



Operating Manual
Version 1.0

RadarVision™ 1000
V1.0.8.99



TIME DOMAIN

TIME DOMAINSM

THE NEW WIRELESS MEDIUMSM

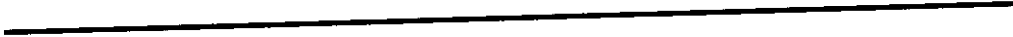


RadarVisionTM 1000 Operating Manual

Version 1.0

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REGULATORY

Important Disclaimer - FCC Information - Class B

This device complies with the limits for a Class B digital device, pursuant to Part 15 of the FCC Regulations. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates radio frequency energy that if used improperly may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If harmful interference to nearby radio or other electronic reception is found to occur, the user can perform operations to alleviate the problem. The following measures should be undertaken:

- Reorient or relocate the radar or receiving antenna.
- Increase the separation between the equipment and the receiver.
- Consult a Time Domain technician for assistance.

NTIA Regulatory Approval

Federal customers should apply for an *equipment frequency allocation* from the NTIA to use this device in their location.

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ABOUT RADARVISION™ 1000

RADARVISION™ 1000 SYSTEM CONTENTS

Time Domain's **RadarVision™ 1000** Through-Wall Surveillance Motion Detection system consists of the following equipment:

- 1 **RadarVision™ 1000** Through-Wall Motion Detector
- 1 Travel Case
- 2 2 hour, 12V Lead Acid Batteries
- 1 12V Battery Recharger
- 1 12V DC Power Supply with Cable
- 1 Operating Manual
- One-Year Limited Warranty
- One-Year Technical Support
- Shipping FOB Huntsville, AL



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ABOUT RADARVISION™ 1000

Development Platform Software includes the addition of the following:

- 2 Floppy Disks with RV Controller Application Software
- 1 Serial Cable
- 1 Null Modem Connector
- 1 **RadarVision™ 1000** Controller Software Manual

ONE-YEAR TELEPHONE TECHNICAL SUPPORT

Time Domain's customer support activity for **RadarVision™ 1000** will continue for a duration of one year from the date of shipment. With the external controller software option, and at no additional cost, customers will receive software releases and upgrades as the software becomes available.

TECHNICAL SUPPORT

Technical support is available (8:00 a.m. to 5:00 p.m. CST/CDT) by calling Time Domain Corporation at **1-888-826-8378**, or via the Web at <http://time-domain.com/contact.html> (enter *Tech Support* for faster response). Please have the unit serial number available when contacting TDC Technical Support.

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PREFACE

WELCOME TO THE TIME DOMAIN RADARVISION™ 1000

Congratulations on your acquisition of the RadarVision™ 1000 Through-Wall Motion Detection radar system. Time Domain Corporation has developed this hand-held radar system to detect the movement and range of personnel in the presence of other obstructions. The RadarVision™ 1000 monitors very specific range gates, reducing the potential for false alarms created by movements made outside the area of interest. Additionally, short duration pulses that transmit power over a large bandwidth provide an advantage by making the system exceedingly covert. Because of these and other features, the RadarVision™ 1000 provides an optimum product for field use, testing, evaluation, and guidance for future developments. RadarVision™ 1000 is the first in a family of products that incorporate Time Modulation Ultra-Wideband (TM-UWB) technology.

The RadarVision™ 1000 is a single-unit, battery-powered, man-portable device that can detect the presence of motion through structures, debris, foliage, and other nonmetallic boundaries. The RadarVision™ 1000 scans incremental range “slices” within its operational field and maps that impulse response into memory. By rapidly comparing subsequent scans, variations in impulse response can be correlated to motion. The result is the capacity to detect the presence of moving entities within the mapped area.

The RadarVision™ 1000 not only has the flexibility to capture data, but also allows development of motion mapping, radar imaging, and target discrimination. The RadarVision™ 1000 provides critical, real-time information with a low probability of detection (LPD). The device overlays and operates with other existing radio transmitters and receivers without interference and maintains covert conditions by spreading its low power pulses over a wide bandwidth.

This manual explains the operation and care of the RadarVision™ 1000 unit. Some helpful terminology is included to increase understanding of the technology and general operation of the RadarVision™ 1000.

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TERMINOLOGY

Unless otherwise specified, the terms *unit*, *radar*, and *system* are used interchangeably in this manual to refer to the **RadarVision™ 1000**.

Area of View - The beam pattern radiated by the antenna can be described as the intersection of a cone and a sphere, with a 120° field of view (120° azimuth by 100° elevation). This area can be thought of as a half-eaten ice cream cone, where the portion of the ice cream left inside the cone describes the space (Fig. p.1). The radar shield starts its coverage wide and curved and then flattens out as it moves farther away from the radar. The area of coverage is not perfectly shaped like a cone, as the sides nearest to the antenna bulge out somewhat. When specifying a range gate, the measurements that are referred to can be thought of as an arc in space with the beginning and ending measurement being drawn through the forward center of the arc (i.e., range gate of 5 feet would be measured directly from the center of the antenna outward by 5 feet). (See *Range Gate, Window*)

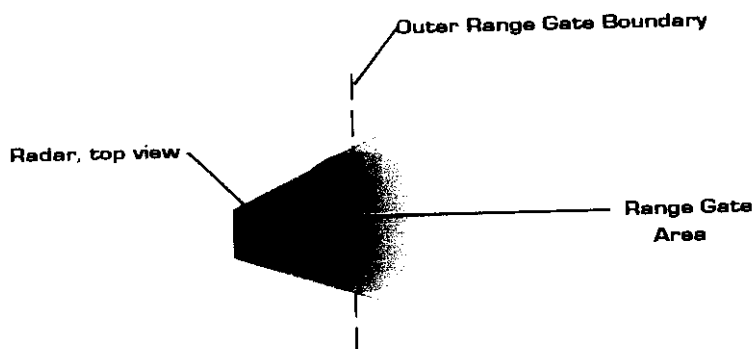


Figure p. 1 Area of View

Bin - A delay value required by the receiving antenna to control which range gate is being observed.

