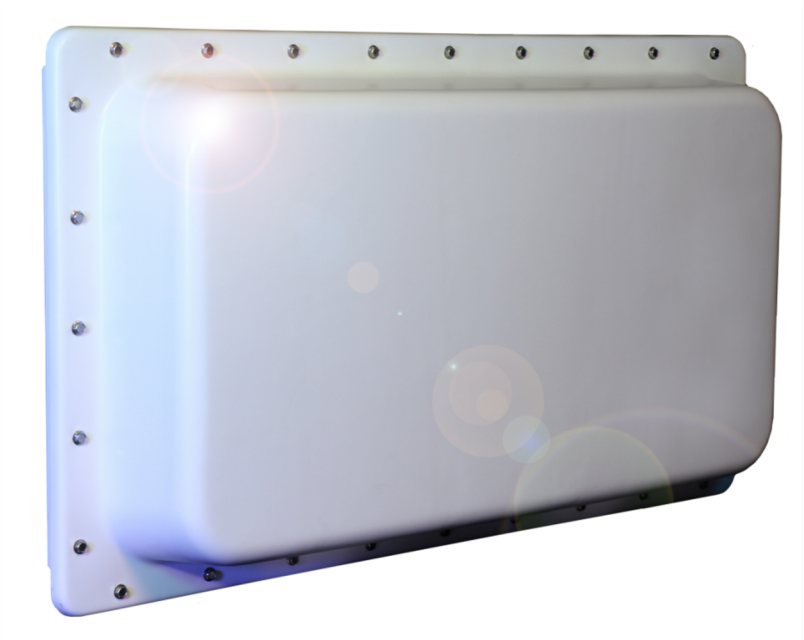
DYNETICS INCORPORATED

GroundAware™ Reconfigurable Surveillance Sensor



Installation, Operation, and User's Manual

GROUNDAWARE™ RECONFIGURABLE SURVEILLANCE SENSOR

Installation, Operation, and User's Manual

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Section

1

Important Safety Instructions

WARNING! Do no remove any part of the product enclosure or create an opening in the produce enclosure in any way. Risk of fatal electrical shock exists with any exposure to the internal product components. Further, any opening of modification of the enclosure by any non-Dynetics personnel voids the product warranty and can only be reinstated by Dynetics in writing.

The GroundAware™ product should only be used with the power and data cables supplied with the unit by Dynetics. Failure to use provided cabling may result in damage to the unit and increased risk of electrical shock.

Safe Usage

Dynetics recommends that at least two people be used to move the unit. The unit should only be mounted by qualified personnel using the appropriate safety lanyards to prevent unrestrained unit fall should the mounting fail. The mounting fixture, power receptacle, and data receptacle used with the unit should be appropriately grounded by a qualified electrician.

VERY IMPORTANT: GROUNDAWARE IS A RADIATING DEVICE WITH RF HAZARDS. INSTALLATION AND OPERATIONAL PROCEDURES MUST ENSURE THAT NO HUMANS OR ANIMALS PASS WITHIN ONE METER (1 m) OF THE FRONT OF THE UNIT WHILE IT IS POWERED.

Section

2

General Description and Specifications

GroundAware™ is a user Reconfigurable Surveillance Sensor that detects, tracks, classifies, and provides actionable information relevant to objects within a 120° field of view up to five kilometers from the sensor. This capability is implemented via the interoperation of four sub-systems:

The radar sub-system transmits S-band radio frequency signals, digitizes and processes the received returns, identifies detections, clusters detections to identify tracks, and associates tracks with feature data that can be used to classify the object. The radar can be configured to use three different waveforms, based on installed site, that will be explained in further detail in later sections. This manual should be used with radar sub-system model number 10024640.

The server sub-system receives track data, receives and processes classification data, hosts the GoogleMaps based user interface, and implements external sensor (e.g. single/dual band PTZ camera, unattended ground sensor, etc) integration. Server hosting of the user interface includes managing user-defined alert zones, per-zone alerting criteria, and the per-zone violation log. Commodity grade desktop or laptop computers may be used to execute the server sub-system software.

The client sub-system renders the GoogleMaps user interface for each unique browser session. Users may maintain their own zoom and view settings, while sharing zone definitions, alert criteria, and camera control with other users. The user interface is browser agnostic, but works best with Mozilla Firefox. While the client software is executed on each user's machine within a web browser, it is provided upon authentication and managed by the server sub-system software.

The optional interface sub-system provides a cellular data link, optional use network interfaces, and independent radar power on/off control. The interface sub-system also includes the cabling, encoder, and power supplies required to integrate external cameras or other sensors. This sub-system is self-contained in an environmentally sealed enclosure with the external switches and connectors as required by the customer.

