IRSM/IRC
User's Guide

Version 5.2

ANAFAZE
Measurement & Control

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WARNING

ANAFAZE has made efforts to ensure the reliability and safety of the ANAFAZE 8 IRSM and provide recommendations for its safe use in systems applications. Please note that in any application, failures can occur that will result in full control outputs or other outputs that may cause damage or unsafe conditions in the equipment or process connected to the ANAFAZE 8 IRSM.

Good engineering practices, electrical codes, and insurance regulations require independent, external safety devices be used to prevent potentially dangerous or unsafe conditions. Assume that the ANAFAZE 8 IRSM can fail with outputs full on, outputs full off, or other unexpected conditions.

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1.0 Introduction

The ANAFAZE 8 IRSM is a compact sensor with the features needed for diverse temperature measurement and control applications. The ANAFAZE 8 IRSM combines a wide temperature range, peak hold, simultaneous sample and hold, adjustable emissivity, and an internal temperature sensor, all enclosed in a stainless steel shell only 2 inches in diameter. An optional combination air purge and air cooling shell can be added for high temperature and severe environments.

The ANAFAZE 8 IRSM is ideal for temperature measurement and control of paint drying and curing, heat treating, plastic extruding and forming, fabric dying, gluing, paper coating and printing, and other applications where the object is moving, small, delicate or too hot for contact measurement.

Features

Industrial Package: The ANAFAZE 8 IRSM is enclosed in a rugged 1/8th inch stainless steel tube only 2 inches in diameter. The optional air cool/purge shell increases the diameter to only 2.5 inches. In addition to providing both air purge and air cooling, it includes standard 1 inch pipe threads for connection of conduit or site tubes. Sealing for most environments is possible with the air shell and a site tube can be used to prevent spray from hitting the lens.

Multiple Sensor Applications: Simultaneous sample and hold permits systems with multiple sensing modules to measure at exactly the same time (with-in 1ms). This feature also permits reading to be "locked in" to synchronize measurements with process events.

Peak Hold: Peak hold enables the sensor to respond to increasing temperatures without filtering while delaying the response to decaying temperatures. The decay rate is externally adjustable with a potentiometer or resistor. This feature allows the measurement and control of objects that are occasionally blocked, separate objects moving past the sensor, and will detect the highest temperature on unevenly heated objects.

Target Size Versatility: The ANAFAZE 8 IRSM focus can be factory adjusted to match different target requirements. The measurements are accurate at any distance between the sensing module and the target as long as the target is large enough to fill the area viewed by the IRSM. The field of view is the distance to the target divided by 20. Thus at a distance of 20 inches the target size is 1 inch. Since the focus can be adjusted small targets are measured at closer distances; the minimum target is about 0.2" at 4.0". The adjustable focus also makes wide angle measurement possible where an average temperature over a wide area is desired.

The IRSM provides non-contact temperature measurement using the infrared wavelength of 8-14 microns. The output is a linear signal of 0-10 mAdc representing 0-1000 degrees F. Other outputs are available including 4 to 20 mA and J thermocouple. A single power supply of 5 vDC at 25 mA for the 0 to 10 mA and J thermocouple outputs or 15 vDC at 35 mA for the 4 to 20 mA outputs.

Sample and hold, which can also be used as a track and hold is standard in the ANAFAZE 8 IRSM. This permits systems with multiple IRSM's to measure at exactly the same time (within 1ms). A single IRSM can be synchronized to a process event, to enable measurements to be taken at an exact time, for example when a moving object is in front of the IRSM. The reading is effectively held as long as the hold line is connected to ground.

Peak Hold is also included and provides a "one way" filter that enables the IRSM to respond at full speed to increasing temperatures while delaying the response to falling temperatures. An external resistor or potentiometer can be used to adjust the decay rate of the Peak Hold.

