NET SAFETY
MONITORING INC.

# Unitized
# Infrared
# Flame Detector

## User Manual

## Model:

## IRS-A or AR

ISO 9001:2000

QMI REGISTERED

Part Number: MAN-0038-00 Rev 8
May 2006

# IMPORTANT INFORMATION

This manual is for informational purposes only. Although every effort has been made to ensure the correctness of the information, technical inaccuracies may occur and periodic changes may be made without notice. Net Safety Monitoring Inc., assumes no responsibility for any errors contained within this manual.

If the products or procedures are used for purposes other than as described in the manual, without receiving prior confirmation of validity or suitability, Net Safety Monitoring Inc., does not guarantee the results and assumes no obligation or liability.



Net Safety Monitoring Inc., products are carefully designed and manufactured from high quality components and can be expected to provide many years of trouble free service. Each product is thoroughly tested, inspected and calibrated prior to shipment. Failures can occur which are beyond the control of the manufacturer. Failures can be minimized by adhering to the operating and maintenance instructions herein. Where the absolute greatest of reliability is required, redundancy should be designed into the system.

## Warranty

Net Safety Monitoring Inc., warrants its sensors against defective parts and workmanship for a period of 24 months from date of purchase; other electronic assemblies for 36 months from date of purchase.

No other warranties or liability, expressed or implied, will be honoured by Net Safety Monitoring Inc.

Contact Net Safety Monitoring Inc., or an authorized representative for details.

We welcome your input at Net Safety Monitoring. If you have any comments please contact us at the phone/address below or visit our web site and complete our on-line customer survey: www.net-safety.com.

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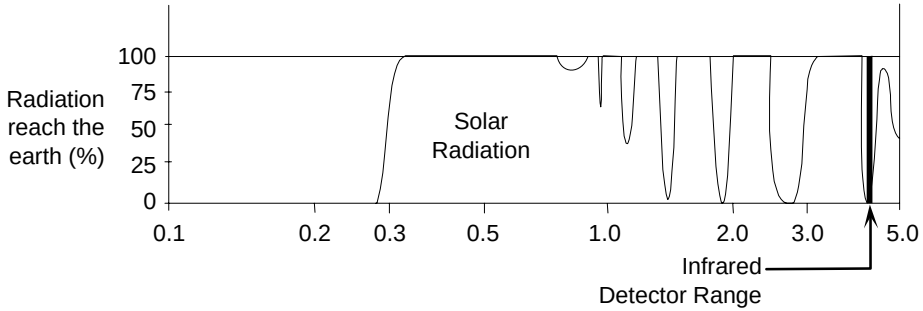
# INTRODUCTION

The IRS is a smart, stand-alone infrared flame detector. The detector is designed to respond to IR radiation emitted by a wide range of hydrocarbon based fires. It is ideal for both indoor and outdoor applications and has been proven reliable in even the most extreme environments.

## Spectral Sensitivity Range

The IRS fire detector responds to IR radiation in the 4.4 micron range.




## Locate Detector

When positioning fire detectors, consider such factors as distance to the fire, type of fuel and temperature as well as any environmental factors which may influence the detector's response to radiation.

### Typical applications

- automotive-manufacturing and paint spray booths
- aircraft hangars (commercial and military)
- offshore platforms, refineries, pipelines and production ships
- printing industry facilities
- oil, gas and petrochemical refineries/production/storage/off loading/shipping
- various production, processing and storage facilities
- munitions handling
- warehouses (flammable liquids/toxic gases) and tank farms (floating/non-floating)
- power generation pumps, generators and unmanned stations

### Potential ignition sources

A hydrocarbon fuel-based fire can erupt in areas where the following are found:

- alcohol
- acetylene
- diesel and hydraulic fuel
- gasoline
- natural gas
- liquefied natural gas (LNG)
- paint
- solvents
- liquefied petroleum gas (LPG)
- aviation fuel
- heptane/naptha
- propane/methane/butane

### Potential inhibitors

A potential inhibitor is anything located between the detector and a potential fire source which could prevent the IRS from detecting a fire or reduce its sensitivity to fire. Possible inhibitors include but are not limited to solid objects such as machinery, glass or plexiglass located between the detector and potential fire source.

And, although the IRS is quite tolerant of airborne contaminants, water, fog, rain, dirt or dust on the detector window or heavy smoke between the detector and potential fire source can influence the IRS sensor.

### Immune

The IRS exhibits excellent immunity to many conditions/activities including but not limited to the following:

- steady hot body radiation
- artificial lighting
- x-rays
- sunlight (direct/reflected)
- arc welding radiation (outside 30 feet/9 metres)

## RANGE

The practical application distance is directly related to the intensity of the infrared radiation source.

**Table 1:** Summary of Distances

| Fuel | Size | Distance |
|---|---|---|
| n-heptane | 1’ x 1’ | 80 feet |
| gasoline | 1’ x 1’ | 80 feet |
| methanol | 1’ x 1’ | 60 feet |
| diesel | 1’ x 1’ | 50 feet |
| JP-4 | 1’ x 1’ | 50 feet |
| lube oil | 1’ x 1’ | 40 feet |
| propane | 16” flame | 25 feet |
| paper | 2’ x 2’ | 90 feet |

### Field of View (as per FM and NFPA definition)

The area in front of a flame detector, where a standardized flame can be detected and which is specified by distance and angle off the central axis, is the Field of View. The referenced flame is moved to 50% of the maximum on-axis detection distance and then moved off-axis horizontally and vertically to the limit of detection. These off-axis angle limits specify Field of View.

According to this definition the Field of View is 90 degrees vertical and 90 degrees horizontal.

### Effective Field of View (up to 120 degrees)

There are numerous factors which contribute to the effective Field of View including the reflected energy from a fire. Note that a flame can be detected well beyond the specified Field of View if it is closer to the detector, if the flame becomes larger, fuel composition changes, temperature shifts or other factors lead to increased intensity of infrared energy reaching the detector.

## Installation Considerations

The following should be considered when mounting flame detectors.