GroundAware™ enables a customer to use the system in an environment where the interface is continually monitored by personnel on desktop or mobile devices, or in an

unmonitored environment where personnel can be alerted to intrusions based on user defined criteria.

Figure 2-1 below illustrates how the GroundAware™ system and sub-systems interact and what is typically provided by Dynetics and by the user/reseller. NOTE: Optional integrated cameras and other sensors not shown.

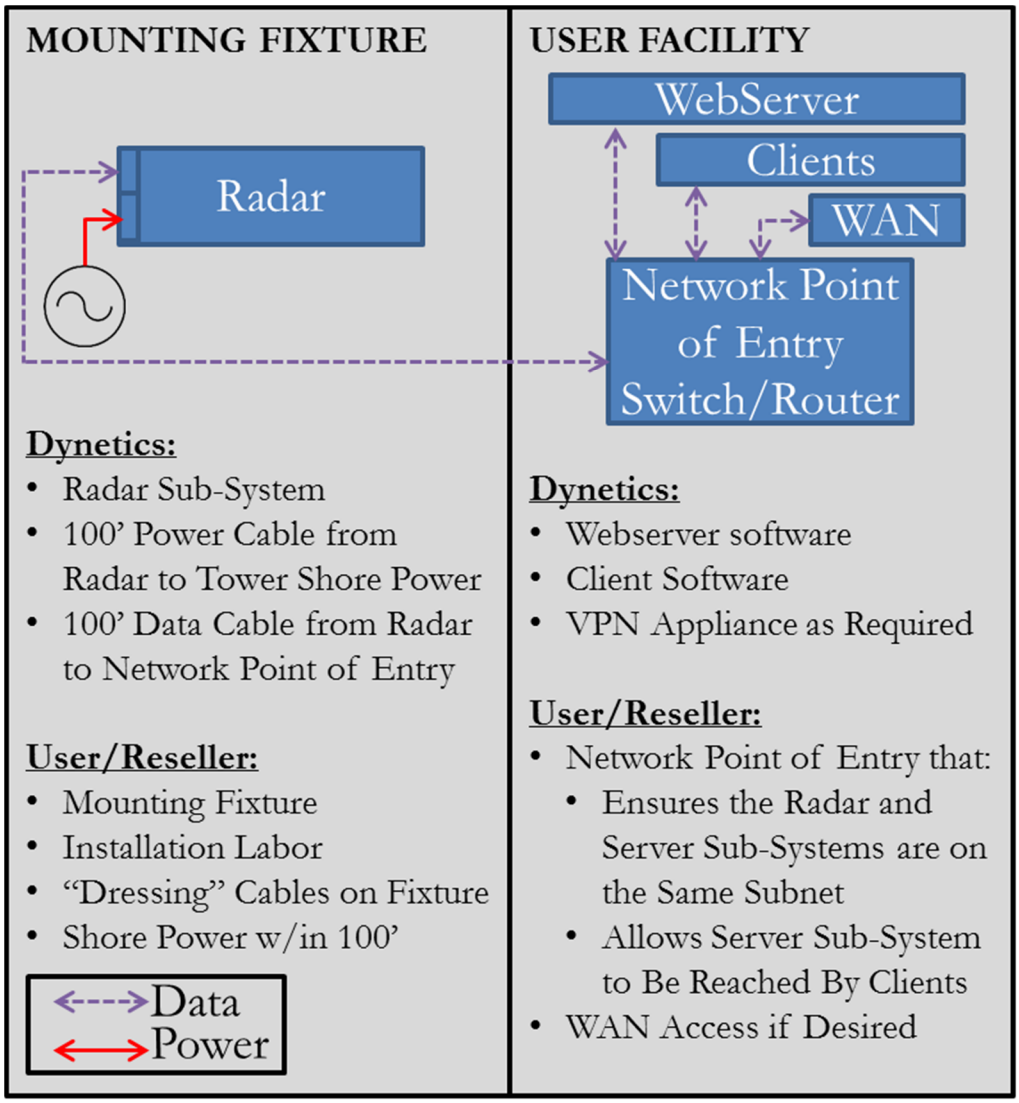

FIGURE 2-1 GroundAware™ System/Sub-System Block Diagram

Specifications

The GroundAware™ system is a sophisticated, multi-channel digital beam-forming device that utilizes state of the art Direct Digital Synthesis (DDS) waveform generation and digital signal processing to detect and very accurately track small, slow targets while minimizing false alarms. The GroundAware™ design has been refined by Dynetics and end user testing across the United States at various critical infrastructure facilities, and each unit is integration tested before delivery and verified to meet the

specifications enumerated in Table 2-2 below. NOTE: These specifications only apply to the Radar Sub-System.