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Blanking - An algorithm that prevents alarms at more distant range gates. This is a method designed to aid user interpretation of a signal by ignoring the shadow effect and multipath.

Coupling - A signal that propagates directly from the transmit antenna to the receiving antenna without reflecting an object.

Process Gain - The gain (improvement in signal-to-noise ratio) resulting from processes after the signal is received. Many data samples are collected and averaged. By averaging the signal, the signal-to-noise-level compared to a single sample is improved, resulting in a process gain.

Propagation - The way in which a radio signal travels through the air and reflects from or penetrates the materials around it. The effect of propagation on radio signals often results in a loss of signal returning to the antenna. Propagation can also influence shadow effect.

Range Gate - A selected zone being monitored at a specific range (Fig. p.2). The unit is designed to detect motion at a specified distance from the antenna and includes an area preceeding it. Objects may be nearer than they are indicated to be. For example, if motion is detected at 14 feet (as below), the radar will indicate activity in the 15 foot range gate display. Default range gates are set to 5, 10, 15 and 20 feet.

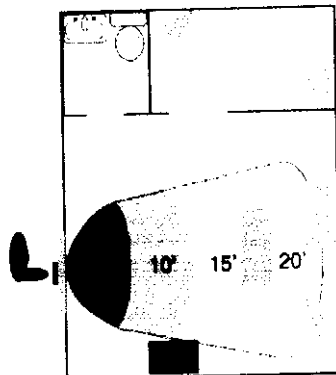


Figure p. 2 Range Gates

Shadow Effect - The radar monitors multiple range gates to determine if there are any changes within a single, specified range gate. Any observed changes indicate movement within that range. However, movement detected in close proximity to the radar will block a portion of the energy that is propagated to further ranges. This movement may cause a "shadow" to be cast upon the more distant ranges. The shadow effect in the more distant ranges will either cease or follow in conjunction with the movement as it travels through the specified range (Fig. p.3). As a result, an operator of the system can easily discriminate real movement from shadow effect. With a single look angle, as in the case of this unit, a subject moving in a close range gate may "cast a shadow" at a more distant range gate. The radar system effectively "sees" not only the presence of the closer target motion, but also detects the apparent absence, as the signal is prevented from reflecting from objects that are more distant.

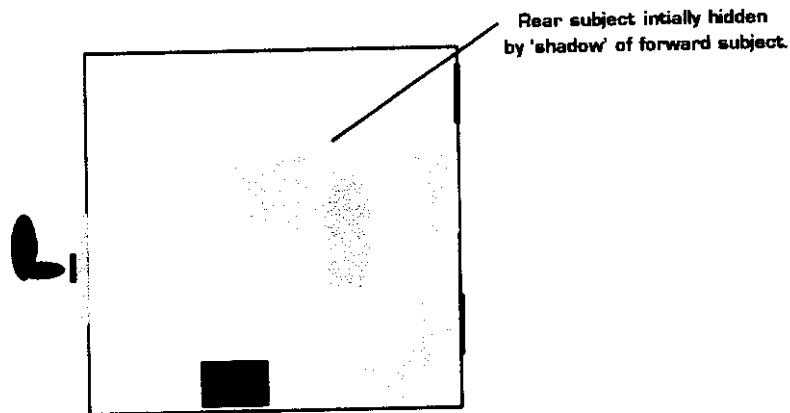


Figure p. 3 Shadow Effect

Motion detected at 10 feet. Activity at 15 feet also registers initially, but does not discriminate until second object either moves or remains stationary.

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Time Modulation - A variation of the time periods between pulses. When UWB systems transmit a uniform pulse stream, energy is concentrated at discrete harmonic frequencies within the bandwidth. By randomizing the timing of sequential pulses (as shown in Fig. p.4), a noise-like signal is produced, and coherent harmonics are reduced. This variation has many benefits, including reduction of range ambiguities, improved co-location, improved covertness, and better electromagnetic compatibility.

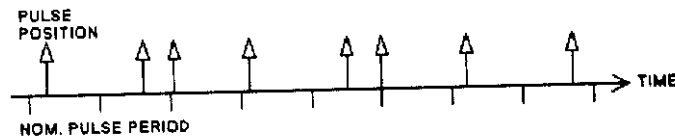


Figure p. 4 Time Modulation

Time Modulated Ultra-Wideband Radar - A low-energy, exceptionally wide band radar and coherent correlating receiver that utilize both time-modulation and ultra-wide bandwidth to generate radar images through walls. TM-UWBSM technology uses very short duration, pseudo-random time encoded electromagnetic pulses (Fig. p.5). The resultant transmission is a noise-like signal that is spread over a wider frequency range than conventional systems. These low power, TM-UWBSM signals are very difficult to detect.

