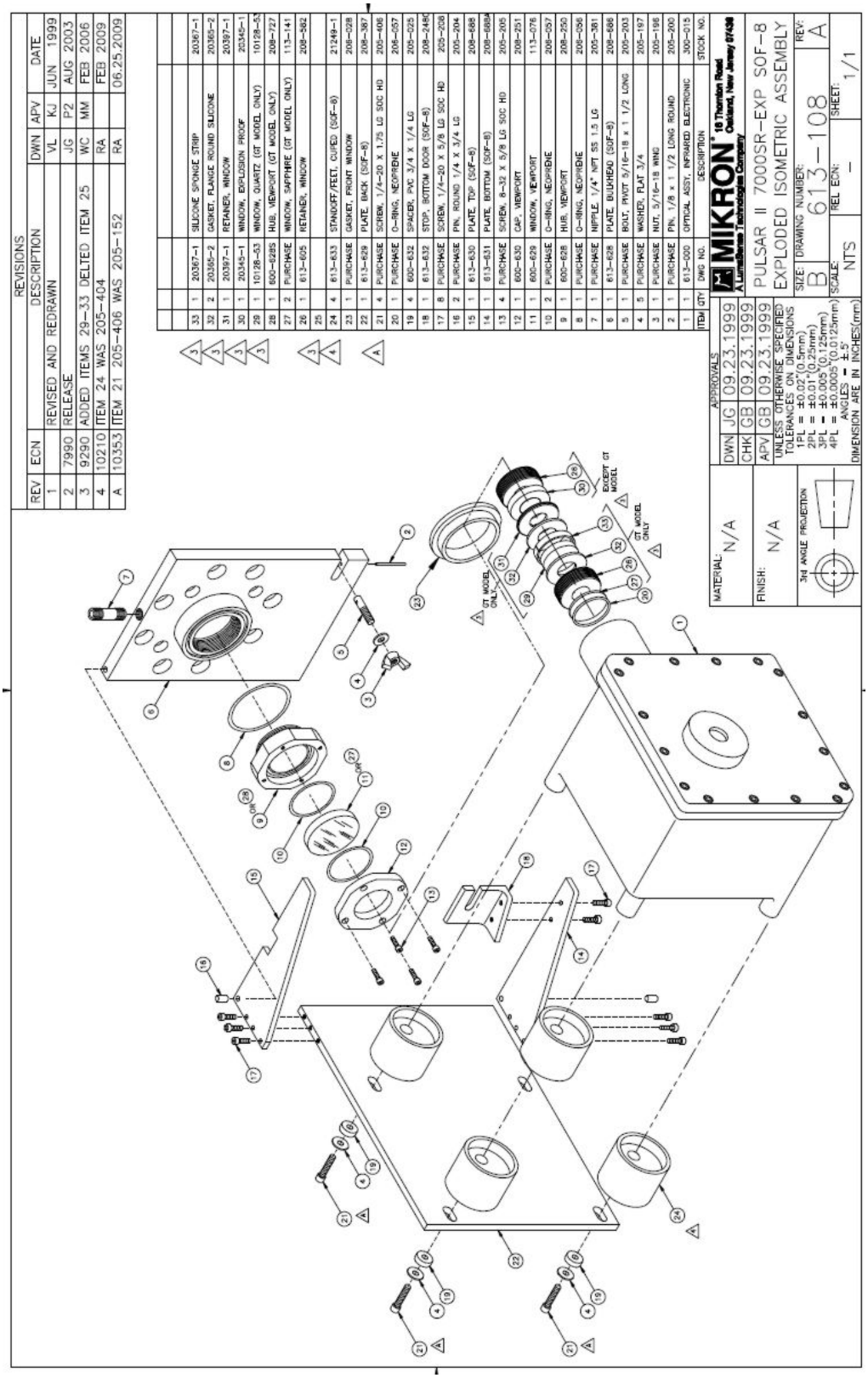
Mikron Infrared Incorporated
16 Thornton Road
Oakland, New Jersey 07436
(201) 405 0900 FAX: (201) 405 0090

APPENDIX E: ENGINEERING DRAWINGS


NOTES:
1. INSTRUMENT MAY BE PRE-FOCUSED IN THE SWING-OUT POSITION ON AN OBJECT APPROXIMATELY THE SAME DISTANCE AS THE POINT OF INTEREST IN THE FURNACE (REACTOR). A CLEAR SIGHT PATH INTO THE FURNACE (REACTOR) IS REQUIRED WHEN SIGHTING THRU THE PULSAR II. THIS SHOULD BE THE VIEW:
FOCUSING TARGET RETICLE CENTERED
EDGE OF 2 INCH PASSAGE INTO FURNACE (NO OBSTRUCTIONS)
FIELD OF VIEW
STRUCTURE MEMBER
DEPOSIT BUILDUP
BACK OF BURNER
REDUCED VIEW AREA
2. DIMENSION "L" SHOULD BE OF SUFFICIENT DISTANCE TO ALLOW A CLEAR SIGHT PATH ACCROSS REACTOR WITHOUT ENCOUNTERING ANY OBSTRUCTION, TYPICALLY FROM 4 TO 6 FEET DOWN STREAM FROM THE BURNER END.
