

864 Series

IR-EYE™

Long Range Passive Infrared Thermal Telescopes



Widest deployment

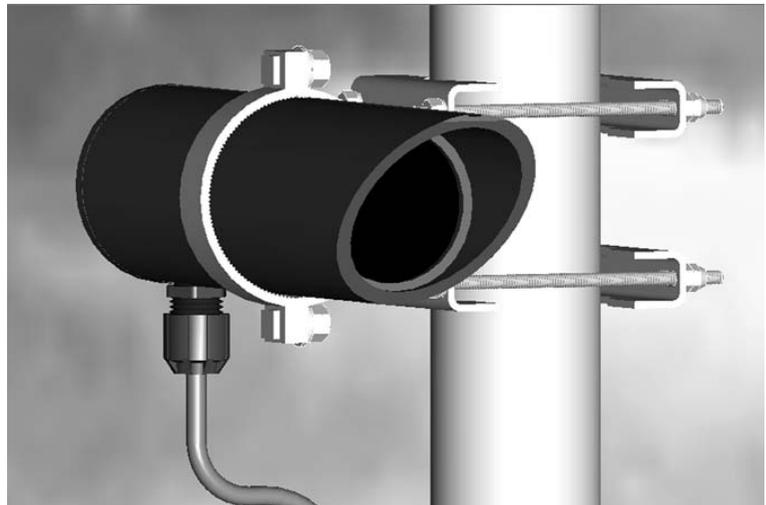
- Worldwide,
- All environments,
- More than 2 decades

Thermal Sensing of People & Vehicles for

- Perimeter protection
- Border observation
- Tactical surveillance
- Airfield security
- Covert runway monitoring
- Homeland Security

Providing:

- CCTV wakeup
- Alarm
- Coded transmitter activation
- Evidentiary camera trigger



Passive Detection of Thermal Radiation: An Exciting Approach to Outdoor Security

- 500 ft nominal detection range for personnel
- Well-defined narrow field-of-view
- Curtain coverage
- Sun, salt, sand, moisture, chemical resistant construction
- High immunity against potential false alarm sources
- Two-stage optical filtering
- Precision optics
- Adaptive threshold detection
- Low noise electronics
- Low power draw

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SECTION 1 - - - INTRODUCTION TO THE MODEL 864 / 864M3

1.1 BASICS OF PASSIVE INFRARED (PIR) DETECTION

Each person, object or animal emits infrared energy as a function of its surface temperature and size. For temperatures around ambient the maximum of the radiated energy is in the region of 10 microns (20 times the wavelength of visible light). Thermal changes, relative to the background, within the telescope's field of view as produced by a moving target generate a signal which will trigger an alarm.

PIR detection has become the most widely used approach for indoor intrusion detection and Eltec provides a proven high reliability sensor for outdoor applications.

PIR detection does not require an emitter, but makes use of a radiation which is already there - 100% natural and harmless. The fact that no radiation is emitted also means that:

- A sensor unit cannot be detected by any technical means. Like the human eye, it is completely passive in operation
- No license is required as for microwaves
- No eye protection required as with many active IR devices
- Neighboring units will not interfere with each other

1.2 DESCRIPTION

These telescopes are specifically designed for use as a component in a total security system for long range detection of people and vehicles. Eltec's passive infrared thermal telescopes have been deployed worldwide for over two decades in security systems for industrial, governmental and military installations. The rugged, watertight, hermetically sealed construction of these telescopes make them ideal for outdoor applications. The telescope's use of state-of-the-art detector technology, advanced signal processing and precision optics optimizes the discrimination of moving targets from other events. This technology is an exciting alternative to microwave or active infrared links and it is also ideal in critical applications where dual technologies are desired. The simple installation process, and the variety of options available, make these telescopes well suited for a number of applications, some of which include detection of personnel, vehicles, boats, airplanes, fires, explosions, etc. The telescopes can be used in both fixed and temporary installations to monitor events at long distances.

1.3 FUNCTION

A person or a vehicle will always have a temperature contrast in respect to the background, producing a change of radiation within the field of view when passing through it. This temperature contrast can be as little as 1C° or less (either positive or negative) for a person at the nominal distance of 500 ft to trigger the alarm. A precision mirror focuses the radiation onto a parallel opposed dual (POD) pyroelectric detector which will produce a defined signal from a moving target while cancelling common mode signals received simultaneously by both elements. Two stage optical filtering restricts the radiation to the so-called atmospheric window (8 - 14 microns) where the effects of the normal constituents of the atmosphere (particularly humidity) least affect the transmission of infrared radiation. This double optical filtering minimizes unwanted radiation from sunlight or headlights which otherwise may produce false alarms. Sophisticated signal processing is used to discriminate even very weak signals caused by a moving target from the unwanted signals caused by wind, clouds and precipitation.

1.4 FIELD OF VIEW - - Curtain Coverage (Model 864)

PLEASE NOTE: THIS MANUAL DISCUSSES INSTALLATION AND OPERATION OF THE STANDARD MODEL 864 TELESCOPE.

Both the standard Model 864 and Model 864M3 (NARROW FIELD-OF-VIEW VERSION) have optics designed for perimeter protection. The field of view consists of two distinct segments with opposed polarity. Both models have the same coverage in the horizontal field of view (see Fig 1.1).

The DIFFERENCES in the models are in the vertical field of view coverage where the Model 864 has additional downward vertical coverage (curtain coverage) from the main axis (Fig 1.2). Telescope model and serial number are located within the back housing and are accessed by unscrewing the back cover.

On the Model 864, the point where the vertical direction curtain coverage begins will vary depending upon how the telescope is aimed. The differences in where the start of the curtain coverage begins (based on grounding the telescope or aiming straight ahead) can be seen in Table 1 and Figs 1.3 & 1.4. It should be noted that the mounting height of the Model 864 may make it possible to crawl beneath the curtain coverage in some locations if the background temperature and the person's body/clothing temperatures are nearly equal. Consideration should be given to the lowest possible mounting height to minimize this phenomenon.