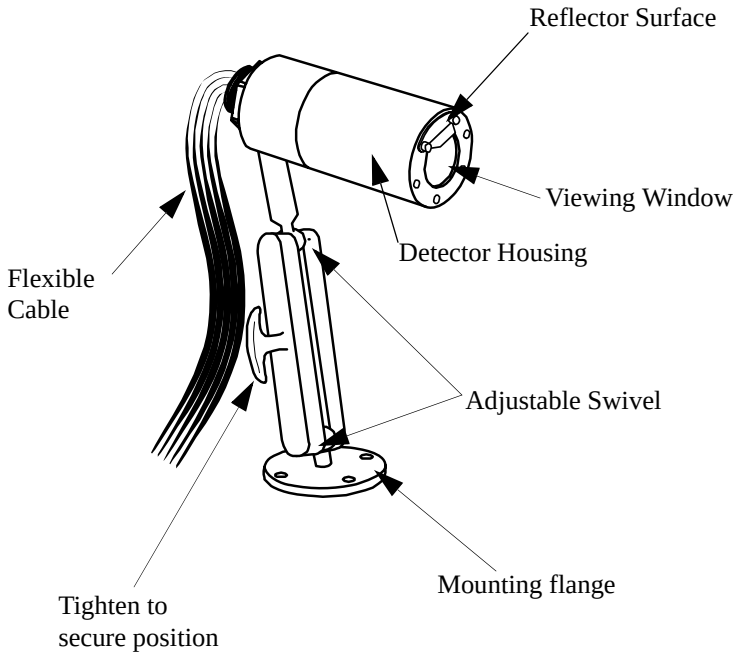
- Point detector toward where the flame is expected.
- Ensure an unobstructed view of the area to be monitored.
- Employ more than one detector to ensure the hazard is fully covered.
- Mount the detector a few feet (about 1 metre) below the ceiling so it can respond before being blocked by smoke accumulation at the ceiling.
- If dense smoke is likely to accumulate prior to flame (as in an electrical fire), supplement IR detector(s) with other protection such as Net Safety Monitoring’s Airborne Particle Monitor.
- The detector should be accessible for cleaning the window and reflector surfaces.
- Tilt detector downward a minimum of 10 to 20° to reduce dirt and dust accumulation which could obscure the detector’s viewing window.
- Securely mount detector so as to reduce vibration as much as possible.
- When located outside, detector sensitivity can be reduced by heavy fog, rain and/or ice.
- Consider shortening the time delay settings when smoke is expected to accumulate before or during a fire (refer to "System Sensitivity" on page 8).
- Reduce sensitivity setting if false alarms, related to surrounding activities, occur (refer to "System Sensitivity" on page 8).
- If a detector is located close to an intense, flickering IR source, the detector’s sensitivity may be affected.
- When installed near or on water (such as an off shore platform), be sure to take into account the low horizon level when tilting detector downward.

## UNPACK

Carefully remove all components from the packaging. Check components against the enclosed packing list and inspect all components for obvious damage such as broken or loose parts.

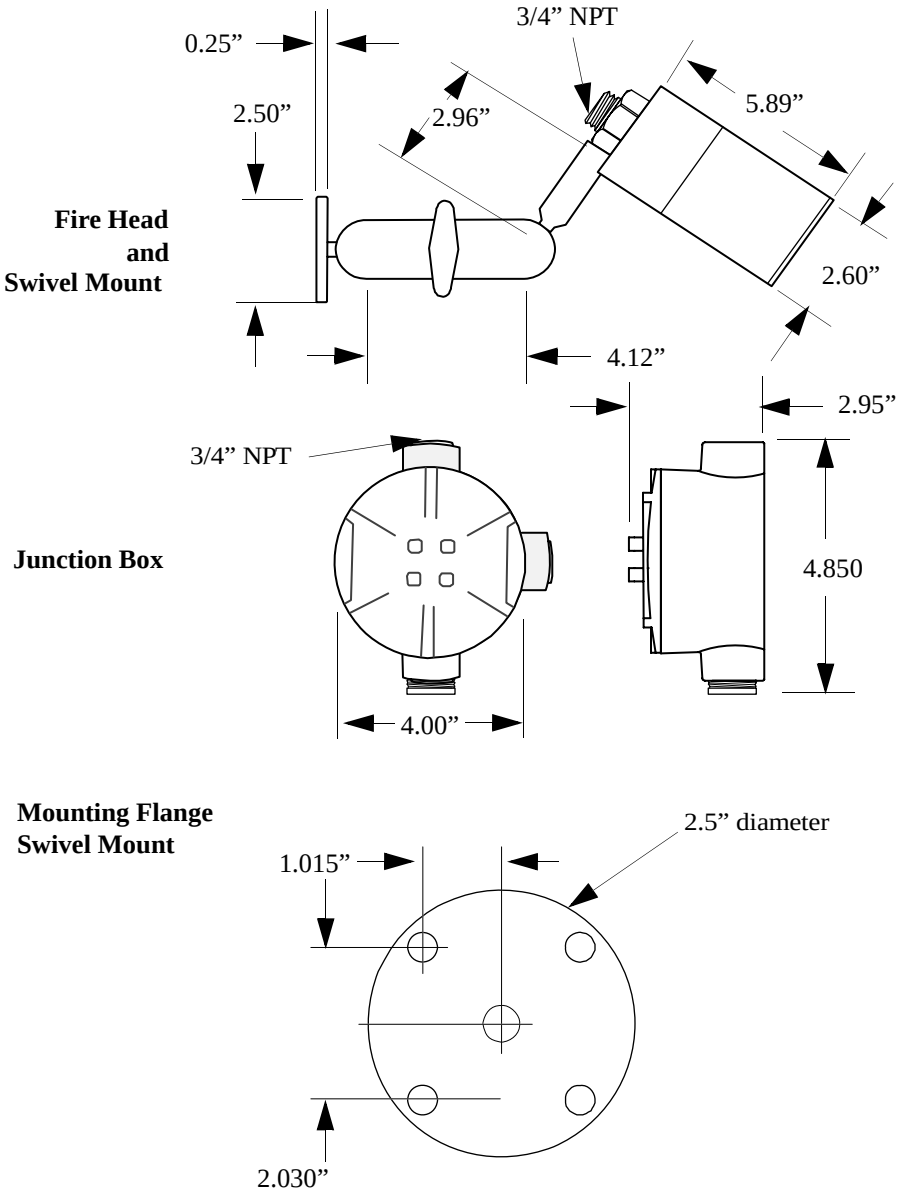
If you find any components missing or damaged, notify the representative or Net Safety Monitoring immediately.

