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Reference 921-0011-00-MAN-RO6

E-MAIL SUPPORT

STS-1400@icxt.com

When sending e-mail, please include:

- Contact info (e-mail, phone, fax, other as required)
- Radar model and software version number
- If possible, the radar serial number (on unit)
- A description of the problem or issue
- Data recordings and/or log files, if available
- Any other information that may help us help you

CUSTOMER SUPPORT - 24/7 HOTLINE

ICx Technologies Inc., Central Sales Service Desk will respond 24/7 and efficiently communicate your information and issues to the appropriate personnel at ICx Radar Systems. Be sure to mention the product model STS-1400 in order for the information to be directed to the right personnel.

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RECORD REVISION TABLE

Manual Revision	ECO	Pages	Description
2.0	08-016	All	STS-1400 Software Version 2.00
3.0	08-024	All	STS-1400 Software Version 2.01
4.0	08-026	All	STS-1400 Software Version 2.02
5.0	09-012	All	STS-1400 Software Version 3.2, Hardware V3
6.0	10-016	All	STS-1400 Software Version 4.0

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

OVERVIEW ORGANIZATION OF THIS DOCUMENT

The STS-1400 Operator Manual is organized according to the following sections:

Section 1.0 Describes general information regarding the nature of the document and its intended audience. This section also describes the equipment features and limitations of the STS-1400 radar assembly.

Section 2.0 Contains an overview of the STS-1400 radar system.

Section 3.0 Describes various components of the STS-1400 radar system.

Section 4.0 Describes the operation of the STS-1400 radar system software components.

Section 5.0 Describes the troubleshooting process of the STS-1400 radar system.

Definitions and Acronyms

AXML	Amphitech eXtensible Markup Language
BIT	Built-in Test
CE	Refers to CE marking, a conformity mark in Europe
CFAR	Constant False Alarm Rate
FCC	Federal Communications Commission (usually refers to the US agency)
GPS	Global Positioning System
GUI	Graphical User Interface
IP	Internet Protocol
MBPS	MegaBits Per Second
MMW	Millimeter Wave
PPI	Plan Position Indicator
PPS	Pulse Per Second
PSR	Perimeter Surveillance Radar
RCS	Radar Cross Section
RF	Radio Frequency
VDC	Volts of Direct Current
XML	Extensible Markup Language

1 INTRODUCTION

This manual describes the STS-1400 Perimeter Surveillance Radar's (PSR) operation. The Operator Manual is intended for an audience of technically qualified personnel.

For installation and configuration of the STS-1400 Radar System, or for more advanced functions, please refer to the STS-1400 Installation Manual.

NOTE: Please note that product name STS-1400 is used throughout this manual for ease of reading. The given information is also valid for products STS-700 and STS-2800 unless otherwise noted.

1.1 EQUIPMENT FEATURES

The mid-range radar product line provides detection capability for moving objects on the ground out to an instrumented range of 700, 1400 or 2800 meters (for STS-700, STS-1400 and STS-2800 respectively) over an area of up to 360° around the radar and presents detection data to the operator via a graphical user interface (GUI). The data may also be transmitted via XML (eXtensible Markup Language) to a third-party software application responsible for implementing security policies.

STS-700, STS-1400 and STS-2800 Specifications for Hardware Version 3.0	
Weight	22 Lbs (10 Kg)
Cooling	No forced cooling required
Operating Temperature Range	-30º C to +60º C
Operating Altitude Range	Up to 15 000 feet / 4572m
Power Input	20 - 32 VDC (Nominal 28 VDC), less than 45 W
Frequency Band	Ka
Detection Range	Minimum 5 m., Maximum of 700m, 1400m or 2800m extended range (optional) In 2800m mode, human detection performance is reduced (depending on environmental conditions)
Sensitivity	Detection of a 0.5 square meter (RCS) target located at a range of 1000m (in 700m and 1400m range modes)
Warm up Time	Ready to operate approximately 30 seconds after power-up
Revisit Rate	55 scans / minute

Table 1 - STS-700, STS-1400 and STS-2800 Radar Assembly Specifications

STS-700, STS-1400 and STS-2800 Specifications for Hardware Version 3.0	
Certification	FCC class B, EN 301489, Parts 1 & 3CE: EN 60215 EN 300019-1-4 (Class 4.1E with -40°C) EN 300019-1-5 (Class 5.2 including mechanical class 5M3)

Table 1 - STS-700, STS-1400 and STS-2800 Radar Assembly Specifications

Description	Minimum Requirements
Dedicated computer for the radar server	Intel, Dual-Core 2.80 GHz, 2 GB of RAM, 2 Ethernet adapters
Operating System	Windows XP, Windows 2000 Server
Power Supply	Xantrex XFR 60-20. 28 VDC power supply with a capacity of at least 120 Watts continuous
Ethernet Cabling	Cat 5e or 6 Ethernet cable
Ethernet Switch	4-port Ethernet switch 10 Mbps or higher

Table 2 - Recommended Equipment

DISCLAIMER: The STS-1400 is designed for operation while in a fixed location and is not intended for use on moving platforms. Failing to adhere to this recommendation could compromise the detection capability of the unit.

DISCLAIMER: Due to the inherent nature of radar detection, the STS-1400 may present "nuisance" alarms triggered by animals, moving tree branches, ocean surf or waves moving within the radar field of detection. Strategies to reduce these nuisance alarms are discussed in the Installation Manual.

DISCLAIMER: Due to the inherent nature of radar detection, small and/or very slow moving objects may not be detected by the STS-1400.

DISCLAIMER: Under heavy rainfall conditions (>10mm/hr), the STS-1400 performance can be reduced, typically for targets furthest away. Under such conditions, the unit may not detect some moving objects and it may result in increased nuisance alarms.

2 RADAR OVERVIEW

Critical infrastructures such as airports, harbors, nuclear power plants, pipelines, encampments and other sensitive sites require reliable surveillance capabilities to detect intruders. This requirement was traditionally met by guards using visual observation. Experience has demonstrated that this solution can be of limited effectiveness in conditions of reduced visibility and, as a result, can provide an inadequate security response time. Millimeter Wave **(MMW)** and Perimeter Security Radar **(PSR)** bring three important features to the surveillance solution:

1. Ability to penetrate poor visibility environments
2. Accurate ranging capability in excess of a kilometer
3. Ability to quickly detect moving targets over a 360° field of view

The STS-1400 system provides for timely alerts of moving objects within the monitored area programmed in the system and increases user's awareness of potential threats. This is achieved with radar technology and sophisticated detection and alarm processing software.

The STS-1400 operates by transmitting frequency modulated continuous RF radio signals at a given azimuth angle, and then computes the frequency differences between the transmitted signal and the signals from objects/targets that are bounced back to the receiver. The frequency differences are converted to target ranges.

This bouncing off effect, or backscatter, from an object depends mainly on factors such as the material from which the object is made, its dimension, its shape and the angle at which the signal hits the object. This is defined as the Radar Cross Section **(RCS)**.

The RCS is a measure of the target's ability to reflect radar signals back in the direction of the radar receiver. The detection of an object also depends on its distance from the radar. The further away the object, the more difficult it is for the radar to detect it.

The STS-1400 Perimeter Surveillance Radar is designed to detect an object with a RCS of 0.5 m^2 at 1 km (1000 meters). An RCS of 0.5 m^2 does not mean that the object is physically 0.5 m^2 in cross section; it means that its apparent size as observed by the radar is equivalent to a metallic sphere with a projected area of 0.5 m^2.

Table 3 shows detection ranges for targets detected in a mildly cluttered environment. The actual detection distances obtained depends on a number of factors, such as: radar installation height, tilt angle, terrain type, terrain relief, weather, etc.

Target	Physical Dimensions		Approximate RCS (m^2)	Probable Detection Ranges (700 m)	Probable Detection Ranges (1400 m)	Probable Detection Range (2800 m)
	Height (m)	Width (m)				
Crawling person	0.3	0.3	.03 ~ 0.1	5 - 500 m.	5 - 500 m.	5 - 500 m.
Walking person	1.7	0.5	0.3 ~ 1	5 - 700 m.	5 - 1400 m.	5 - 1900 m.
Car	1.5	2.5	5 ~ 100	5 - 700 m.	5 - 1400 m.	5 - 2500 m.

Table 3 - Detection Distance as a Function of Target Type

With accurate positioning in the azimuth, the position of an object relative to the radar can be determined with high precision. For the STS-1400 radar to provide timely alerts and accurate object location in latitude and longitude, latitude/longitude coordinate inputs are required at installation time.

The system is fully adaptive to the environment. Using the data from the processed signal returns and with constant false alarm rate **(CFAR)** algorithms, the radar automatically adjusts for rain, clutter and other environmental factors.

3 SYSTEM DESCRIPTION

3.1 HARDWARE COMPONENT DESCRIPTION

The STS-1400 Radar System supports the following components. Some of these components may not be used, depending on the specific installation.

1. STS-1400 Radar Assembly
2. Radar Server computer
3. Client computer
4. Breakout box
5. Radar power supply
6. Network infrastructure
7. Cabling

3.1.1 Physical System Overview

Figure 1 shows a typical STS-1400 Radar System, from a hardware components perspective.