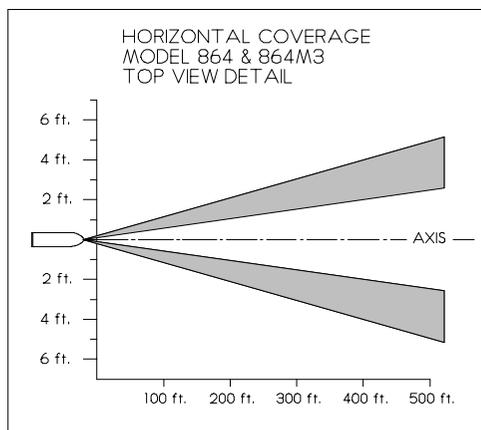


Figure 1.1

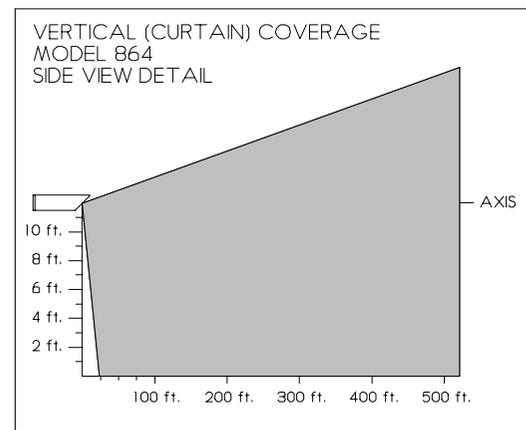


Figure 1.2

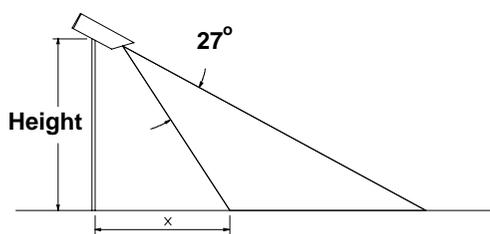


Figure 1.3 - Vertical field-of-view (grounded)

TABLE 1
DISTANCE (X) FOR START
OF VERTICAL (CURTAIN) COVERAGE

HEIGHT	FOV GROUNDED		FOV AIMED STRAIGHT AHEAD
	X @ 300 ft.	X @ 500 ft.	X @ ANY DISTANCE
4 ft.	7.2 ft.	7.3 ft.	7.8 ft.
8 ft.	13.9 ft.	14.3 ft.	15.6 ft.
12 ft.	20.3 ft.	21.1 ft.	23.3 ft.
20 ft.	32.0 ft.	34.0 ft.	39.1 ft.

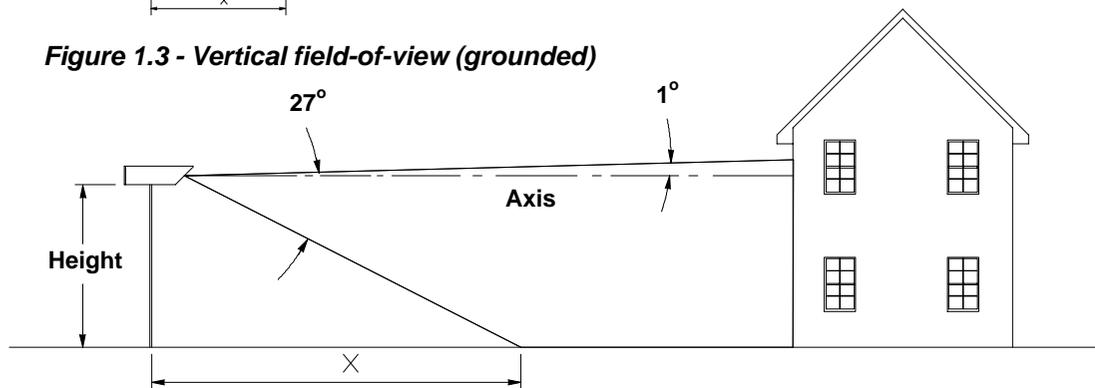


Figure 1.4 - Vertical field-of-view (aimed straight ahead)

Note: Data is calculated and subject to variations in environmental changes.

1.4 FIELD OF VIEW - - Narrow Field of View (Model 864M3)

The Model 864M3 (NARROW FIELD OF VIEW) is ideally suited for observation of a defined spot from a distance. Figure 1.5 shows the narrow vertical field of view coverage. The unit is often used to monitor a gate or trap-zone at a distance and mounted high when response to activity in the intermediate zone is not desired. The area covered, as a function of distance, is shown in Fig 1.6. If the telescope is used for perimeter protection as an invisible barrier to detect an intrusion, the small cross section of the segments close to the telescope would make it possible to crawl beneath or climb across the segments without being detected, therefore the standard Model 864 is recommended. For further details, please refer to the sections INSTALLATION CONSIDERATIONS and ORDERING INFORMATION.

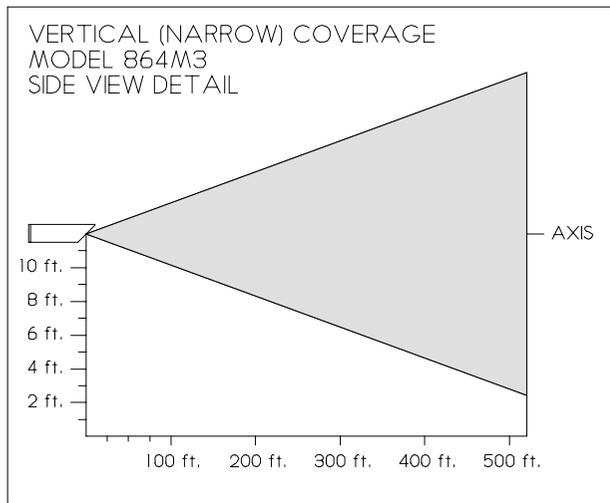


Figure 1.5

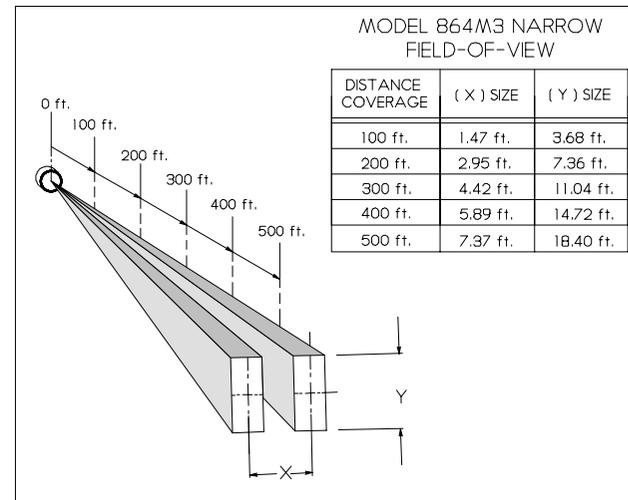


Figure 1.6 - Model 864M3 Narrow Field of View

Note: Data is calculated and subject to variations in environmental changes.