Operational Frequency	S Band: Dynetics Configurable by Site Between 3,156.250 MHz – 3,296.875 MHz
Antenna	Microstrip patch array
Azimuth Coverage	120° (60° Either Side of Radar Boresight)
Elevation Coverage	30° (15° Above/Below Radar Boresight)
Average Transmit ERP	20 W
Range Accuracy	2 m
Range Resolution	10 m
Minimum Detectable Velocity	0.5 m/sec
Instrumented Range	100 m to 5.0 km
Walker Detection Range	>2 km
Dimensions	12” x 30” x 10”
Weight	45 lbs
Power Requirements	400W max., 120Vac, 60 Hz, single phase
Data Interface	RJ45 Terminated IP4/IP6 Ethernet
Operating Ambient Temp	-20 deg C to +65 deg C
Storage Ambient Temp	-40 deg C to +80 deg C
Operating/Storage Humidity	0% at 78 °F to 100% percent at 95 °F
Operating Altitude	0 to 12,500 ft MSL
Rain Resistance	12 in./hr
Hail Resistance	3 cm hailstone strike at 30 m/s
Ice Resistance	Clear ice at 1/4 in. radial measured from the sensor surface to the outer shell of the ice
Solar Radiation Exposure	Annual solar radiation up to 6500 MJ/m2
Sand/Dust Resistance	Dust environments of 1.03 gm/m3 Sand: 1.06 gm/m3, 40 kts wind.
Maximum Sustained Winds & Gusts	50 mph, sustained;75 mph gusts
Browser Compatibility	Mozilla/Chrome w/ Quicktime
User Defined Parameters	User-defined alarm and ignore zones User-defined alarm criteria per zone

TABLE 2-2 GroundAware™ System/Sub-System Block Diagram

Installation

The GroundAware™ system is very easy to install and prepare for configuration and operation. As illustrated briefly in previous sections, installation falls into three fundamental phases: mechanical, electrical, and data.

Mechanical installation of the system includes mounting the unit such that it is horizontally level and perpendicular to the center point of the area to be monitored. The unit includes carrying handles on each side to aide in the recommended two-

person emplacement of the system. ??? pattern X-Y-Z helicoils are included on the top and bottom of each unit to allow a custom mount to be designed and built for whatever fixture the customer requires.

Electrical installation includes connecting the unit to a maximum 400 watt, 120 volt, 60 Hz, single phase, grounded alternating current source using the provided power cable. Optionally, the unit may be powered through the switch in the interface sub-system as described previously. Any additional switches utilized in the provision of power to the system (e.g. installed by the customer) should be rated for the type and quality of power specified.

Data connectivity installation includes connecting the unit to an IP4/IP6 network through which connectivity to the server sub-system can be obtained. The unit may be connected to the server sub-system network by several different means such as, wired 50directly, cellular, Wi-Fi extending antennas, etc. based on user requirements.

Given a basic understanding of system connectivity, installation and startup should proceed as follows, given a basic three sub-system setup:

1. Mount the radar sub-system unit mechanically per the customer site requirements and preparations.

2. Connect the radar sub-system unit to the IP4/IP6 server sub-system network using means required by the customer site.

3. Connect and power-on the server sub-system on the same IP4/IP6 network as the radar sub-system.

4. Connect the radar sub-system to commercial power that meets the previously provided specifications.

5. Wait approximately 90 seconds before proceeding to the activities described in Section 3.

Section

3

Operation

This section assumes that the precautions and setup steps of the previous two sections have been read, understood, and followed. If any of the material or steps from sections 1 and 2 have been skipped or poorly understood, please pause and review the information and re-perform whatever steps may be necessary to ensure that GroundAware™ is properly and safely installed, powered, and connected before the activities of this section are performed.

Configuration

GroundAware™ may be generally configured by the user for three modes of operation: short, medium, and long rage. Table 3-1 below specifies the parameters of interest for each one of these modes.

Once the desired operational mode has been determined from the information provided in Table 3-1, the following steps should be performed:

1. From the server sub-system, connect to the radar configuration page.
2. Select and save the configuration file corresponding to the radar sub-system mode to be used.
3. Command the radar sub-system to begin radiating.

Note: GroundAware™ has been UL certified for operation in the three modes described above and each unit is tested by Dynetics in each of these modes prior to delivery. Additionally, each unit will be calibrated on-site by Dynetics personnel to detect and track a 2m tall, 92kg human at a distance of 1610m assuming at least a 10m emplacement height and unobstructed line of sight to target.

User Access

At this point, the desired operational mode should be set, the radar should be radiating, and any site specific calibration by Dynetics personnel should be complete.

User's Guide

The GroundAware™ user interface is an extended instance of GoogleMaps and is very intuitive to use by anyone who has experience with web-based mapping web sites. The traditional controls for zoom, pan, etc. work the same as with a standard GoogleMaps

website. Dynetics will provide training as necessary to allow operators to monitor the system using this interface and configure alarm zones to their preferences.