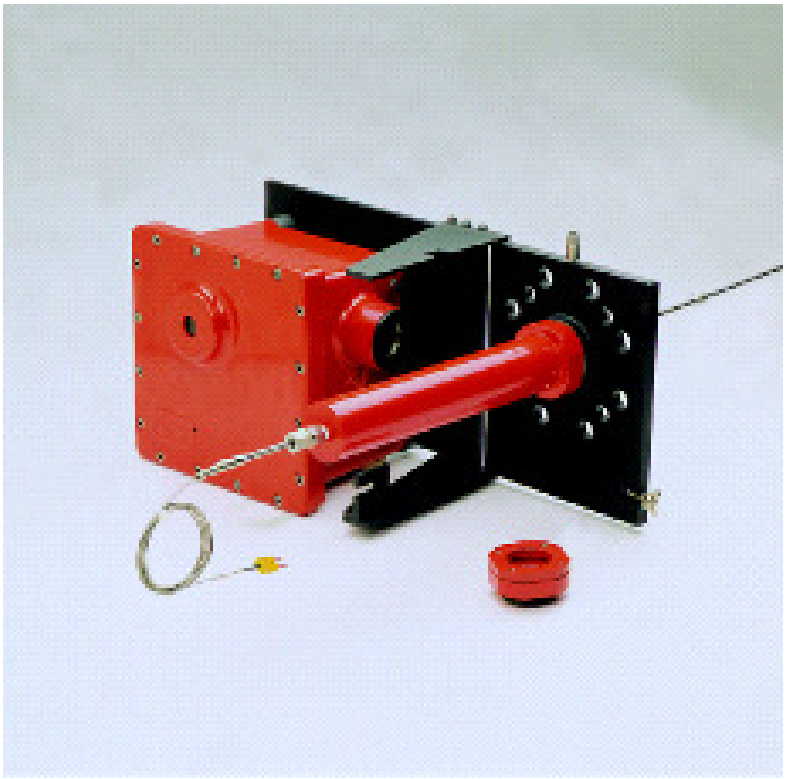
Mikron Infrared/E^{2}T PULSAR III

M7000SR-EXP

Operations Manual



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Definitions and Abbreviations

PULSAR III 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.
PULSAR III MODEL 7000SR-EXP	The complete Sulfur Recovery Reactor (furnace) Temperature Measuring SYSTEM may consist 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 RT Model measures refractory temperature. The GT Model measures gas/flame temperature. The FF Model measures average temperature.
REACTOR	Reaction Furnace, Sulfur Reactor or Furnace.
SOF-8	A fixture which allows the operator to swing the PULSAR III 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-10P	A VIEWPORT ASSEMBLY consisting of a Pyrex window mounted in a housing which screws into the SOF-8 BULKHEAD PLATE.

P/N: 11180-104 Rev A

Date: June 2009

Approved:

MIKRON/E^{2}T's PULSAR III
Model M7000SR-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/E^{2}T's** M7000-EXP Temperature Measurement System.

For those customers already familiar with this equipment, see section 1.5, *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 the following approvals:

CSA International and US
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 switched off first. When it is necessary to service instrument with the power applied, ensure proper safe environmental conditions exist and that such maintenance is authorized and pursuant to safe conditions.

Reference: Section 8 Safety Assurances and Precautions

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OPERATIONS MANUAL
PULSAR III 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 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 III wide range non-contact thermometer. The most common limitation of the typical infrared thermometer is its narrow single scale limits. The PULSAR III 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 662 to 3632°F (350 to 2000°C). Unlike its predecessor, the Pulsar II, this model contains two channels that provide the measurements of the GT (Gas Temperature) and RT (Refractory Temperature) simultaneously using the same optics.

The PULSAR III is a compact, single unit, electro-optical instrument with two 4-20 mA linear outputs (one for each channel). Even after dedicating a viewport on a reactor to the installation of the PULSAR III Model M7000SR-EXP System, the operator can still look into the reactor via the "sight-through" aiming optics.

Features of the PULSAR III 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.

b. **KEMA** EExd IIB T4, ATEX certified for all models.

c. Pulsar family acceptance by the EPA as an accurate and reliable temperature measurement tool

d. Wide temperature range - Ambient (with BUP-10) to 3,632°F (2,000°C)

e. Two 4-20 mA sourcing and isolated linear outputs.

f. An emissivity adjustment from 1.00 to 0.10 in standard mode. (0.05-1.0 aLP in FMA mode)

g. Two programmable alarm setpoints with form “C” mechanical relays.

h. A choice of three measurement modes to provide average, gas, or refractory temperatures.

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

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

k. High quality sight-through optics

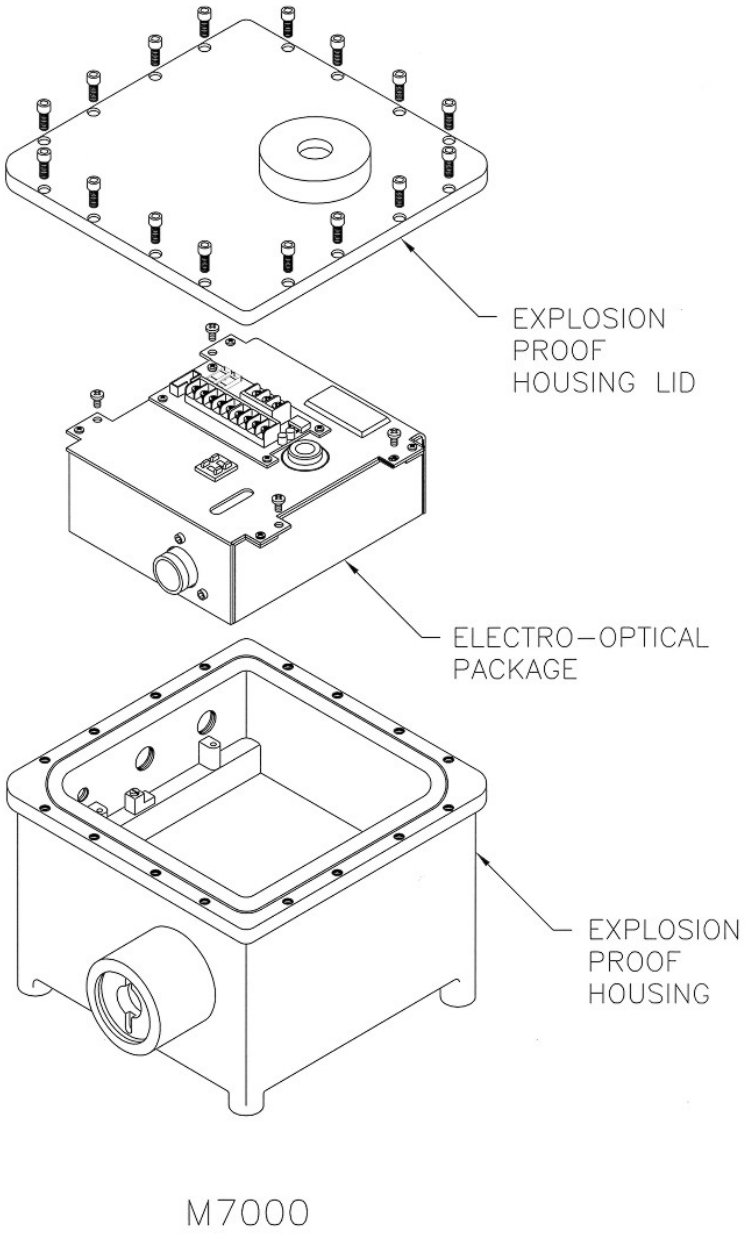

EXPLOSION
PROOF
HOUSING LID
ELECTRO–OPTICAL
PACKAGE
EXPLOSION
PROOF
HOUSING
M7000

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 III 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 4-20mA or 0-20mA.

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 III 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 III'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 III will accurately track temperatures as they rise and fall. A reference temperature can be easily obtained through the use of MIKRON/E2T's BUP-10 Backup Probe.

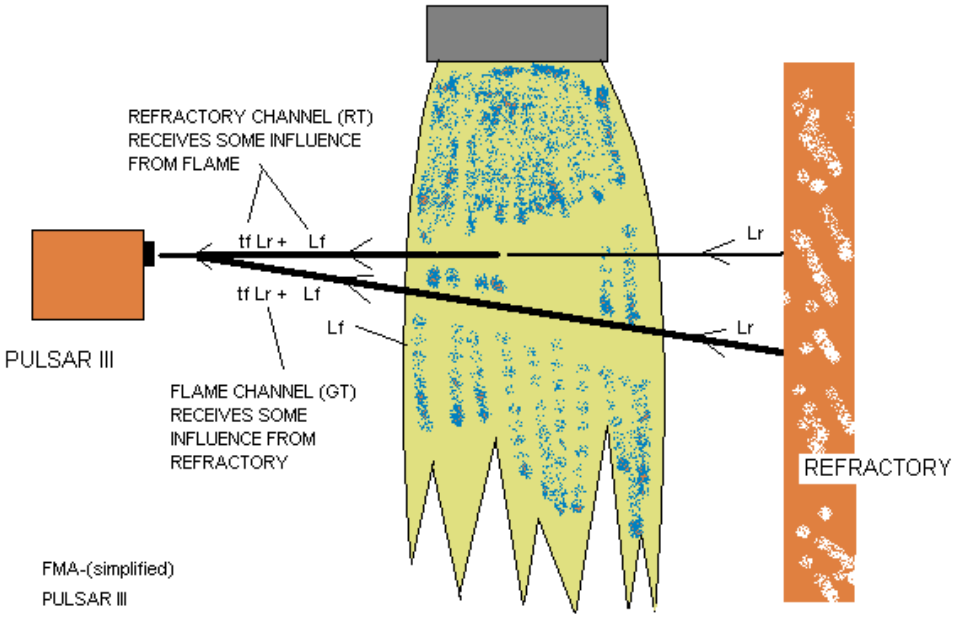
1.3 Expected Performance

The outputs of the PULSAR III are accurate to within ±0.5% 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 ±5°C, and so on.

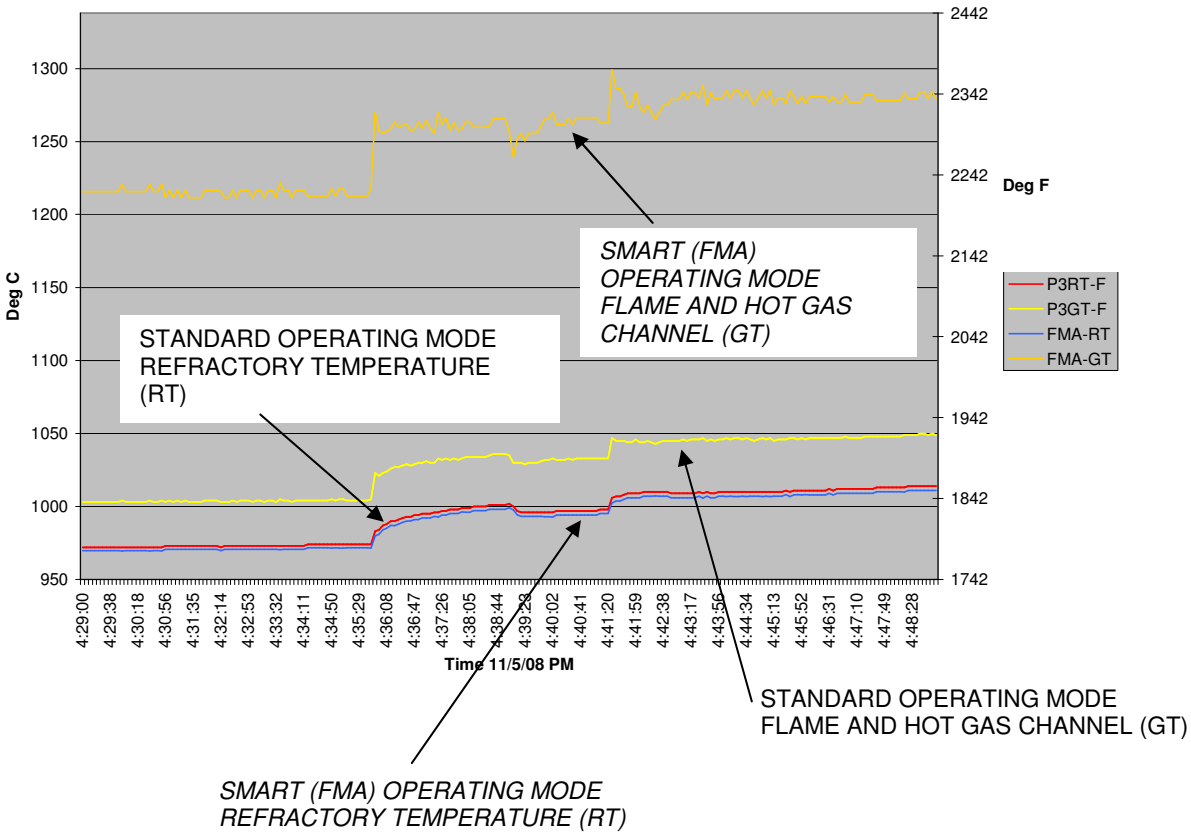
As with any precision instrument, the PULSAR III requires periodic calibration. However, since there are no moving parts and ultra-stable sensors are used, much longer recalibration intervals may be incorporated.

1.4 Smart FMA mode:

Mikron has developed a unique method to compensate for inter-channel effects when measuring hot gasses and refractory temperatures called Mikron Flame Measurement Algorithm (FMA). In a normal situation, a flame can add (or reduce) the signal emitted from the refractory depending on the quality, quantity and absorption of the flame. In a similar manner, some transparency of the flame or hot gas can cause refractory radiance to add (or reduce) the flame temperature. This algorithm virtually removes these unwanted 'crosstalk' artifacts and solves for more meaningful refractory and flame/hot gas temperatures. This is based on the following physics (simplified):



ACTUAL SRU DATA SHOWING STANDARD MODE
VS. SMART FMA MODE ACTIVATED



The chart above illustrates the difference between ‘Standard’ operating mode and ‘Smart FMA’ operating mode (field switchable). Notice as the flame intensity undergoes step changes, refractory (RT) and standard flame/hot gas (GT) waveforms have dampened responses. You expect it on the refractory due to the thermal mass of the refractory but not on the flame response which is influenced by the refractory radiance. With Smart FMA activated, the hot gas channel (GT) displays a step change similar to the actual combustion air and gas flows into the SRU. In this mode, the response time is limited to 0.5 seconds, but the results will provide a new and valuable monitoring system.