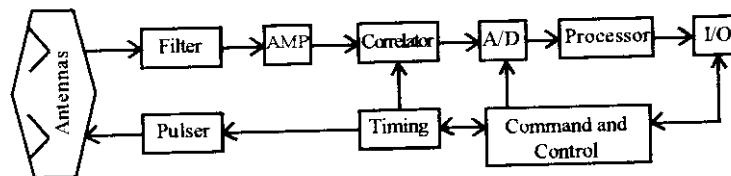


Figure p. 5 Time Modulated Ultra-Wideband Radar

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Ultra-wide Bandwidth - The Defense Advanced Research Projects Agency (DARPA) has defined ultra-wideband as a system that has a fraction bandwidth, the ratio of the bandwidth divided by the center frequency, greater than 25%.

Window - The range gate or 'cell', from the closest to the farthest range, as it is scanned.

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GETTING STARTED 1

INTRODUCTION

The **RadarVision™ 1000** is an initial production unit intended for test, evaluation, and training by technically sophisticated developers and users. This manual is to be used in conjunction with training from TDC or other authorized vendors. Please refer to this manual when raising service or operational questions.

BEFORE USING THIS SYSTEM

Before using the radar unit, please read the following section and familiarize yourself with all aspects of the system. The **RadarVision™ 1000** can be used portably as a hand-held device. It can also be mounted to a permanent structure or placed on a tabletop. The unit may be powered by either the TDC-provided battery or connected directly to a 12V, 2-Amp power source using the TDC-supplied power supply.

Portable use

The **RadarVision™ 1000** can be used as both a stationary and a portable unit. Special considerations must be made when using the radar as a portable unit. A grip handle will allow the user to hand hold the unit; however, the weight of the unit and the need to keep it steady must be considered. When using the unit portably, turn the unit on before approaching the target structure. Gently place the unit against a wall, door, or other flat surface and hold steady while making any necessary adjustments.

Familiarization with product

Please familiarize yourself with the hardware of the **RadarVision™ 1000** before turning the unit on.

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GETTING STARTED

STARTING THE SYSTEM

Power Supply

When using the radar with the TDC-provided power supply (Fig. 1.1), plug the female socket cable into the radar, the red banana plug into the red power supply socket, and the black banana plug into the black socket.

To turn the unit on when using the power supply, the proper sequence must be followed:

1. Make sure all cables are connected prior to powering-up the unit.
2. Turn the power supply *ON*.
3. Switch the power button on the side of the radar to *ON*

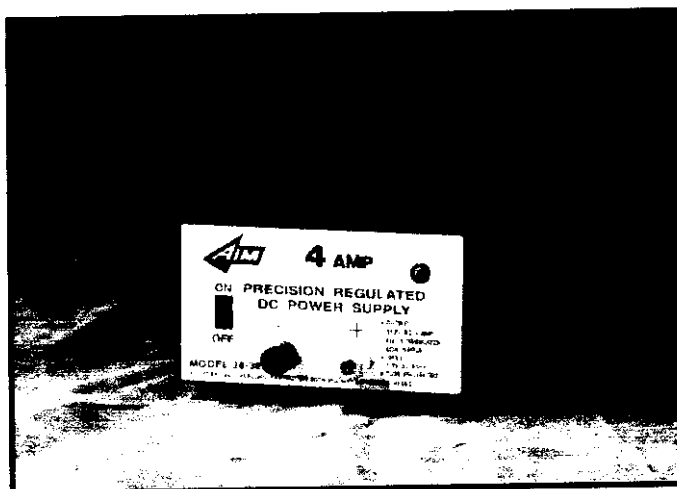


Figure 1.1 Power Supply

TURNING OFF THE SYSTEM

To turn the unit off when using the power supply, the proper sequence must be followed:

1. Switch the power button on the side of the radar to *OFF*.
2. Turn the power supply *OFF*.

Battery Operation

Before operating the unit with the battery (Fig. 1.2), the battery must be charged (it may take as long as 12 hours to charge completely). Plug the battery charger into a 110V outlet, and attach the socket connector on the battery to the matching charger connector. To replace the rechargeable battery with the backup battery, do the following:

- Turn the unit *OFF*.
- Detach cable from the unit to the battery.
- Unscrew the two locking screws and remove the battery.
- Insert the tab on the bottom of the new battery into the metal slot on the unit.
- Swing the battery toward the case.
- Tighten the two locking screws.
- Reattach the cable.

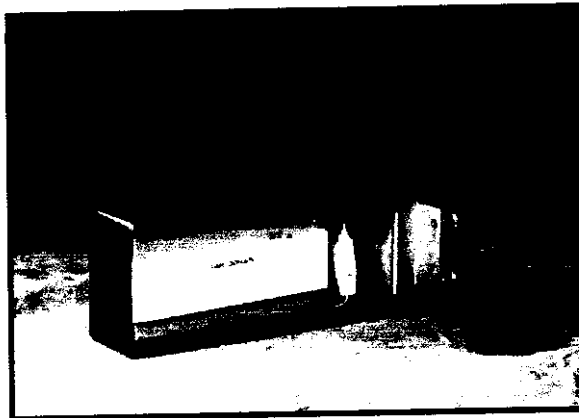


Figure 1.2 Rechargeable Battery

WARNING

Do not charge the battery with a charger other than the one shipped with the radar. If you need a replacement charger, contact Time Domain Corporation. *Caution:* Do not replace a battery while the unit is in the *ON* position. Doing so may blow the battery fuse.