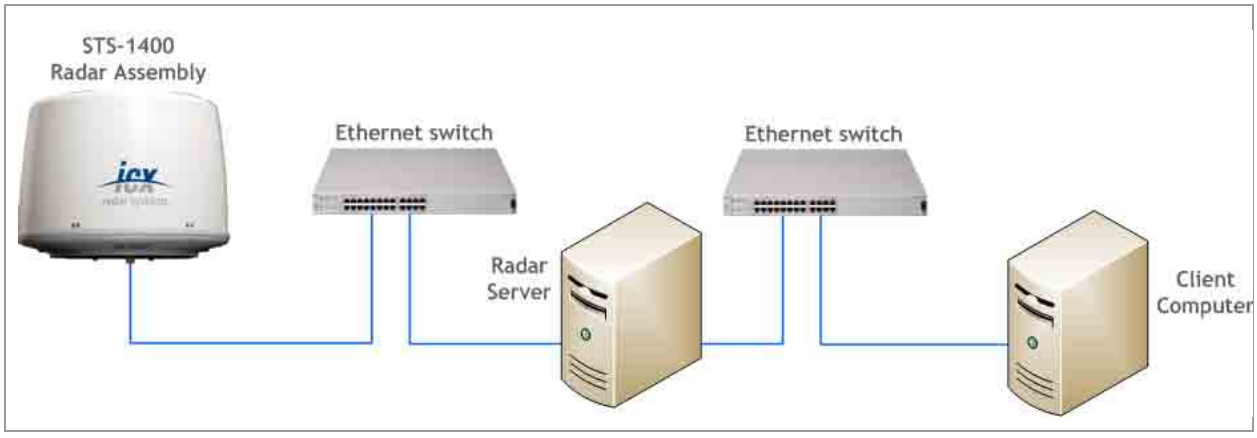

Figure 1 - STS-1400 Radar System Physical Overview

The STS-1400 Radar Assembly consists of the radar antenna and RF components, a mechanical scanning sub-assembly, and a processor sub-assembly.

Figure 2 - STS-1400 Radar Assembly

The STS-1400 Radar Assembly possesses a hardware revision number that determines some of its functionality. **Table 4** provides the hardware revision number according to the radar assembly serial number. Unless otherwise specified, this manual will refer to revision 3.0 of the hardware.The STS-1400 Radar Assembly possesses a hardware revision number that determines some of its functionality. **Table 4** provides the hardware revision number according to the radar assembly serial number. Unless otherwise specified, this manual will refer to revision 3.0 of the hardware.

Radar Assembly P/N	Hardware revision number
921-0011-02-R05.XX	1.0
921-0011-02-R24.XX 921-0011-02-R27.XX	1.5
921-0011-03-R27.XX 921-0011-04-R02.XX	2.0
921-0011-05-R06.XX	3.0
921-0011-R05-R07.XX	4.0

Table 4 - STS-1400 Radar Assembly Hardware Revision Number

3.1.2 Radar Server Computer

The Radar Server computer hosts the following applications: Radar Application Manager, Radar Server, Radar Terminal, Radar Console (configuration and diagnostics only) and Control Station Interface.

Depending on the installation, the Radar Server computer may also host the client applications and function as the Client Computer (see below).

3.1.3 Radar Client Computer

The Client computer hosts the client applications (Radar Console, Radar Terminal, Control Station or an XML third-party application). The Radar Console can also be used for remote diagnostics.

3.1.4 Breakout Box

In some installations a **breakout box** may be installed in close proximity of the radar to contain the radar power supply and/or an Ethernet fiber-optic media converter.

3.1.5 Radar Power Supply

A 28VDC power supply is recommended to power the STS-1400 Radar Assembly.

NOTE: V3.O Units has been designed to run on as little as a 20 VDC supply.

3.1.6 Network Infrastructure

The network infrastructure consists of Ethernet switches, Ethernet media converters, wireless Ethernet transceivers, etc. The network infrastructure provides the physical support for the Device and the Client networks. Refer to the installation manual for a description of these networks.

3.1.7 Cabling

ICx Radar Systems provides connectorized cables for sale in standard lengths. Cables can be ordered with connectors at each end. Please contact ICx Radar Systems for assistance.

3.2 SOFTWARE COMPONENT DESCRIPTION

The STS-1400 Radar System comprises seven (7) installable software modules.

The seven (7) software modules included in the **ICX Radar System Software Package** are:

1. Radar Application Manager
2. Radar Server Application
3. Radar Terminal Application
4. Radar Console Application

5. Radar Loader Application
6. Control Station Interface
7. Radar TRaCS (purchased separately)

NOTE: **Control Station Interface** application is optional and is used only when deploying with other ICx radar models such as the (**STS-350, STS-350ER, STS-4400** and **STS-12000**).

NOTE: When multiple radars (any models) are deployed in a single network, the **Cameleon Tactical** application is recommended as the **Command & Control** application. See your ICx Sales Rep for information.

Refer to the installation manual for installation and configuration of these software modules.

3.2.1 Radar Application Manager

The **Radar Application Manager** is a software application that performs the following functions:

- Startup of ICx application software (Radar Server, Radar Terminal, Radar Console and Control Station Interface)
- Configuration of ICx application software
- Monitoring of ICx application software

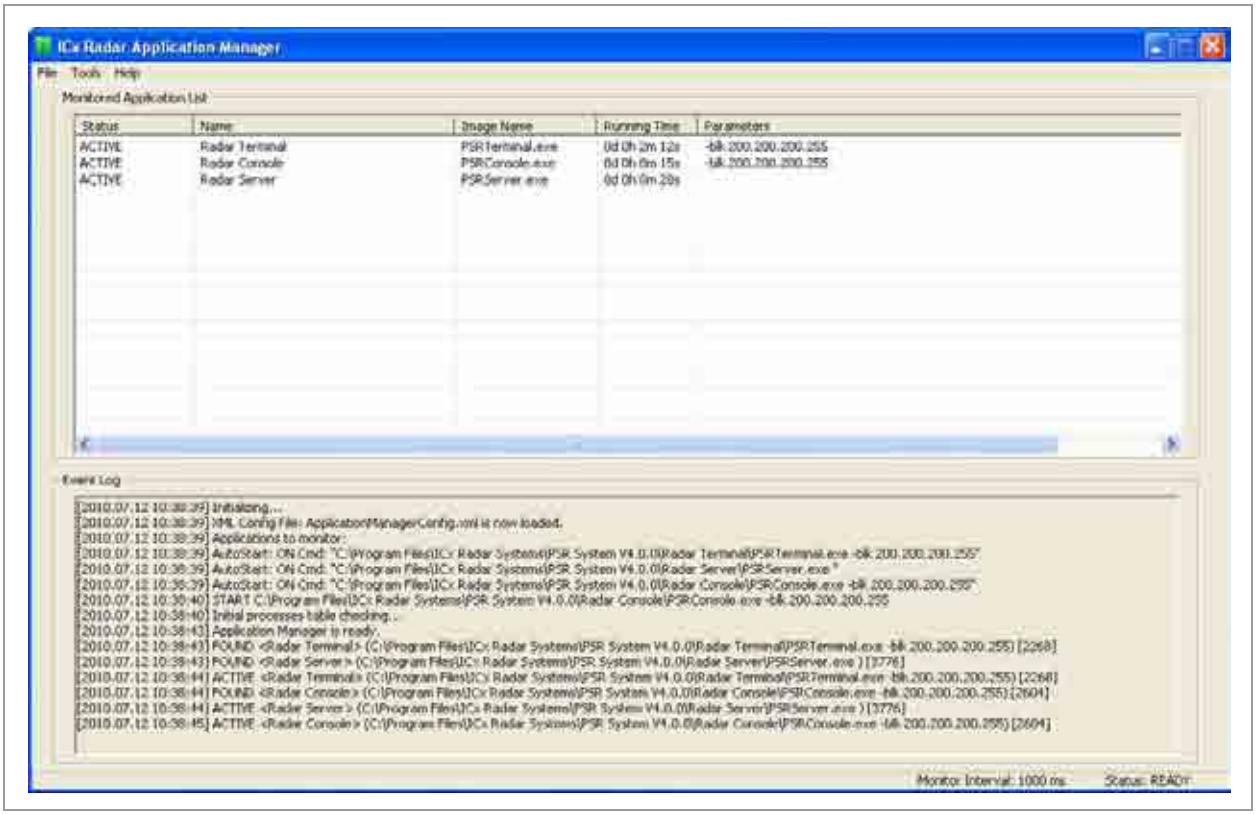

Figure 3 - Radar Application Manager

3.2.2 Radar Server Application

The **Radar Server** is a software application that interfaces with STS-1400 Radar Assemblies and Client applications (i.e. Radar Console, Radar Terminal, etc.). The Radar Server principally performs the following functions:

- Generation of targets and intruders;
- Management of targets and intruders;
- Output of detection data to local or remote applications;
- Output of detection data in an XML format to third-party applications;
- Time synchronization of the radar assemblies.