1.5 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: Appendix E – Engineering Drawings

Section 2: **Mechanical Installation**

Section 3: **Electrical Installation**

Section 8: **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.

WARNING: All conduits must be sealed (potted) at a distance of NO GREATER than 18 inches (45 cm) from the M7000-EXP housing.

For  *II 2 G, EEx d IIB T4 applications, this seal must be directly at the enclosure entry.*

a) Mounting the Instrument

Reference Appendix F, 613-227, Mechanical Connection

PULSAR III Model M7000SR-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:

1. Viewport 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 air purge 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 and is not recommended. If housing purge is used, clean, dry, instrument air or nitrogen is required. Since the housing is sealed and purge flow will approach zero, max pressure allowed is 5 psig.

Quick Installation Procedure continued

c) Electrical

Reference Appendix E – Engineering Drawings
Review: Section 7.2 Electrical Service protection:

WARNING: All conduits must be sealed (potted) at a distance of NO GREATER than 18 inches (45 cm) from the M7000-EXP housing!

For  II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.

1. Connect Instrument Power

24VDC power is marked on Terminals. Separate supply wires from signal wires by routing through separate ¾" NTP conduit ports.

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. **The relays are rated for 30VDC, 1A maximum.**

   b) Connect one or both 4-20mA output lines to corresponding (MA-) and (MA+) terminals. Cable shield is to be connected only at one end of the cable

Quick Installation Procedure continued

Hazardous location Safety minder
At no time should the cover be removed unless power is switched 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.
WARNING: All conduits must be sealed (potted) at a distance of NO GREATER than 18 inches (45 cm) from the M7000-EXP housing!

For  *II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.*

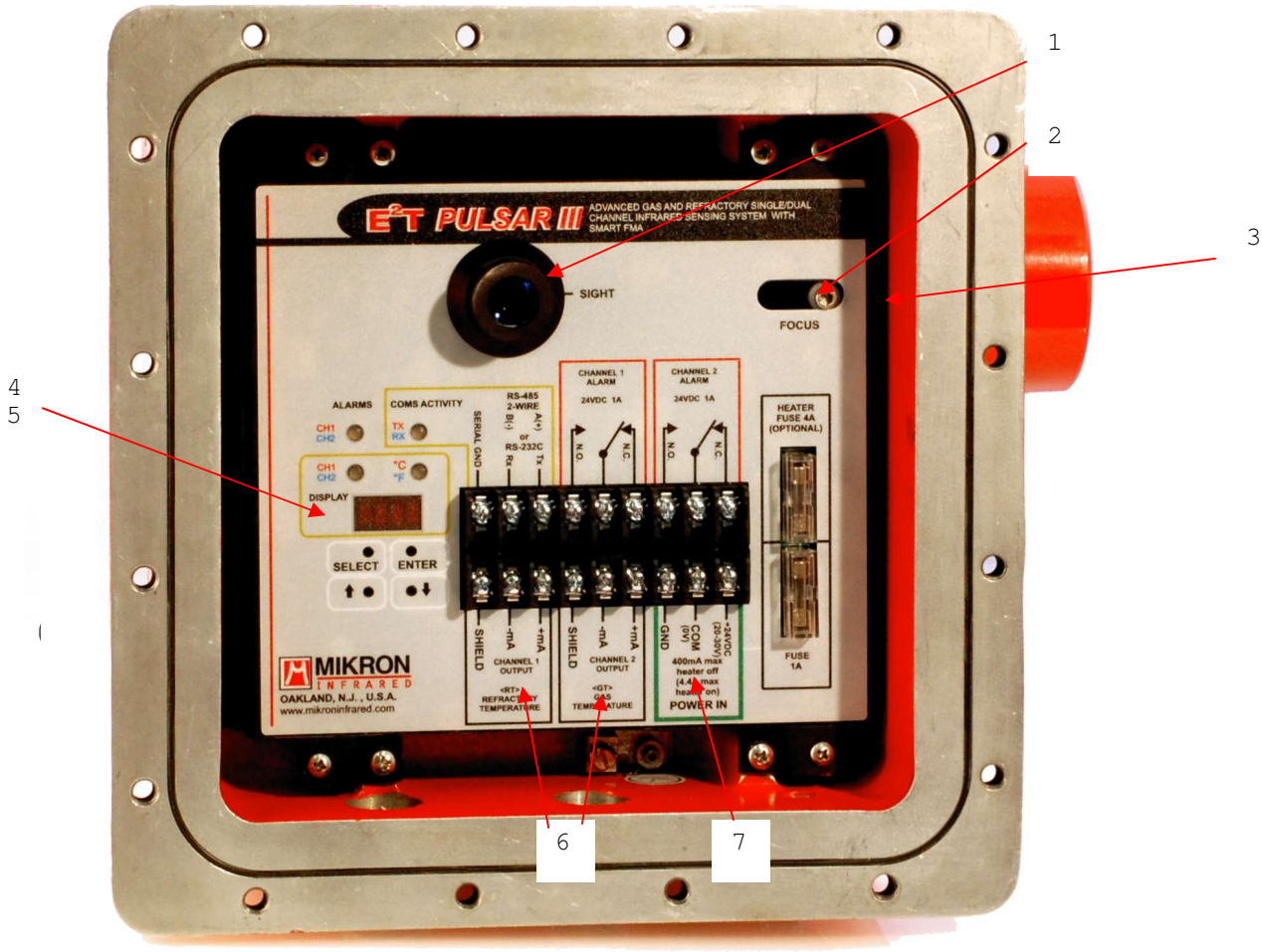
d) **Focus the instrument (Adjust Lens)**

e) **Aim the instrument to the Target**

Configure the Instrument

Prior to start-up, review your measurement needs and configure the Pulsar III to match your requirements. The Pulsar III is like having 3 pyrometers in one box so it offers you many measurement options. In order to get the most out of this instrument, you should become familiar with all of its functions and configuration parameters prior to commissioning. Please read through section 4.8 and Parameter Configuration tables in Appendix A.

If it is too overwhelming in the beginning, use factory default settings first. Monitor the results for a while. Then turn on FMA mode and monitor the results. Proceed in more detail as time permits.



1. Eyepiece Lens with Reticle
2. Focus adjust and Lens Locking screw
3. Objective Lens
4. Digital Emissivity
5. Set–point Adjust.
6. Signal I/O to Electronics
7. 24VDC Supply connector to Electronics

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 M7000SR–EXP for possible damage incurred during shipping.

Instrument's serial number:
Each Mikron/E^{2}T's M7000SR-EXP instrument is configured for default settings which are found in Appendix A. Upon installation and reviewing this manual, configure the instrument to match the application.

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 III M7000SR-EXP.

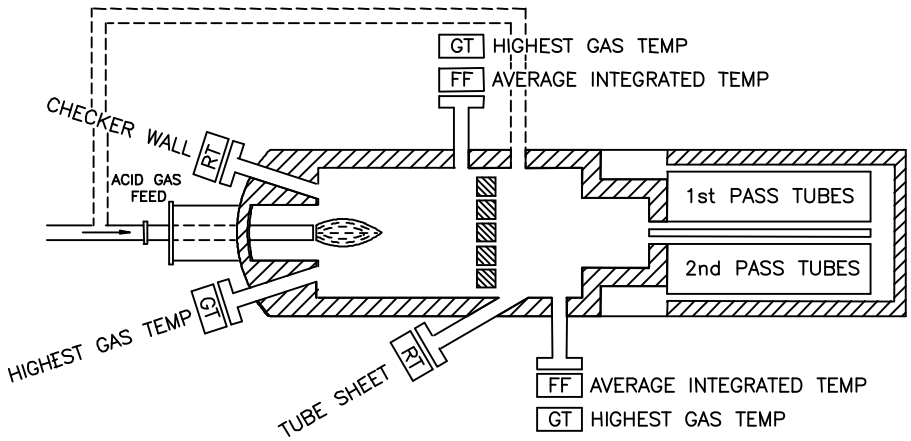
Reference: Section 8 Safety Assurances and Precautions

2.2 Furnace Location

2.2.1 Choice of Temperature Measurements

The PULSAR III, Model 7000SR-EXP comes in three operating modes:
a. The RT measures the refractory, checker work, or tube sheet temperatures.
b. The GT measures the hottest gas temperature.
c. The FF measures average calculated from the above two.

2.2.2 Choice of Locations (typical)



2.3 Mechanical Installation

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

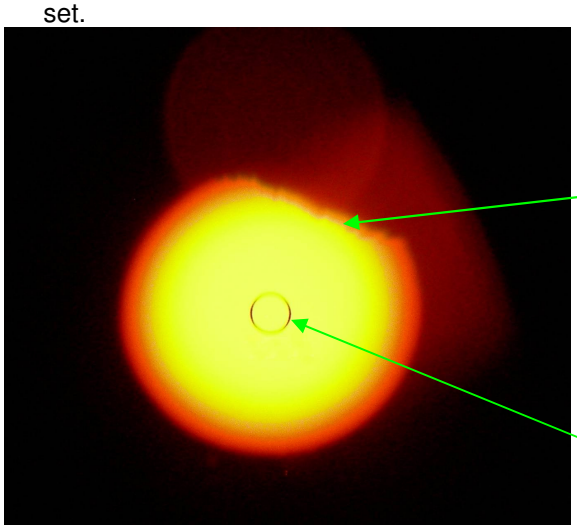
Reference: Appendix E - Engineering Drawings

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 III assembly in such a way to allow easy access to the instrument controls and allow the instrument to be swung away at least 55°. 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 reticule 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.



Properly aligned and focused Pulsar III

Notice the edge of build-up in the view piping is in focus. This ensures the smallest spot size is at the entrance to the furnace.

If aiming at a specific target inside the furnace, adjust focus to see a sharp image of that target, otherwise, focus for the end of the viewing piping as shown here.

Reticule (indicates measuring spot size)

4. **AIMING (SIGHTING) ADJUSTMENTS**:

An advantage of the PULSAR III System is, if the target is in a closed chamber such as a kiln or furnace, the PULSAR III 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 III 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**.

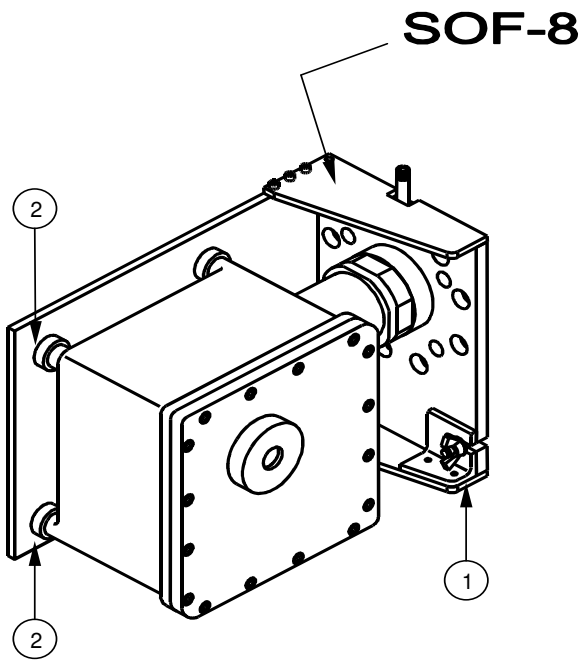
When sighting though the PULSAR III's optics, the circular targeting RETICLE should be centered down the middle of the port. Three adjustments are available to achieve proper alignment.

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 SIGHTING ADJUSTMENTS

Figure 2-1

2.4 Ambient Temperature Limits

The internal operating temperature limits of the PULSAR III are 0°C to 60°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 wind chill 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 140°F (60°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 III, cooling will be required by one of two methods:

Reference: Appendix E:

2.5.1 WATER COOLING

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

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 140°F (60°C).

2.5.2 AIR COOLING

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

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 10 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, but it will waste power.

2.6 Air Requirements 

Reference: Appendix E:

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 20290-MID)

2. **COMBUSTION PURGE** - MIKRON/E2T recommends the air purge between the valve and the combustion chamber be supplied through a 1/2" valve 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. 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 depth is maintained.

Reference: Section 8 Safety Assurances and Precautions

4. **VORTEX COOLER (If Required)**- Vortex Cooler air supply refer to Section 2.5.2.

3 ELECTRICAL INSTALLATION

3.1 Electrical Installation – Guidelines

Reference: Appendix E – Engineering drawings

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. **WARNING: THE SEAL FITTINGS MUST BE LOCATED NO GREATER THAN 18 INCHES (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING.**

For II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.

Mikron/E^{2}T 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/E^{2}T 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.

Review: Section: 8 Safety Assurances and Precautions

Over-current protection / service switch: It may be 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 signal outputs or digital communication lines.

Service markings:
Input Power service (24Vdc) and Fusing type is factory set.