**Figure 1:** Detector Housing and Swivel Mount




**Note:** Units are factory sealed.

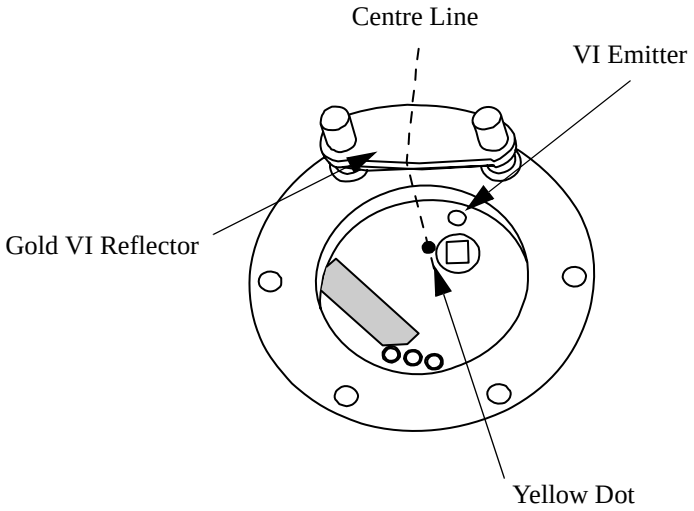
**Figure 2:** Dimensional Drawing



### Positioning

Ensure the external gold VI reflector is placed directly over the VI Emitter (refer to Figure 8, "Detector Viewing Window", on page 9 for VI source location). Also ensure the detector is mounted with the VI reflector in the TOP position, centred over the yellow dot.

**Figure 3:** Position of VI Reflector




# FIELD INSTALLATION

**WARNING:** Compliance with regulations is the responsibility of the installer. Wiring must comply with applicable regulations relating to the installation of electrical equipment in a hazardous area.

## WIRING

The use of shielded cable run through conduit is highly recommended for power input and signal wires to protect against interference caused by extraneous electrical 'noise'. Recommended detector cable is four conductor (or greater), shielded 18 AWG rated 300 V for distances up to 150 feet. When cable is installed in conduit, the conduit must not be used for wiring to other electrical equipment. Detectors can be located over 150 feet and up to 2000 feet if 16 AWG shielded conductor is used. The maximum distance between the sensor and controller is limited by the resistance of the connecting wiring, which is a function of the gauge of the wire being used. Refer to Appendix B, " Resistance Table (Ohms)", on page 15.

### Grounding

Proper shielding and grounding procedures, for the specific area of installation, should always be followed.

## SEALING

Water-proof and explosion-proof conduit seals are recommended to prevent the accumulation of moisture within the junction box. Seals should be located as close to the device as possible and not more than 18 inches (46 cm) away. Explosion-proof installations may require an additional seal where conduit enters a non-hazardous area. When pouring a seal, use a fibre dam to ensure proper formation of the seal. Seals should never be poured at temperatures below freezing.

The jacket and shielding of the cable should be stripped back to permit the seal to form around the individual wires. This will prevent air, gas and water leakage through the inside of the shield and into the enclosure.

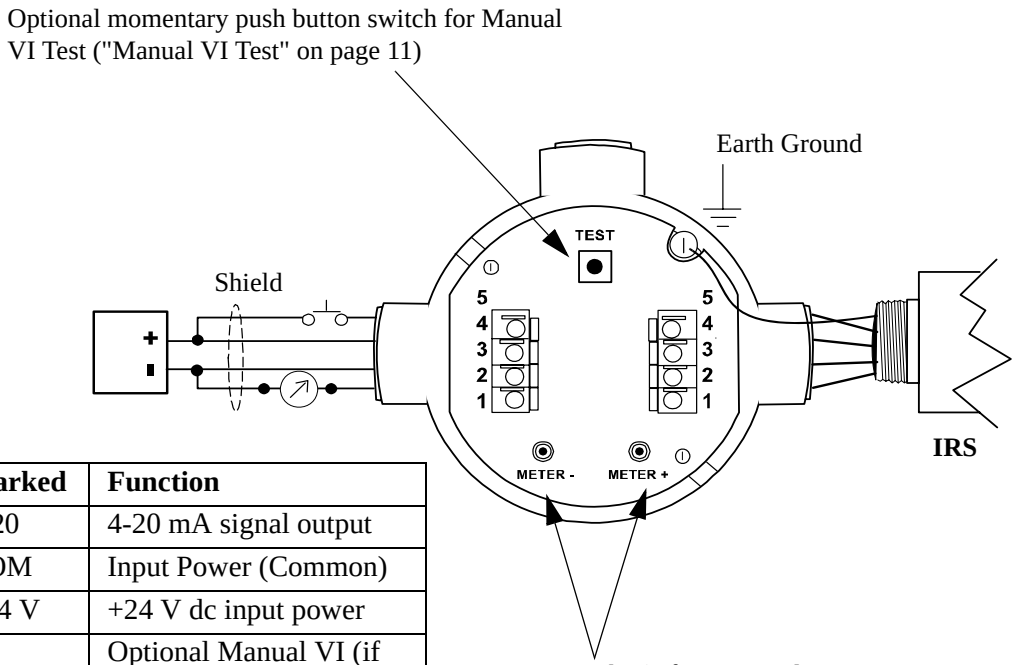
It is recommended that explosion-proof drains and conduit breathers be used. Changes in temperature and barometric pressure can cause 'breathing' which allows moist air to enter conduit. Joints are seldom enough to prevent 'breathing'.

## CONNECTING

There are two configurations of the IRS available: Analog (A) and Analog/Relay (A/R). Review the following figures for wiring and other settings specific to the A or A/R board configurations.