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SYSTEM OVERVIEW 2

INTRODUCTION

This section will provide the user with a general overview of the system.

ABOUT THE HARDWARE

Hardware for the RadarVision™ 1000 consists of the radar, two rechargeable batteries, a power supply, and cables.

HARDWARE

Front View -

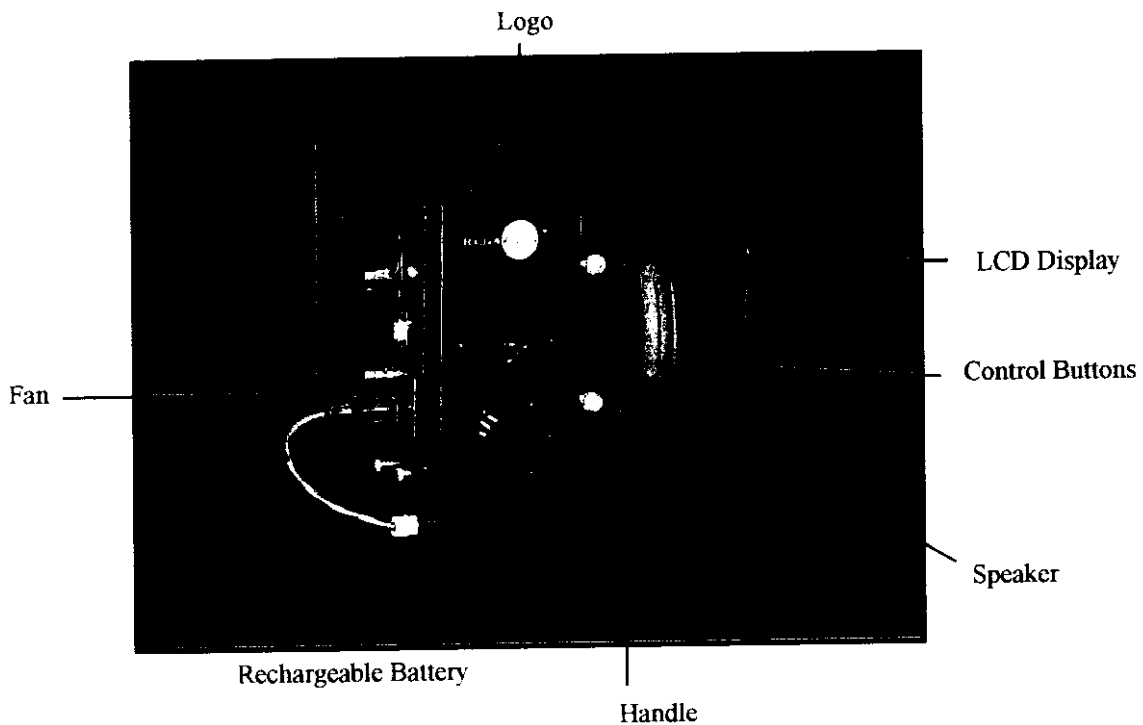


Figure 2.1 RadarVision - Front View

Rear View -

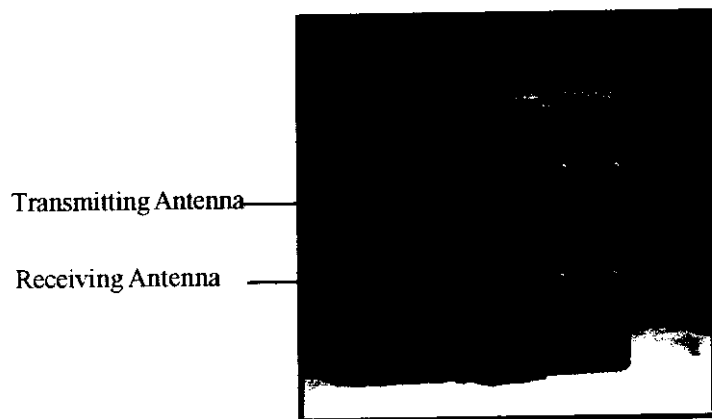


Figure 2.2 Antenna Array

Side View -

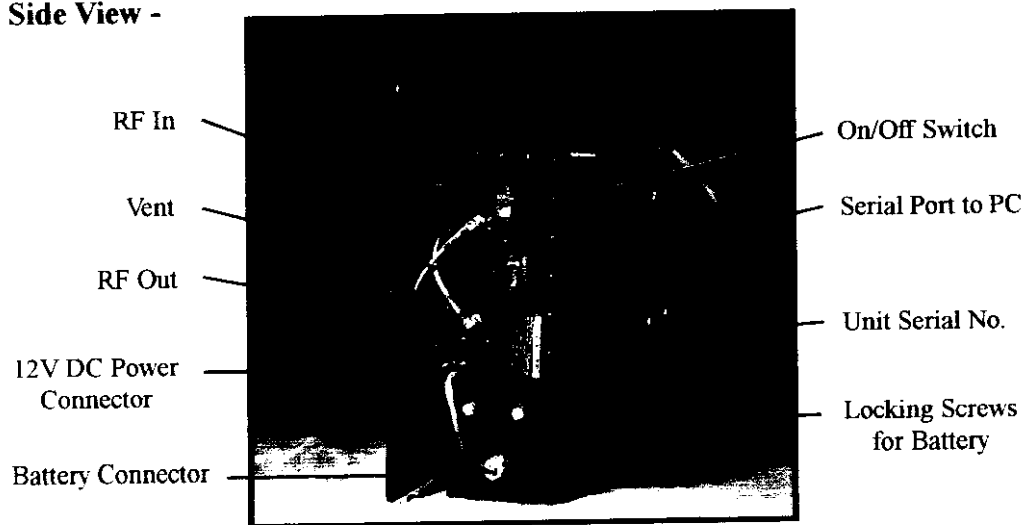


Figure 2.3 Switches and Connectors

SYSTEM OVERVIEW

Power Supply -

The power supply provided by TDC is the AIM Model # 38-384, 4 AMP, precision regulated power supply. Output parameters: TDC adjusted to 12V DC, 4 AMP, fully regulated, low ripple. Input parameters: 117V AC 60Hz, fuse protected. Electronic overload protection with instant automatic reset.

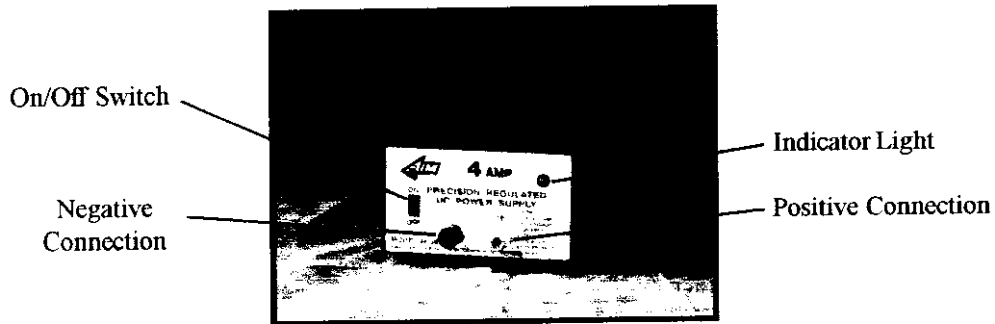


Figure 2.4 AIM Power Supply

Battery -

The rechargeable battery is a lead acid industrial/commercial use battery of 9 to 13 volts. Fully charged, it has a full capacity use life of 2 hours.



Figure 2.5 Rechargeable Battery

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OPERATION 3

INTRODUCTION TO THE RADARVISION™ 1000 SYSTEM

The RadarVision™ 1000 was designed to be used as both a portable unit and as a fixed location unit. Depending upon the use of the product, operation may vary slightly. The following section will provide the user with general operating procedures and will help familiarize them with alternatives to standard use.

Environment

It is best to limit exposure of the unit to any dust, humidity, and temperature fluctuations that might make the unit susceptible to condensation. It is also important to establish an uncluttered area for testing the unit's performance. If the radar is pointed in a direction where movement occurs outside the test area (such as a hallway on the other side of a test wall), then the unit may indicate unwanted movement during testing.

Portable Use