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

Cover attachment:

Review: Section 8 Safety Assurances and Precautions

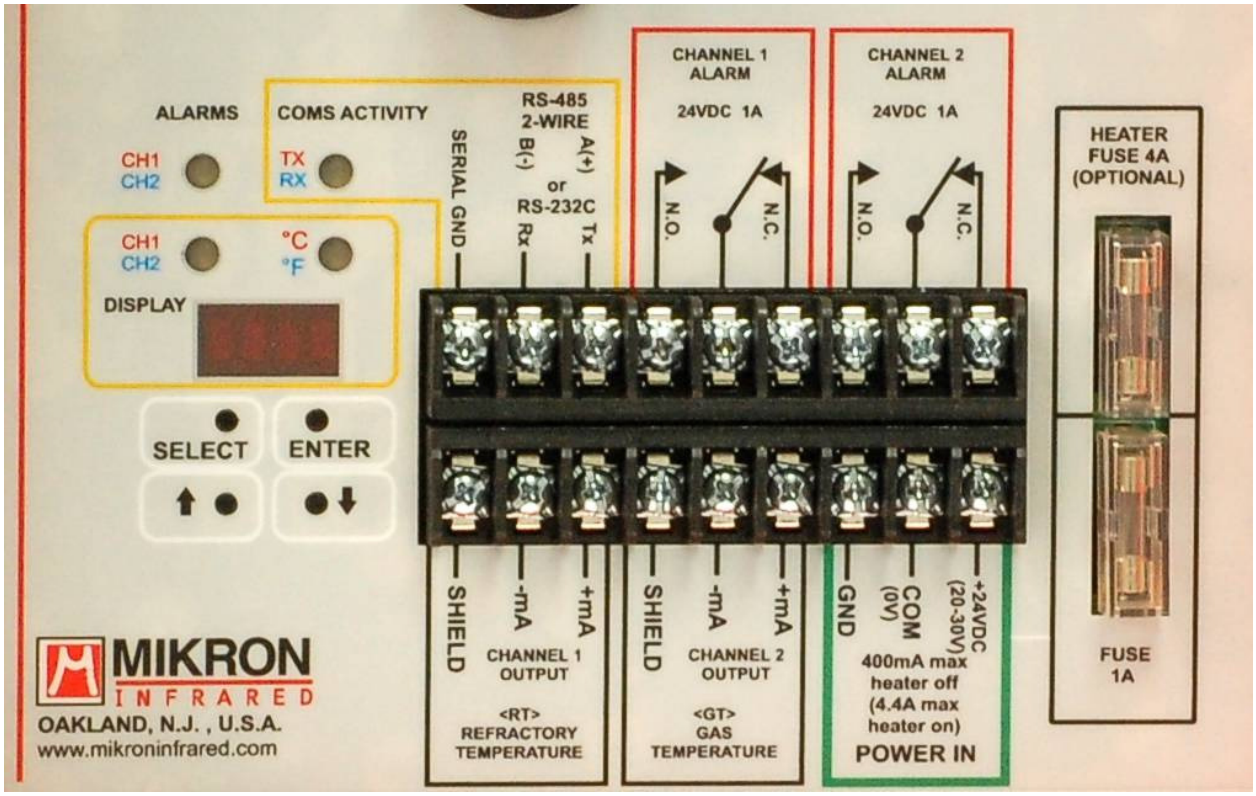
Hazardous location Safety minder

At no time should the cover be removed unless power is switched 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.

Extra reminder:

WARNING: THE CONDUIT SEAL FITTINGS MUST BE LOCATED NO GREATER THAN 18 INCHES (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING.

For Ex II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.


ALARMS
COMS ACTIVITY
CH1
CH2
TX
RX
RS-485
2-WIRE
B(-)
A(+)
or
RS-232C
SERIAL GND
Rx
Tx
CHANNEL 1
ALARM
24VDC 1A
CHANNEL 2
ALARM
24VDC 1A
N.O.
N.C.
HEATER
FUSE 4A
(OPTIONAL)
°C
°F
DISPLAY
SELECT
ENTER
SHIELD
-mA
+mA
CHANNEL 1
OUTPUT
<RT>
REFRACTORY
TEMPERATURE
SHIELD
-mA
+mA
CHANNEL 2
OUTPUT
<GT>
GAS
TEMPERATURE
GND
COM
(0V)
+24VDC
(20-30V)
400mA max
heater off
(4.4A max
heater on)
POWER IN
FUSE
1A
MIKRON
INFRARED
OAKLAND, N.J. , U.S.A.
www.mikroninfrared.com

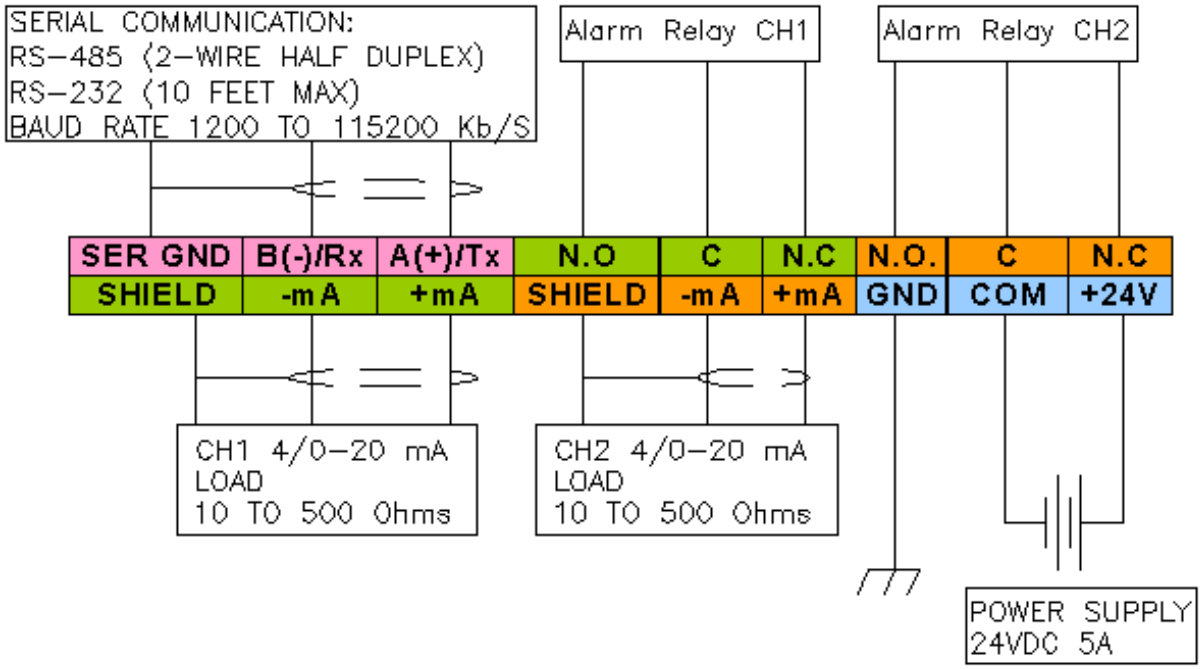

SERIAL COMMUNICATION:
RS–485 (2–WIRE HALF DUPLEX)
RS–232 (10 FEET MAX)
BAUD RATE 1200 TO 115200 Kb/S
Alarm Relay CH1
Alarm Relay CH2
SER GND
B(-)/Rx
A(+)/Tx
N.O
C
N.C
N.O.
C
N.C
SHIELD
-mA
+mA
SHIELD
-mA
+mA
GND
COM
+24V
CH1 4/0–20 mA
LOAD
10 TO 500 Ohms
CH2 4/0–20 mA
LOAD
10 TO 500 Ohms
POWER SUPPLY
24VDC 5A

Figure 3-1

3.2 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 20290-SC, Service Connections.

Connect 24Vdc to Terminal, as shown on previous page.

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

WARNING: THE CONDUIT SEAL FITTINGS MUST BE LOCATED NO GREATER THAN 18 INCHES (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING.

For Ⓔx II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.

3.3 Fusing

Mains:
Two fuses: F1 and F2 each are mounted within fuse holders.
F1 is for 24VDC input power configurations rated at 1A.
F2 is for the internal 24VDC heater and is rated 4A.

3.4 Connection for Reading a Temperature Using mA Output

Each 4-20mA (or 0-20mA) current output is an isolated, self-powered linear output for recorders or controllers requiring current loop feedback. The PULSAR III supplies its own 4-20mA current to the load. The 4-20mA is isolated. Loads up to 500 ohms maximum may be connected in SERIES. A signal of 4mA (or 0mA) corresponds to the bottom-end temperature and 20mA corresponds to the top-end temperature, with points in between falling on a linear scale.

Connect 0/4-20mA loop to Terminal as shown in Figure 3-1.

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

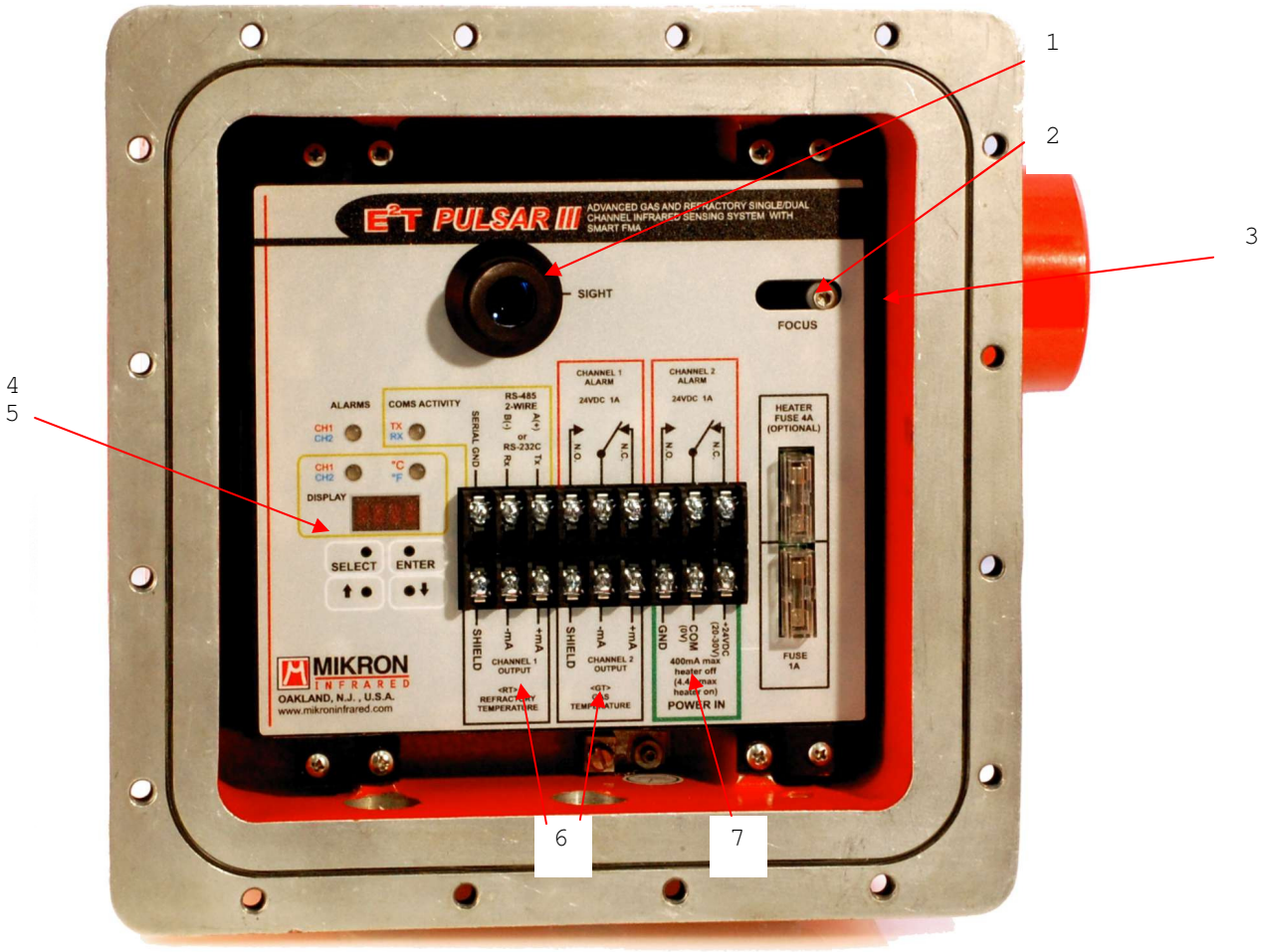
3.5 Connecting the Alarms

Each channel has a programmable alarm relay (form C) providing a dry contact with a normally open or normally closed output for a high or low temperature alarm. The contact relay is rated 1amp resistive at 30 VDC maximum.

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
6. Signal I/O to Electronics
7. 24VDC Supply connector to Electronics

Figure 4.1

4.2 Installation/Start-up Checklist

Prior to start-up, review your measurement needs and configure the Pulsar III to match your requirements. The Pulsar III is like having 3 pyrometers in one box so it offers you many measurement options. In order to get the most out of this instrument, you should become familiar with all of its functions and configuration parameters prior to commissioning. Please read through section 4.8 and Parameter Configuration tables in Appendix A.

If it is too overwhelming in the beginning, use factory default settings first. Monitor the results for a while. Then turn on FMA mode and monitor the results. Proceed in more detail as time permits.

Hazardous location Safety minder

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

WARNING: THE CONDUIT SEAL FITTINGS MUST BE LOCATED NO GREATER THAN 18 INCHES (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING.

For  II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.

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 2.3.3).

d. Connect power as described in Section 3, ELECTRICAL INSTALLATION. Allow at least 10 minutes warm-up before proceeding.

e. Aim the PULSAR III at the object or process to be measured. Observe the output of the PULSAR III on the temperature display or with an ammeter connected in series with 0/4-20mA terminals. If the PULSAR III output does not seem to match the actual temperature, then an emissivity adjustment is necessary. Use the BUP-10 (See Section 4.6) to obtain the proper emissivity calibration temperature. Adjust the emissivity until the PULSAR III reads the correct temperature. The preferred method is to activate FMA mode using default aLP setting of 0.15 before attempting to adjust GT channel emissivity to match a thermocouple. Be aware that a sheathed thermocouple inserted into a gas stream will usually read lower than the actual gas/flame temperature due to thermal conduction down the t/c sheath. The FMA mode will provide better performance than an emissivity calibration of the GT channel with FMA turned off.

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

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

h. Verify temperature of PULSAR III housing is not above 122°F (50°C).

4.3 Two Spectral Ranges

The PULSAR III, Model 7000SR-EXP continuously measures in two spectral ranges.

a. The GT measures the hot gas temperature in its field of view.
b. The RT measures the refractory, checker wall or tube sheet temperatures in its field of view.
c. FF is an average temperature extracted from the GT and RT channels.

Each channel output must be assigned to a temperature measurement function. This is done by selecting one of six output assignment configuration modes. See section 4.8 for details.

4.4 Emissivity Adjustment and FMA mode

The PULSAR III Model 7000SR-EXP may require an emissivity 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 digital emissivity adjustment is accessible using the pushbuttons or using the digital communications.