**WARNING:** Prior to wiring, ensure power is disconnected. Improper wiring can cause damage to the detector.

**Figure 4:** Junction Box Connection — **ANALOG**

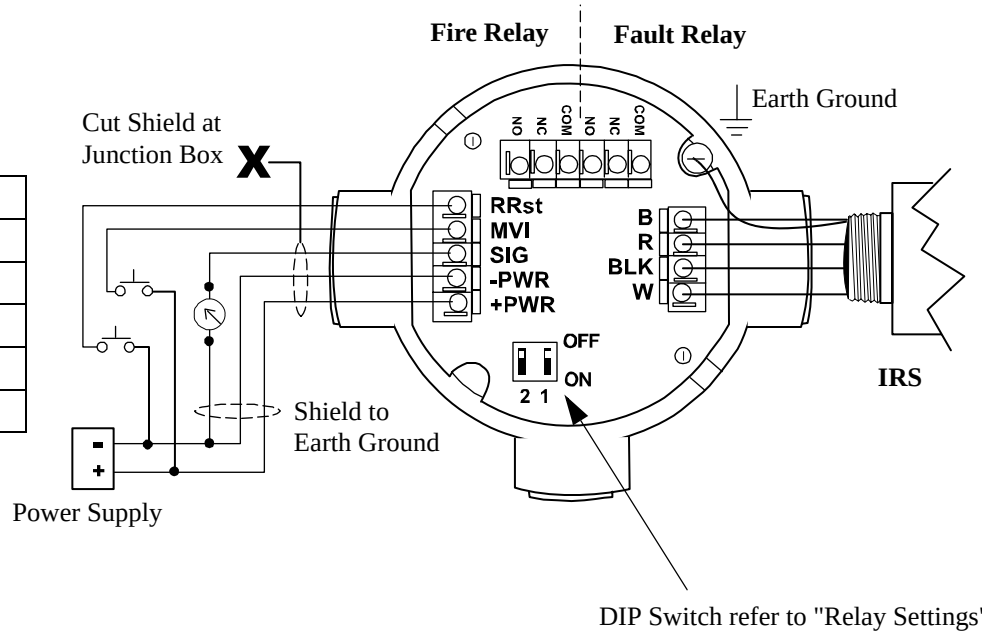



| Terminal | Marked | Function |
|---|---|---|
| 1 | 4-20 | 4-20 mA signal output |
| 2 | COM | Input Power (Common) |
| 3 | +24 V | +24 V dc input power |
| 4 | MVI | Optional Manual VI (if not used, leave disconnected |

| Terminal | Detector Wire | Function |
|---|---|---|
| 1 | Red | Signal Output |
| 2 | Black | System Common (-) |
| 3 | White | 11.0-32 V dc (+) |
| 4 | Blue | Manual VI (optional) |

**Figure 5:** Junction Box Connection — **ANALOG/RELAY**

| | |
|---|---|
| NO | Normally Open |
| NC | Normally Closed |
| COM | Common |




| SIGNAL OUTPUT | |
|---|---|
| R Rst | Optional Remote Reset |
| MVI | Manual VI (optional ) |
| SIG | 4-20 mA signal output |
| -PWR | -24 V dc input power |
| +PWR | +24 V dc input power |

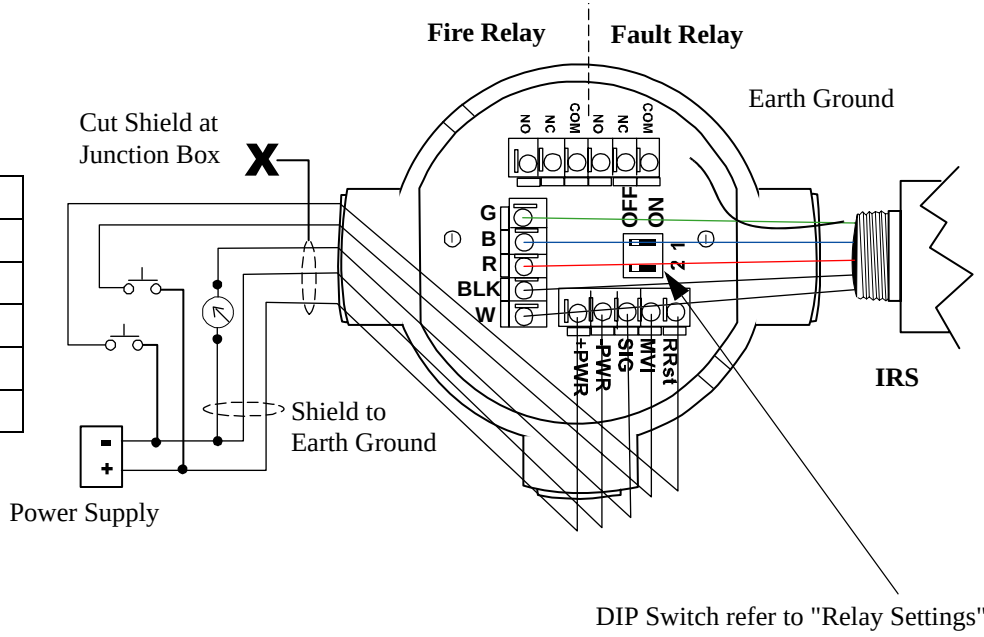
| SIGNAL INPUT | | |
|---|---|---|
| Blue | B | Manual VI (optional) |
| Red | R | 4-20 mA Signal Output |
| Black | BLK | System Common (-) |
| White | W | 11.0-32 V dc (+) |
| Green | | Earth Ground |

**Note:** If the 4-20 mA signal is not used, connect a jumper between the terminals for 4-20 mA signal output (SIG) and -24 V dc input power (-PWR) on the Signal Output terminal block.

**WARNING:** Net Safety manufactures two different Relay junction boxes. If you have the stainless steel model (JB-F-R-SS), then refer to Figure 6, "Stainless Steel Junction Box Connection (JB-F-R-SS)— Analog/Relay" on page 7.

**Figure 6:** Stainless Steel Junction Box Connection (JB-F-R-SS)— **ANALOG/RELAY**

| | |
|---|---|
| NO | Normally Open |
| NC | Normally Closed |
| COM | Common |




| **SIGNAL OUTPUT** | |
|---|---|
| R Rst | Optional Remote Reset |
| MVI | Manual VI (optional ) |
| SIG | 4-20 mA signal output |
| -PWR | -24 V dc input power |
| +PWR | +24 V dc input power |

| **SIGNAL INPUT** | | |
|---|---|---|
| Green | G | Earth Ground |
| Blue | B | Manual VI (optional) |
| Red | R | 4-20 mA Signal Output |
| Black | BLK | System Common (-) |
| White | W | 11.0-32 V dc (+) |

**Note:** If the 4-20 mA signal is not used, connect a jumper between the terminals for 4-20 mA signal output (SIG) and -24 V dc input power (-PWR) on the Signal Output terminal block.

**WARNING:** Net Safety manufactures two different Relay junction boxes. If you do not have the stainless steel model (JB-F-R-SS), then refer to Figure 5, "Junction Box Connection — Analog/Relay" on page 6.