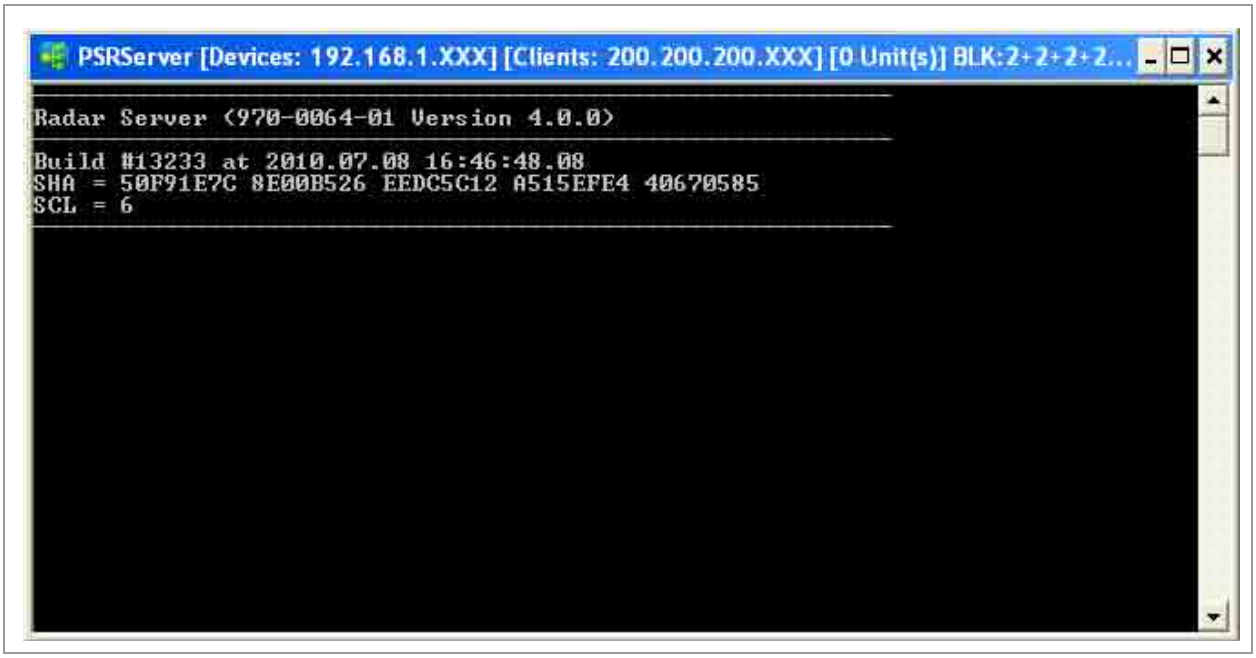

Figure 4 - Radar Server Application

3.2.3 Radar Console Application

The **Radar Console** is a software application that interfaces with the Radar Server application, or directly with the STS-1400 Radar Assembly, and performs the following functions:

- Displays radar status
- Displays radar contacts and segments
- Displays radar targets and intruders
- Displays and edits radar zones (contact and intrusion zones)
- Displays radar Plan Position Indicator (PPI)
- Displays and configures system parameters
- Displays geographic map as an underlay
- Logs radar assembly warning messages
- Logs radar assembly status

3.2.4 Radar Terminal Application

The **Radar Terminal** is a software application that interfaces with the Radar Server. The Radar Terminal primarily performs the following functions:

- Keeps the connection between the radar assembly and Radar Server active
- Displays all radar assemblies connected to the Radar Server application
- Displays radar assembly status and radar communication configuration information

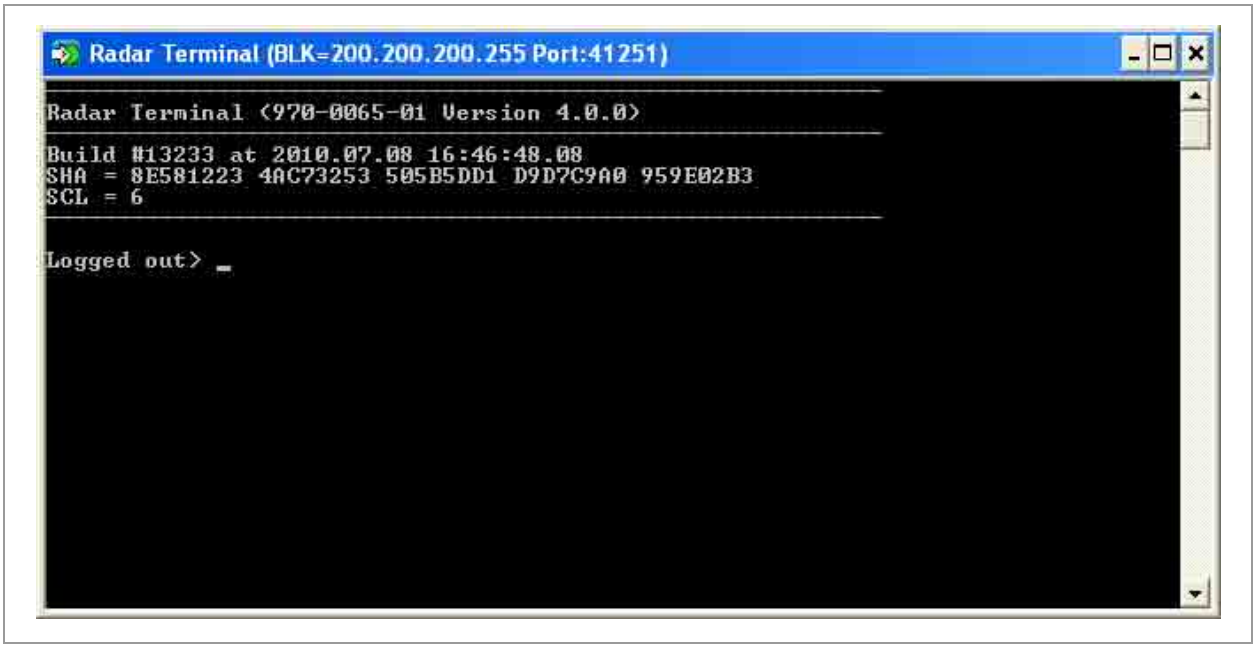

Figure 5 - Radar Terminal Application

3.2.5 Radar Loader Application

The **Radar Loader** is a software utility designed to load new versions of the STS-1400 Radar Assembly firmware. This application is started automatically by the Radar Console application when executing the **Loader** command.

4 STS-1400 SYSTEM OPERATION

This section covers operation of the STS-1400 Radar System using the Radar Console application. For details on how to operate the STS-1400 Radar System using the Control Station application, please refer to the Control Station Operator's Manual.

For details on how to perform the installation of the STS-1400 Radar System and installation of the required applications, please refer to the STS-1400 Installation Manual.

4.1 RADAR APPLICATION MANAGER

This section covers the operation of the Radar Application Manager. For details on how to configure Radar Application Manager to monitor specific applications, please refer to the STS-1400 Installation Manual.

Figure 6 shows the Radar Application Manager main window. The description of each element is described in the following sections.