Field calibration is possible by measuring the furnace temperature under normal operating conditions using MIKRON/E2T BUP-10. However, The preferred method is to activate FMA mode using default aLP setting of 0.15 before attempting to adjust GT channel emissivity to match a thermocouple. Be aware that a sheathed thermocouple inserted into a gas stream will usually read lower than the actual gas/flame temperature due to thermal conduction down the t/c sheath. The FMA mode will provide better performance than an emissivity calibration of the GT channel with FMA turned off. Try activating FMA mode and monitor results using default settings prior to attempting an emissivity calibration using external t/c probes.

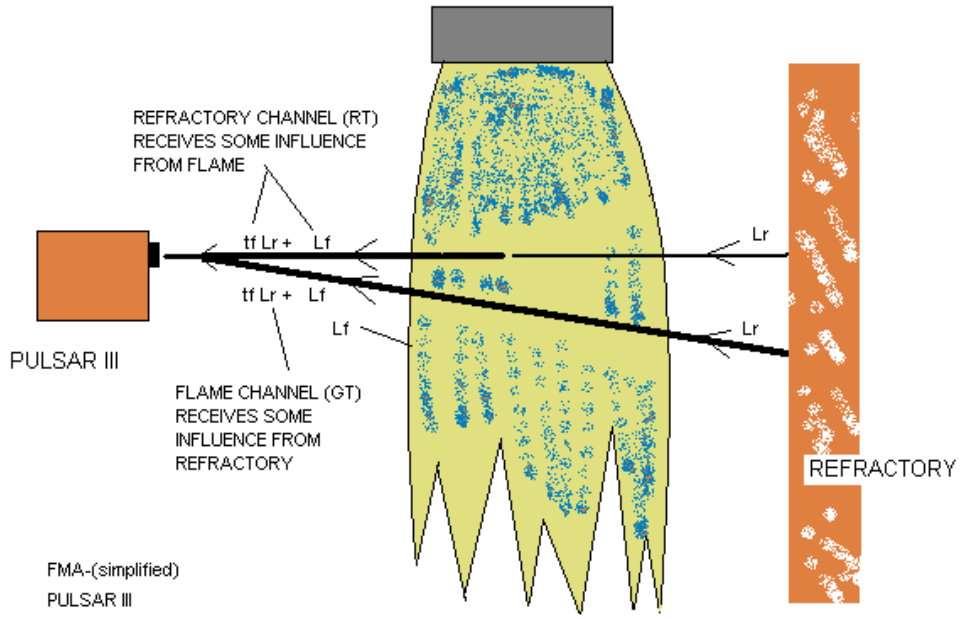
The BUP-10 consists of a sacrificial K-type thermocouple inserted through the BACKUP PROBE (BUP) adapter mounted in place of the viewport (VP-10) in the SWING-OUT FIXTURE (SOF-8). Recommended procedure for this measurement follows in section 4.6. The combustion temperature of the infrared instrument and the thermocouple (T/C) are then compared. In some cases the PULSAR III may read different from the T/C. To compensate for this temperature difference, the emissivity value can be changed to make the two temperatures agree if in Standard mode. If in FMA mode, aLP parameter may be changed. (See FMA description). Once the emissivity (or aLP) is set, the PULSAR III will accurately track temperatures in the furnace. Introduction or removal of major furnace gas constituents may require a re-adjustment of the emissivity (or aLP).

The RT spectral range can only be field calibrated with a dedicated refractory thermocouple installed in close proximity to where the Pulsar III is viewing the opposite refractory wall. Alter the RT channel emissivity to match the thermocouple.

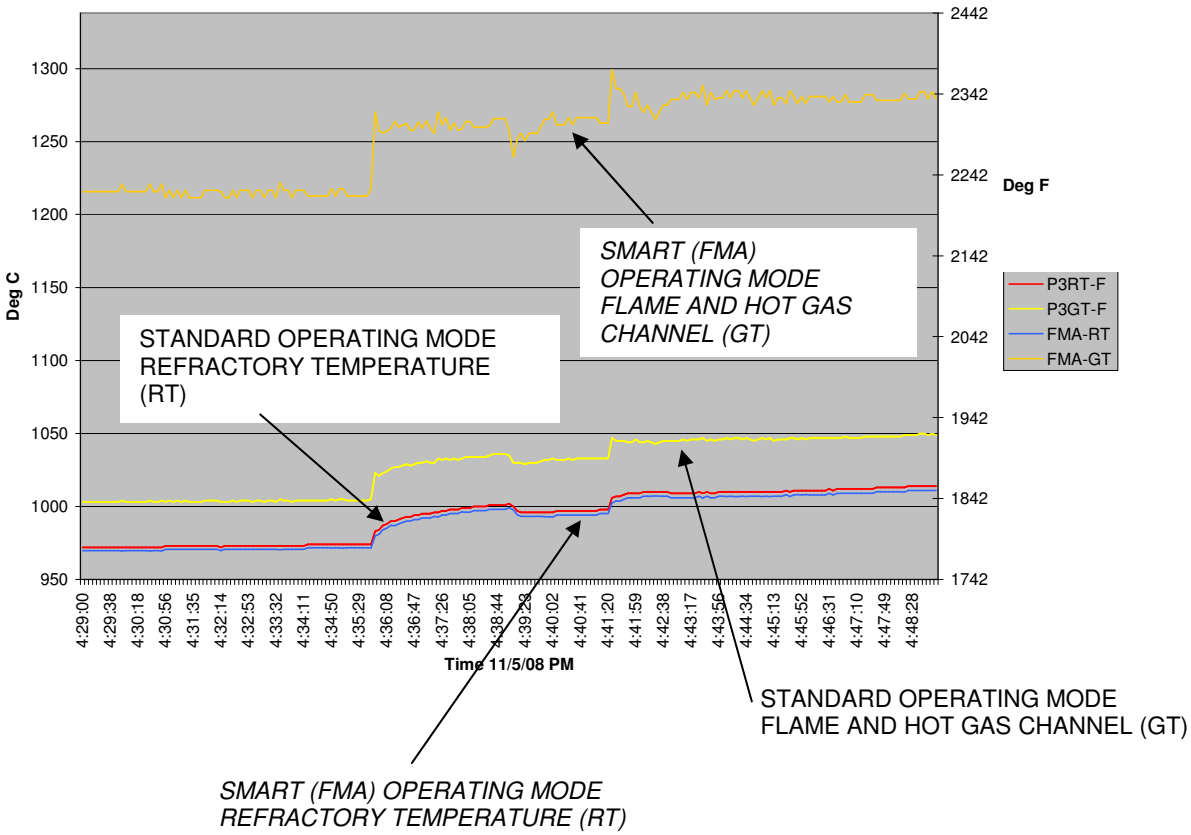
Note: The Pulsar III is always operating internally as RT on CH 1, GT on CH 2. When selecting FF on any channel, all adjustments such as Emi (and aLP when in FMA mode) apply to the RT and GT measurements respectively. The FF average output is a calculated average of the internal RT and GT measurements.

4.4.1 Smart FMA mode: (repeated here for convenience)

Mikron has developed a unique method to compensate for inter-channel effects when measuring hot gasses and refractory temperatures called Mikron Flame Measurement Algorithm (FMA). In a normal situation, a flame can add (or reduce) the signal emitted from the refractory depending on the quality, quantity and absorption of the flame. In a similar manner, some transparency of the flame or hot gas can cause refractory radiance to add (or reduce) the flame temperature. This algorithm virtually removes these unwanted 'crosstalk' artifacts and solves for more meaningful refractory and flame/hot gas temperatures. This is based on the following physics (simplified):



ACTUAL SRU DATA SHOWING STANDARD MODE
VS. SMART FMA MODE ACTIVATED



The chart above illustrates the difference between 'Standard' operating mode and 'Smart FMA' operating mode (field switchable). Notice as the flame intensity undergoes step changes, refractory (RT) and standard flame/hot gas (GT) waveforms have dampened responses. You expect it on the refractory due to the thermal mass of the refractory but not on the flame response which is influenced by the refractory radiance. With Smart FMA activated, the hot gas channel (GT) displays a step change similar to the actual combustion air and gas flows into the SRU. In this mode, the response time is limited to 0.5 seconds, but the results will provide a new and valuable monitoring system.

4.5 Setpoint Adjustment (Alarms)

Set the setpoint temperatures using the front panel pushbuttons. Refer to "Instrument Settings and Parameter Description" section.

Each channel has a high temperature limit alarm that drives its own form-c relay that has Normally open and Normally closed dry contacts. As the process temperature exceeds the limit setpoint, the relay is energized. The factory default setpoint for each channel is 2000°C which effectively makes the alarms inactive. The contacts are rated 30VDC at 1 AMP maximum.
! Do not attempt to switch 115VAC or 230VAC with these relays!

Front panel indicators turn on when the alarm relay is energized. The LED color indicates the channel that is in alarm condition (relay is energized). RED = CH1, BLUE = CH2, RED+BLUE or VIOLET = Both channels are in alarm condition. These are non-latching alarms and will reset when the process temperature falls below the setpoint minus the hysteresis parameter setting. (See HYS parameter).

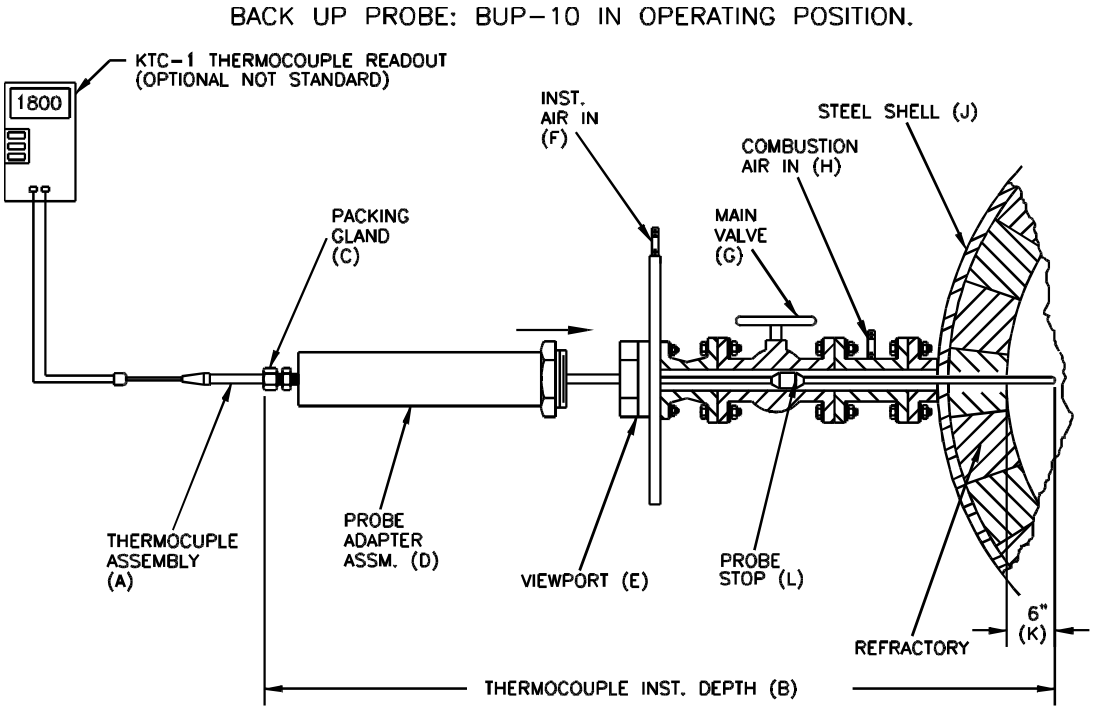


Figure 4-2

4.6 Operation of Backup Probe (BUP-10) Assembly

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

Reference: Figure 4-2

1. Prepare the Backup Probe Assembly for your installation in the following way:
   A. Compute the length of (T/C) to be inserted through the BUP .Measure the distance from the packing gland (C) to the outside surface of the reactor shell. Add to it the shell thickness (usually a half to one inch) plus 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. Lay out this total distance on the thermocouple beginning at the measuring tip and make a mark on the T/C sheath (near the connecting wire end).
   C. **The probe stop must be installed.** Insert the T/C into the assembly and install the probe stop. Set the probe stop to 6 inches from the measuring tip 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). **Failure to install this stop could result in hazardous gas leakage if the T/C is accidentally pulled all the way out of the packing gland!**
2. Loosen wing nuts on the SOF-8 and swing infrared thermometer out of the line of path.
3. Close valve (G).
4. Turn off instrument air purge (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.
5. Disconnect instrument air line to ensure there is no pressure between the valve (G) and the viewport (E).
6. Check for leakage of combustion gases. The gases should not leak past the valve seat and out through the instrument air in port (F).
7. 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.

8. 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.
9. Push the T/C that was previously installed 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 air purge line (F) and open the instrument air valve. Ensure the pressure in the air purge 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 into the reactor until the previously measured 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. After successful measurement, 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 on GT channel if in Standard operating mode or adjust aLP if in FMA mode as described in section 4.4.