1.5 DETECTABILITY CONSIDERATIONS

These passive infrared telescopes produce an alarm signal when seeing a change of optical radiation corresponding to a movement within or across the field of view. Although the telescopes are most sensitive to movements across the field of view, movement towards the telescope will also be detected with a high degree of probability.

1.6 ENVIRONMENTAL CONSIDERATIONS

One of the major concerns is the influence of various weather conditions on the detection range. Calculations verified by actual tests show that the infrared signal attenuation can almost be neglected for points 1 to 9 on the International Visibility Scale (see Table 2), corresponding to dense fog and perfectly pure air, respectively. Only for visibility 0 (very dense fog) will the attenuation be significant, but detection range will still be typically up to 50% more than the distance the human eye will see.

1.7 INSTALLATION CONSIDERATIONS

In perimeter protection applications, or similar fixed installations for people detection, it is recommended to limit the required detection range to 300 ft by grounding out the telescope. Longer sections of a perimeter can

be divided into portions of 300 ft, each being covered by one telescope (see Fig 1.7). This kind of set-up will give reliable detection under virtually all climatic conditions.

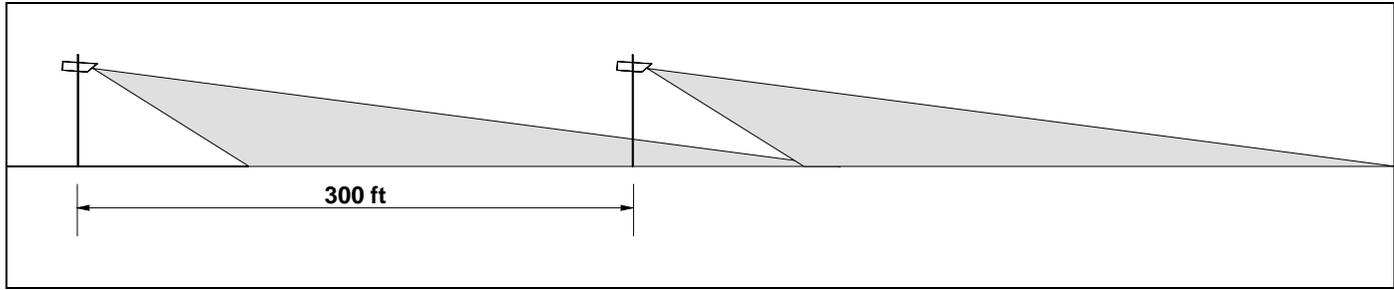


Figure 1.7

It is important to note that the range of the telescope is not limited by, but a function of, size and temperature of the target. A car or an airplane may trigger an alarm when crossing the field of view at a mile distance depending on the conditions. This is avoided in practice by pointing the telescopes slightly downward or by having the telescopes face a defined background (wall, hill, or embankment).

An alternate, which is commonly chosen in high security applications, is to protect a given section by two telescopes facing each other (see Fig 1.8). By electrically linking two units in an "and" function, an alarm will only be triggered if both telescopes give a simultaneous alarm, indicating a movement seen by both units. Naturally this type of set-up greatly reduces the false alarm probability. Additionally, such an arrangement, if switched to an "or" function at certain times of increased risk of intrusion or very poor visibility, can be made extremely sensitive.

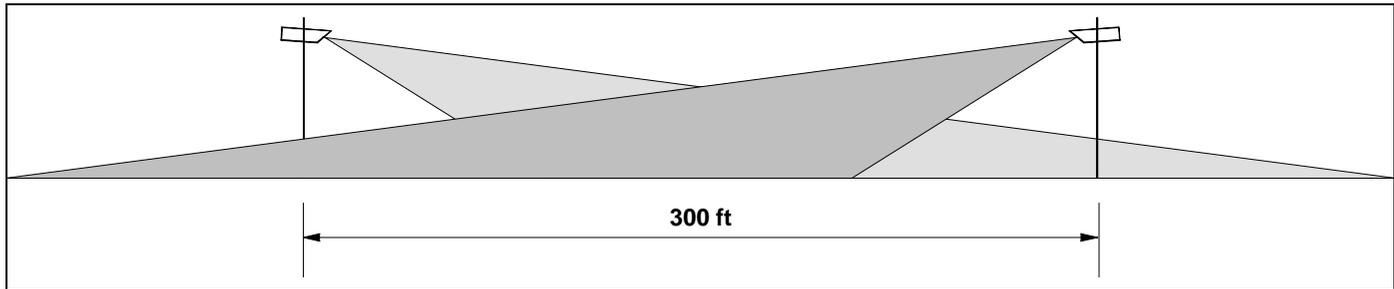


Figure 1.8

For protection of a corner the following installations are recommended (Figs 1.9 & 1.10)

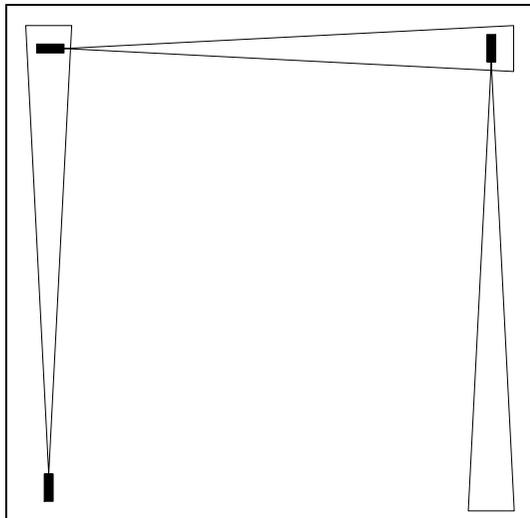


Figure 1.9

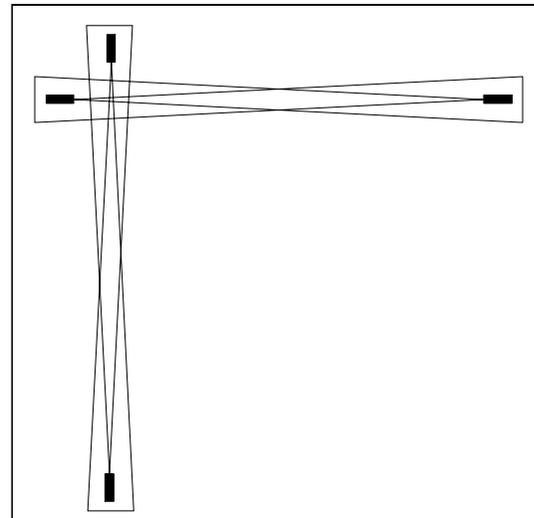


Figure 1.10

For Perimeter with Chain-Link Fence:

If the telescope is aimed at the fence, it will "see through" the fence and alarm in response to people and vehicles on the other side. To avoid this, the telescope can be aimed at the ground. Or a panel can be added to the fence. Possible materials: marine plywood or acrylic plastic sheet (this is opaque in the long wave infrared). See Fig 1.11.