When operating the unit portably, the following criteria should be considered:

- Use a solid surface (such as a table or wall) to support the radar.
- Steady the unit against a wall or other surface when supporting the unit by hand. Unwanted readings may result if operator is not completely still.
- Have both batteries fully charged and ready for use.
- Do not shake or jar the unit unnecessarily.

Battery

Before operating the unit with the battery, you must charge the battery (it may take as long as 12 hours to charge completely). Plug the battery charger into a suitable 110V outlet, and attach the socket connector on the battery to the matching charger connector. To replace the rechargeable battery with the backup battery, do the following:

- Turn the unit **OFF**.
- Detach cable from the unit to the battery.
- Unscrew the two locking screws and remove the battery.
- Insert the tab on the bottom of the new battery into the metal slot on the case.
- Swing the battery toward the case.
- Tighten the two locking screws.
- Reattach the cable to the unit.

Fixed-location Operation

When operating the unit in a fixed or permanent location, the following criteria should be considered:

- Provide a smooth, level, and stable surface to support the unit. (Tripod available)
- Face the rear (antenna) side of the unit toward the area to be scanned.
- Plug in the power cables.

Power Supply and Electrical Outlets

Turn the power supply "ON" *before* powering up the RadarVision™ 1000. Standard 110V grounded electrical power outlets (with no UPS required) are sufficient to operate the power supply.

RADAR OPERATION

The RadarVision™ 1000 (used as a stand-alone unit) has a *Main Interface* LCD screen that displays radar activity and provides limited messaging (Figure 3.1). There are three user control functions (Tone, Mode, Attenuation), a battery life indicator, an ambient noise indicator, a tone indicator, a mode indicator, an attenuation indicator, and a heartbeat indicator. Each facet of the interface will be described below.