3. SEALING FITTINGS REQUIRED ON CONDUIT LINES FOR PRESSURE INTEGRITY; RECOMMEND ADALET CATALOG #XWJ-SEC F6.
POWER REQUIRED IS 110 OR 220 VAC AS SPECIFIED. INSTRUMENT OUTPUTS ARE 4 TO 20 MA AND 1 MV/DEG C OR F. MA VOLT SIGNALS ARE ISOLATED FROM POWER.
WARNING: THE CONDUIT SEALFITTINGS MUST BE LOCATED NO GREATER THAN 18" (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING FOR (Ex d IIB T4) APPLICATIONS. THIS SEAL MUST BE DIRECTLY AT THE ENCLOSURE ENTRY.
4. COOLING WATER AT 60°F MAX AT 10 GPH REQUIRED WHEN AMBIENT TEMPERATURE IS ABOVE 120°F.
5. MATERIAL IS 1018 CRS, 3/8" THICK PYREX WINDOW, 500°F SILICONE "O" RINGS.
6. 1/2" NPT FITTING FOR 10 SCFM OR GREATER COMBUSTION AIR BLEED TO ENSURE SIGHT PATH CLEARANCE. SPOOL I.D. 2" OR 3" MAY BE REQUIRED TO PROVIDE AIR PURGE NOZZLE FOR CONTINUOUS PURGING. THE SPOOL MAY BE 6 INCHES TO 4 FEET LONG DEPENDING ON CLEARANCE REQUIREMENT FOR INSTALLATION.
7. APPROX. 1 SCFM FLOW RATE FROM A RECOMMENDED 20 PSIG AIR SUPPLY OR SUFFICIENT TO MAINTAIN FLOW RATE AGAINST THE SRU OPERATING PRESSURE THRU REGULATOR OR NEEDLE VALVE. INSTRUMENT AIR OR NITROGEN RECOMMENDED.
8. INDEPENDENT THERMOCOUPLE TEMPERATURE MEASUREMENT IN THE REACTOR MAY BE MADE UTILIZING THE BACK-UP PROBE ASSEMBLY (MODEL BUP-10) INSTALLED IN PLACE OF THE VIEWPORT (MODEL VP-10).
9. HOUSING PURGE NOT REQUIRED TO MEET CSA OR CENELEC HAZARDOUS AREA RATINGS.
DATE SYM REVISION RECORD AUTH DR CK
7/01 -1 7640: Dimensions DD LSL MG
1/23/06 -2 9255: ADDED NOTE MGM WKC
COMBUSTION/ADAPTER SPOOL (USER SUPPLIED)
3"-150# OR 3"-300# BALL VALVE (USER SUPPLIED)
14.75" (375mm)
9.365" (239mm)
90°
45°
MOUNTING HOLES FOR 3"-150# OR 3"-300# RAISED FACE BALL VALVE
VALVE MOUNTING PLATE 1018 CRS
LOCATIONS NOT RECOMMENDED
END OF REACTOR LOCATION WILL WORK IF NO OBSTRUCTIONS IN VIEW PATH. MAY REQUIRE OPENINGS ON TUBE SHEET, NOT ON TUBE OPENINGS IN WASTE HEAT BOILER.
⑥ COMBUSTION AIR PURGE 1/2" NPT
⑤ VIEWPORT MODEL VP-10
⑤ VIEWPORT MODEL VP-10
① RECOMMENDED LOCATION ON HORIZONTAL DIAMETER 4 TO 6 FT DOWNSTREAM
④ WATER BASE FITTINGS
SWING-OUT LOCK (WINGNUT)
③ WARNING: ADJACENT CONDUIT PORT 3/4" NPT
⑨ 1/4" NPT HOUSING PURGE PORT (CLIENT SUPPLIED)
FLEX LINES REQUIRED FOR SWING-OUT
③ WARNING: INSTRUMENT CONDUIT PORT 3/4" NPT
L ②
11.575" (294mm)
RECOMMEND MOUNTING SWING-OUT FIXTURE WITH HINGE LINE IN VERTICAL PLANE. AIR PURGE FITTING MAY BE PLACED FACING UP DO NOT RECOMMEND MOUNTING UNIT WITH HINGE LINE IN HORIZONTAL PLANE.
TOLERANCES EXCEPT AS NOTED
DECIMAL .XXX ±.005 .OO ±.01
FRACTIONAL 1/64
ANGULAR 1.0
MATL NOTED
SCALE NONE
DR L. S. LEE
APP
TITLE PULSAR II 7000SR-EXP/SOF-8 MECHANICAL INSTALLATION DIAGRAM
DATE 2/9/99
DWG NO 613-227 -2


OUTPUT PCB
User I/O
Signal I/O to Electronics
Main power to Electronics
HEATER CONNECTIONS
Note 2
Note 3
Note 4
System GND connection
Explosion Proof Housing with cover removed
Explosion Proof Housing
1/4" NPT Note 5
1/4" NPT HOUSING INSTRUMENT AIR PURGE PORT (FACTORY SEALED—NO PURGE REQUIRED)
SEALING FITTING 3/4" CONDUIT (CLIENT SUPPLIED) Note 1
Earth GND
12.33
10.85
18.00 MAX
NOTES:
1. THE CONDUIT SEAL FITTINGS MUST BE LOCATED NO GREATER THAN 18" (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING. FOR (Ex II 2G), (EEx d IIB T4) APPLICATIONS, THIS SEAL MUST BE DIRECTLY AT THE ENCLOSURE ENTRY.