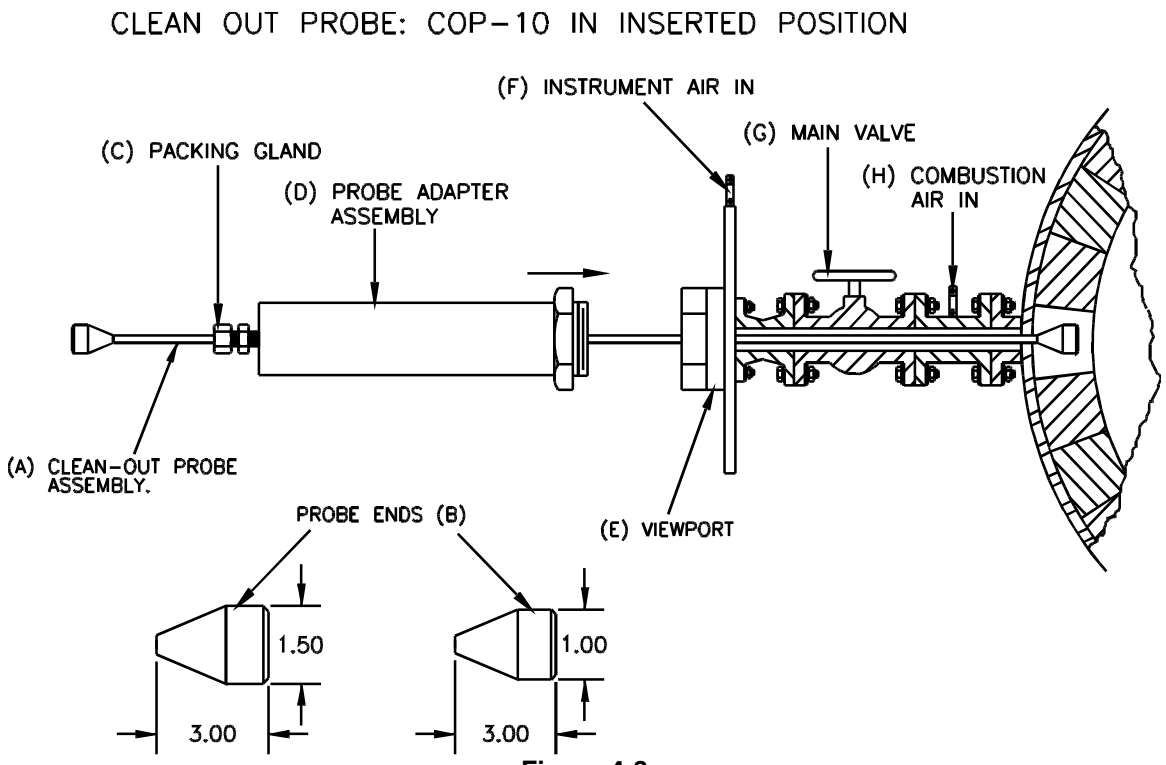


Figure 4-3

4.7 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 4-3

1. Prepare the COP-10 for use: 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.
2. Swing infrared thermometer out of the line of path.
3. Close valve (G).
4. Turn off instrument air purge (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.
5. Disconnect instrument air line to ensure there is no pressure between the valve (G) and the viewport.
6. Check for leakage of combustion gases. The gases leak past the valve seat and out through the instrument air in port (F).
7. 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.
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 air purge line (F) and open the instrument air valve. Ensure the pressure in the air purge 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 into the reactor pushing any debris out of the way.
12. Withdraw the COP-10 until the main valve (G) can be closed.

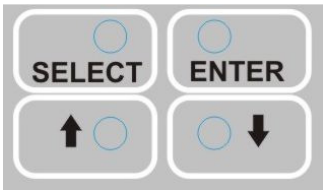
13. Close the main valve (G).
14. Turn off the instrument air (F) to the Swing-away Fixture (SOF) and remove the instrument air fitting to ensure ambient pressure in the adapter cavity.
15. Unscrew the BUP Assembly and COP-10, and remove from the SOF.
16. Reinstall the larger Probe end (B) and repeat 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 look through the Pulsar III sighting optics to ensure there is a clear sight path for measuring reactor temperatures. There should be no obstructions within the target reticule. If there are, repeat this entire clean-out process until the sight path is clear.

IMPORTANT: AS WITH ALL OPTICAL TEMPERATURE SENSORS, THE SIGHT PATH IS PART OF THE PRIMARY MEASURMENT LOOP. IT IS IMPORTANT THAT THIS PATH REMAIN CLEAR. THIS INCLUDES THE CONDITION OF THE VIEWPORT. AN OBSTRUCTION IN THE SIGHT PATH OR A DIRTY VIEWPORT <u>WILL</u> INFLUENCE THE OPERATION OF THE PULSAR III AND CAUSE ERRONEOUS MEASUREMENTS.

4.8 Instrument Settings and Parameter Descriptions.

All parameters are adjustable via the integrated push buttons as well as serial interface / software. After connecting the pyrometer to the power supply the display shows software version. After that the pyrometer's display automatically changes to the measuring mode to show the momentary measuring temperature on selecting channel. The dual color LED shows selecting (displayed) channel

Setting Keys.



SELECT - *Parameter Selection*:

1) Start *Menu* mode.
2) Steps through the *Menu* (down).
3) Aborts a parameter change without making the change and jumps to the next Parameter name.

ENTER - *Proceed:*

1) Show current value of the selected parameter. Press ENTER again if you want to exit from the *Menu*.
2) Adopts the change. If the parameter was changed (by ▼ or ▲) the display will flash with different intensity until ENTER (to accept and exit from the *Menu*) or SELECT (to abort and jump to the next parameter) button is pressed.

▼-*Decrease:*

1) Steps through the *Menu* (down).
2) Decreases the current parameter value (when possible). The values change more quickly as the button is pressed a longer time.

▲- *Increase:*

1) Steps through the *Menu* (up).
2) Increases the current parameter value (when possible). The values change more quickly as the button is pressed a longer time.

NOTE: Device automatically will exit the *Menu* without any changes if no activity on the back panel within approximately 2 minutes.

Parameters

NOTE: All temperatures will be shown according to C / F configuration. Command marked (1) apply for individual channel and marked (2) for both channels if available. *[indicates operating mode dependence or a global function that affects the Pulsar III as a whole; not channel dependent]*

1) Emissivity (ε)(2) *[Standard mode-both channels/FMA mode-RT channel only]*
For a correct measurement in mono (or 1- color) mode it is necessary to adjust the Emissivity. This Emissivity (emission coefficient) is the relationship between the emission of a real object and the emission of a black body radiation source (this is an object which absorbs all incoming rays and has an Emissivity of 100%) at the same temperature. Different materials have different Emissivity ranging between 0% and 100% (settings at the pyrometer between 10 and 100%). Materials with reflective surfaces or transparent materials have a lower Emissivity and the Emissivity setting of the pyrometer needs to be adjusted accordingly. In most furnace SRU applications, the emissivities should be set at 1.000 (100%).

Settings: "Emi "
"0.100" to "1.000"
Default: "1.000"

2) aLP (aLP)(1) *[FMA mode-GT channel only-replaces Emi adjustment]*
This parameter represents the quality of the flame in % which is the product of absorption, length and pressure. Lower value represents more transparency. Raising this value will decrease the GT channel output when in FMA mode and decreasing will raise the output.

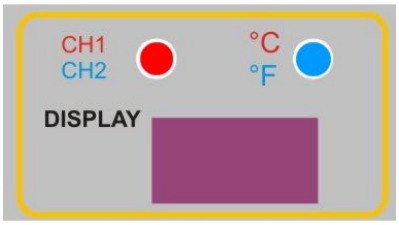
Settings: "aLP" (must be in FMA mode-active only on CH 2)
" 5" …….. " 100" %

Default: " 15"

3) Display (Ch1/Ch2)(2) *[Any operating mode]*
This selects the channel that is on the display *and* active with the configuration menu. (Selects the channel on which to make any configuration changes) Shown here is CH1 on display and it is in °F. Any configuration menu items apply only to CH1. To access the configuration menu of CH2, you must first use this button sequence to make the display active on CH2. Only then can you access the configuration menu for CH2. Note CH1 and CH2 can be assigned according to "AOUT" menu.

Settings: "Dspl"
"Ch1 "
"Ch2 "

Default: "Ch1 "



4) Response time (t90 / s)(2)
The response time is the time (in minutes) when a step change on the measured temperature reaches 90% of the final value. Also known as 'input filter' on process instruments.
In the "Min " position, the device operates using the time constant defined in the specification.

Note: In FMA mode, response time is limited to 0.5 seconds and if one channel has slower time setting, it automatically applies to both channels. In FMA mode, both channels must have equal response times.

Settings: "t90 "
"Min " *
"0.50"
"1.00"
"2.00"
"5.00"
"10.0"
"30.0"
"60.0"
"90.0"
"120."

Default: "Min " in Standard mode, 0.5 in FMA mode.
* Minimum time is not available in FMA mode.

5) Clear time (tCL)(2) *[Any operating mode]*
The 'maximum value storage' or commonly known as 'peak hold' stores the highest measurement value. The clear time defines the time period to hold the stored value and replace it by a new one.
The following settings are possible:
• "OFF": The storage or peak function is switched off. (recommended for furnace applications)
• tCL (stands for time CLear) the maximum value will be cleared in selected period of time.
• "EXT ": The external clearing of the storage can be activated with the software. *Even though this function is available with the Pulsar III, it is not recommended for use with furnace applications.*

• "AUTO": This mode is used for discontinuous measuring tasks. For example objects are transported on a conveyer belt and pass the measuring beam of the pyrometer only for a few seconds. Here the maximum value for each object has to be indicated. In this mode the maximum value is stored until a new hot object appears in the field of view. The temperature, which has to be recognized as "hot", is defined by the low limit of the adjusted sub range. The stored maximum value will be deleted when the temperature of the new hot object rises above low limit of the sub range (see LO) by 1% or at least 2°C. *Even though this function is available with the Pulsar III, it is not recommended for use with furnace applications.*
• "HOLD": In this mode it is possible to freeze the with the last reading via software activation. *Even though this function is available with the Pulsar III, it is not recommended for use with furnace applications.*

Settings: "tCL "
"OFF "
"0.10"
"0.25"
"0.50"
"1.00"
"5.00"
"25.0"
"EXT "
"AUTO"

Default: "OFF "

6) Flame Measurement Algorithm (FMA)(2) [global]
This turns the FMA mode ON or OFF. When OFF, the Pulsar III operates in its Standard mode. When ON, it is operating in FMA mode which uses a unique and proprietary algorithm to infer flame or hot gas temperatures with more accuracy and less cross-talk between channels. See separate description in this manual. This mode was developed for enhanced performance in SRU applications and is highly recommended to turn it on. It is best to make the channel subranges match when using this mode (see LO or HI).

Settings: "FMA"
"ON"
"OFF "

Default: "OFF "

7) Analog output Channel Assignment (AOUT) [global]
Each channel output must be assigned to a temperature measurement function. This is done by selecting one of six output assignment configuration modes.

Settings:	Assignments		Description
	CH 1	**CH 2**	
RTGT	RT	GT	Refractory on CH 1, Gas/Flame on CH 2 (factory default)
RTFF	RT	FF	Refractory on CH 1, Average of Refractory & Gas on CH 2
RTRT	RT	RT	Refractory on both channels (for redundancy)
FFGT	FF	GT	Average of Refractory & Gas on CH 1, Gas/Flame on CH2
FFFF	FF	FF	Average of Ref & Gas on both channels (for redundancy)
GTGT	GT	GT	Gas/Flame on both channels (for redundancy)

Note: The Pulsar III is always operating internally as RT on CH 1, GT on CH 2. When selecting FF on any channel, all adjustments such as Emi (and aLP when in FMA mode) apply to the RT and GT measurements respectively. The FF average output is a calculated average of the internal RT and GT measurements.

8) Analog output (mA)(2)
The analog output has to be selected according to the signal input of the connected instrument (controller, PLC, etc.). You can choose the current output to be either 0 to 20 mA or 4 to 20 mA. Channels may be mixed.

Settings: "mA "
"0-20"
"4-20"

Default: "4-20"

9) Subrange (LO)(2)
You may alter the Pulsar III temperature range within the basic measuring range of the pyrometer. This Subrange sets the temperatures for the analog output beginning and end. "LO" is the beginning temperature of the subrange and corresponds to 4mA (or 0mA if 0-20mA is selected above). Additionally, with the setting of a Subrange it is possible to fulfill the requirements of the "AUTO" clear mode of the maximum value storage (see tCL). Subranges for each channel do not have to match. They may be set differently. If planning to use FMA mode (see FMA), they should be set to match for best performance.

Settings: "LO "
" 350" ……..."1949" (when in °C)

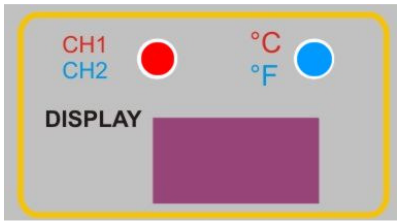
Default: 350 (662°F)
Limitations: minimum 51°C/124°F span

10) Subrange (HI)(2)
You may alter the Pulsar III temperature range within the basic measuring range of the pyrometer. This Subrange sets the temperatures for the analog output beginning and end. “HI” is the end temperature of the subrange and corresponds to 20mA. If planning to use FMA mode (see FMA), they should be set to match for best performance.

Settings: “HI “
“ 401” ……..“2000”

Default: 2000°C (3632°F)

11) Temperature units (C / F)(2) [global]
The temperature can be displayed in °C or °F.
Dual color LED shows current setting. °F shown here. →
Note: Cannot mix channel settings. The entire Pulsar III will operate in the last change made to this setting for both Channels. Alarm setpoints, subranges, etc. will automatically be converted to most recent units.



Settings: “C/F “
“'C “
“'F “

Default: “'C “

12) Limit switch or Alarm Relay (LIM)(2)
The instrument is equipped with a relay contact for each channel controlled by the measured signals. The switch point of this relay is adjustable with the function ”LIM”. The minimum value is limited to Subrange ‘LO’ plus 21°C/38°F and maximum value is HI (see LO, HI). The relay changes state when temperature rises above switch point.

Settings: “LIM ”
“ 371” ……..“2000”

Default: 2000°C (3632°F)

13) Hysteresis (HYS)(1)
To avoid contact noise of the relay at switch-point (see LIM) Hysteresis is used.
The relay will change state to below setpoint when measuring temperature falls below switch-point LIM minus HYS value.

Settings: “HYS ”
“ 20” ……..“ 2”

Default: “ 20”

14) Serial interface (COM)(2) [global]
Selection of RS232 or RS485. Note this is a global setting. Changing this applies to the entire Pulsar III.

Setting: "COM "
"232 "
"485 "

Default: "232 "

15) Address (Adr)(2)
For the connecting of several pyrometers with RS485 with one serial interface it is necessary to give each instrument an individual address for communication. It is necessary to assign each channel an address. If multiple Pulsar III's are connected, each channel of each Pulsar III are treated as a separate instrument. After all instruments/channels are assigned addresses where no two channels' addresses are duplicated, they can be connected.

Settings: "Adr "
" 00" ……." 97"

Default: "01" for Channel 1, "02" for Channel 2

16) Baud rate (kBd)(2) [global]
The transmission rate of the serial interface in Baud (Bd) is dependent on the length of the cable. A standard cable length with RS232 for 19200 Bd is 7 m, with RS485 2 km. The baud rate should be reduced by 50% if the transmission distance is doubled.