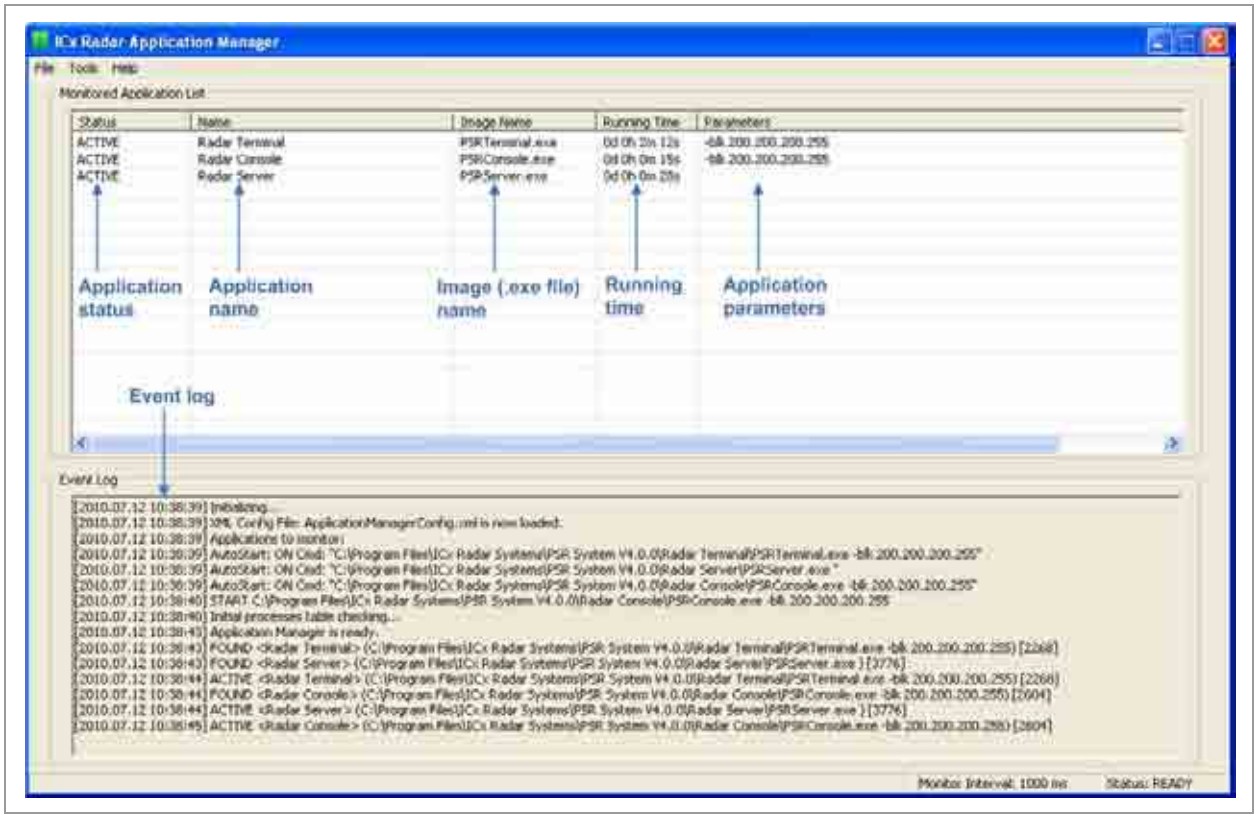

Figure 6 - Radar Application Manager Main Window

4.1.1 Application Status

The application status will read either **ACTIVE**, **UNLINK** or **TIMEOUT**. An ACTIVE application is monitored by the Application Manager and will automatically re-start in the event of a crash, power outage or system failure. An UNLINK status reflects an application started manually and that is not monitored by the Application Manager. If the application is closed or hangs, the Application Manager will not re-start it. When either application with a status of an ACTIVE or UNLINK is closed or hangs, its status changes to TIMEOUT.

4.1.2 Application Name

Displays the name (e.g. Radar Console, Radar Server, Radar Terminal, etc.) of each application listed.

4.1.3 Image Name

The image name contains the executable file name of each application.

4.1.4 Application Running Time

The application running time displays the duration that each application has been running. When an application is re-started by the Radar Application Manager, the duration is reset to zero. Additionally, this value is reset to zero every day at midnight.

4.1.5 Application Parameters

The application parameters field contains the command-line parameters used to start monitored applications.

4.1.6 Event Log Window

The event log window contains a list of events that occurred since start-up of Radar Application Manager. These events include the (re)starting of applications, timeouts, etc.

4.2 RADAR CONSOLE

The Radar Console allows the configuration of STS-1400 Radar assemblies, the configuration of detection and intrusion zones, and the visualization of radar sectors, targets and intruders.

4.2.1 Operator Login

This application requires the user to login to access most of its functions, as shown in **Figure 7**. Four (4) login levels are supported by Radar Console. This document covers the two (2) first levels (**Operator** and **Administrator**).

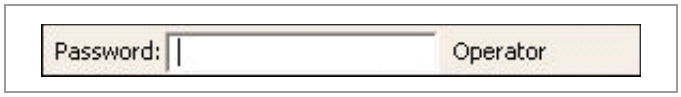

Figure 7 - Login Operator Mode

Once logged in, the radar console screen displays available radars in the left pane.

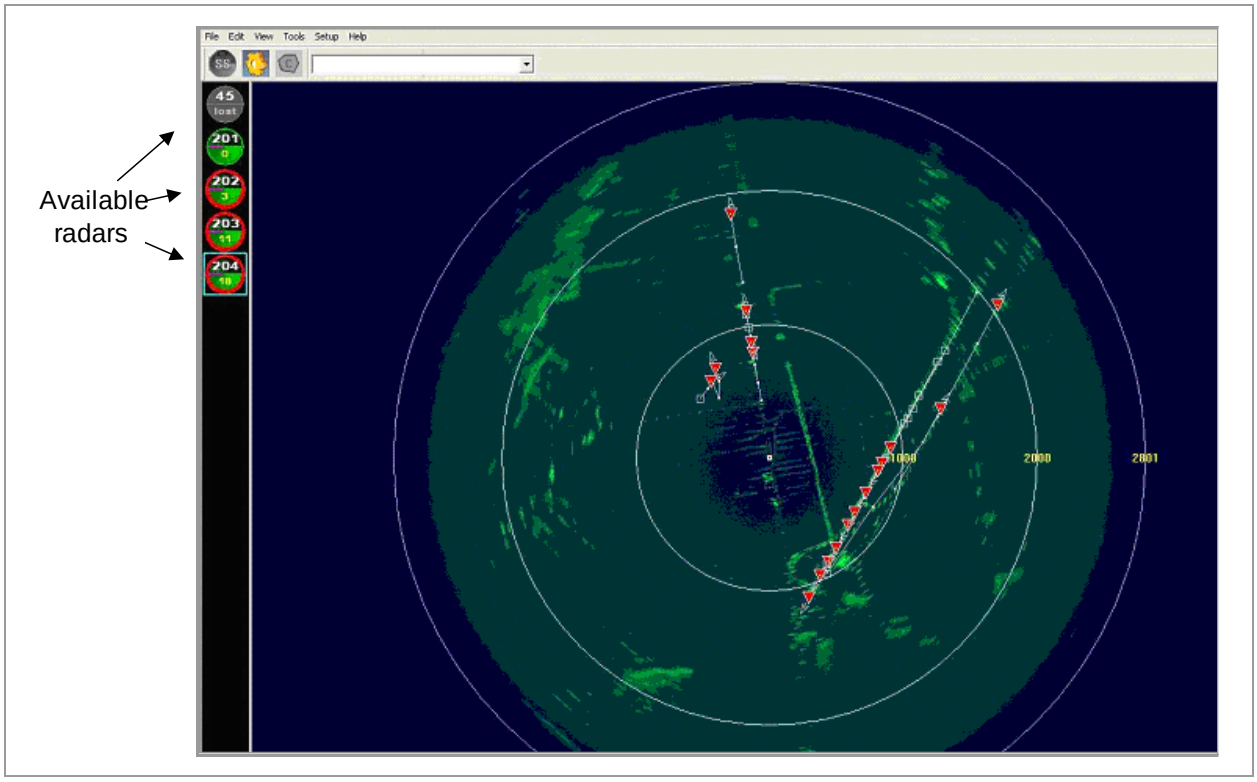

Figure 8 - Radar Console Displaying Available Radars

Table 5 shows the functions that are accessible as a function of the login level. The **Direct** column refers to functions accessible when the Radar Console is connected directly to the radar, and the **Server** column refers to functions accessible when the Radar Console is connected to the radar via the Radar Server.

Menu Item	Function	Operator		Admin	
		Radar Console Direct	Radar Console	Radar Console Direct	Radar Console
Edit	Edit / create intrusion zones				✓
	Edit / create contact zones				✓
View	View intruders / targets		✓		✓
	View tracks		✓		✓
	View identification number		✓		✓
	View radar PPI	✓	✓	✓	✓
	Change PPI color palette			✓	✓
	View radar location	✓	✓	✓	✓
	Intrusion / contact coverage		✓		✓
	View background map	✓	✓	✓	✓
	View intrusion / contact zones		✓		✓
	View contacts				✓
Tools	Targets / intruders list view		✓		✓
	Targets / intruders tree view		✓		✓
	Replay radar data			✓	✓
	Explore Logs directory	✓	✓	✓	✓
	Explore Maps directory	✓	✓	✓	✓
	Explore Capture directory	✓	✓	✓	✓
	Explore Recording directory	✓	✓	✓	✓

Table 5 - Radar Console Functions vs. Login Level

Menu Item	Function	Operator		Admin	
		Radar Console Direct	Radar Console	Radar Console Direct	Radar Console
Setup	Set Logs directory			✓	✓
	Set Maps directory			✓	✓
	Set Capture directory			✓	✓
	Set Recording directory			✓	✓
Right mouse click on radar icon	Set radar to XMIT / STBY			✓	✓
	Reset radar			✓	✓
	Configure radar parameters	✓	✓	✓	✓
	Show warnings and traces	✓	✓	✓	✓
	Set unit position from GPS			✓	✓
	Set Radar Server time from GPS				✓
	Enable / disable AXML				✓
	Record targets / intruders				✓
	Record radar data			✓	✓
	Reset communication statistics			✓	✓
	Load new radar firmware			✓	✓

Table 5 - Radar Console Functions vs. Login Level (Continued)

4.2.1.1 Radar Symbology

This section defines the symbology for the radar icon located in the left-hand column of the radar console. Keep in mind that the colors have a specific meaning as well as the information embedded in the icon. Below is an icon lexicon describing the various color codes and symbols.