2. FUSE F2, F4: PRESENT ONLY IN 220/230 VAC SYSTEMS
3. MARKINGS INDICATE INPUT POWER RATINGS
4. MAIN SERVICE POWER CONNECTION REFER TO MANUAL FOR COMPLETE INSTALLATION GUIDANCE
5. Cooling cavity connection. Used for water or optional Vortex Cooling. Input to either location is acceptable. Explosion proof ratings are not required. Refer to manual for details
MIKRON
Model 7000 EXP
SERVICE CONNECTIONS
613-800 -5




REVISIONS
REV ECN DESCRIPTION DWN APV DATE
1 REVISED AND REDRAWN VL KJ JUN 1999
2 7990 RELEASE JG P2 AUG 2003
3 9290 ADDED ITEMS 29—33 DELTED ITEM 25 WC MM FEB 2006
4 10210 ITEM 24 WAS 205—404 RA FEB 2009
A 10353 ITEM 21 205—406 WAS 205—152 RA 06.25.2009
ITEM QTY DWG NO. DESCRIPTION STOCK NO.
33 1 20367—1 SILICONE SPONGE STRIP 20367—1
32 2 20365—2 GASKET, FLANGE ROUND SILICONE 20365—2
31 1 20397—1 RETAINER, WINDOW 20397—1
30 1 20345—1 WINDOW, EXPLOSION PROOF 20345—1
29 1 10128—53 WINDOW, QUARTZ (GT MODEL ONLY) 10128—53
28 1 600—628S HUB, VIEWPORT (GT MODEL ONLY) 208—727
27 2 PURCHASE WINDOW, SAPPHIRE (GT MODEL ONLY) 113—141
26 1 613—635 RETAINER, WINDOW 208—562
25
24 4 613—633 STANDOFF/FELT, CUPED (SOF—8) 21249—1
23 1 PURCHASE GASKET, FRONT WINDOW 208—028
22 1 613—629 PLATE, BACK (SOF—8) 208—387
21 4 PURCHASE SCREW, 1/4—20 X 1.75 LG SOC HD 205—406
20 1 PURCHASE O—RING, NEOPRENE 206—057
19 4 600—632 SPACER, PVC 3/4 X 1/4 LG 205—025
18 1 613—632 STOP, BOTTOM DOOR (SOF—8) 208—2485
17 8 PURCHASE SCREW, 1/4—20 X 5/8 LG SOC HD 205—208
16 2 PURCHASE PIN, ROUND 1/4 X 3/4 LG 205—204
15 1 613—630 PLATE, TOP (SOF—8) 208—688
14 1 613—631 PLATE, BOTTOM (SOF—8) 208—6884
13 4 PURCHASE SCREW, 8—32 X 5/8 LG SOC HD 205—205
12 1 600—630 CAP, VIEWPORT 208—251
11 1 600—629 WINDOW, VIEWPORT 113—076
10 2 PURCHASE O—RING, NEOPRENE 206—057
9 1 600—628 HUB, VIEWPORT 208—250
8 1 PURCHASE O—RING, NEOPRENE 206—056
7 1 PURCHASE NIPPLE, 1/4" NPT SS 1.5 LG 205—361
6 1 613—628 PLATE, BULKHEAD (SOF—8) 208—686
5 1 PURCHASE BOLT, PIVOT 5/16—18 x 1 1/2 LONG 205—203
4 5 PURCHASE WASHER, FLAT 3/4 205—197
3 1 PURCHASE NUT, 5/16—18 WING 205—196
2 1 PURCHASE PIN, 1/8 x 1 1/2 LONG ROUND 205—200
1 1 613—000 OPTICAL ASSY, INFRARED ELECTRONIC 300—015
APPROVALS
DWN JG 09.23.1999
CHK GB 09.23.1999
APV GB 09.23.1999
MATERIAL: N/A
FINISH: N/A
UNLESS OTHERWISE SPECIFIED TOLERANCES ON DIMENSIONS
1PL = ±0.02"(0.5mm)
2PL = ±0.01"(0.25mm)
3PL = ±0.005"(0.125mm)
4PL = ±0.0005"(0.0125mm)
ANGLES = ±.5°
DIMENSION ARE IN INCHES(mm)
3rd ANGLE PROJECTION
MIKRON 10 Thornton Road Oakland, New Jersey 07436 A Lumasense Technologies Company
PULSAR II 7000SR-EXP SOF-8
EXPLODED ISOMETRIC ASSEMBLY
SIZE: B
DRAWING NUMBER: 613-108
REV: A
SCALE: NTS
REL ECN: -
SHEET: 1/1
EXCEPT GT MODEL
GT MODEL ONLY
GT MODEL ONLY