2.0 Specifications

Infrared Spectrum:	8-14 microns.
Temperature Range:	0 to 1000 F.
Accuracy:	±1% Reading, ±1 F, above 100 F
Time Constant:	300ms.
Spot Size (90% energy):	Distance/20.
Smallest Spot:	0.2" @ 4".
Focal Distance (factory):	4" to infinity.
Sample and Hold:	1ms acquisition.
Peak Hold:	0 to 100% external resistor set.
Peak Hold Reset:	contact to ground.
Emissivity:(.90 Standard)	0.20 to 0.99, internal jumpers.
Emissivity Thumbwheels (optional):	0.20 to 0.99
Outputs:	0 to 10mA 4 to 20mA J thermocouple
Ambient Sensor:	RTD type, available for measurement.
Power:	+ 5 vDC or +8 to 15 vDC 1mA+ current output
Construction:	Stainless Steel, 1/8" tubing.
Dimensions:	2" dia, x 5.125"
Weight:	1.5 lb
Air cool/purge housing (optional):	Anodized Aluminum,1/8" tubing, std. pipe thread for conduit or site tube.
Dimensions:	2.5" dia., x 5.75"
Weight:	2.3 lb W/IRSM
Cable:	12' std. length 8 wires 24 gauge.
High Speed Option:	80 ms response

3.0 Ordering Information for ANAFAZE 8 IRSM

Infrared sensing module part numbers are created by adding options to basic part number separated by dashes.

A8IRSM-: Infrared Sensing Module including 6 inch pigtail cable with in-line connector wired to module and mating connector for customer furnished cable (for complete cable add -CA12). Standard temperature range of 0 to 1000 degrees F with corresponding output of 0 to 10 mA.

IRSM-S: Standard response time 300 ms time constant.

IRSM-F: Fast response time 80 ms time constant.

IRSM-CFXX: Close focus at XX inches from 4 to 20 inches.

IRSM-J T/C: J thermocouple output curve on copper wire for use with controller or other device where the thermocouple reference compensation can be bypassed or eliminated. This eliminates the need for thermocouple extension wire and improves accuracy.

IRSM-J T/C-REF: Thermocouple reference for use with above option. Small module attaches at controller and simulates thermocouple wire if reference junction can not be eliminated.

IRSM-4-20MA: 4 to 20 mA output replacing 0 to 10 mA output.

IRSM-T: Thumbwheel emissivity adjust.

IRSM-AS: Air purge/cooling shell with conduit adapter and sight tube adapter.

IRSM-VC: Vortec cooler for use with air purge/cooling shell, provides operation at ambient temperatures up to 300 F.

IRSM-CA-12: Standard 12 foot interconnecting cable with IRSM mating connector on one end and tinned leads on the other.

IRSM-CAXX: Special cable length specify XX as length in feet.

ANAFAZE 8 IRC

IRC: ANAFAZE 8 IRC Infrared Sensing Module Display with two setpoints. Provides power for IRSM and terminal strips for connection to IRSM and AC power. Panel size is approximately 1/8 DIN.

4.0 Installation

The following sections contain installation information for the ANAFAZE IRSM.

4.1 Mounting

The IRSM is enclosed in a stainless steel housing and can be mounted in any position. For environments that are dusty, wet, or have other contaminants the IRSM-AS air purge/cooling shell must be used.

The case is 1/8th inch tubing and can be mounted using pipe clamps, conduit fittings or other means. The lens should be protected during mounting, although an inadvertent small scratch will not appreciably effect the accuracy.

WARNING: The lens must be kept clean for accurate measurements. A dirty lens will tend to reduce the signal output and can cause overheating in control applications.

If the unit is mounted without the IRSM-AS air purge/cooling shell or if the air is turned off on the shell the lens should be check prior to operating the system. The lens should be checked periodically and cleaned with a cotton swab if necessary.

4.2 Connections

WARNING: The peak hold feature is enabled unless pin J (wire color BROWN) is connected to ground.

The IRSM comes with a 6" cable with a 9 pin connector. There are two configurations. A mating connector is supplied and is wired per the pin listing below. If the optional CA12 cable is purchased the wire colors are as listed:

PIN	COLOR	S/N 1399 and lower	S/N 1400 and up
A	ORANGE	SIGNAL OUT +	SIGNAL OUT +
B	WHITE	SIGNAL OUT -	SIGNAL OUT -
C	BLACK	GROUND	GROUND
D	GREEN	-5 VDC	+8 to 15 VDC *
E	RED	+5 VDC	+5 VDC *
F	BLUE	AMBIENT	AMBIENT
H	YELLOW	Sample & Hold	Sample & Hold
J	BROWN	PEAK HOLD	PEAK HOLD
K	SHIELD	SHIELD	SHIELD

*Only one supply can be used at a time.