# DETECTOR SETUP

## SYSTEM SENSITIVITY

The IRS fire detector can be adjusted to a high or low sensitivity level. The level is dependent upon the intensity of the infrared radiation reaching the detector, which in turn depends on the type of fuel, temperature, flame size and distance of flame from the detector.

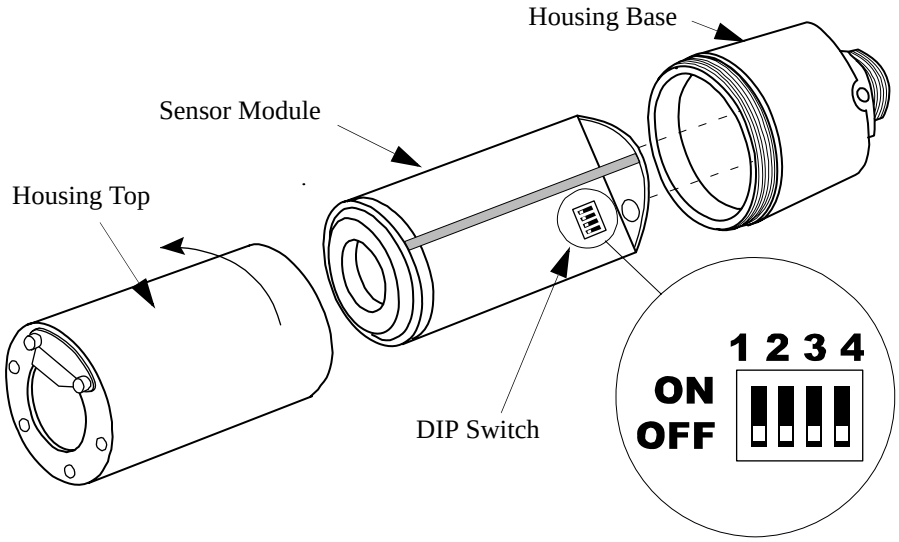
### DIP Switch Access

DIP Switches are used to set the detector's sensitivity and time delay settings. The DIP Switches are located on the internal Sensor module of the IRS.

**Note:** DIP Switch Position 1 is NOT used on the Sensor module.

1. Unscrew the Housing Top counter clockwise.
2. Slide a DIP Switch to the ON or OFF position. Refer to Figure 7, "DIP Switch Location", on page 8 and Table 2, "Sensitivity and Time Delay Settings (Sensor Module)", on page 8 for DIP Switch positioning instructions.

**Figure 7:** DIP Switch Location




**WARNING:** Do not touch internal components other than the DIP Switches (see Appendix A, " Electrostatic Sensitive Device (ESD)", on page 14).

### Sensitivity Setting

The adjustable Sensitivity setting is used to optimize the IRS for various installations.

When selecting High or Low sensitivity, consider the following points:

- Size of potential fire
- Distance between possible fire and detector
- Type of flammable substance to be detected
- Environmental factors

### Time Delay Setting

Defining the Time Delay allows the Fire alarm signal to delay (for the specified time), before indicating an alarm. This feature can be beneficial depending upon the conditions/activities surrounding the detector.

**Table 2:** Sensitivity and Time Delay Settings (Sensor Module)

| Sensitivity | | | Time Delay | | |
|---|---|---|---|---|---|
| | **Position 1** | **Position 2** | | **Position 3** | **Position 4** |
| Low | n/a | ON | 3 seconds | ON | ON |
| High | n/a | OFF | 4 seconds | ON | OFF |
| | | | 5 seconds | OFF | ON |
| | | | 7 seconds | OFF | OFF |

**Note:** Default settings are High Sensitivity and a 5 second Time Delay.

### Closing the Housing

When closing the Housing Cover, be sure that the top and bottom are screwed together tightly.

**TIP:** It is extremely important that the VI reflector is centred over the yellow dot (refer to "Positioning" on page 4 for details).

## RELAY SETTINGS

### Coil and Latch Status

The Junction Box (Relay only) has a two-position DIP Switch to define the Coil and Latch Status for the Fire Relay. Refer to Figure 5, "Junction Box Connection — Analog/Relay", on page 6 for DIP Switch location.

**Note:** The default Fire Relay is normally De-energized/Non-Latching. The Fault Relay is factory set to normally Energized/Non-latching and cannot be modified.

**Table 3:** Relay Setting (Junction Box)

| Coil and Latch Status | | |
|---|---|---|
| **Fire Relay** | **Position 1** | **Position 2** |
| De-energized / Non-latching | ON | ON |
| Energized / Non-latching | ON | OFF |
| De-energized / Latching | OFF | ON |
| Energized / Latching | OFF | OFF |

### Remote Reset-Relay Only

The IRS can be connected to allow for the Remote Reset of a latched alarm. The Latch Status must be set to Latching (refer to "Relay Settings" on page 9). To reset the latched alarm the terminals marked R.Rst and -PWR on the Junction Box (Relay only) must be momentarily connected.

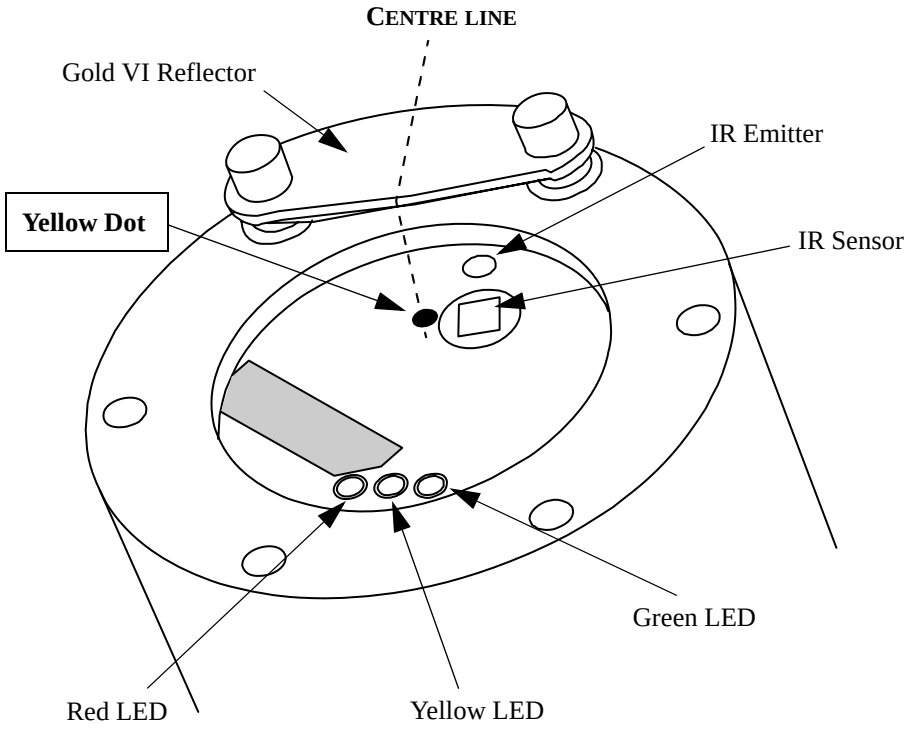
### Final Setup

- Ensure all internal settings complete
- Securely close Housing
- Ensure reflector positioned over the Yellow Dot
- Clean detector lens
- Mount and align detector