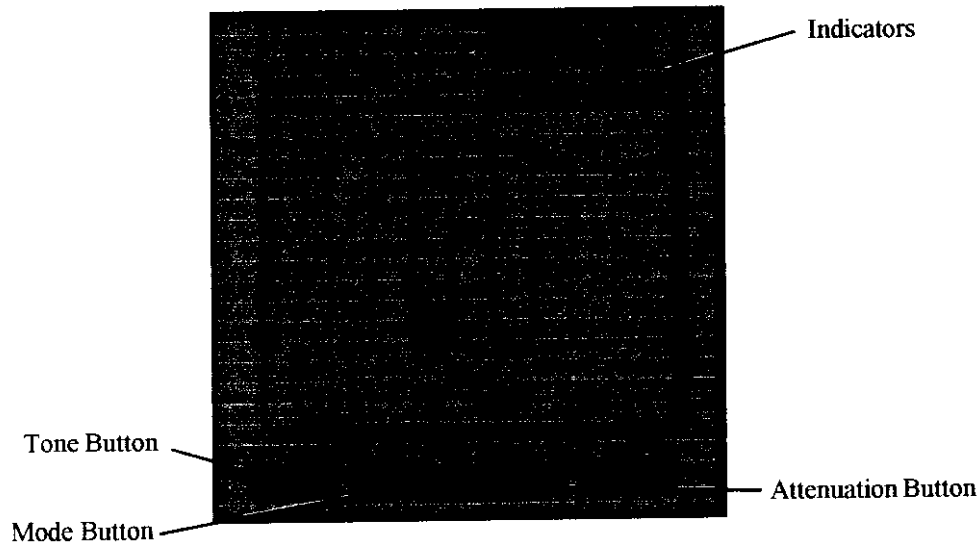


Figure 3.1 Main Interface (Motion Display)

Main Interface (Motion Display)

When the **RadarVision™ 1000** is turned on, a Boot Up screen will appear displaying company information and the message, "Please wait while radar boots." The boot up should take approximately 30 seconds. (If the unit fails to boot after 40 seconds, turn the radar off and restart). The **Main Interface** screen will then appear. This back-lit LCD screen provides the user with a real-time motion display that shows where movement is occurring. Each of four bars represents a specific range gate (See *Terminology* section). The radar is preset to 5, 10, 15, and 20 foot range increments (displayed from left to right). If movement occurs within a range gate, the representative bar will show a solid fill. Wherever activity is greatest, that bar will fill the most. Other bars may show activity due to shadow effect (See *Terminology* section) or due to movement in that additional area.

Generally, the operator can recognize the difference between shadow effect and movement occurring within distinct range gates. If activity is due to shadow effect, the bars will show consecutive activity in descending order (i.e., the 5 foot range gate will register a solid fill, and the 10' range gate will register a partial fill). With shadow effect, as the movement stops or passes out of the range, the other affected bars will quickly stop registering any activity. If, however, the bars register activity due to movement in two separate range gates, two non-adjacent bars may fill, or two adjacent bars will fill fully.

The parameters for each range gate can be changed via the **RadarVision™ 1000 Controller Software** (See *RadarVision™ 1000 Controller Software Manual* for details).

Tone

The **Tone** button controls the audible alarm. When **Tone** is activated, a combination of beeps will sound as activity is being registered. When **Tone** is deactivated, the alarm is silent. Press to toggle between **Tone ON** and **Tone OFF**.

Mode

The **Mode** button allows the user to change the manner the received data is displayed; either *threshold* or *continuous* mode. The first mode (threshold), is the default and is applicable for normal operation. Threshold mode displays data registering in each range gate after an automatically controlled threshold has been applied. Motion registering in this mode is usually caused by a distinct movement. This prevents false alarms that may be caused by finer movements from such things as fans, wind, small animals, etc.

The second mode (continuous) allows the user to monitor the raw data being continuously read by the radar. This mode is used to determine the base ambient readings and to identify very slight movements, such as breathing. Continuous mode displays the bars filled halfway. This half-way point becomes, in effect the 0 point. In this regard, the user would be able to see all movement registering in each channel. This information shows the continuous data being received by the radar before processing. This mode would mainly be used for testing procedures and development.

Att

The *Att* (Attenuation) button is designed to allow the user to increase or decrease the sensitivity of the unit's receiver. The indicator for *Att* is on the second row of the top left-hand corner of the LCD display (Figure 3.2). The default setting is 20 dB. Each time the *Att* button is depressed, the attenuation will increase by 5 dB units to a maximum of 30 dB. The attenuation then cycles back to 0 dB. By altering the attenuation setting, the sensitivity to the *received* signal will be affected. The lower the dB value, the lower the sensitivity. The higher the dB value, the more sensitive the unit will become (while the transmitted signal is not affected). A user may choose to raise the attenuation setting to achieve more sensitivity when, for example, the readings from the radar must be taken through particularly thick walls.

Battery Life

The *BAT* bar graph (top right-hand portion of LCD display - Figure 3.2) shows the relative amount of life left in the battery. A solid bar represents full charge; an empty bar represents no charge. While the radar is powered by the power supply, the battery life indicator will show active power to the unit with a half-filled bar at 12 Volts. The bar will register as full if the power supply reads higher than 12 Volts.

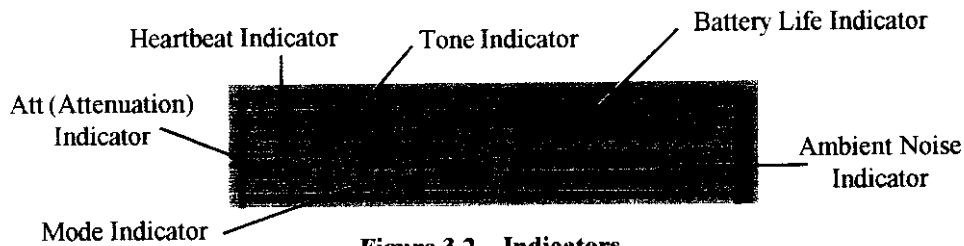


Figure 3.2 Indicators

OPERATION

Ambient Noise

The *AMB* bar graph (second row of the top right-hand portion of LCD display - *Figure 3.2*) shows any ambient noise being picked up by the radar. This includes all jamming and interference. When there is any ambient noise being registered in this graph, the motion data displayed by the radar cannot be considered accurate. The user is encouraged to check the area for potential interference (cellular phones, etc.) and remove them if possible.