Settings: "kBd " (in Kbytes/second)
"1.20"
"2.40"
"4.80"
"9.60"
"19.2"
"38.4"
"57.6"
"115."

Default: "19.2"

17) Wait time (tw)(2) [global]
Using a pyrometer with serial interface it is possible that the connection is not fast enough to receive the pyrometer's answer to an instruction from the master. In this case, a wait time can be set to slow down the data transfer (e.g.: tw = 02 at a baud rate 9600 means a wait time of 2/9600 sec). Each type of interface (see COM) may be assigned its own wait time value.

Settings: "tw "
" 0" ……." 99"

Default: " 10" for RS232, " 40" for RS485

18) Test mode (TEST)(1)
This diagnostic mode generates a current on the analog output, which is used to check if a connected external indicator shows the correct temperature value. The test current output is centered to the chosen analog output span, consequently 10 mA is supplied if the analog output is set to 0 to 20 mA and 12 mA is supplied if the analog output span is set to 4 to 20 mA. The display will flash showing the respective

current along with the corresponding temperature. For example if a measuring range of 650°C to 1800 °C is selected, the temperature shown in the display will be 1225°C. This temperature must be the same as the external indicator (within 1° typically) which is supplied by the respective current. If this is not the case, the selected analog input current span of the indicator is not equivalent to the chosen current output span of the pyrometer and one of the current spans or temperature ranges has to be modified. To exit from this mode, press SELECT or ENTER, if none of those keys is pressed, the instrument will go off from this mode automatically in 2 minutes.

Settings: "TEST" Default:" "center of subrange"/"10mA" or "center of subrange"/"12mA"

19) Internal temperature (Int)(2)
Shows internal temperature of the device in the operating units of the Pulsar III.

Settings: "Int "
Display: " 30"

20) Maximum internal temperature (MAX)(2)
Shows the maximum internal temperature the device ever reached (in operating units).

Setting: "MAX "
Display: " 60"

21) Error status (eSt)(2) [global]
In case of a device error the pyrometer displays a hex code, which identifies this error to MIKRON service.

Settings: "eSt "
Display: "0000"

22) Password (PSSW)(2) [global]
Set password.

Settings: "PSSW"
"0000"……..."9999"

Display: "****" (shipped from factory with default code = 5555)

23) Lock Panel (LOCK)(2) [global]
To prevent any attempt to change configuration of the unit, access to the panel can be locked or unlocked with your own software or by the following options:
• "PULC": Panel unlocked.

• "TLCK": Panel is locked as long as power is maintained to the Pulsar III. If power is disconnected, the unit will start up in unlocked mode and remain until an operator resets this lock. To unlock the panel, you will be prompted to dial the password.
(see PSSW).

• "PLCK": Panel is locked permanently. To unlock the panel, you will be prompted to dial the password (see PSSW).

Settings: "PLCK"
"TLCK"
"UNLC"

Default: "PULC"

5. Digital Communications

The Pulsar III has an array of remote commands available via its RS-232 or RS-485 (user selectable) communication port. This instrument is compatible with Mikron InfraWin communication software (included with your Pulsar III). A description of the protocol is shown below for those who wish to do their own programming.

Data format UPP (Universal Pyrometer Protocol)
The data exchange occurs in ASCII format.
The interface settings of the instrument are defined to be 8 data bit, one stop bit, even parity (8,1,e).
Each command sequence is composed of a 2 character address, followed by 2 character command ID (two letters or one letter and one digit), zero or more parameters and a trailing carriage return (no line feed).

The device responds to the entry of a command with: output (e.g. the measuring value) + CR (**C**arriage **R**eturn, ASCII 13), to pure entry commands with "ok" + CR.
Example: Entry: “00em“+ <CR>
The emissivity setting (ε) of the device with the address 00 is returned
Answer: “0970“+ <CR> means Emissivity = 0.97 or 97.0%

Set of commands supported by Pulsar III:

Command	Format		Description
	Read	Set	
Analog output	AAas	AAasX	X = 0...1 0 = 0...20 mA 1 = 4...20 mA
Ref. number	AAbn		XXXXXX (hex 6-digit)
Baud rate	AAbr	AAbrX	X = 0...6 or 8 (dec) 0 = 1200 baud 1 = 2400 baud 2 = 4800 baud 3 = 9600 baud 4 = 19200 baud 5 = 38400 baud 6 = 57600 baud (7 is not allowed) 8 = 115200 baud
Emissivity	AAem	AAemXXXX	XXXX = 0010 ... 1000 (dec, in 0.1% resolution)
°C / °F	AAfh	AAfhX	X = 0: display in °C; X = 1: display in °F
Response time t90	AAez	AAezX	X = 0 ... 0 (dec) 0 = intrinsic time constant of the device 1 = 0.50 s 2 = 1.00 s 3 = 2.00 s 4 = 5.00 s 5 = 10.0 s 6 = 30.0 s 7 = 60.0 s 8 = 90.0 s 9 = 120.0 s

Error status	AAfs		XX (hex, 00 = no error) Contact MIKRON
Device address	AAga	AAgaXX	XX = (dec, 00 ... 97) 00 ... 97 = regular device addresses
Internal temperature	AAgt		XXX (dec)
External reset	AAlx		Simulation of an external reset contact (for Peak Hold)
Reset maximum value	AAlz	AAlzX	X = 0 ... 8 (dec) 0 = Maximum value storage off 1 = 0.10 s 2 = 0.25 s 3 = 0.50 s 4 = 1.00 s 5 = 5.00 s 6 = 25.00 s 7 = external reset (n/a) 8 = automatically reset
Set temperature range		AAm1XXXXYYYY	XXXXYYYY (hex, 8-char) XXXX - beginning of temp. range YYYY - end of temp. range
Read temperature range	AAmb		XXXXYYYY (hex 8-char) XXXX = beginning of temp. range YYYY= end of temp. range
Read temperature value	AAms		XXXXX (dec, in 0.1 resolution)
Read specified number of samples of temperature.	AAmsXXX		XXX = 000...999 (number of requested samples)
Device type	AAna		“PULSARIII MIKRON” (16 ASCII-characters)
Read parameters	AApa		AABCDEEFFG0 (dec, 11 digits). AA - Emissivity (00 means 1) B - t90 (Response time) C - tCL (clear time) D - Analog output EE - Int Temperature in °C FF - Device Address G - Baud rate 0 - always 0
FMA mode OFF/ON	AAru	AAruXXX	XXX=001 = ON XXX=000 = OFF
Serial number	AAsn		XXXXX (dec, 5-digits)
Max. internal temperature	AAtm		XXX (dec)
Wait time (see Note 1)	AAtw	AAtwXX	XX = 00 ... 99 (dec, 2-digits)
Device type / software version	AAve		XXYYZZ (dec, 6-digits) XX = 85 (PulsarIII) YY = Firmware month ZZ = Firmware year
Software version in detail	AAvs		dd.mm.yy XX.YY(14 ASCII characters) dd = Day mm = month yy = year XX.YY = software version

Additional instructions for the RS 485 interface:

Requirements to the master system during half-duplex operation:
1. Wait-time from reception of a valid command to beginning of the answer. This time is specified in bit-times of the selected baud rate and is a minimum. The time really needed may be longer depending on the processing time for the answer string.
2. The pyrometer's response will follow after 50 ms at the most.
3. If there is no response, there is a parity or syntax error and the inquiry has to be repeated.

6. TROUBLESHOOTING

6.2 Problem Isolation Checkout Procedure

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

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

6.2.1 Optical Alignment and Focus

The PULSAR III measures the temperature of the area inside the round reticule seen through the eyepiece. Check to see the reticule 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 reticule in the eyepiece do not move relative to each other. Move the lens in or out to obtain correct focus.

6.2.2 Clear Sight Path and Clean Optics

IMPORTANT: AS WITH ALL OPTICAL TEMPERATURE SENSORS, THE SIGHT PATH IS PART OF THE PRIMARY MEASURMENT LOOP. IT IS IMPORTANT THAT THIS PATH REMAIN CLEAR. THIS INCLUDES THE CONDITION OF THE VIEWPORT. AN OBSTRUCTION IN THE SIGHT PATH OR A DIRTY VIEWPORT WILL INFLUENCE THE OPERATION OF THE PULSAR III AND CAUSE ERRONEOUS MEASUREMENTS.

Ensure that the PULSAR III is aligned properly by looking into the eyepiece. The round reticule 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 III.

Without a clear optical path, the radiation from a target cannot reach the detector. If the viewport assembly, front window assembly, or lens 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.
WARNING! Refer to drawing 20290-0 Rev-C (or later) for the proper assembly method. Look for dirt or heavy smudges. 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.

6.2.3 Power Fuse

Check that F1 (1A) is not open. Remove the fuse from its holder and test with an ohmmeter.
Check F2 (4A) to ensure the internal heater will work if the ambient temperature approaches 0°C/32°F.

6.2.4 Low-End Temperature Reading

With the PULSAR III swung away from looking into the reactor, check the low-end temperature reading on the display. This is the bottom-end temperature of the unit minus one degree if the subrange has been set equal with the full instrument range. Otherwise, it will may display “UNDR”. A flashlight (non-LED type) may be used to functionally test the Pulsar III. Aim the flashlight into the Pulsar III optics. The display should show some temperature above the beginning of the range.

6.2.5 Check Instrument Loops

Check the temperature display or recorder when in “Test Mode” to ensure that the signal is being transmitted and makes it to the control room display.

6.2.6 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. Use a field mA calibrator or ohm meter to check for continuity of all wiring.

6.2.7 Component Failure

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.

Although it is not recommended, 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 662°F (350°C) to 3632°F (2000°C).
c. An optical alignment bench with variable aperture and a constant temperature infrared source.
d. A computer capable of communicating with the instrument 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.

6.3 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. The EXP housing is not required to return if the problem is with the electronics. Remove the electronics assembly from the EXP housing, then package the instrument 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

7. MAINTENANCE

7.1 General Maintenance

Hazardous location Safety minder
At no time should the cover be removed unless power is switched off first. When it is necessary to service instrument with the power applied, insure proper safe environmental conditions exist and that such maintenance is authorized and pursuant to safe conditions.
WARNING: THE CONDUIT SEAL FITTINGS MUST BE LOCATED NO GREATER THAN 18 INCHES (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING.

For Ex II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.

Reference: Section 8 Safety Assurances and Precautions

The PULSAR III 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

Repairs performed without affecting instrument performance are replacement of MOV components, heater assemblies, switches, interconnecting cables, connectors, eyepiece and lens and Front Window Assembly.
Components in the "calibration" system may not be replaced.

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 III is to be used in a critical control installation.

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

7.2 Cleaning the Optics

The optics of the PULSAR III consists 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 alignment and 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 and lens cleaning wipes available at camera stores. 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 switched off first. When it is necessary to service instrument with the power applied, ensure proper safe environmental conditions exist and that such maintenance is authorized and pursuant to safe conditions.

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

1. Close ball valve.
2. Loosen Swing-out Wing Nut Lock on the SOF-8 and rotate out of slot.
3. Swing Sensor Assembly sufficiently to have clear access to viewport. Turn off air purge and disconnect line to bleed pressure (Drawing # 20290-MID, 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. Toothpaste may be used to clean stubborn dirt on windows. Thoroughly wash with water afterwards.
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. Reconnect purge line.
12. Turn on air purge.
13. Open ball valve.
14. Verify that air purge flow is at least 1 SCFM.
15. Check for leaks. If detected, close ball valve immediately.

7.4 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 7.3
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)
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 7 to 15 in section 7.3.

7.5 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.

8. Safety Assurances and Precautions 

8.1 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 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 that 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 local and manufacturer's Explosion Proof practices
- When replacing top cover, the sixteen M8 x 1.25 socket head screws must be torqued 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 of housing 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

THE CONDUIT SEAL FITTINGS MUST BE LOCATED NO GREATER THAN 18 INCHES (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING.

For  ***II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.***

Safety Assurances and Precautions continued

8.2 Electrical Service protection:

Over-current protection / service switch: It may be 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.

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.
WARNING: THE CONDUIT SEAL FITTINGS MUST BE LOCATED NO GREATER THAN 18 INCHES (457mm) FROM THE INSTRUMENT ENCLOSURE TO MAINTAIN EXPLOSION PROOF RATING.