# DETECTOR FUNCTIONALITY

## DETECTOR WINDOW

**Figure 8:** Detector Viewing Window




## START UP PROCEDURE

Once powered up, the IRS will begin a 90 second start up routine. During this time, the current output will be 3 mA and the Green power LED will be on. Once the start up procedure has finished, and no faults are present, the detector will begin Normal operation (current output 4 mA and Green LED will remain on).

### System Check

Once powered up the system should be checked. Refer to the section entitled "Manual Check Procedure " on page 11 for instructions.

**WARNING:** When testing the system, ensure all external equipment is disabled to prevent unwanted activation during testing and enabled once testing complete.

## MONITOR

The Detector's status can be determined by monitoring the current loop and/or the condition LEDs.

### Condition Status—LEDs

There are three (3) LEDs used to indicate the status of the detector (refer to Table 4, "Status LEDs and Current Output", on page 10).

### Condition Status—Current Output

The Current Loop status can also be measured to determine detector condition.

Test Jacks are available on the Analog board in the Junction Box. The area must be de-classified prior to opening the Junction Box.

Also, the detector can be monitored using the 4-20 mA Signal Output.

Refer to the section entitled "Connecting" on page 5 for details.

**Table 4:** Status LEDs and Current Output

| LED Status | Current O/P | Green LED (Power) | Red LED (Alarm) | Yellow LED (Fault) |
|---|---|---|---|---|
| Internal Power Fault or system power out of range | 1 mA | off | off | Solid |
| Automatic or manual VI Test Failure | 2 mA | off | off | Flashing |
| Power up - 90 second start delay | 3 mA | Solid | off | off |
| Normal Operation | 4 mA | Solid | off | off |
| Background IR source | 8 mA | Solid | off | off |
| Manual VI Testing Adequate | 10 mA | Solid | Solid | off |
| Manual VI Testing Good | 11 mA | Solid | Solid | off |
| Manual VI Testing Excellent | 12 mA | Solid | Solid | off |
| Early Warning - Intermittent IR detected | 16 mA | Solid | off | off |
| Fire confirmed | 20 mA | Solid | Flashing | off |

# DETECTOR MAINTENANCE

The IRS does not require calibration. Although an automatic testing of the optics is done every 30 seconds, the system should be periodically checked. To maintain maximum sensitivity, the viewing window and reflector should be cleaned on a routine basis depending on the type and amount of contaminants in the area.

## TESTING

**WARNING:** When testing the system, ensure all external equipment is disabled to prevent unwanted activation.

### Manual Check Procedure

The whole system should be checked periodically with an Net Safety IR test lamp to make sure that the detectors are not obstructed, that the area covered by the detector has not changed and that there is no fault in the VI circuit.

1. Direct the IR test lamp into the detector viewing window. The current output will change with the amount of radiation being detected and the Red LED will flash (refer to "Status LEDs and Current Output" on page 10).
2. Turn off the IR test lamp and repeat steps 1 & 2 for all detectors in the system.
3. After all detectors have been checked, return the system to the normal operating mode and enable any external equipment.

### Automatic Visual Integrity (VI) Test

The detector performs an automatic Visual Integrity (VI) test every 30 seconds during normal operation. If the automatic VI Test fails, three consecutive times, the Yellow LED will Flash and O/P drop to 2 mA indicating a dirty window, dirty reflector or failed sensor. The detector will remain in this condition until the problem is corrected.

The detector window should be promptly cleaned (refer to "Cleaning Window and Reflector" on page 12) or the obstruction remove. Also refer to Table 5, “Possible Problems and Solutions,” on page 13.

If the obstruction was only temporary, the detector will return to normal operation with the next VI test.

### Manual VI Test

The test procedure can assist with maintenance planning. The Manual VI test will return one of three current output responses depending upon the cleanliness of the detector window and reflector.

- Adequate (10 mA) clean optical surfaces
- Good (11 mA) no action required - surface moderately clean
- Excellent (12 mA) no action required - surface perfectly clean

The detector has a manual VI input. The manual VI test is performed by:

- connecting Manual VI to system power by a direct connection OR
- connecting a momentary contact push button between system power and the manual VI input OR
- using the Manual VI Test Button, located in the Analog Junction Box (area MUST be de-classified prior to opening the Junction Box).

**Note:** The manual VI feature is optional on the IRS-A (if not used, leave the manual VI input unconnected or tied to system common).

**WARNING:** The detector will stay in the manual VI test mode as long as the manual VI input is held at the system power voltage. During the manual VI test all other detector functions are disabled. It is therefore imperative that after this test is performed the manual VI test input be released.

#### Test Procedure

1. Connect the manual VI test input terminal to system power by either a direct connection or manual push button or use the Manual VI Test Push Button (once area de-classified).
2. Hold the manual VI input at this voltage for at least two seconds. The Red LED will be activated for the duration of the test.
3. Two seconds after the test has commenced, the detector will output a current that corresponds to the quality of the VI reading obtained (see Table 4, "Status LEDs and Current Output", on page 10).
4. Release the manual VI test input. The detector will immediately return to normal operation if a VI fault is not present.
5. If a VI fault is present, the current output will indicate 2 mA and the Yellow LED will flash.

## Cleaning Window and Reflector

When cleaning the window and reflector use the cloth and the cleaning solution provided with the detector. Use only the provided cleaning solution as some cleaners can leave a residue or film that can block IR radiation.

To minimize dirt accumulation around the VI surface, a product such as Net Safety's Air Shield should be purchased to minimize particulate build up on the viewing window.