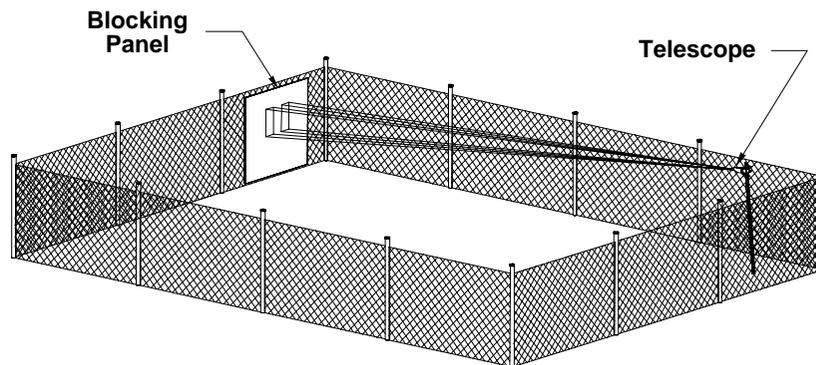
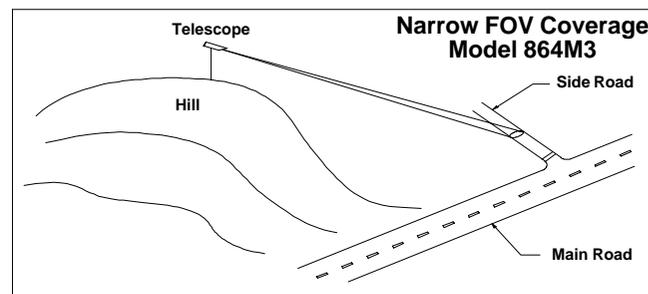
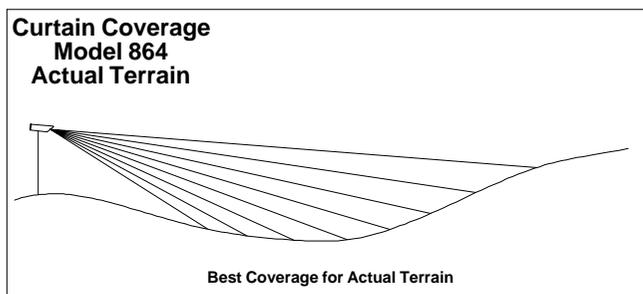


Figure 1.11 - Use of a Blocking Panel



Figures 1.12 & 1.13 - Grounding with Actual Terrain

1.8 POTENTIAL FALSE ALARM SOURCES

Various sources may affect the performance of an outdoor security system. For instance, DO NOT aim the telescope into the horizon (straight out), UNLESS you are aiming into a wall, the side of a building or an embankment that is within your monitored perimeter. Although the telescope will detect a person at 500 feet under most conditions, it may detect a larger heat source, like a truck or an airplane, to a distance greater than several thousand feet, or thermal perturbations in distant atmospheric masses. Thus, the end of the field of view should be a stable thermal background (something that changes temperature very slowly, like the earth or a concrete wall, etc.). See Figures 1.12 & 1.13. If the telescope seems to be giving false trips, the first thing to check (after verifying that there is 10.2 volts or greater power at the telescope) is the aiming, to make sure that detection of motion of distant objects (animals, blades of grass, branches of trees, etc.) is not the source of unwanted alarm signals. REFER TO INITIAL OPERATION, AND ALIGNMENT SECTIONS. Passive infrared detection can perform exceptionally well under almost all conditions. Specific weather conditions, including effects of wind on vegetation are not likely to cause false alarms although it is recommended to avoid bushes and trees within the field of view. All internal false alarm sources have been considered carefully and component selection made accordingly. Finally, the whole system is designed for optimum signal to noise ratio by using precision optics and low-noise electronics.

SECTION 2 - - - MODEL 864 / 864M3 INSTALLATION AND OPERATION

2.1 INTRODUCTION AND PRECAUTIONS

Before installing the telescope, please read this section carefully. Should any difficulties arise, contact your supplier or Technical Support staff at Eltec Instruments directly.

IMPORTANT NOTICES FOR INSTALLATION AND SERVICE PERSONNEL:

Handle the telescope with care

The unit is a precision instrument and will not function to its specifications if subjected to mechanical shock or undue stress.

DO NOT point the unit into the sun or other intense source of infrared radiation

The telescope contains precision optical components that focus infrared energy onto very sensitive pyroelectric components. Intense sources of infrared will destroy these components and possibly damage the optics.

DO NOT touch the front window with bare hands

Salt and acids from the hands may damage the surface of the window. To clean the window, use only a soft, clean cloth. Cloth may be moistened with distilled water or alcohol in severe conditions. Clean the window very gently, do not apply undue pressure as the window is fragile and may be damaged or broken.

Use precautions in lightning storms

In lightning prone areas, take measures to arrest lightning discharges and electrostatic buildup.

2.2 UNPACKING

Remove the unit from the shipping container and carefully check for signs of damage. Any such damage should be reported to your supplier or to the Technical Support staff at Eltec Instruments directly. Do not attempt to install a damaged unit until advice has been obtained.

2.3 POWER REQUIREMENTS

The telescope can be used over a wide voltage range from 10.2V to 30.0V DC. The voltage must be DC, with a maximum of 1.0 V RMS ripple, DC to 400 MHz. Avoid running low voltage DC next to AC power cables over long distances. Induced AC ripple and noise in the DC supply may cause the telescope to false alarm.

2.4 CONNECTION TO EXTERNAL EQUIPMENT

Alarm Signalling

There are two types of alarm signalling from the telescope: One set of form C (SPDT) isolated relay contacts and an open collector transistor to ground. See Fig 2.1 for signal connections.