4.2.1 Power Supply and Output Signal Level

The ANAFAZE 8 IRSM is designed to operate using one of two different supplies. The 5 VDC operation is provided for use in systems where 5 VDC is available; it is recommended for the 0 to 10 mA output. The 8 to 15 VDC supply is needed when using the 4 to 20 mA output if the loop impedance is greater than 50 ohms. With the 5 vDC supply, the loop impedance is limited to 100 ohms for the 0 to 10 mA and 50 ohms for the 4 to 20 mA output. The 8 to 15 Vdc supply drives the following loop impedances:

Power Supply Voltage	Output Compliance Voltage	4-20 mA Output Max Load Resistance	0-10 mA Output Max Load Resistance
5 V *	1 V	50 ohms	100 ohms
8 V	4 V	200 ohms	400 ohms
10 V	6 V	300 ohms	600 ohms
12 V	8 V	400 ohms	800 ohms
15 V	11 V	550 ohms	1100 ohms

* using special 5.0 volt power input

4.2.2 Sample and Hold

The sample and hold is activated by connected pin H (Yellow) to ground pin C (Black). The sample is held as long as the line is grounded with minor decay. To use the IRSM as a Sample and Hold the line should be held at ground until the sample is to be taken. The line is then released for the sample period (minimum 10 ms) and the connected to ground.

To use the IRSM as a track and hold the line is left disconnected and the IRSM will track the temperature. When the sample is desired pin H (Yellow) is connected to ground as above. When the IRSM is returned to the track mode by disconnecting the line.

4.2.3 Peak Hold

Peak hold is enabled by removing pin J (brown) from ground. A 10 megohm potentiometer should be connected between pin J (brown) and pin C (black). This potentiometer can be adjusted to regulate the peak hold decay rate. When the desired decay rate is obtained the potentiometer can be replaced by a fixed resistor.

4.3 Calibration

The IRSM should retain specified accuracies and needs to be only periodically checked against known temperatures. Depending on the application approximately every 6 months or yearly.

Use of a black body temperature source or an independent method of measuring the object temperature can be used to check the IRSM. The test equipment must be capable of reading temperature of at least equal to or greater than the IRSM accuracy.

Any unit which does not meet calibration accuracy should be returned to the factory for re-calibration and testing.

4.4 Ambient Conditions

The ANAFAZE IRSM is designed for operation in ambient temperatures up to 120°F. For longest life, ANAFAZE recommends temperatures below 100°F. The ANAFAZE IRSM-AS air purge/cooling shell allows operation up to 300°F with a low temperature air supply. The ANAFAZE IRSM-VC Vortec Cooler will provide this cool air from normal instrument air at 70°F with a flow rate of approximately 3-4 SCFM.

As with any precision sensor, avoid rapid changes in the ambient temperature. A change which exceeds one °F per minute may cause measurement errors. If a faster ambient temperature change occurs, wait approximately 20 minutes for the output to stabilize.

The ambient temperature of the IRSM may be obtained from the ambient sensor mounted in the IRSM. This signal is available on pin F AMBIENT with reference to pin C Ground. The temperature is from a posisistor element with a base resistance of 100 ohms at 77°F.

When the IRSM is used with the ANAFAZE IRC, the ambient temperature is available at the touch of a button. This signal may be used by other ANAFAZE controllers to indicate and record the IRSM ambient temperature and to control the cooling air flow to the air cooling shell.

Ambient Temperature Sensor Table

°F	Ohms
0	680
25	785
50	885
77	1000
100	1090
125	1205
150	1315
175	1420
200	1535
300	1990

5.0 Practical Infrared Temperature Measurement

This section the basic information needed to successfully make non-contact infrared temperature measurements. Where necessary infrared theory is discussed but only in a general sense to improve the understanding needed for measurement or control.