Mode Indicator

This symbol (*Figure 3.2*) represents the mode that is currently in operation. When the arrow is pointing to the left, the mode is set to auto-threshold (default). When the arrow is pointing up and down, the mode is set to display continuous data being received by the radar.

Heartbeat Indicator

This symbol (*Figure 3.2*) shows that the radar unit is functioning. Even though there may be no activity registering on the Main Interface, this allows the operator to verify that the equipment is operating properly.

Tone Indicator

This symbol (*Figure 3.2*) represents *Tone On* () and *Tone Off* ().

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CARE AND MAINTENANCE 4

INTRODUCTION

Regular care and maintenance of the **RadarVision™ 1000** is essential for optimum performance of the unit. The following section describes procedures for the care and maintenance of the **RadarVision™ 1000**.

CARE

Environment

The **RadarVision™ 1000** must be kept free from dust, moisture, and static. Do not smoke near the unit. If utilized in an area that does not conform to these conditions, ensure that the unit is not directly exposed to adverse conditions. Maintain the temperature of the environment between 50° and 100° Fahrenheit (10° to 38° Celsius).

Regular Use

Place the radar unit securely on a table or other solid structure. When the radar is not in a permanent or fixed location, be careful not to bump, drop, or jar the unit.

Portable/Outdoor Use

When using the unit portably, take precaution to ensure a clean, dry environment. When holding the unit by hand, hold the unit steady, preferably secured against a solid structure such as a wall. Do not shake, jar, bump, or drop the unit. If using or mounting the unit outdoors, ensure an appropriate environment by sheltering the unit from adverse elements. When sheltering the unit, ensure that the shelter does not interfere with the range of the antenna.

Travel

When traveling with the **RadarVision™ 1000**, pack the unit in the case provided. If the unit is ported in a container other than the provided case, TDC will not assume responsibility for damage. Hand carry unit at all times. Do not allow the unit to be checked through baggage handling or opened by unauthorized personnel. Operation of the unit in some countries outside the U. S. requires the use of appropriate power converters.

Packing

To pack the **RadarVision™ 1000**, it is recommended to use the travel case provided. Place the unit in the case as shown (Figure 4.1). Be sure to wrap each item in the TDC-provided packing material. Step by step instructions are shown in Figures 4.2 - 4.8.

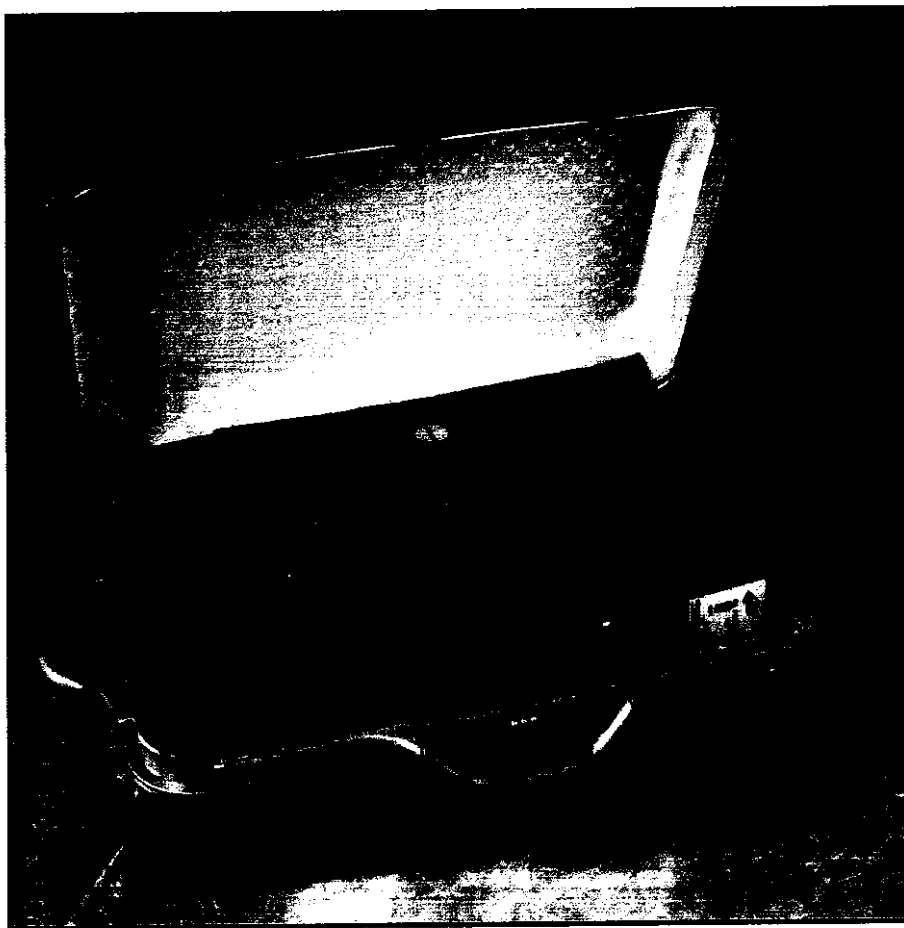


Figure 4.1 RadarVison™ system packed in suitcase.