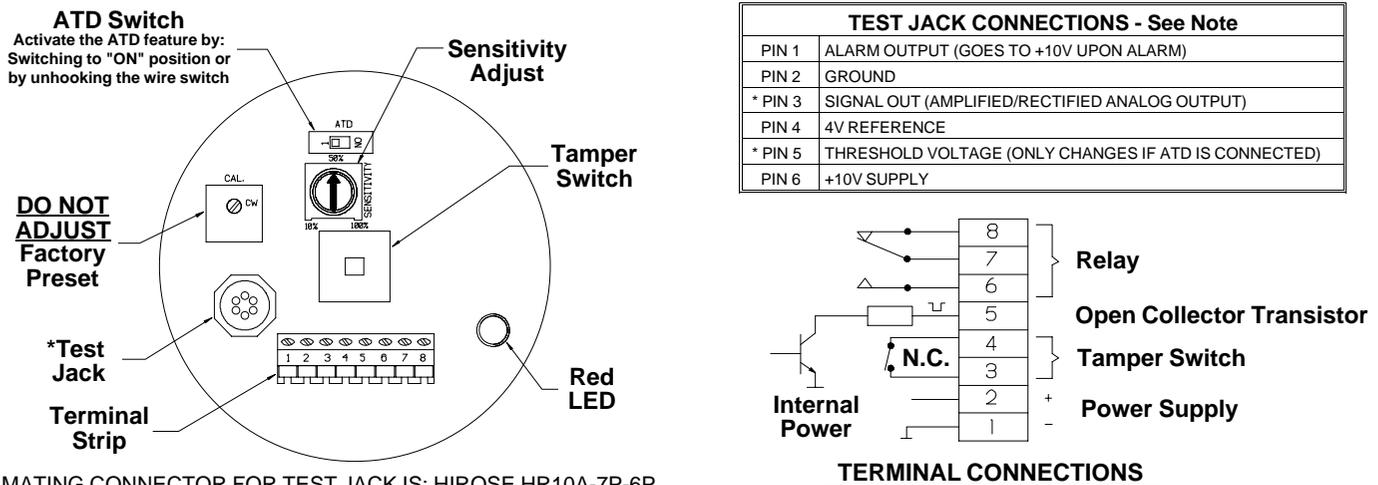


Figure 2.1 - Internal Controls And Terminal Connections

The relay contacts change state and the transistor switch goes low on alarm. Alarm reset time is 1.6 to 2.0 seconds.

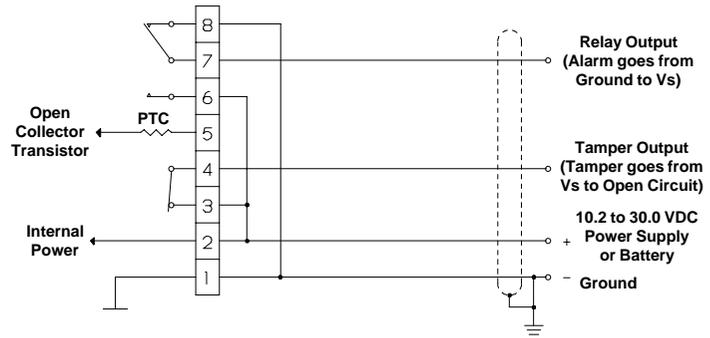
The suggested method of configuring the alarm wiring is to select the normally closed relay contact. To prevent tampering of the telescope, a tamper switch has been designed for the rear cap. This should be connected in series with the normally closed relay contact. If the telescope is opened or the cable is cut, an alarm will be initiated. Figures 2.2 and 2.3 detail wiring configurations.

Wiring Diagram for Normally-Open Relay Output *

Relay contacts (terminals #6 & #7) CLOSE and the output goes from low to high when:

- 1) Intruder passes through telescope field of view
- 2) Power to telescope is lost (contacts are open only while the telescope is powered and not in an alarm condition).

Using the "normally open" relay contacts will not give an alarm indication if the cable to the telescope is cut because access to the closed contacts will not exist. Therefore, the "tamper switch" should be used because it is "closed" as long as the back is on and would appear "open" if the cable is cut and tamper output voltage would go to zero.



NOTE: Shielded cable is recommended (preferably with foil shield). GROUND SYSTEM AT CONTROL PANEL TO AVOID GROUND LOOPS

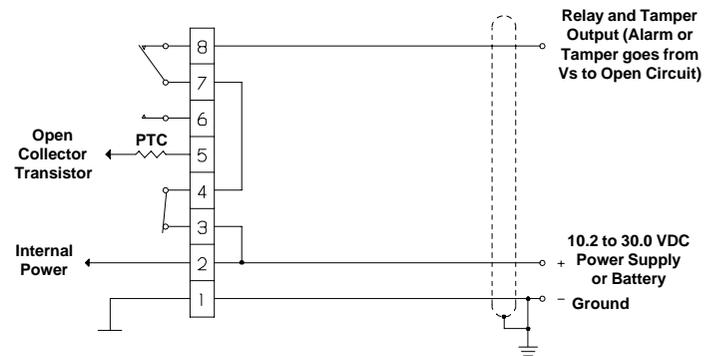
Figure 2.2

Wiring Diagram for Normally-Closed Relay Output *

Relay contacts (terminals #7 & #8) OPEN and the output voltage goes from high to low when:

- 1) Intruder passes through telescope field of view
- 2) Power to telescope is lost (contacts are closed only while the telescope is powered and not in an alarm condition).
- 3) Back of telescope is removed

Note: Red LED inside back of telescope for walk testing is only active and visible when the back cover is removed. However, the tamper switch opens when the back cover is removed. Therefore, this wiring method would throw the unit into alarm condition when the back cover is removed unless the tamper switch is jumpered for walk testing. Also, some alarm installers use two-way radios with one person walking through the telescope field of view and the other at the central alarm control panel to verify full operationality.