**WARNING:** Always bypass Alarm Output when performing maintenance tasks and ensure all external equipment has been disconnected/ deactivated.

### O-ring

The rubber o-ring on the detector housing is used to ensure the detector is watertight. The housing should be opened periodically and the o-ring inspected for breaks, cracks or dryness. To test the o-ring, remove it from the detector housing and stretch it slightly. If cracks are visible, the o-ring should be replaced. If it feels dry to the touch, a thin coating of lubricant should be applied (such as polyalphaolefin grease). When re-installing the o-ring, be sure that it is properly seated in the groove on the housing.

The o-ring must be properly installed and in good condition to prevent water from entering the detector and causing failure. The life expectancy of rubber o-rings varies depending on the type and amount of contaminants present in the area. The person who maintains the system must rely on experience and common sense to determine how frequently the rings should be inspected. A coating of lubricant should also be applied to the enclosure threads before reassembling the detector to help prevent moisture from entering.

# How to Return Equipment

A Material Return Authorization number is required in order to return equipment. Please contact Net Safety Monitoring at **(403) 219-0688** before returning equipment or consult our Service Department to possibly avoid returning equipment.

If you are required to return equipment, include the following information:

1. A Material Return Authorization number (provided over the phone to you by Net Safety).
2. A detailed description of the problem. The more specific you are regarding the problem, the quicker our Service department can determine and correct the problem.
3. A company name, contact name and telephone number.
4. A Purchase Order, from your company, authorizing repairs or request for quote.
5. Ship all equipment, prepaid to:

   **Net Safety Monitoring Inc**
   2721 Hopewell Place NE
   Calgary, Alberta, Canada
   **T1Y 7J7**

6. Mark all packages: **RETURN for REPAIR**

Waybills, for shipments from outside Canada, must state:

**Equipment being returned for repair**
**All charges to be billed to the sender**

Also, please ensure a duplicate copy of the packing slip is enclosed inside the box indicating item 1-4 along with the courier and account number for returning the goods.

**All Equipment must be Shipped prepaid. Collect shipments will not be accepted.**

Pack items to protect them from damage and use anti-static bags or aluminium-backed cardboard as protection from electrostatic discharge.

# TROUBLESHOOT

The occurrence of a false alarm may be due to various factors. In order to determine the source of a false alarm, keep accurate records of alarms including time, date, weather conditions, activities in area, etc.

Consult the following table for possible solutions to false alarm conditions.

**Table 5:** Possible Problems and Solutions

| False Alarm Condition | | | | Possible Problem | Possible Solution |
|---|---|---|---|---|---|
| **Current O/P** | **Green LED** | **Yellow LED** | **Red LED** | | |
| 0 mA | | Solid/ off | | Shorted signal Output<br>Loss of Power<br>Loose Wire(s) | Check wiring<br>Check fuses (3 AMP fuse on bottom PCB) (any in-line power fuse)<br>Check power source at unit |
| 1 mA | | Solid | | Internal power fault<br>System power out of range | Check power supply (should be between 11.0-32 V dc) |
| 2 mA | | Flashing | | VI (visual integrity) fault | Clean window (use Net Safety Monitoring Lens cleaner only)<br>Check for obstruction(s) within Field of View<br>Check reflector position and alignment<br>Check IR source bulb<br>If not using 4-20 output ensure jumper is in correct position ("Junction Box Connection — Analog/Relay" on page 6) |
| 8 mA | Solid | | | Background IR source | Confirm external IR source by covering detector window so it is blind to all radiation.<br>- If signal goes away, background IR is present. Field of View should be cleared of IR sources/activities (i.e., hot bodied sources like manifolds, heaters, etc); realign detector coverage area; redefine Time Delay; reset Sensitivity setting.<br>- If signal persists, electrical wiring or detector electronics may be at fault |
| 10 mA | Solid | | Solid | Manual VI test (adequate) | Clean all optical surfaces (use Net Safety Monitoring Lens cleaner only) |
| 11 mA | Solid | | Solid | Manual VI test (good) | No action required, optics are moderately clean |
| 12 mA | Solid | | Solid | Manual VI test (excellent) | No action required, all optical surfaces are perfectly clean |

# Appendix A:
# ELECTROSTATIC SENSITIVE DEVICE (ESD)

Electrostatic discharge (ESD) is the transfer, between bodies, of an electrostatic charge caused by direct contact or induced by an electrostatic field.

The most common cause of ESD is physical contact. Touching an object can cause a discharge of electrostatic energy—ESD! If the charge is sufficient and occurs near electronic components, it can damage or destroy those components.

In some cases, damage is instantaneous and an immediate malfunction occurs. However, symptoms are not always immediate—performance may be marginal or seemingly normal for an indefinite period of time, followed by a sudden failure.

To eliminate potential ESD damage, review the following guidelines:

- Handle boards by metal shields—taking care not to touch electronic components
- Wear grounded wrist or foot straps, or ESD shoes or heel grounders to dissipate unwanted static energy
- Prior to handling boards, dispel any charge in your body or equipment
- Ensure components are transported and stored in static safe packaging
- When returning boards, carefully package in the original carton and static protective wrapping
- Ensure ALL personnel are educated and trained in ESD Control Procedures

In general, exercise accepted and proven precautions normally observed when handling electrostatic sensitive devices.

A warning label is placed on the packaging, identifying product using electrostatic sensitive semiconductor devices.