For  ***II 2 G, EEx d IIB T4 applications , this seal must be directly at the enclosure entry.***

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 & Parameter Settings

TEMPERATURE RANGE	
Single Continuous Scale	662 - 3632°F 350 - 2000°C
ACCURACY	±0.5% Reading or ±5°C ±1 Digit, whichever is greater
RESPONSE TIME	Programmable from 0.2 sec to 120 sec. (0.5s to 120s when FMA mode is ON)
OUTPUT	Two 4-20mA outputs. User selectable to 0-20mA Outputs are assigned to RT, GT, or FF via configuration mode.
RELAY CONTACTS	30VDC 1A , Resistive
EMISSIVITY ADJUSTMENT	0.10 to 1.00 digital on both channels when in Standard mode 0.005 to 1.00 aLP when in FMA mode on GT channel
FOCUSING RANGE	20" to infinity - Standard
TARGET SIZE	60:1 Standard Resolution Where *1* = Target Size in Inches *60* = Distance to Target in Inches (Measuring spot size = distance / 60)
POWER RATINGS	24V +/-20% 0.4A maximum 5A with heater.
FUSING	ELECTRONICS: 24Vdc 1A,'T' Time-Lag 5x20mm HEATER : 24Vdc 4A, Fast TR5, Wickman 370-1400
AMBIENT TEMPERATURE LIMITS	A. -40 to 120°F (-40 to 49°C) with no cooling and using internal heater B. 34 to 200°F (1 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

HAZARDOUS CLASSIFICATION Reference Appendix B: Area Classifications / Protection concepts	Explosion Proof, prevent flame propagation CSA/US all models Class 1, Division 1, Groups C and D Class 1, Division 2, Groups A through D Temp code – T4A Enclosure Type – 4X KEMA/ATEX approved Zone 1 Type : Ex II2 G EEx d IIB T4
TORQUE SPEC, LID BOLTS	50in-lbs,+/-5 ; 5.5N-m
AIR	Housing Purge: not required View port purge: 20 psig min., 1 SCFM Combustion purge: 20 psig min., 10SCFM
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)

Configuration of Parameters:

Pulsar III Configuration Table

Unit Firmware =	
Unit Serial No. =	
Date =	
Tech =	

Factory defaults

Default		FMA=OFF	FMA=ON
Parameter	**CH1**	**CH2**	**CH2**
Emi	1.000	1.000	0.15
Dspl	CH1	CH2	
t90	0.50	0.50	0.50
tCL	OFF	OFF	
FMA	OFF		
AOUT	RTGT		
mA	4-20	4-20	
LO	350	350	
HI	2000	2000	
C/F	C		
LIM	2000	2000	
HYS	20	20	
COM	232		
Adr	01	02	
kBd	19.2		
tw	10 (RS-232), 40 (RS-485)		
TEST	12mA	12mA	
Int	25	25	
MAX	nnn	nnn	
eSt	0000		
PSSW	5555		
LOCK	PULC		

Custom configuration for this unit if not default

CUSTOM		FMA=OFF	FMA=ON
Parameter	**CH1**	**CH2**	**CH2**
Emi			
Dspl			
t90			
tCL			
FMA			
AOUT			
mA			
LO			
HI			
C/F			
LIM			
HYS			
COM			
Adr			
kBd			
tw			
TEST			
Int			
MAX			
eSt			
PSSW			
LOCK			

- Boxes spanning 2 columns indicate they are same if FMA is on or off.
- Boxes spanning all 3 columns indicate global settings.
- Shaded boxes indicate read-only parameters.
- When in FMA mode, t90 will always force CH1 and CH2 to equal the highest t90 value that is set on either channel. (t90's cannot be different when in FMA mode)

Pulsar III Configuration Table

Unit Firmware =	
Unit Serial No. =	
Date =	
Tech =	

Factory defaults

Default		FMA=OFF	FMA=ON
Parameter	**CH1**	**CH2**	**CH2**
Emi	1.000	1.000	0.15
Dspl	CH1	CH2	
t90	0.50	0.50	0.50
tCL	OFF	OFF	
FMA	OFF		
AOUT	RTGT		
mA	4-20	4-20	
LO	350	350	
HI	2000	2000	
C/F	C		
LIM	2000	2000	
HYS	20	20	
COM	232		
Adr	01	02	
kBd	19.2		
tw	10 (RS-232), 40 (RS-485)		
TEST	12mA	12mA	
Int	25	25	
MAX	nnn	nnn	
eSt	0000		
PSSW	5555		
LOCK	PULC		

Custom configuration for this unit if not default

CUSTOM		FMA=OFF	FMA=ON
Parameter	**CH1**	**CH2**	**CH2**
Emi			
Dspl			
t90			
tCL			
FMA			
AOUT			
mA			
LO			
HI			
C/F			
LIM			
HYS			
COM			
Adr			
kBd			
tw			
TEST			
Int			
MAX			
eSt			
PSSW			
LOCK			

- Boxes spanning 2 columns indicate they are same if FMA is on or off.
- Boxes spanning all 3 columns indicate global settings.
- Shaded boxes indicate read-only parameters.
- When in FMA mode, t90 will always force CH1 and CH2 to equal the highest t90 value that is set on either channel. (t90's cannot be different when in FMA mode)

Pulsar III Quick Configuration Reference

Default Parameter Settings

Default		FMA=OFF	FMA=ON
Parameter	**CH1**	**CH2**	**CH2**
Emi	1.000	1.000	0.15
Dspl	CH1	CH2	CH2
t90	0.50	0.50	0.50
tCL	OFF	OFF	
FMA	OFF		
AOUT	RTGT		
mA	4-20	4-20	
LO	350	350	
HI	2000	2000	
C/F	C		
LIM	2000	2000	
HYS	20	20	
COM	232		
Adr	01	02	
kBd	19.2		
tw	10 (RS-232), 40 (RS-485)		
TEST	12mA	12mA	
Int	25	25	
MAX	1635	1635	
eSt	0000		
PSSW	5555		
LOCK	PULC		

Parameter Choices

	FMA=OFF	FMA=ON
CH1	**CH2**	**CH2**
0.1 - 1.000	0.1 - 1.000	0.05 -1.000
CH1 or CH2		
Min - 120s	Min - 120s	0.5 - 120s
OFF/ON	OFF/ON	
OFF/ON		
RTGT/RTFF/RTRT/FFGT/FFFF/GTGT		
0-20/4-20	0-20/4-20	
350 to HI-51°	350 to HI-51°	
2000 to LO+51°	2000 to LO+51°	
C/F		
2000 to LO+HYS	2000 to LO+HYS	
2 - 20°	2 - 20°	
(RS) 232/485		
00 – 99 (must be different from channel 2)	00 – 99 (must be different from channel 1)	
115k to 1.2kb/s		
0 - 99		
10mA/12mA fixed by mA parameter	10mA/12mA fixed by mA	
Displays detector temperature	Displays detector temperature	
Max det temp ever	Max det temp ever	
error code		
0000 - 9999		
PULC/TLCK/PLCK		

- Boxes spanning 2 columns indicate they are same if FMA is on or off.
- Boxes spanning all 3 columns indicate global settings
- Shaded boxes indicate read-only parameter
- When in FMA mode, t90 will always force CH1 and CH2 to equal the highest t90 value that is set on either channel. (t90's cannot be different when in FMA mode)

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 (X)

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

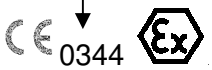
T4: Temperature code: maximum surface temperature will not exceed 135°C (275°F)
Pertinent when considering gas ignition temperatures that may come in contact.

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: Label Markings continued

CSA markings and classification for all models M7000-EXP PULSAR III.

US = Tested to UL standards for NRTL acceptance.

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.

APPENDIX C: Declaration of Conformity / Certificates

CSA INTERNATIONAL

Certificate of Compliance

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

Project: 1819738 **Date Issued:** 2006/10/19

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'

C US

Issued by: Rob Kohuch E.I.T.

Authorized by: Patricia Pasemko, Operations Manager

PRODUCTS

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

The 'C' and 'US' indicators adjacent to the CSA Mark signify that the product has been evaluated to the applicable CSA and ANSI/UL Standards, for use in Canada and the U.S., respectively. This 'US' indicator includes products eligible to bear the 'NRTL' indicator. NRTL, i.e. National Recognized Testing Laboratory, is a designation granted by the U.S. Occupational Safety and Health Administration (OSHA) to laboratories which have been recognized to perform certification to U.S. Standards.

DQD 507 Rev. 2004-06-30

CSA INTERNATIONAL

Certificate:	1127146 ((LR102584))	**Master Contract:**	184781
Project:	1819738	**Date Issued:**	2006/10/19

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.

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. 2004-06-30

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: **2**

(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 2095609.

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

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

(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 22 November 2006 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.

P.B.A. Jansen
Certification Manager

Page 1/2

PRODUCTS RvA C 101

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. 2**

(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, 0.5A: 50/60 Hz or 24 Vdc, 4A or 5A
Output signal : 4-20 mA

7000-EXP PULSAR III

Power supply : 24 Vdc, 5A
Output signal : 4-20 mA, 2 channels

Installation instructions

The cable entry devices and blanking elements shall be certified in type of protection flameproof enclosure "d", suitable for the condition of use and correctly installed.

With the use of conduit, a certified sealing device (stopping box) shall be provided immediately at the entrance of the enclosure.

Routine tests

None.

(16) **Test Report**

KEMA No. 2095609.

(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. 2095609.

MIKRON INFRARED

Declaration of Conformance

Application of Council Directives:

European Community 89/336/EEC

Issued by: Mikron Infrared, Inc.
Oakland, NJ

Date of Issue: 10/14/05

Type of Equipment: Infrared Thermometer

Brand Name: Mikron M7000-EXP Pulsar III

Standards to Which Conformance is Declared:

EN61326:2002, Class A Emissions
Radiated Emissions 30MHz to 1GHz

EN61326 Immunity
EN61000-4-2, Electrostatic Discharge Susceptibility
EN61000-4-3, Radiated Electromagnetic Field susceptibility
EN61000-4-4, Conducted Electrical Fast Transients Susceptibility
EN61000-4-5, Surge Immunity
EN61000-4-6, Conducted Disturbances Induced by RF Fields
EN61000-4-8, Power Frequency Magnetic Fields

I, The Undersigned, Hereby Declare That The Equipment Specified Above Conforms to the Directives and Standards As Specified

M. MacBurney, Mfg. Eng. Mgr.

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.

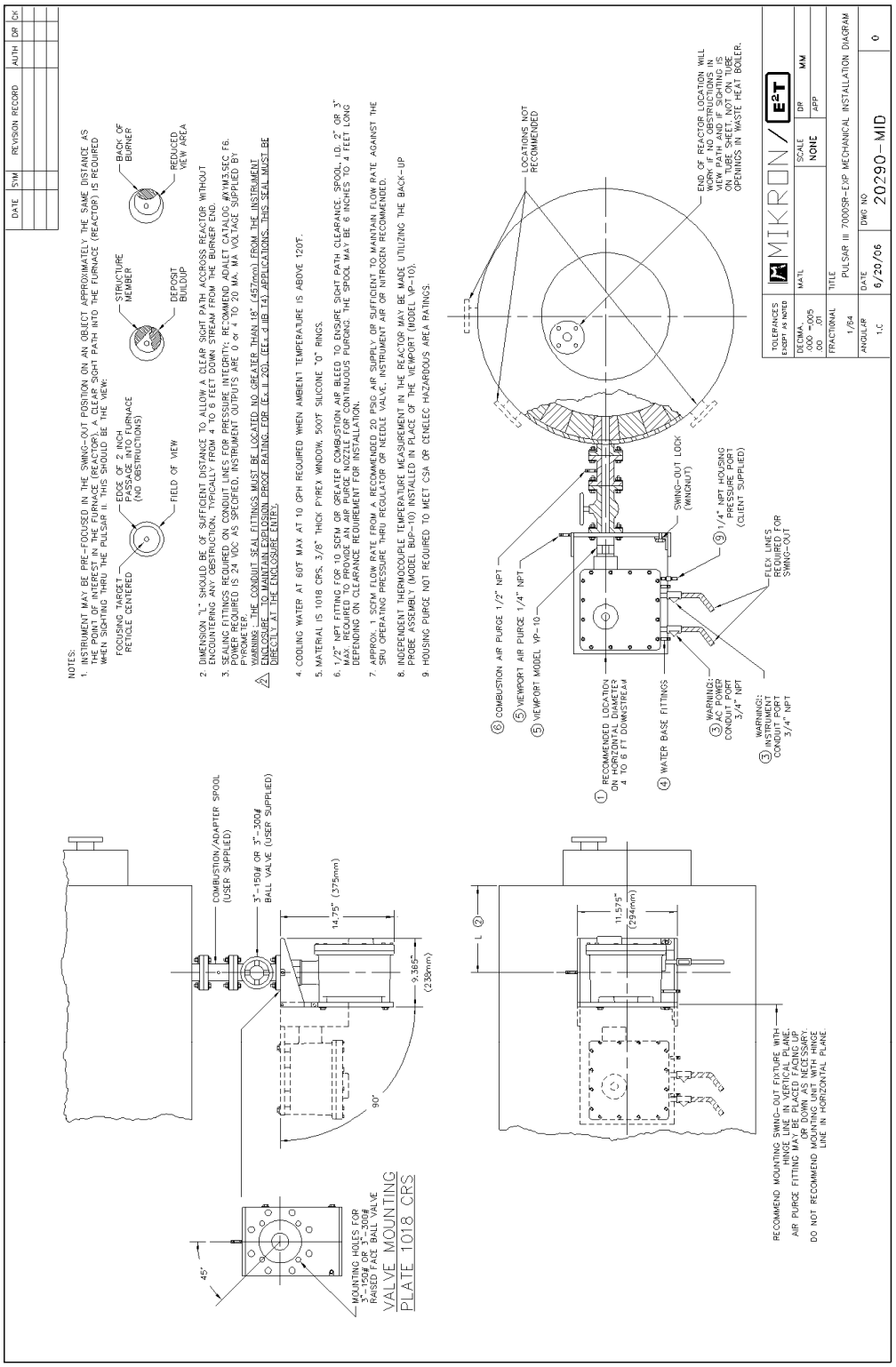
The customer's/end user's sole and exclusive remedy in the event of a perceived or real defect is herein and expressly limited to the correction of said defect(s), at Mikron Infrared Corporation's election and expense. There shall be no obligation on the part of Mikron Infrared Corporation to repair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