NOTE: Shielded cable is recommended (preferably with foil shield). GROUND SYSTEM AT CONTROL PANEL TO AVOID GROUND LOOPS

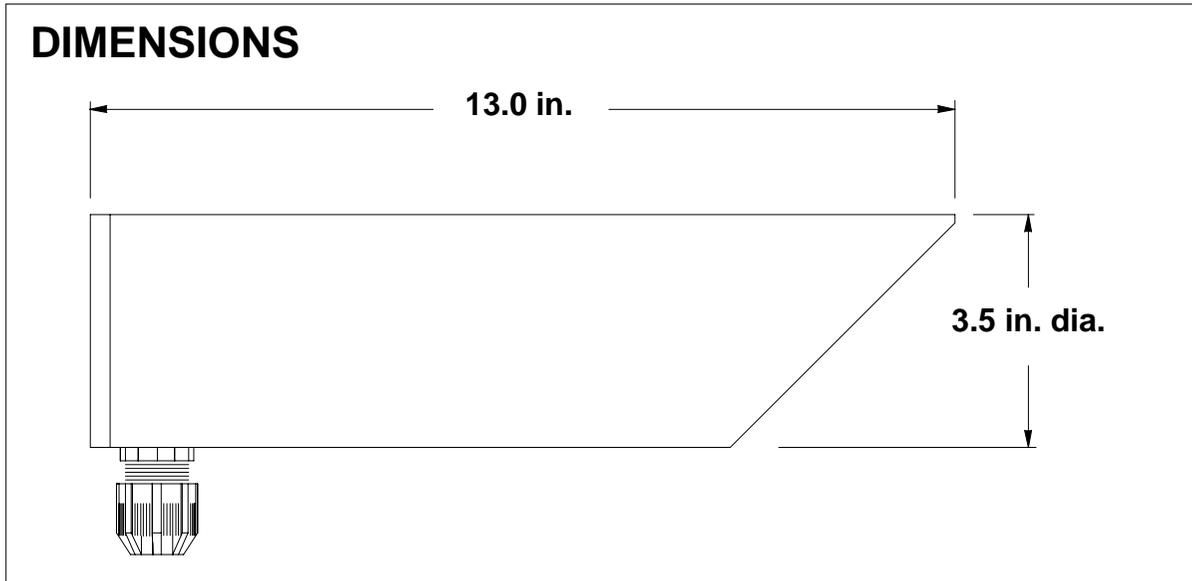
Figure 2.3

*** BOTH RELAY AND TAMPER SWITCH ARE SHOWN IN FIGURES 2.2 AND 2.3 ABOVE WITH THE TELESCOPE ENERGIZED (POWERED) IN THE NORMAL, NON-ALARM CONDITION AND THE BACK COVER IN PLACE**

2.5 MECHANICAL OUTLINE

Optics and electronic circuits are sealed into a rugged watertight hermetically sealed PVC housing providing exceptional thermal isolation and immunity to thermal shock. RFI protection is provided for use near strong RF sources such as radar and communications transmitters.

The back of the telescope can be removed (threaded cover) for access to the terminal block and sensitivity adjustment and is protected by a tamper switch.

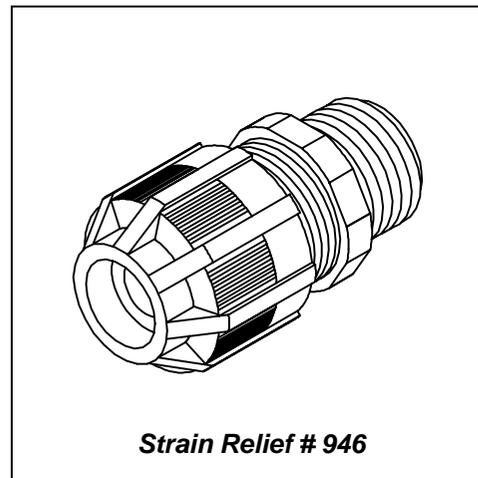
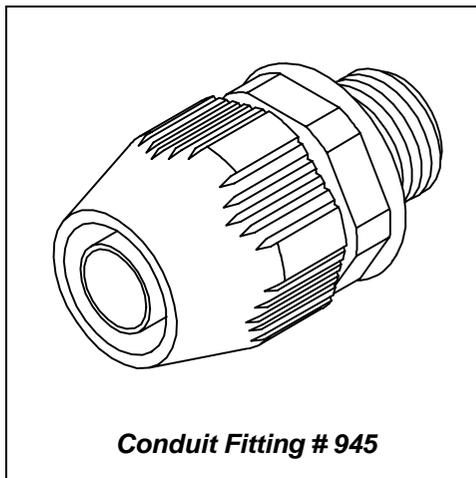


2.6 CABLE/CONDUIT INSTALLATION

The telescope comes with a cable strain relief installed. This strain relief is designed to fit a cable diameter of .125" to .375". The strain relief grip must be tightened securely to the cable in order to prevent moisture intrusion.

Also supplied separately is a conduit fitting. If conduit is used in the installation, simply remove the strain relief, replace it with the conduit fitting and fasten securely. Watertight 1/2" conduit must be used.

TO PREVENT MOISTURE INTRUSION, MAKE SURE STRAIN RELIEF (OR CONDUIT FITTING) AND BACK COVER ARE SECURELY FASTENED. FAILURE TO DO SO MAY RESULT IN DEGRADATION OF PERFORMANCE AND/OR INTERNAL DAMAGE WHICH MAY NOT BE COVERED UNDER WARRANTY.



2.7 MOUNTING

Refer to Figs 1.3, 1.4 and Table 1, which show the effect of different mounting heights on curtain coverage.

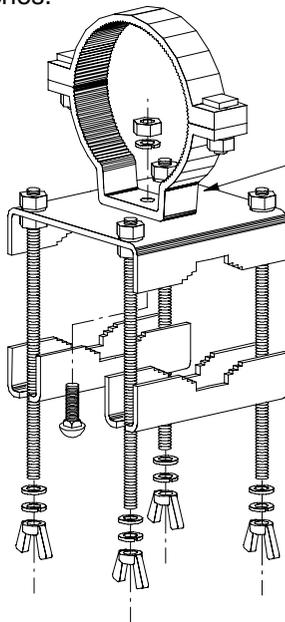
The telescope is an extremely sensitive long range detector. For this reason mounting must be on a very stable structure. The very long, narrow detection field and high sensitivity of the telescope makes it susceptible to false alarms from motion if not mounted securely.

2.8 MOUNTING AND ACCESSORIES

The telescopes are easily mounted on any stable vertical pole or other solid structure. For stable mounting and easy aiming the following accessories can be supplied:

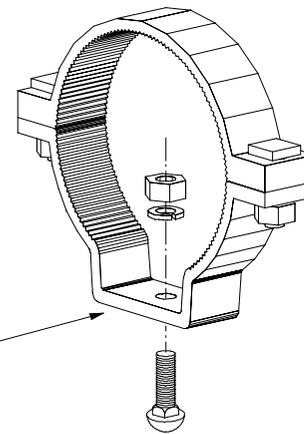
Double Mounting Bracket No. AO54M1

The part clamping the telescope is fixed to a platform with a nut for adjustment of the elevation. The other part is fixed to the pole with 360° rotation capability for aiming the telescope to any desired direction (bracket shown on the brochure cover photo). Suitable for pole diameters of 1.5 to 3.0 inches.