PACKING INSTRUCTIONS



Figure 4.2 Remove handle from RadarVision™ unit.



Figure 4.3 Place RadarVision™ (with battery) in suitcase, as shown.



Figure 4.4 Place power supply on right side of suitcase, as shown.



Figure 4.5 Place second battery between RadarVision™ and power supply.



Figure 4.6 Place battery charger at right rear of suitcase.



Figure 4.7 Place all cables between the battery and RadarVision™.



Figure 4.8 Place handle on top of second battery.

MAINTENANCE AND BATTERY CARE

Cleaning

To clean the unit, use a dry, lint-free, and static-free cloth. Wipe the outside of the unit whenever dusty. If the unit gets wet, power down and unplug the unit from the power source before wiping off. If the LCD screen needs cleaning, use a photo lens quality solution and a soft, lint-free cloth to wipe off.

Recharging the Battery

To recharge the battery, plug the battery charger into a suitable 110V outlet and attach the socket connector on the battery to the matching charger connector.

Replacing the Battery

To replace the rechargeable battery with the backup battery, do the following:

- Turn the unit *OFF*.
- Detach cable from the unit to the battery.
- Unscrew the two locking screws and remove the battery.
- Insert the tab on the bottom of the new battery into the metal slot on the unit.
- Swing the battery toward the case.
- Tighten the two locking screws.
- Reattach the cable.

Replacing the Battery Fuse

To replace the battery fuse, remove the battery from the unit, unscrew the base of the battery, gently remove the translucent plastic housing, and remove the fuse. Replace with a 312, 5Amp (312-005 type) fuse.

Service Calls

Regular maintenance should be scheduled when the service contract stipulates. Call a TDC service technician for information at 1-888-826-8378.

WARNING

Do not disassemble this unit! Opening the unit voids the warranty and may violate compliance with FCC regulations.

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TECHNICAL SPECIFICATIONS 5

GENERAL SPECIFICATIONS

| | |
|-------------------------------|---|
| Optimum Operational Range: | 0 to 20 feet |
| User Selectable Range Gates: | Default set to 5-foot increments |
| Movement Velocity Detection: | 0.5 to 15 feet/second |
| Power Source: | 1 12V DC, 2 AMP power supply 2 rechargeable gel cell batteries w/recharger (2-hour duration each, continuous use) |
| Power Consumption: | 19 Watts |
| Radar Dimensions: | 13 x 13 x 8 inches |
| Radar Dimensions with Handle: | 13 x 13 x 13 inches |
| Radar Weight with Battery: | 14 pounds |
| Radar Weight without Battery: | 10.5 pounds |

CHARACTERISTIC SPECIFICATIONS

| | |
|-----------------------------|--|
| Center Frequency: | 2.0 GigaHertz |
| Bandwidth: | 1.4 GigaHertz |
| Baud Rate: | 9600 - 115,200 bps |
| Range Resolution: | 4.5 inches |
| Transmit Power: | 0.01 milliWatts |
| Antenna Gain: | 6 deciBels over isotropic |
| Effective Radiated Power: | 0.04 milliWatts EIRP (effective isotropic radiated power) |
| Code Span: | 25 nanoseconds |
| Code Length: | 1001 chips |
| Nominal Pulse Rep. Rate: | 5 Megapulses per second |
| Field of View - Azimuth: | 120 degrees |
| - Elevation: | 100 degrees |
| Minimum Target Sensitivity: | -10 dBsm |
| Detection Velocities: | 0.5 through 15 feet/second |

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LICENSING, TERMS, AND WARRANTY 6

LIMITED WARRANTY

Time Domain warrants its **RadarVision™ 1000** to be free of manufacturing defects for a period of one year commencing on the date of shipment. During the warranty period, Time Domain will repair or replace any defective products at no expense to the customer. TIME DOMAIN MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND TIME DOMAIN EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED IN THIS LIMITED WARRANTY. Return shipping is at the customer's expense and must be in the original shipping container. The warranty is voided if the customer has opened the **RadarVision™ 1000** unit, or if the unit is shipped to Time Domain in a container other than the original shipping container.

LIMITATION OF LIABILITY

Time Domain's maximum aggregate liability arising from this contract is limited to the total price under the purchase order. NEITHER PARTY SHALL BE LIABLE FOR ANY SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, NOR FOR ANY LOSS OF GOODWILL, PROFITS, DATA, OR LOSS OF USE ARISING OUT OF, RESULTING FROM, OR IN ANY WAY CONNECTED WITH THE PERFORMANCE OR BREACH OF THIS CONTRACT.

PROHIBITION ON REVERSE ENGINEERING

Customer acknowledges that its **RadarVision™ 1000** contains several trade secrets of Time Domain Corporation. Customer agrees not to reverse engineer the **RadarVision™ 1000** or to allow others to reverse engineer the **RadarVision™ 1000**.

SOFTWARE LICENSE

Time Domain grants to customer a nonexclusive, nontransferable, royalty-free license to use its software solely on the **RadarVision™ 1000** delivered under this contract. Customer agrees not to modify, reproduce, or release Time Domain's software to anyone other than customers employees. Customer agrees it will not decompile or disassemble the software. Customer further agrees to use its best efforts to prevent decompilation or reverse assembly by a third person.

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