# Appendix B: RESISTANCE TABLE (OHMS)

| Distance (Feet) | AWG #20 | AWG #18 | AWG #16 | AWG #14 | AWG #12 | AWG #10 | AWG #8 |
|---|---|---|---|---|---|---|---|
| 100 | 1.02 | 0.64 | 0.40 | 0.25 | 0.16 | 0.10 | 0.06 |
| 200 | 2.03 | 1.28 | 0.80 | 0.51 | 0.32 | 0.20 | 0.13 |
| 300 | 3.05 | 1.92 | 1.20 | 0.76 | 0.48 | 0.30 | 0.19 |
| 400 | 4.06 | 2.55 | 1.61 | 1.01 | 0.64 | 0.40 | 0.25 |
| 500 | 5.08 | 3.20 | 2.01 | 1.26 | 0.79 | 0.50 | 0.31 |
| 600 | 6.09 | 3.83 | 2.41 | 1.52 | 0.95 | 0.60 | 0.38 |
| 700 | 7.11 | 4.47 | 2.81 | 1.77 | 1.11 | 0.70 | 0.44 |
| 800 | 8.12 | 5.11 | 3.21 | 2.02 | 1.27 | 0.80 | 0.50 |
| 900 | 9.14 | 5.75 | 3.61 | 2.27 | 1.43 | 0.90 | 0.57 |
| 1000 | 10.20 | 6.39 | 4.02 | 2.53 | 1.59 | 1.09 | 0.63 |
| 1250 | 12.70 | 7.99 | 5.03 | 3.16 | 1.99 | 1.25 | 0.79 |
| 1500 | 15.20 | 9.58 | 6.02 | 3.79 | 2.38 | 1.50 | 0.94 |
| 1750 | 17.80 | 11.20 | 7.03 | 4.42 | 2.78 | 1.75 | 1.10 |
| 2000 | 20.30 | 12.80 | 8.03 | 5.05 | 3.18 | 2.00 | 1.26 |
| 2250 | 22.80 | 14.40 | 9.03 | 5.68 | 3.57 | 2.25 | 1.41 |
| 2500 | 25.40 | 16.00 | 10.00 | 6.31 | 3.97 | 2.50 | 1.57 |
| 3000 | 30.50 | 19.20 | 12.00 | 7.58 | 4.76 | 3.00 | 1.88 |
| 3500 | 35.50 | 22.40 | 14.10 | 8.84 | 5.56 | 3.50 | 2.21 |
| 4000 | 40.60 | 25.50 | 16.10 | 10.00 | 6.35 | 4.00 | 2.51 |
| 4500 | 45.70 | 28.70 | 18.10 | 11.40 | 7.15 | 4.50 | 2.82 |
| 5000 | 50.10 | 32.00 | 20.10 | 12.60 | 7.94 | 5.00 | 3.14 |
| 5500 | 55.80 | 35.10 | 22.10 | 13.91 | 8.73 | 5.50 | 3.46 |
| 6000 | 61.00 | 38.30 | 24.10 | 15.20 | 9.53 | 6.00 | 3.77 |
| 6500 | 66.00 | 41.50 | 26.10 | 16.40 | 10.30 | 6.50 | 4.08 |
| 7000 | 71.10 | 44.70 | 28.10 | 17.70 | 11.10 | 7.00 | 4.40 |
| 7500 | 76.10 | 47.90 | 30.10 | 19.00 | 12.00 | 7.49 | 4.71 |
| 8000 | 81.20 | 51.10 | 23.10 | 20.20 | 12.70 | 7.99 | 5.03 |
| 9000 | 91.40 | 57.50 | 36.10 | 22.70 | 14.30 | 8.99 | 5.65 |
| 10 000 | 102.00 | 63.90 | 40.20 | 25.30 | 15.90 | 9.99 | 6.28 |

**Note:** Resistance shown is one way. This figure should be doubled when determining closed loop resistance.

# Appendix C: SPECIFICATION

| IRS | IRS-A (Analog) | IRS-AR (Analog/Relay) |
|---|---|---|
| Operating Voltage | 11.0 to 32.0 V dc | |
| Power Consumption (at 24 V dc) | Nominal 70 mA/1.7 W<br>Maximum 120 mA/2.9 W | Nominal 90 mA/2.2 W<br>Maximum 135 mA/3.3 W |
| Inrush Current | 600 mA for 2.5 ms | 800 mA for 2.5 ms |
| Operating Temperature | -40°C to +75°C (-40F to +167F) certified/ -50°C to +75°C (-58F to +167F)operational | |
| Field of View | 90 degrees horizontal / 90 degrees vertical | |
| Spectral Range | IR radiation in the 4.4 micron range | |
| Time Delay | DIP switch selectable 3, 4, 5, 7 seconds | |
| Sensitivity Settings | DIP switch selectable High and Low | |
| Enclosure Material | Anodized Aluminum (optional stainless steel) | |
| Humidity Range | 0 to 100% relative humidity, non-condensing | |
| Weight (with swivel) | 2.1 Kg/4.5 lbs (Stainless Steel Option 3.4 Kg/7.5 lbs) | |
| Certification | CSA and NRTL/C certified for hazardous locations. Class I, Division 1, Groups B, C and D. Temperature code T5. Enclosure type NEMA 4X. IEC Rating Ex d IIB+H2 T5.<br>CE Ex II 2 G, Ex d II B+H2 T5<br>Factory Mutual (FM) flame detector performance certification. | |
| Current Output | 0 to 20 mA - Into a maximum loop impedance of 800 Ohms @ 32 V dc or 150 Ohms @ 11.0 V dc. Non-isolated loop supply. | |
| Relay Output | | Form C contacts rated 1 Amp @ 30 V dc, 0.5 Amp @ 125 V ac. Selectable energized/de-energized, latching/ non-latching Fire relay. Fault relay fixed as energized/ non-latching. |

**Note:** Units are factory sealed.

# Appendix D: RESPONSE TESTING

| | | | | |
|---|---|---|---|---|
| **Detector Range Response (high sensitivity)** | **Fuel** | **Size** | **Distance** | **Notes** |
| | n-heptane | 1’ x 1’ | 80 feet | |
| | gasoline | 1’ x 1’ | 80 feet | |
| | methanol | 1’ x 1’ | 60 feet | |
| | diesel | 1’ x 1’ | 50 feet | |
| | JP-4 | 1’ x 1’ | 50 feet | full burn |
| | lube oil | 1’ x 1’ | 40 feet | full burn |
| | propane | 16” plume | 25 feet | |
| | paper (crumpled newspaper 10” high) | 2’ x 2’ | 90 feet | full burn |
| **Typical Response Time** | Response time for the IRS fire detector is as little as 6 seconds, with a mean response time of 8 seconds depending on conditions such as wind, temperature, smoke and so on. | | | |
| **False Stimuli Response** | **False Alarm Source** | **Immunity Distance** | **Response** | **Flame Source** 2” methanol |
| | radio frequency interference | 2 feet | No Alarm | **AAR** |
| | vibration | -- | | |
| | sunlight (direct/reflected) | -- | | |
| | 1500 W heater (modulated/unmodulated) | 20 feet | | |
| | 250 W halogen light | 10 feet | | |
| | incandescent light | 25 feet | | |
| | fluorescent light | 25 feet | | |
| | arc welding | 30 feet | | |

**Note:** AAR = Accurate alarm response

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