Mounting Bracket No. AO56M1

This is only the part actually clamping the telescope (mounting ring and base connection of AO54M1). Suitable for other ways of mounting (e.g. walls or tripods).



Base may have additional holes (not shown)

2.9 INITIAL OPERATION

Mounting

First aim the telescope at the desired direction and fix it firmly as described above.

Electrical Connections

Unscrew the rear cover to gain access to the terminal block. Install your cable, making the appropriate connections to the terminal block.

2.10 OPERATION

Power-Up

When the power is applied to the telescope, there is a period of approximately 30 seconds during which the internal circuitry stabilizes. During this period, the internal LED will illuminate and the unit will be in an alarm state. The circuitry will then reset and the telescope will function normally. For the next 2 minutes the telescope sensitivity may vary slightly as the internal temperature stabilizes. Allow 5 minutes for complete stabilization.

Sensitivity Adjustment

System sensitivity is set for mid range at the factory. However, if a different sensitivity is required in a specific installation (desired detection range well below 300 ft, detection of objects larger or warmer than a person) a sensitivity potentiometer with a convenient finger knob is provided with which the sensitivity can be increased or reduced up to a factor of 10 (10% position). This potentiometer has scale markings of 10%, 50% and 100%. When reducing system sensitivity the probability of false alarms is also reduced but worst case conditions for reliable detection require careful consideration. Always confirm operation by walk testing, initially with the ATD out of the circuit. If nuisance alarms occur, open the wire link or set switch to "ON" to put the ATD in the circuit. If difficulties persist, especially in short range applications or in locations where small animals cannot be excluded from the covered zone, then cut back on the sensitivity.

Note: The telescope responds to the thermal contrast created when something warmer/colder enters the background. Thus if a unit is aimed straight out, it may alarm in response to a large truck with exposed exhaust pipe at a distance of one-half mile or greater. Thus aim down or at a stable background (wall) to limit the field of view. Do not try to range-limit the telescope simply by decreasing sensitivity.

Adaptive Threshold Detection (ATD)

The ATD circuit automatically reduces the detection sensitivity if the background noise increases, thus avoiding nuisance alarms. This option is only recommended for use in areas where severe environmental conditions occur, as it limits the units sensitivity. To switch the ATD circuit on, open the wire link switch (on models so equipped) at the rear of the telescope by pressing down on it with the tip of a screwdriver, or similar tool, and carefully moving the contact wire to one side (or set the switch to "ON").

As mentioned earlier, the electronic circuit includes adaptive threshold detection which automatically reduces the system sensitivity when background noise increases due to environmental sources such as grass, branches or bushes moving in the wind or warm air turbulences. This special feature is a key factor for the system's low false alarm rate.

With the ATD in the circuit (wire link switch disconnected or the switch set to "ON"), successive trips within a few minutes will temporarily depress the sensitivity to the point where the unit may fail to go into an alarm condition at maximum range. Therefore it is recommended that walk testing be done with the ATD disabled except for final test.

The adaptive threshold detection can be disabled if required (walk testing, range measurement, special applications) by closing the wire link switch on the PC board (or by switching to the "1" position).

Nuisance Alarms

When the telescope registers what seems to be false alarms overnight, it is sometimes difficult to identify the source of the problem. Often it is small animal activity which may be confined to only one section of a perimeter. Sometimes it is branches or other vegetation being moved by the wind into the telescope's field of view.

A good approach is to "blind" the telescope with an opaque bag - - testing that it is indeed rendered insensitive to motion. Then if the unit alarms in the trouble period, the source may be power supplied to the telescope (an unlikely problem if other telescopes run from the same supply) or a fault with the telescope itself.

If the telescope does not alarm through the trouble period when blinded, then the actual field of view should be verified by walk testing to insure that the telescope is not picking up distant vehicles or motion from an adjacent area. In addition, many telescope users have used the scope output to trigger a recording CCTV system with time/date stamp for alarm source verification. This approach is highly recommended.

2.11 ALIGNMENT

To align the telescope for small installations, walk testing is recommended. This is the best way to make final adjustments to the detection area. The internal LED can be monitored and minor changes made in the positioning of the unit while a person walks through the detection area. Walk testing should be done with the ATD circuit switched off (wire link switch closed or switch to "1" position).

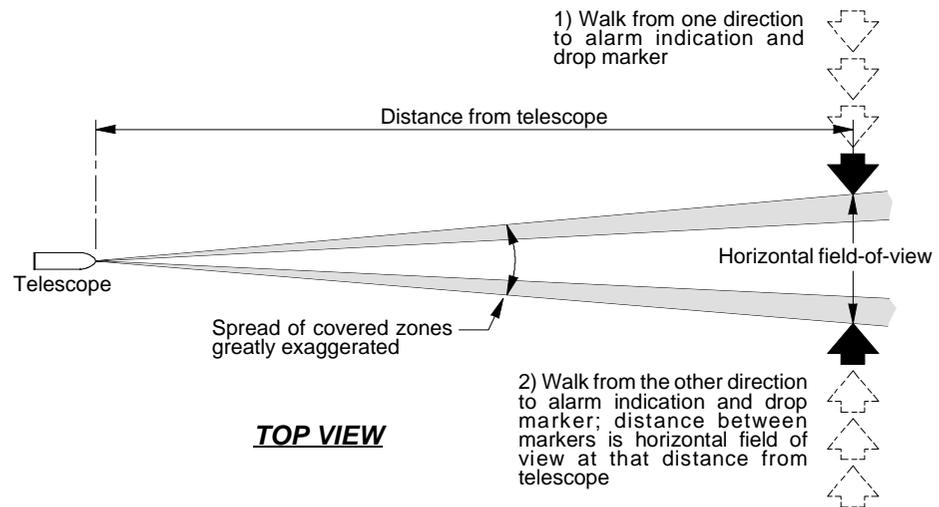
For large installations, it is recommended to use the optional alignment telescope (AO55) for initial aligning with final placement optimized by walk testing.