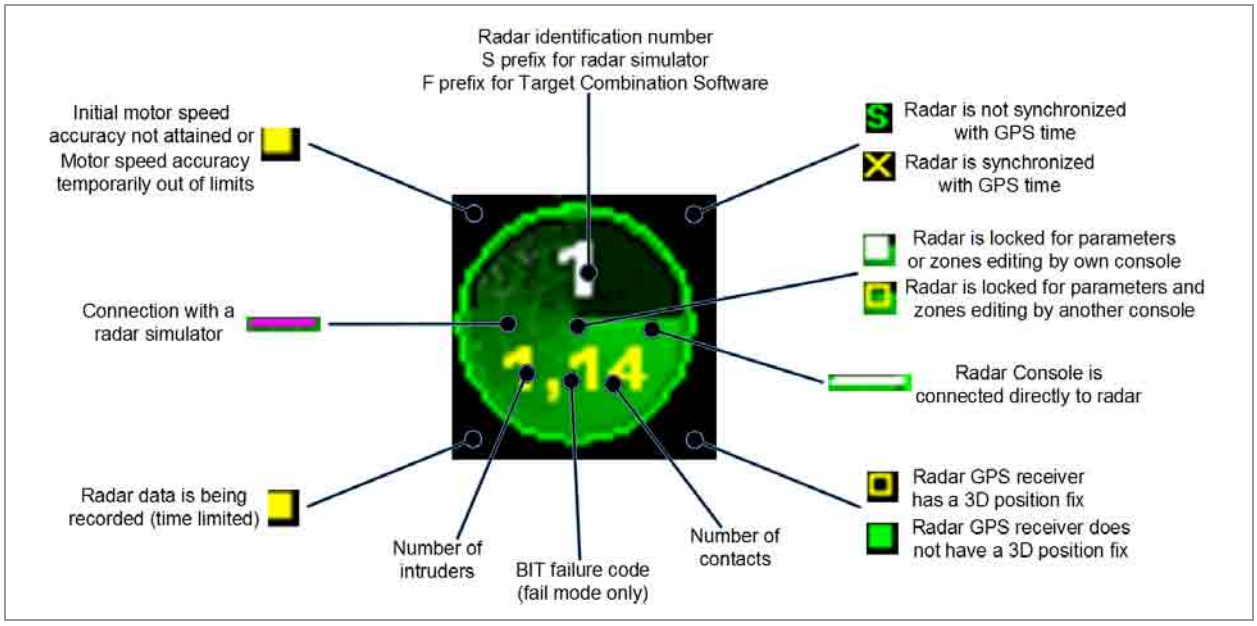

Figure 9 - Radar Lexicon

Radar Icon	Message
	Radar communication link is being established.
	Radar connection is in progress.
	Radar is in standby mode.
	Radar simulator is in standby mode.

Table 6 - Radar Icons and Messages

Radar Icon	Message
	Target Combination Software is stopped.
	Radar is in standby mode, and is connected directly to the Radar Console application (instead of being connected through the Radar Server application).
	Communication with radar has been interrupted for at least five (5) seconds.
	Communication with radar is lost. The Operator can still verify the last unit configured parameters and most recent unit warnings. The Operator can manually delete the lost icon.
	Radar is in limited auto-recovery mode, with failure code 5.60. The Radar will try to recover from the failure automatically. Refer to the error codes section of the Installation Manual for explanatory details.
	Radar is in fail mode, with failure code 5.60. Refer to the error codes section of the Installation Manual for explanatory details.
	Radar is transmitting and initial motor speed accuracy has not yet been reached or is temporarily out of limits.
	Radar is transmitting.
	Target Combination Software is started (with TRaCS only).
 	Target Combination Software is started and tracking one (1) intruder. Icon perimeter is blinking (with TRaCS only).

Table 6 - Radar Icons and Messages (Continued)

Radar Icon	Message
	Radar is transmitting and tracking three (3) intruders. Icon perimeter is blinking.
	Radar is transmitting, tracking one (1) intruder and detecting fourteen (14) contacts.
	The radar is locked by this console for parameters and zones editing.
	The radar is locked by another console for parameters and zones editing.
	The Radar Console is recording data from this radar.
	The radar possesses an embedded GPS receiver which cannot have a 3D position fix. The radar is in standby mode.
	The radar possesses an embedded GPS receiver which has a 3D position fix. The radar is in standby mode.
	The radar possesses an embedded GPS receiver which has a 3D position fix. The radar is in transmit mode but there is no synchronization with the GPS PPS signal.
	The radar possesses an embedded GPS receiver which cannot have a 3D position fix. The radar is in transmit mode and is synchronized with the GPS PPS signal.
	The radar possesses an embedded GPS receiver which has a 3D position fix. The radar is in transmit mode and is synchronized with the GPS PPS signal.

Table 6 - Radar Icons and Messages (Continued)

Radar Icon	Message
	Radar is busy with another client. The radar is accepting only one direct connection. This will be shown only on a radar console used in direct mode when the radar server or another console (direct) is connected to the radar unit.

Table 6 - Radar Icons and Messages (Continued)

When placing the mouse cursor over the radar icon, a radar information box is displayed as follows:

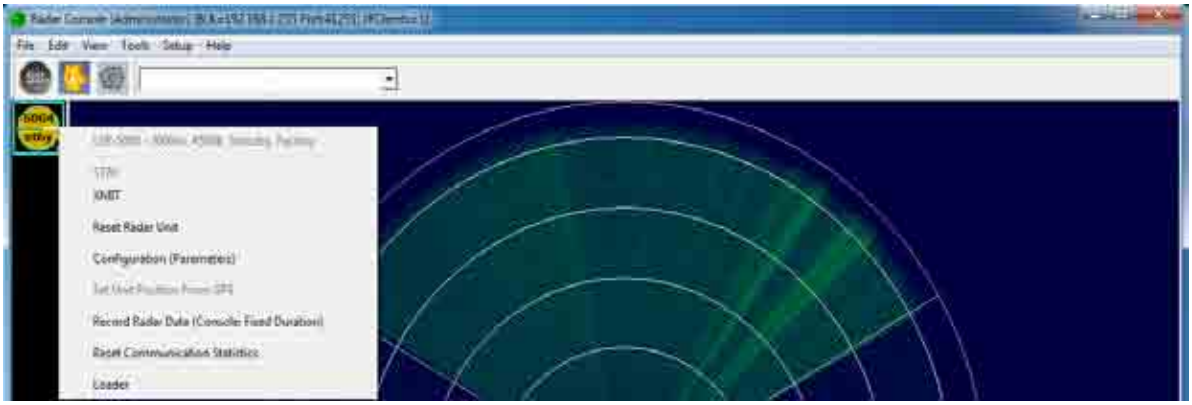

Figure 10 - Radar Information

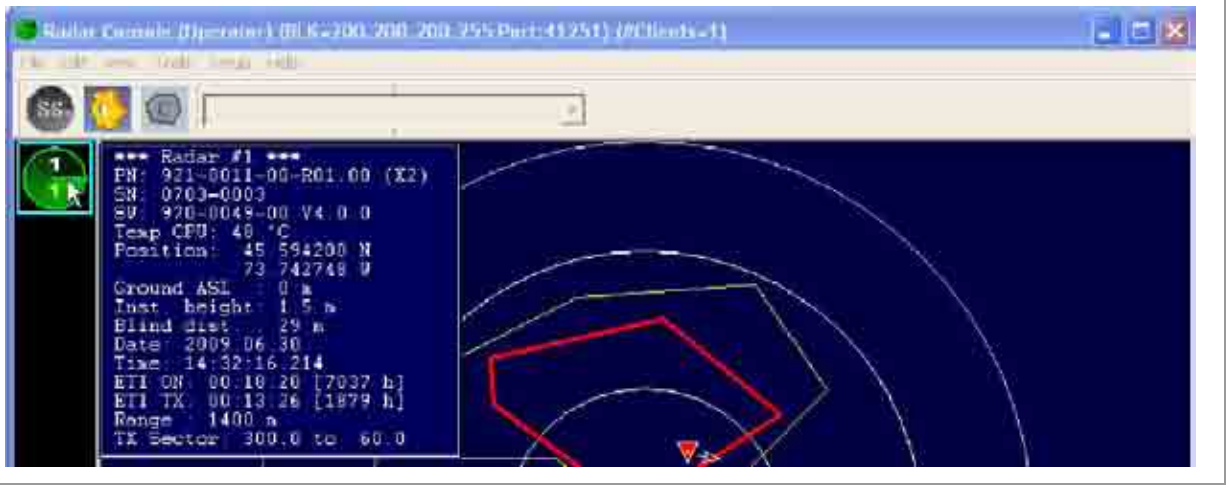

Figure 11 - Radar Information

4.2.2 Editing Zones

The STS-1400 Radar System supports two (2) types of zones: **Contact** and **Intrusion** Zones.

4.2.2.1 Contact Zones

A **Contact Zone** is an area where low-level radar detections are processed to identify potential targets. An exclusive contact zone is a zone in which processing of low-level radar detections is eliminated. The radar uses the contact zones to establish the detection thresholds. ICx Radar Systems recommends the use of the default configuration (no contact zone defined). In this case the entire radar coverage area will be used.

If a particular area is generating false or unwanted targets, such as a highway with automobile traffic, a wind turbine, etc., it may be desirable to establish one (1) or more contact zones that do not include those areas. Alternatively, you can establish exclusive contact zones covering these areas.

4.2.2.2 Intrusion Zones

An **Intrusion Zone** is an area where the targets are considered potential threats and classified as intruders. An **exclusive intrusion zone** is an area in which classification of targets as intruders is prevented. Since intruders trigger alerts (red circle in radar icon – see above) and are sent out through XML, it is important to carefully define intrusion zones to minimize nuisance alarms. In order to provide prompt detection of intruders, it is very important that all intrusion zones be completely contained in contact zones with a sufficient gap (typically > 100m).