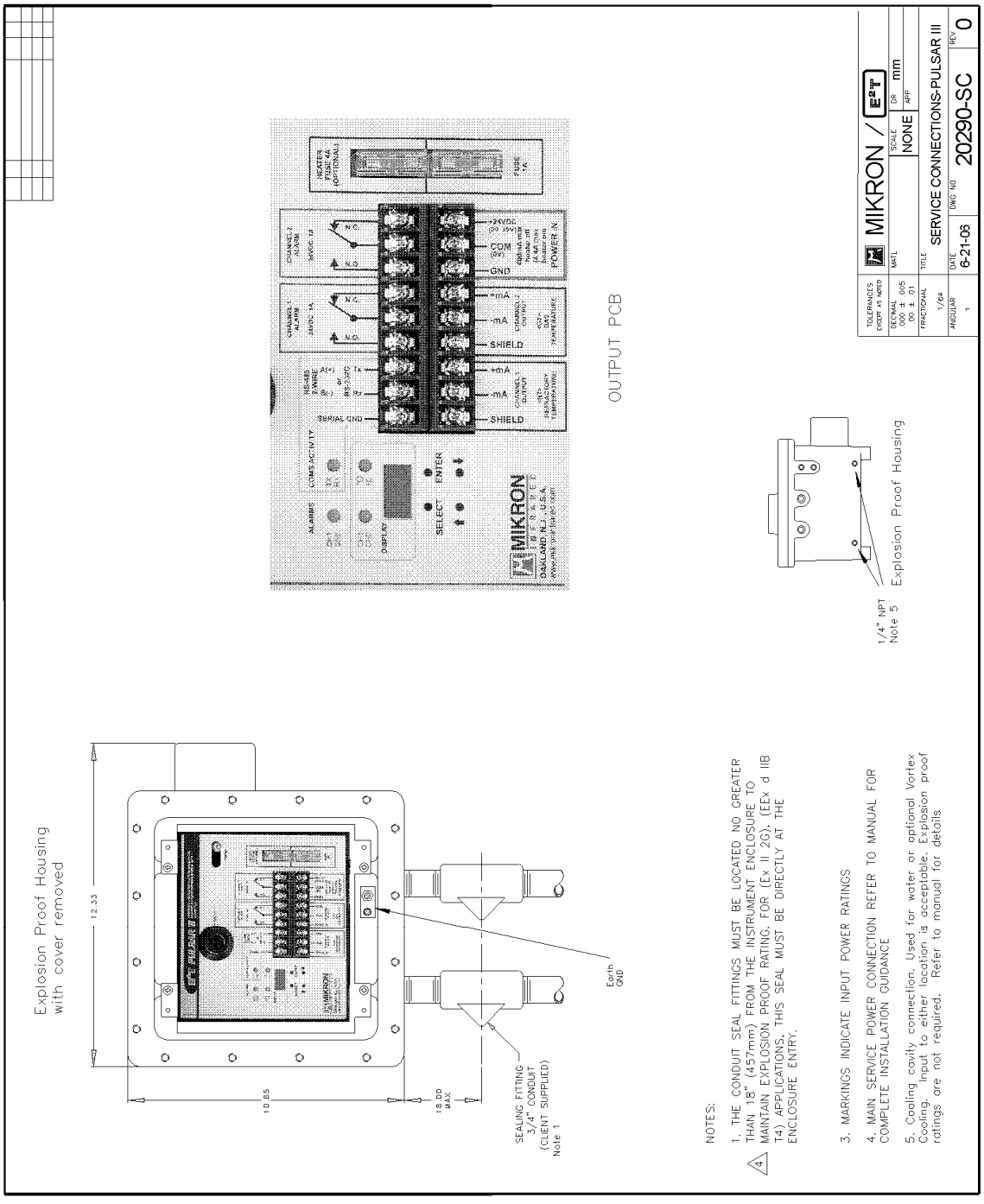
No further representation, or affirmation of fact, including, but not limited to, statements regarding capacity, suitability for use, or performance of, said equipment shall be or be deemed, to infer or be implied to be a warranty or representation by Mikron Infrared Corporation. No representative of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

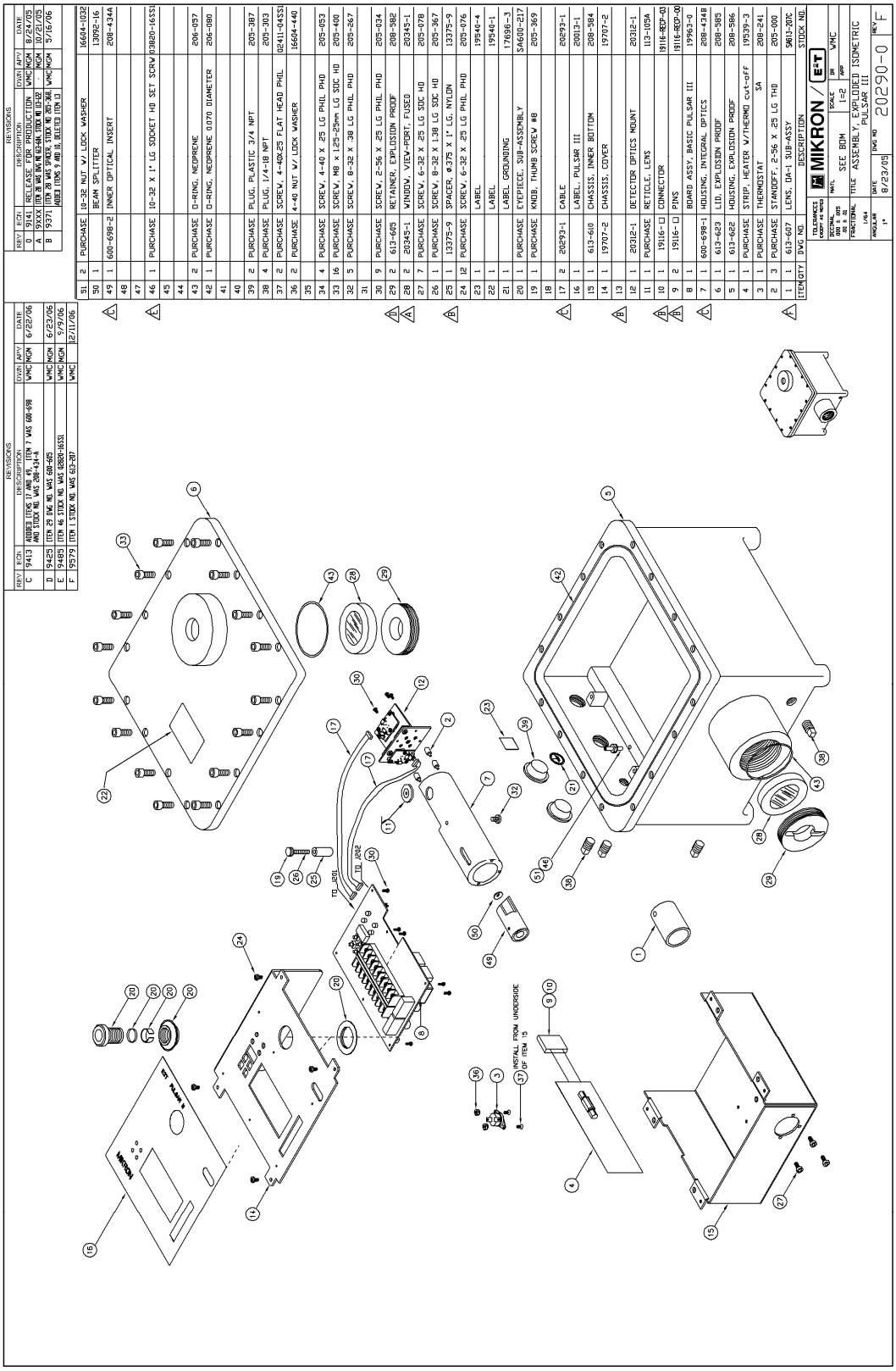
Except as specified and provided in the declaration and agreement, there are NO OTHER WARRANTIES, express or implied, including, but not limited to, any implied warranty, or merchantability, or fitness for a specific application or purpose. IN NO EVENT, shall Mikron Infrared Corporation be subject to, 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.

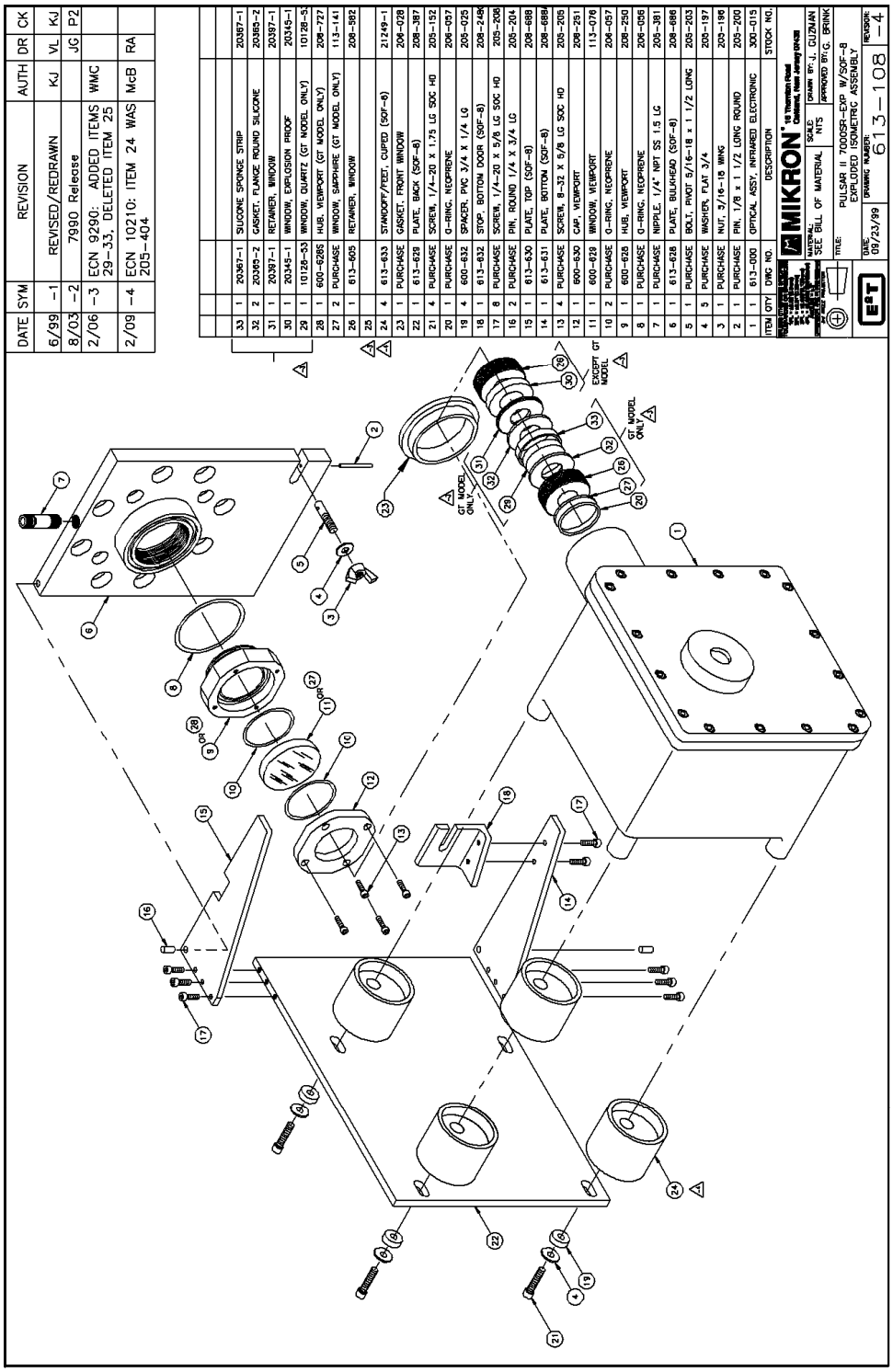
Mikron Infrared Incorporated
16 Thornton Road
Oakland, New Jersey 07436
(201) 405 0900 FAX: (201) 405 0090

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
REFRACT 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 8 FEET DOWN STREAM FROM THE BURNER END.
3. SEALING FITTINGS REQUIRED ON CONDUIT LINES FOR PRESSURE INTEGRITY; RECOMMEND ADALET CATALOG #XM3SEC F6. POWER REQUIRED IS 24 VDC AS SPECIFIED. INSTRUMENT OUTPUTS ARE 0 or 4 TO 20 MA VOLTAGE SUPPLIED BY CUSTOMER.
WARNING - THE CONDUIT SEAL FITTINGS 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 FLOW. RECOMMEND 4" 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
COMBUSTION/ADAPTER SPOOL (USER SUPPLIED)
3"-150# OR 3"-300# BALL VALVE (USER SUPPLIED)
14.75" (375mm)
9.365" (238mm)
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 SIGHTING ON TUBE SHEET, NOT ON TUBE OPENINGS IN WASTE HEAT BOILER.
⑥ COMBUSTION AIR PURGE 1/2" NPT
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: ADALET SEALED CONDUIT PORT 3/4" NPT
③ 1/4" NPT HOUSING PURGE PRESSURE 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 AS NECESSARY. 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°
MATL
SCALE NONE
DR MM
APP
TITLE PULSAR III 7000SR-EXP MECHANICAL INSTALLATION DIAGRAM
DATE 6/20/06
DWG NO 20290-MID
0


OUTPUT PCB
Explosion Proof Housing
1/4" NPT
Note 5
Explosion Proof Housing
with cover removed
12.53
10.85
18.00
MAX
SEALING FITTING
3/4" CONDUIT
(CLIENT SUPPLIED)
Note 1
Earth
GND
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.
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 / E²T
SERVICE CONNECTIONS-PULSAR III
20290-SC
6-21-06
NONE
mm
0




DATE SYM REVISION AUTH DR CK
6/99 -1 REVISED/REDRAWN KJ VL KJ
8/03 -2 7990 Release JG P2
2/06 -3 ECN 9290: ADDED ITEMS 29-33, DELETED ITEM 25 WMC
2/09 -4 ECN 10210: ITEM 24 WAS 205-404 McB RA
ITEM QTY DWG NO. DESCRIPTION STOCK NO.
33 1 20367-1 SILICONE SPONGE STRIP 20367-1
32 2 20369-2 GASKET, FLANGE ROUND SILICONE 20369-2
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 1 613-605 RETAINER, WINDOW 208-582
25
24 4 613-633 STANDOFF/FEET, CUPED (SOF-8) 21249-1
23 1 PURCHASE GASKET, FRONT WINDOW 206-028
22 1 613-628 PLATE, BACK (SOF-8) 208-387
21 4 PURCHASE SCREW, 1/4-20 X 1.75 LG SOC HD 205-152
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) 208-248
17 8 PURCHASE SCREW, 1/4-20 X 5/8 LG SOC HD 205-206
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) 208-688A
13 4 PURCHASE SCREW, 8-32 X 5/8 LG SOC HD 205-205
12 1 600-630 CAP, VIEWPORT 206-251
11 1 600-629 WINDOW, VIEWPORT 113-078
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 205-381
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, 3/16-18 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
MIKRON
MATERIAL: SEE BILL OF MATERIAL
SCALE: NTS
DRAWN BY: J. GUZMAN
APPROVED BY: G. BRINK
TITLE: PULSAR II 7000SR-EXP W/SOF-8 EXPLODED ISOMETRIC ASSEMBLY
DATE: 09/23/99
DRAWING NUMBER: 613-108
REVISION: -4
GT MODEL ONLY
DO NOT STUFF GT MODEL