Infrared energy is emitted by all objects with a temperature above absolute zero. The amount of energy increases as the temperature of the object increases, thus subject to some limitations, if the amount of energy can be measured the objects temperature can be determined. By understanding these limitations accurate non-contact temperature measurements can be made with infrared sensors. These include:

- Emissivity including reflection and transmission
- Object size and distance from the sensor
- Speed of response
- Infrared wavelength
- Ambient conditions

5.1 Emissivity- Reflection and Transmission

The total infrared energy coming from an object can originate from three sources. It can be emitted from the object, it can be reflected from the object, or it can be transmitted through the object. Since the total energy is 100%, the percent of energy from these three sources must add to 100%. Instead of using percentages these portions are normally written as decimal ratios that add up to 1 as follows:

$$\mathbf{E + R + T = 1}$$

where:

E = Emissivity as a ratio

R = Reflection as a ratio

T = Transmission as a ratio

The value of each of these variables can be between 0 and 1 and is determined primarily by the material and surface condition of the object. (These values may also be a function of infrared wavelength and object temperature).

For a theoretical material with 0 transmission and 0 reflection the emissivity would be 1.00. This theoretical object is called a Black Body and would emit the maximum amount of energy at a given temperature.

To measure the object temperature, the portion of the measured energy being emitted verses the transmitted and reflected portion must be estimated. This emitted energy varies as a function of the object temperature. The transmitted and reflected energy are a function of the temperatures of the objects surrounding the object being measured. The larger the portion of emitted energy, the generally more accurate the infrared temperature measurement.

Thus the objects that can be most simply measured with infrared sensors generally have high (near 1) emissivities.

Most organic materials have emissivities between 0.85 and 0.95 making them ideal for infrared measurement.

5.1.1 Determining Emissivity

The most practical method of determining emissivity is by using a alternative technique to measure the actual temperature of the object being measured and adjusting the emissivity of the infrared sensor module until the two readings match. Ideally this should be done as near as possible to the expected operating temperature in the actual operating condition if possible. This will tend to automatically take into consideration the effects of surrounding temperatures such as heaters or oven walls. Some of the possible techniques are:

5.1.1.1 Measure with Contact Sensor

Use a thermocouple or other contact temperature sensor to measure the actual surface temperature while heating the object in as near a possible situation as the actual process. This can be readily accomplished by using a separate input on the ANAFAZE 8 PID controller with a thermocouple input selected. The ANAFAZE 8 PID will display the temperature in degrees F and performs the necessary reference junction compensation and linearization. Direct connection of thermocouples J, K, and T are possible.

5.1.1.2 Heat to Known Temperature

Small objects or a sample of a large object can be heated in an oven or other device to a known temperature. While the object is held at the known temperature aim the Infrared Sensor Module at the object and set its emissivity until the reading matches the known object temperature. If possible remove the object from the oven during measurement or minimize any possible reflection of oven walls in the object to obtain the most accurate emissivity. If reflections are present the emissivity determined will probably be higher than actual.

5.1.1.3 Increase Emissivity to a Known Value

Increasing the emissivity to a known value enables the object temperature to be measured with the infrared sensor module. The sensor module can then be aimed at a non- altered portion of the object and the emissivity adjusted to match the temperature measured at the known emissivity area. The emissivity can be increased as follows:

1. Cover a section of the object with masking tape (low temperatures), oil, water, grease, mold release, or other organic material. An emissivity of 0.95 can be assumed for the covered section.
2. Paint a section of the object with high temperature, non-metallic black paint and again use an emissivity of 0.95 for the painted section.
3. Drill a hole approximately one inch or larger in diameter approximately 6 times deeper than the diameter. Aim the infrared sensor module into the hole and the internal reflections will increase the emissivity to approximately 0.95.

5.1.1.4 Use an Estimated Emissivity

For control or measurement situations where repeatability is more important than absolute accuracy, or in situation where the emissivity can not be determined by any other means an estimated emissivity can be used. The emissivity can be estimated by using the table provided in appendix 1. Please note that the surface condition (i.e. oxidation, rust, or other factors) can have a major effect on emissivity especially of metals -- therefore the tables should be used only when no other method is practical.

5.2 Object Size and Distance from IRSM

In order to make accurate infrared measurements the object being measured must be larger than the measurement area of the IRSM.

The measurement area of the IRSM can be estimated by dividing the distance to the object by 20. Thus at 20 inches the measurement size is about 1 inch in diameter. The measurement size for standard focus instruments is approximately one inch for distances less than 20 inches from the sensor.

For close focus infrared sensor modules, the target size at the focal distance can be estimated by dividing the focal distance by 20. For distances other than the focal distance, the target size will larger than the standard focus instrument, please consult ANAFAZE for additional information.