To prevent a particular area from generating false or unwanted intruders, such as a private road within the surveillance area, a main entrance in a building, etc. either:

1. Establish intrusion zone so as not to include that area, or
2. Establish an exclusive intrusion zone on that area.

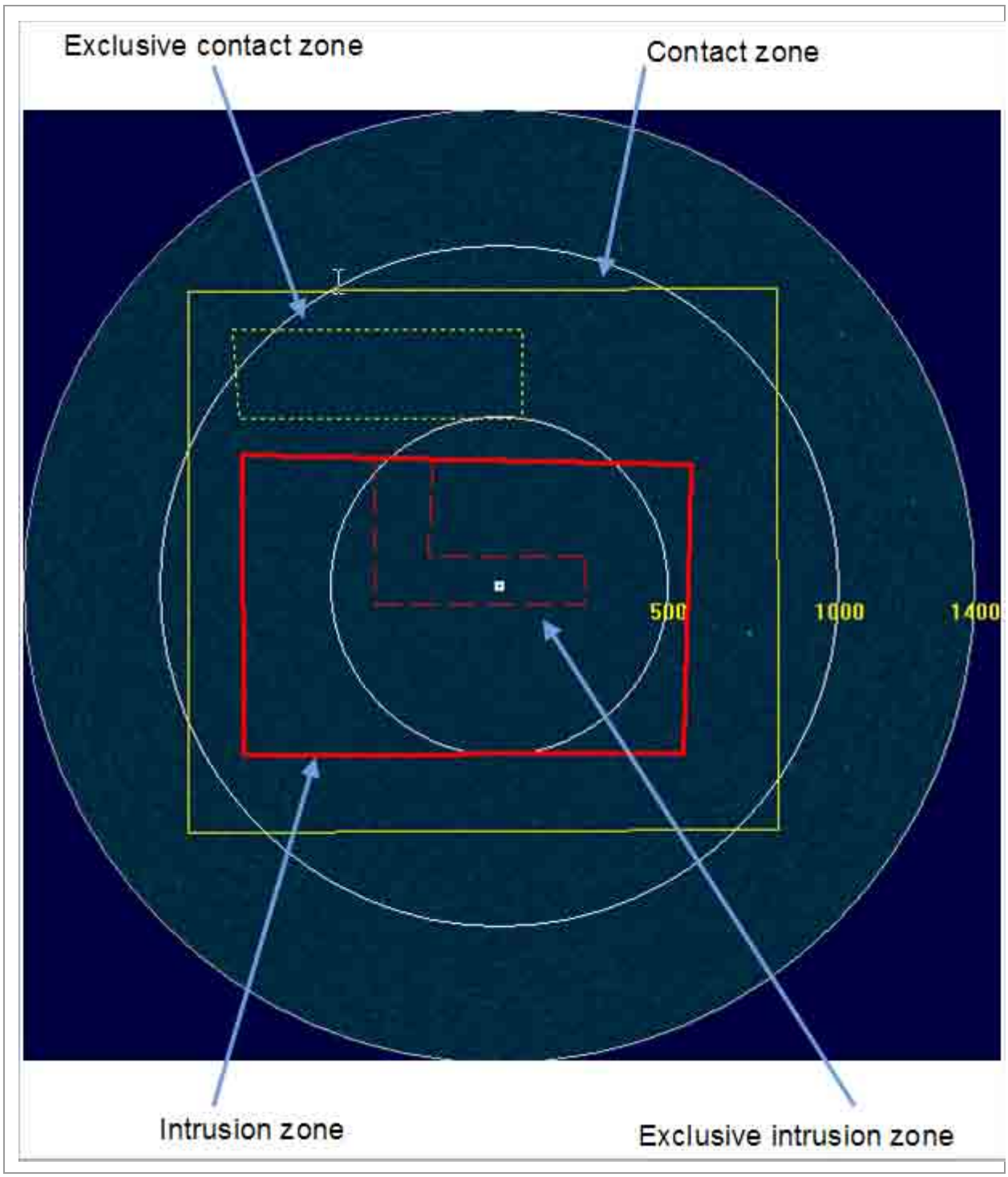

Figure 12 - Contact and Intrusion Zones

4.2.2.3 Creating A Zone

Using the **Edit** menu, select the type of zone to create (intrusion, exclusive intrusion, contact or exclusive contact), as shown in **Figure 13**. The mouse cursor will then change to a diamond (◇) shape.

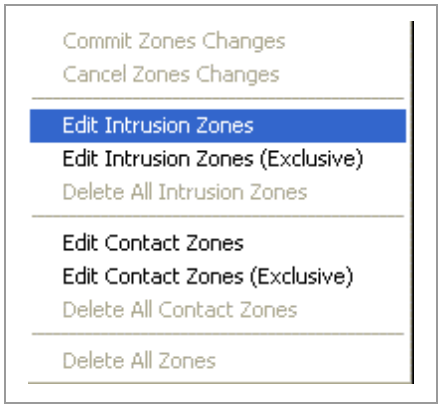

Figure 13 - Edit Menu

A **zone** consists of a polygon made with three (3) or more sides. Each segment is added by left-clicking with the mouse at the desired location. **Figure 14** through **Figure 17** shows a typical zone during the edition process. The dashed line shows how the zone will be defined if the user completes the command.

To start editing the zone, left-click with the mouse at the desired location on the PPI. This will create a start control point, and a segment will be shown between this endpoint and the current mouse location.

Subsequent left mouse clicks will create additional segments to the zone. While editing the zone, the keyboard commands described in **Table 7** can also be used.

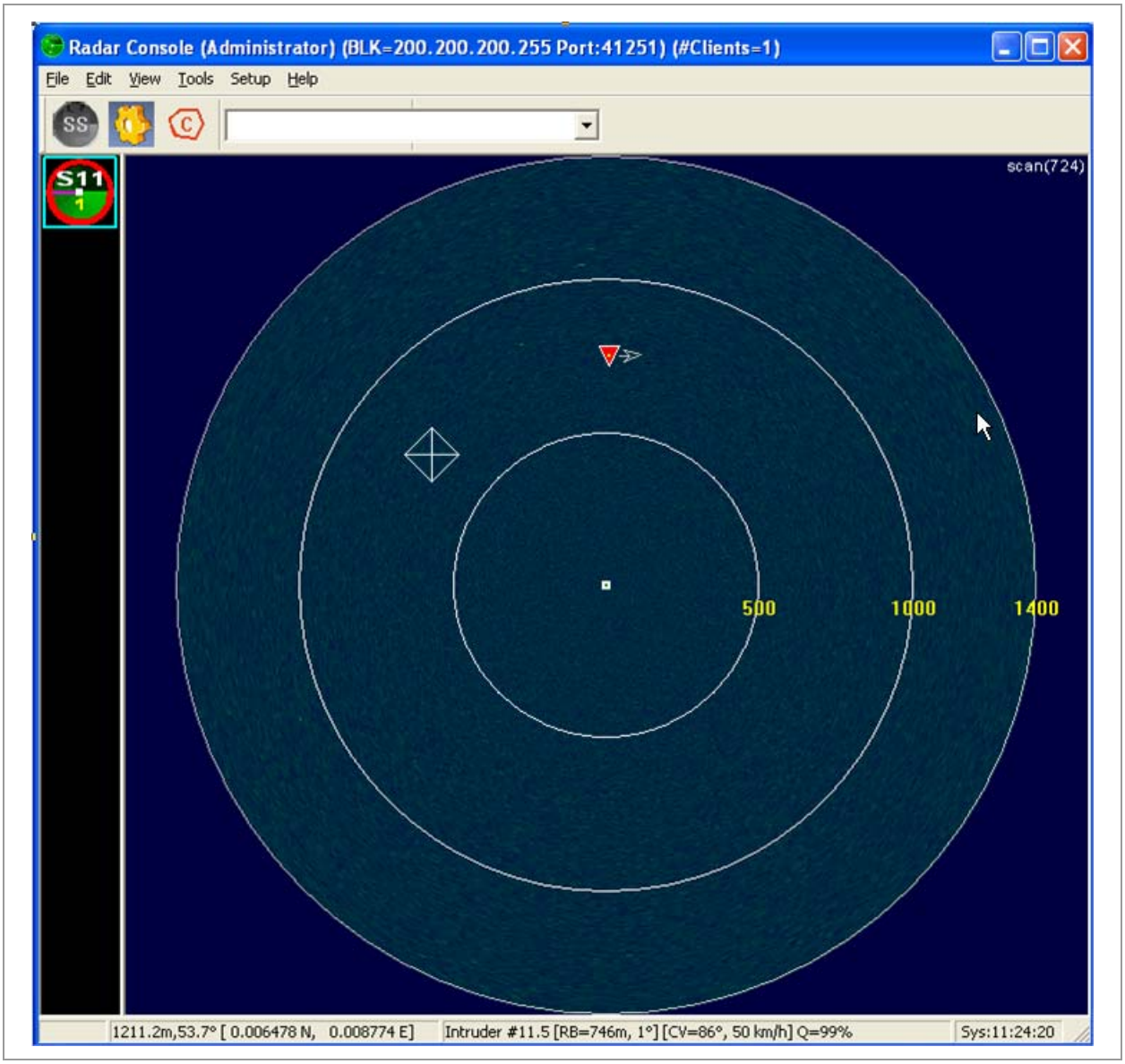

Figure 14 - Creating a Zone (Step 1 of 4)