2.12 WALK TESTING

For walk testing, an LED is provided inside the telescope housing which can be observed with the rear cover removed. Final aiming is done by walking across the field of view and observing the point where an alarm is triggered. For walk testing it is recommended to disable the adaptive threshold detection.

2.13 WALK TESTING HORIZONTAL FIELD-OF-VIEW

The telescope holds the alarm for 1 to 2 seconds. If the walker continues walking until the alarm signal stops, he may be beyond the actual sensitive zone. Thus it is best to walk slowly in one direction until alarm is actuated and then repeat the process from the other direction to accurately define the width of coverage at a given distance. (Do not keep the Adaptive Threshold Detection (ATD) in the circuit when making field of view confirmation walk tests.)



2.14 Maintenance

Servicing

The telescopes are sealed units. The only servicing required is to clean the front window every 90 days with a clean, soft cloth. This may need to be done more often in dusty environments. Cloth may be moistened with distilled water or alcohol in severe conditions. Clean the window very gently, do not apply undue pressure as the window is fragile and may be damaged or broken. At the same time, the detection field should be walk tested to check its sensitivity.

DO NOT TOUCH THE WINDOW WITH BARE HANDS. SALTS AND ACIDS FROM THE HANDS MAY DAMAGE THE SURFACE OF THE WINDOW.

Unscrew the rear cover at some stage during the winter or wet season to check for internal condensation, water droplets or corrosion. Should problems arise, please contact our Technical Support staff for advice.

THE TELESCOPE CONTAINS NO USER SERVICEABLE PARTS AND IN THE EVENT OF FAILURE SHOULD BE RETURNED TO ELTEC INSTRUMENTS, INC. FOR REPAIR. THE INTERNAL HOUSING IS HERMETICALLY SEALED AND NITROGEN BACKFILLED. ANY DISASSEMBLY WILL COMPROMISE THE SEAL AND VOID THE WARRANTY.

2.15 SPECIFICATIONS

Mechanical

Weight	3.0 lbs (1.4 kg)
Size	3.50" (8.89 cm) dia x 12.93" (32.84 cm) long
Enclosure	Painted PVC
Colors	Green, White, Tan, Grey

Optical

Nominal Range	500 ft (152 m)
Horizontal Field of View	
864, 864M3	1.1 °
Spectral Response	8 to 14 microns
Detectors	Pyroelectric POD (Parallel Opposed Dual) Lithium Tantalate integrated sensors

Electrical

Supply Voltage	10.2 to 30.0 VDC (As a low voltage indication, unit will give continuous alarm below 9.40 V). Reverse voltage protected up to -20 Volts. Positive transient protected up to 60 Volts.
Supply Current	4.8 mA nominal, 5.0 mA maximum 11.0 mA with cover removed and alarm LED activated.
Relay	
Output Ratings	Maximum Switching Voltage: 110 VDC, 125 VAC Maximum Switching Current: 1.0 A
Switch Configuration	Maximum Switching Power: 30 W, 63 VA Minimum Switching Capacity: 10 μA, 10 mVDC
Transistor	Open collector, NPN, 40 VDC, 40 mA
Output Impedance (Typ.)	25 Ohm @ 25 °C
Output Protection	PTC resistor, current limited
Alarm Indication	Internal Red LED (Active when back cover is removed)
Alarm Hold Time (Typ.)	2.0 seconds
Sensitivity Adjustment	Finger adjustable knob potentiometer with markings at 10%, 50% and 100% (10:1 range)
Strain Relief Cable Range	.125" to .375" diameter
Terminal Block Wire Size	24 AWG minimum 18 AWG maximum

Environmental

Operating Temperature Range	-40 °C to +70 °C
Storage Temperature Range	-40 °C to +70 °C
Atmospheric Pressure	1 atmosphere (15 PSI) positive or negative (vacuum)
Sealing	Watertight hermetic seal, provided strain relief is properly tightened around cable (RTV sealant is recommended) and rear cover is properly tightened.

- NOTES:**
1. The internal aluminum housing from the front optical window to the rear PC board is hermetically sealed and nitrogen backfilled to prevent condensation of the optics at low temperature. Any disassembly of this unit will break the seal and void the warranty.
 2. Foil shielded cable is recommended for RFI protection.

2.16 ORDERING INFORMATION

The telescopes come in a standard textured grey. See below for color options available.

864 [optics] [color]

Optics

- 864 = Perimeter version, curtain coverage (for FOV's, see Figs 1.1 & 1.2)
- 864M3 = Standard narrow field of view (for FOV, see Figs 1.5 & 1.6)

Colors

- No letter = Dark grey, textured
- A = White, shiny, non-textured
- B = Grey, RAL 7035, non-textured
- C = Green, olive drab, textured
- D = Desert tan, non-textured
- E = Green, flat olive drab, non-textured

Other colors available on special request

Accessories

- AO54M1 = Double Mounting Bracket
- AO56M1 = Single Mounting Bracket (Split Ring)

Notes:

Notes:

NOTICE: The information provided herein is believed to be reliable. However, ELTEC Instruments, Inc. assumes no responsibility for inaccuracies or omissions. Due to industry components being incorporated into ELTEC's devices and ELTEC continually striving for product improvement, specifications may change without notice.



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International Visibility Scale				
Points	Qualitative Visibility	Range of Visibility	Transmissivity per Kilometer	Atmospheric Conditions
0	Very Poor	0 - 50 m	$< 10^{-6}$	Very dense fog
1		50 - 200 m	$10^{-4} - 10^{-6}$	Dense fog; very heavy snow
2		200 - 500 m	$10^{-3} - 10^{-4}$	Moderate fog; heavy snow
3	Poor	500 - 1,000 m	$10^{-2} - 10^{-3}$	Light fog; moderate snow; thick haze
4		1 - 2 km	0.02 - 0.15	Moderate snow; very heavy rain; moderate haze
5	Intermediate	2 - 4 km	0.15 - 0.4	Light snow; heavy rain; thin haze
6		4 - 10 km	0.4 - 0.7	Moderate rain; very light snow; thin haze
7	Good	10 - 20 km	0.7 - 0.8	Light rain; no precipitation
8	Very Good	20 - 50 km	0.8 - 0.9	No precipitation
9	Exceptional	> 50 km	0.9 - 1.0	Perfectly pure air
Notes: 1. The transmittance refers to $\lambda = 0.61 \mu$. 2. The values for 0 - 3 points are rough estimates due to meager experimental data. (Bramson: Infrared Radiation, Plenum Press, N.Y., 1968)				

TABLE 2



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