5.2.1 Practical Object Size

The recommended minimum object size is approximately 2 times the minimum target size as calculated above. The minimum target size is specified at 90% energy since the energy verses target size follows a Gaussian distribution and some energy is always detected even from heat sources substantially off axis. This is similar to the effect that may occur when taking a photograph of an object near the sun and seeing the suns image in the photo.

The possible errors that can result when measuring small object can be minimized by keeping the background temperatures as low as possible.

Since the ANAFAZE IRSM can be factory focused at any distance between 20 and 4 inches, a close focus sensor will allow measurement of small objects if the sensor can be moved close to the target.

5.2.2 Small Object Correction

When the object is smaller than the measurement size the temperature being measured will be the average of the target and the background. If the background is cooler than the object the reading will be low and if the background is hotter than the object the reading will be high.

If the background will remain at an approximately constant temperature or is substantially lower than the object temperature the reading may be corrected by increasing the emissivity (background cooler than the object only) or correcting in a computer or other scaling device. The value of the correction should be determined by independently measuring the object temperature as in section 2.

Contact ANAFAZE for assistance when the background is hotter than the object being measured. A precise energy calculation can be made to estimate the possible errors.

5.3 Response Speed

The standard ANAFAZE 8 IRSM has a time constant of 300 ms. The sensor takes 300 ms for its output to reach 66% of a change in measured temperature.

For example at temperature of 300 F that instantaneously changes to 310 F the sensor will output 307 degrees after 300 ms. After approximately 3 time constants the output will reach 95% of the change or about 310 F. For larger changes the absolute error will be larger.

The error can be reduced in applications requiring high response speed by selecting the optional IRSM-F fast response time for a time constant of 80 ms.

The effective response can be improved in certain applications by using peak hold or sample and hold.

Peak hold can be used when measuring objects separated by short distances. This will act as a one way filter retaining the high readings of the objects being measured. Increases or decreases in temperature will be only small changes from the basic object temperature and thus closely approximated by the IRSM even if the measurement time is short. By using peak hold instead of a normal filter the IRSM will respond as fast as possible to increases in temperature.

Sample and hold can be used to synchronize the measurement to a given measurement event. Thus the sensor output will only change when the object is viewed by the sensor as indicated by an external trigger.

5.4 Infrared Wavelength

The ANAFAZE 8 IRSM is filtered in the infrared wavelength from 8 to 14 microns. This wavelength is optimal for measurement of temperatures between 0 and 1000 F and offers certain advantages:

- The majority of the infrared energy at these temperatures is in the band improving the measurement accuracy.
- There is little atmospheric absorption due to water vapor and carbon dioxide nearly eliminating any errors due to changing humidity and long measurement distances.

Color normally has little effect on emissivity in this band and accurate measurements can be made of most objects of different colors without changing the emissivity value.

5.5 Ambient Conditions

The ANAFAZE 8 IRSM is designed for operation in ambient temperatures up to 120 F. For longest life temperatures below 100 F are recommended if possible. The ANAFAZE IRSM-AS air purge/cooling shell allows for operation up to 300 F with a low temperature air supply. The ANAFAZE IRSM-VC Vortec Cooler will provide this cool air from normal instrument air at 70 F with a flow rate of approximately 3-4 SCFM.

When possible, as with any precision sensor, avoid rapid changes in the ambient temperature. Typically a change exceeding one degree F per minute may cause measurement errors. If a faster ambient temperature change occurs wait approximately 20 minutes for the output to stabilize.

6.0 ANAFAZE Infrared Controller (IRC)

The ANAFAZE IRC provides local display with up to two setpoints. It also provides DC power to the IRSM and includes provision for a fixed peak hold. In normal operation, the measured temperature is displayed. Three push buttons provide display selection of setpoint 1, setpoint 2, or ambient temperature. The setpoints are adjusted using front access potentiometers.

6.1 Specifications

Input range	0-10 mAdc
Display Range	0 to 1000°F
Celsius display	Special order
Accuracy	± .25% of range
Setpoints	Two provided. Each selectable as NO or NC, use as High or Low.
Outputs	Two 5Vdc @ 6mA to drive SSR.
Alarm Lock (Jumper select)	Locks alarms until reset externally.
Case	4.0" x 2.5" x 5.5"
Panel Cutout	3.5" x 1.875"

6.2 Setpoint Adjustment

To change either setpoint, hold the appropriate push-button and adjust the setpoint with a small screwdriver. When the push-button is held, the setpoint is displayed.