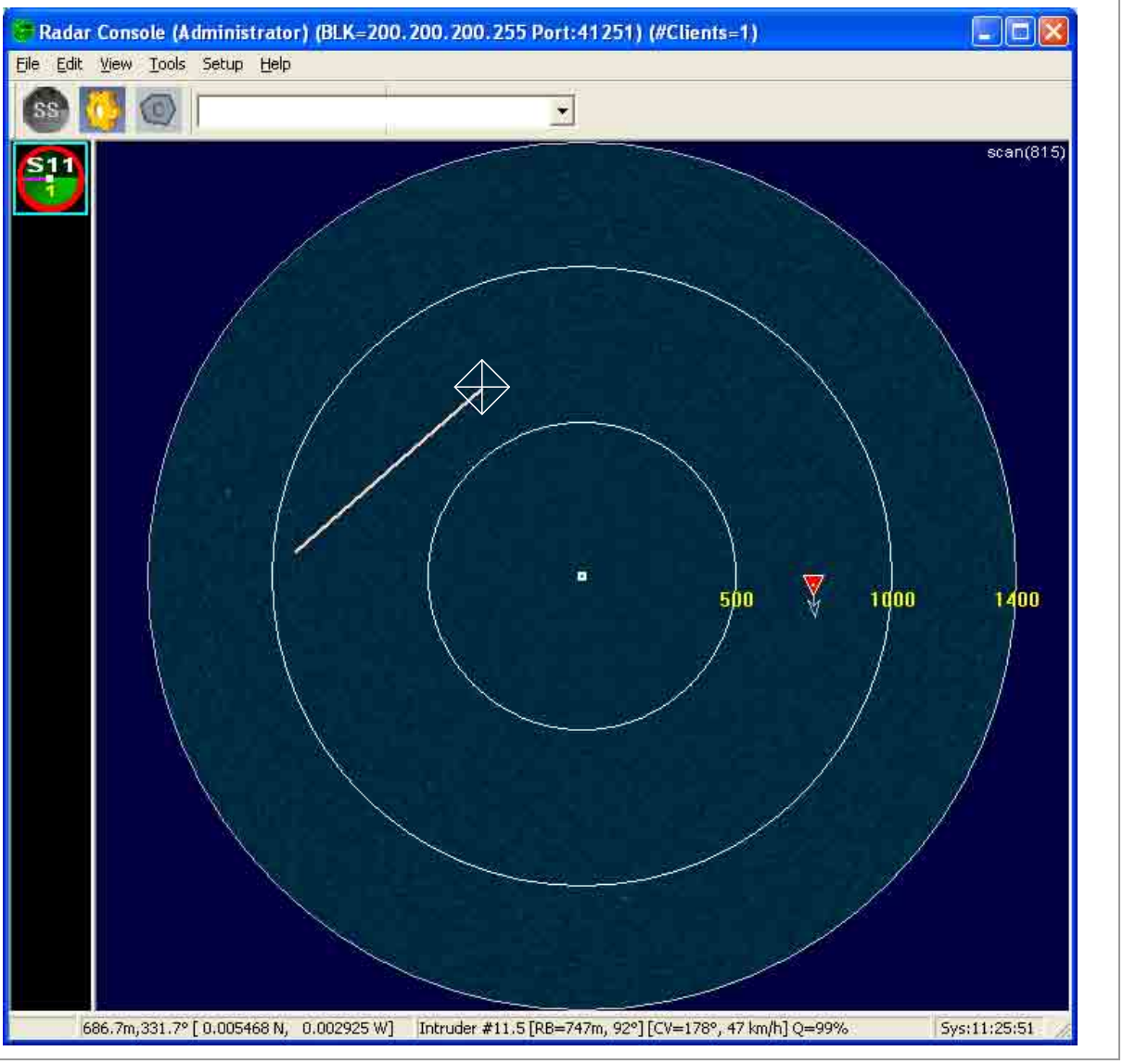

Figure 15 - Creating a Zone (Step 2 of 4)

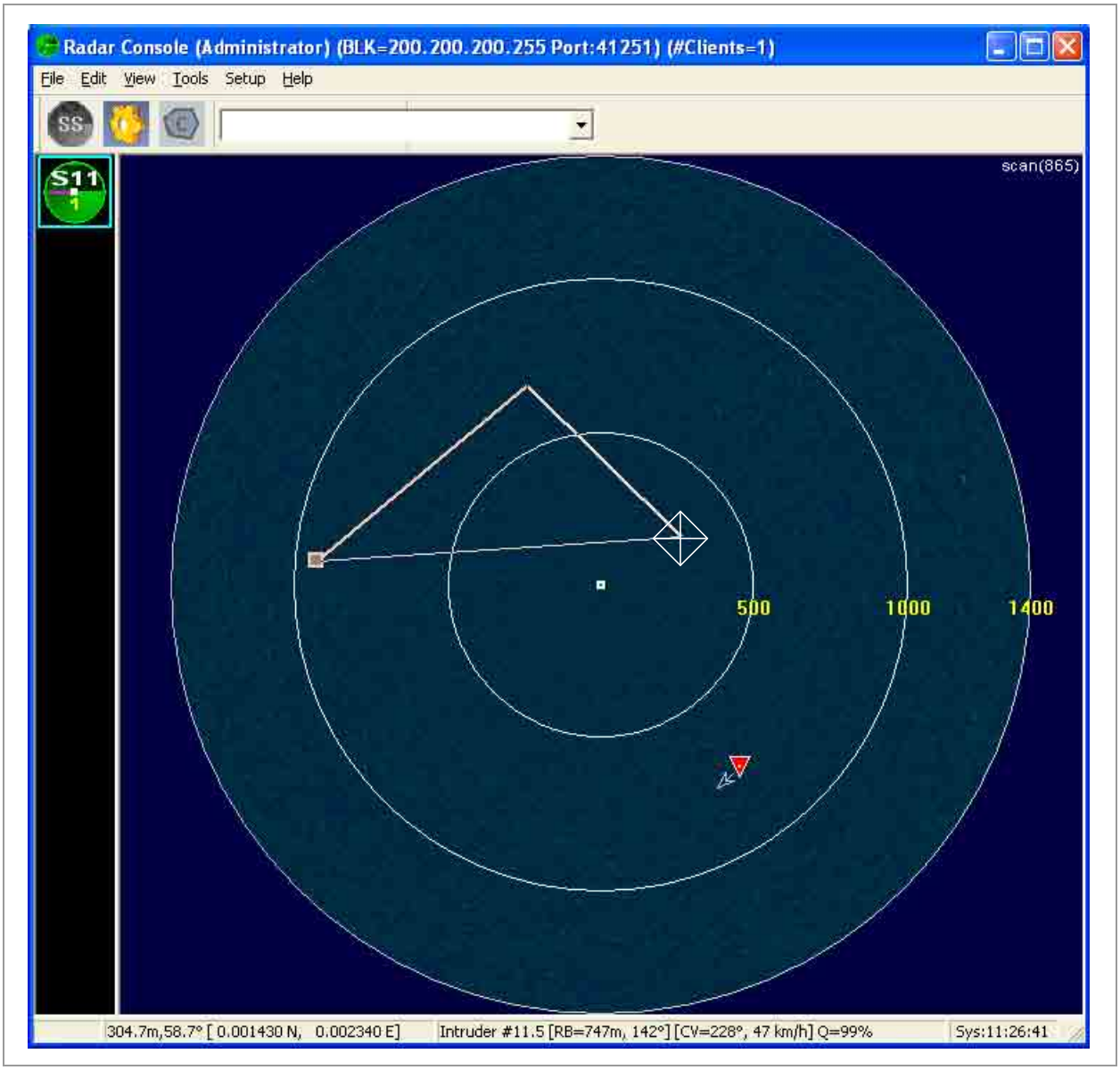

Figure 16 - Creating a Zone (Step 3 of 4)