6.3 Peak Hold

The peak hold is achieved with a fixed 10 megOhm resistor installed in the IRC. Connecting the brown lead of the IRSM to pin 14 will enable the peak hold function. The approximate rate of decay is 1% of the reading per 1 second. Thus, 10 seconds after reading a temperature, the display will be 10% less of the peak value of the temperature. If longer time constants are required, please contact ANAFAZE.

6.4 Ambient Temperature Display

To read the ambient temperature at the IRSM press the AMB button.

7.0 Connections

The IRC is connected to the ANAFAZE IRSM according to the table in **Section 7.1**. The additional connections are described in **Section 7.3**. All the connections are marked on the terminal label on top of the IRC.

7.1 IRC to IRSM Connections

The IRSM comes with a 6" cable with a 9 pin connector. A mating connector is supplied and is wired per the pin listing below. If you do not purchase the CA12 cable, the wire colors are as listed. (Consult ANAFAZE if your IRSM has a serial number less than 1399.)

Pin	Color	IRSM	IRC	Terminal
A	Orange	Signal Out+	Signal Input +	11
B	White	Signal Out-	Signal Ground	9
C	Black	Ground	Signal Ground	9
D	Green	+8-15 Vdc	No Connection	
E	Red	+5 Vdc	+5Vdc	1
F	Blue	Ambient	IRSM temp.	12
H	Yellow	Sample/Hold	N/C	
J	Brown	Peak Hold	Peak Hold	14
K	Shield	Shield	Signal Ground	9

Notes

1. Power supply Pin D, green wire, is not used on IRSM with serial numbers greater than 1400 with the IRC. For serial numbers less than 1399, this connection must be made. Contact ANAFAZE for more information.
2. Peak Hold Pin J, brown wire, will enable the front panel adjustment potentiometer if it is connected to terminal 14. If peak hold is not desired, connect the brown wire to terminal 9, Signal Ground.
3. Sample and Hold Pin H, yellow wire, will activate the holding of the sample when it is grounded to terminal 9, Signal Ground.

7.2 IRC Outputs

The IRC dual outputs may be configured for N.C (reverse action) or N.O. (direct action) when the PV is below the SP. The control action of output #1 may also be configured for On/Off control or as an alarm action with manual reset with internal jumpers. The factory standard setting is for Output #2 to be N.O. and Output #1 to be On/Off.

Warning

Do not use the IRC as an alarm safety final shutdown device for shutdown of any type of process.

7.3 IRC Terminals

Rear of IRC

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

1.	+5Vdc	2.	-5Vdc
3.	Output #2	4.	Output #1
5.	Output Ground	6.	N.C.
7.	120 Vac H	8.	120 Vac N
9.	Signal ground	10.	Reset alarm
11.	+Signal in	12.	Ambient In
13.	+5 Vdc	14.	Peak Hold
15.	N.C.	16.	N.C.

7.4 IRC Internal Jumpers

Function	Jumper
Output #2 N.O.	**1 to 2**
Output #2 N. C.	1 to 3
#1 On/Off	**4 to 5**
#1 Alarm w/reset	6 to 7
Output #1 active	**8 to 9**
Output #1 active	**11 to 12**
Output #1 active	**14 to 15**

(Factory jumper settings are in **bold print.**)

7.5 Alarm with Manual Reset

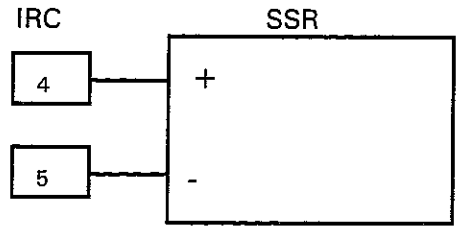
The IRC output #1 may be in the mode of an alarm output requiring an external manual reset. This is accomplished by taking the jumper from 4 to 5 and putting it on 6 to 7.

When the output activates, it will retain that output in that state, no matter where the PV is with respect to the SP. To return to the non-active state, the Reset Alarm terminal 10 must be connected to the Output Ground terminal 5 through a N. C. switch. ANAFAZE recommends that you use Reverse Action (N. C.).

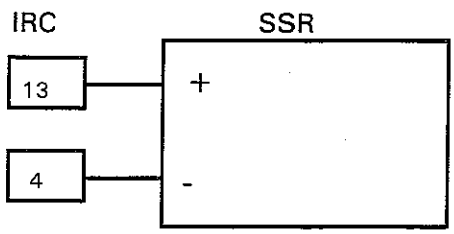
7.6 Output Wiring

Output #1

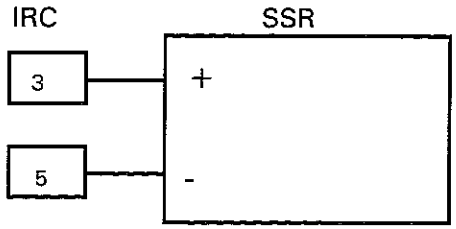
Reverse Action N. C.



Direct Action N. O.



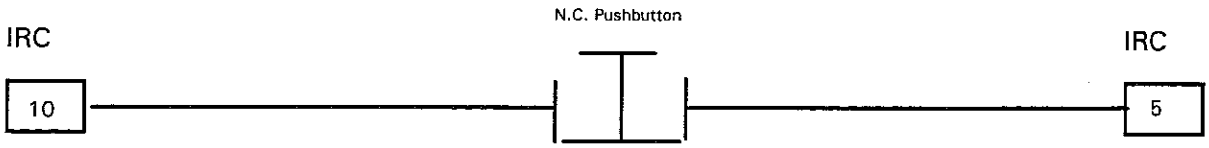
Output #2



Reverse Action N.C. Jumper 1 to 3

Direct Action N.O. Jumper 1 to 2

Alarm with Manual Reset



8.0 IRC Calibration

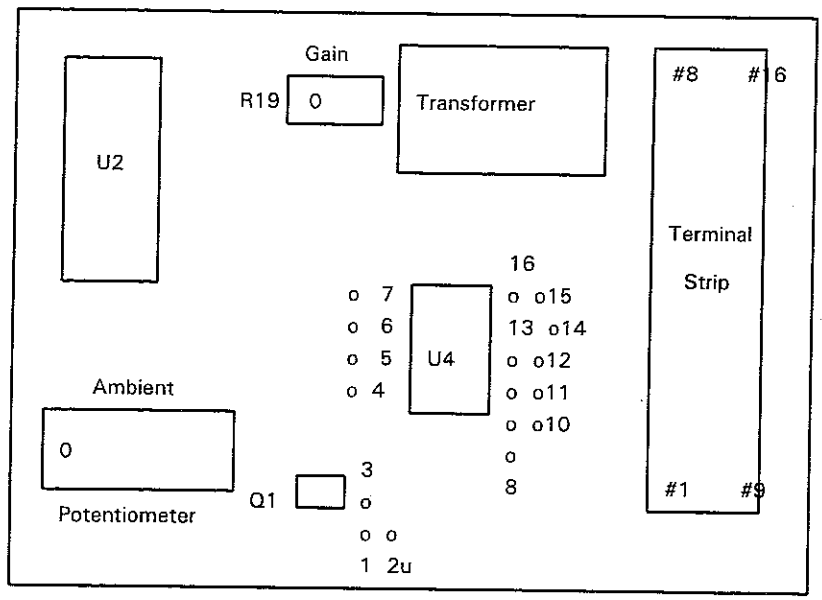
The calibration of the IRC requires a precision current source capable of supplying up to 10 mAdc ±.1% accuracy and a precision resistor at 1000 ohms ±.1%.

8.1 Procedure

1. Disconnect the IRSM from the IRC.
2. Connect the current source to the IRC input terminals- positive to terminal 11 and negative to terminal 9.
3. Set the current source for 8 mAdc. The IRC display should read 800±1. If it does not, adjust R19.
4. Connect the 100 ohm resistor to the Ambient input terminal 12 and Signal Ground terminal 9.
5. Push the AMB push-button. The display should read 77. If it does not, adjust the ambient sensor potentiometer.

This completes calibration of the IRC. Any failure of the unit to calibrate to specifications should be noted; send the unit back to ANAFAZE for repair.

8.2 IRC Jumper Locations



8.3 IRC Panel Cutout