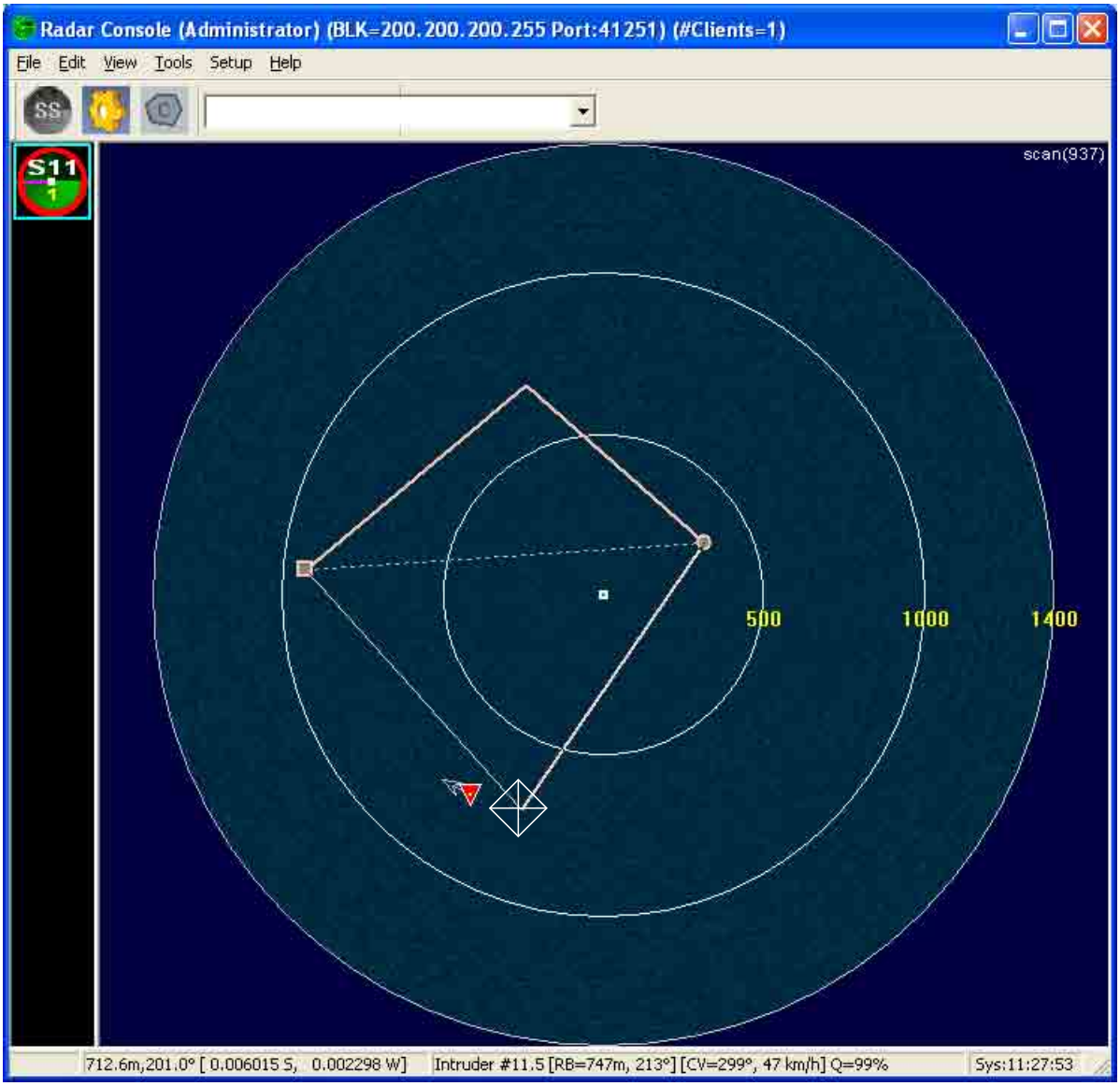

Figure 17 - Creating a Zone (Step 4 of 4)

The user may press the space key to invert the order in which the zone segments are added, as shown in **Figure 18**. The **backspace** keyboard key **removes** the last segment added.

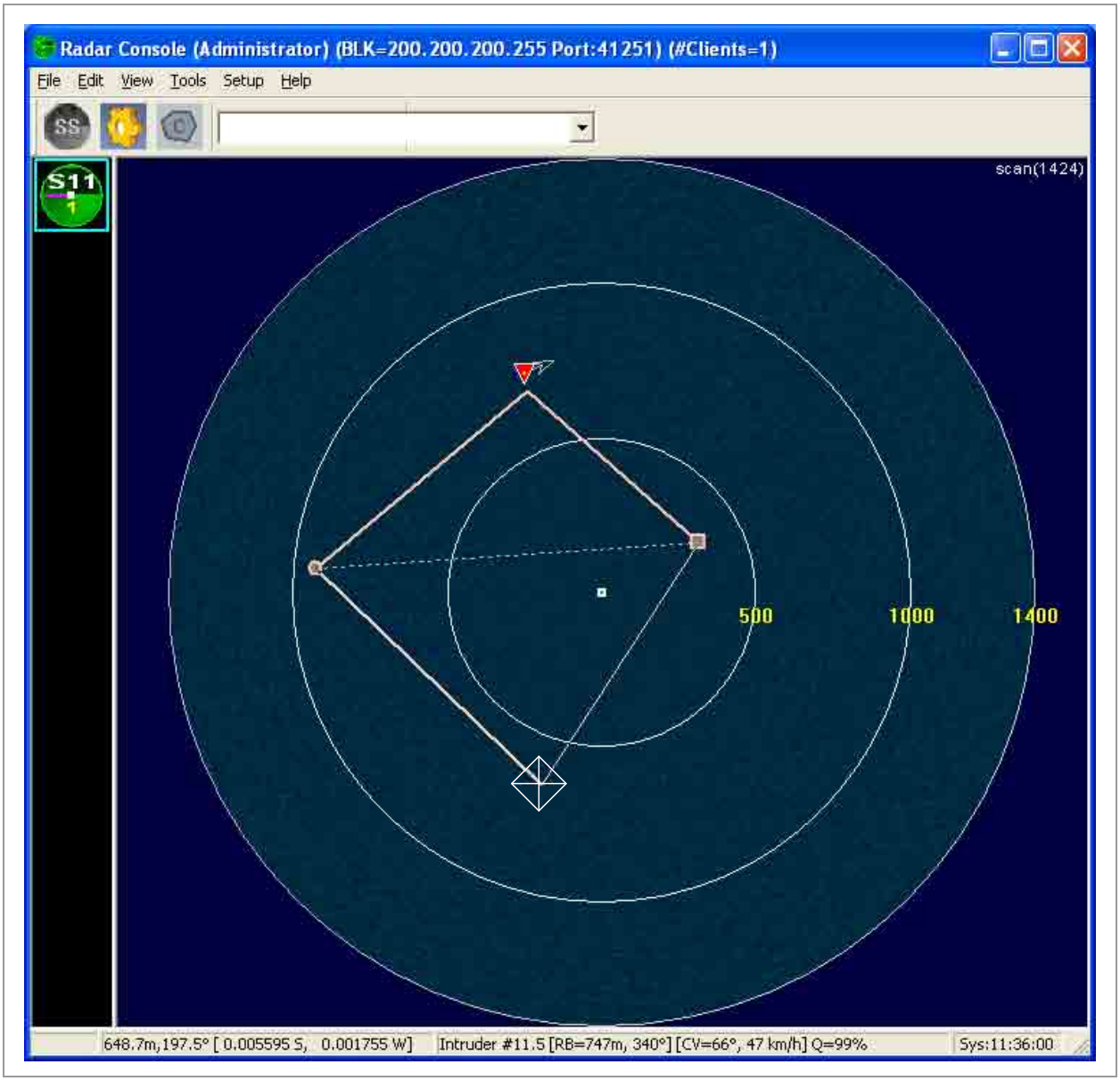

Figure 18 - Changing Segment Adding Order

To complete the editing process, press the **ESC** key or left-click with the mouse on the start control point. The zone will appear as a solid line polygon for a normal zone and as a dashed line polygon for an exclusive zone. Refer to **Figure 12** for an example of each zone type.

After editing one (1) or more zones, the changes may be saved or discarded. This is accomplished using the appropriate **Edit Menu** command, **Commit Zone Changes** as shown in **Figure 19**, or by using the commit button  .

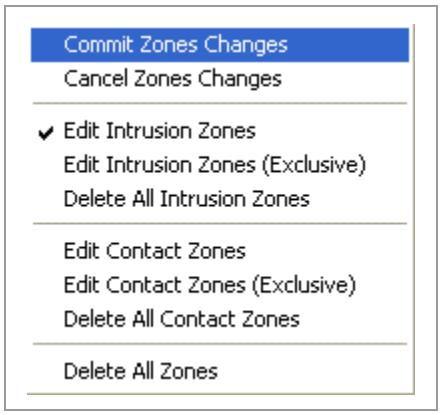

Figure 19 - Edit Menu Commands

4.2.2.4 Modifying an Existing Zone

To modify an existing zone, the user must enter the **zone edition process**. This is accomplished using the appropriate command in the Edit menu, as shown in **Figure 20**.

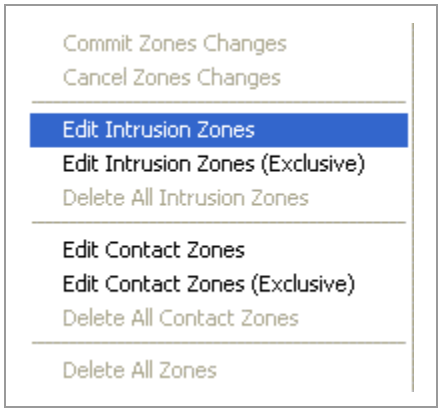

Figure 20 - Edit Menu Commands

Once in the zone edition process, each zone will be displayed with its vertex (control) points, as shown in **Figure 21**. While editing the zone, the keyboard commands described in **Figure 7** can also be used.

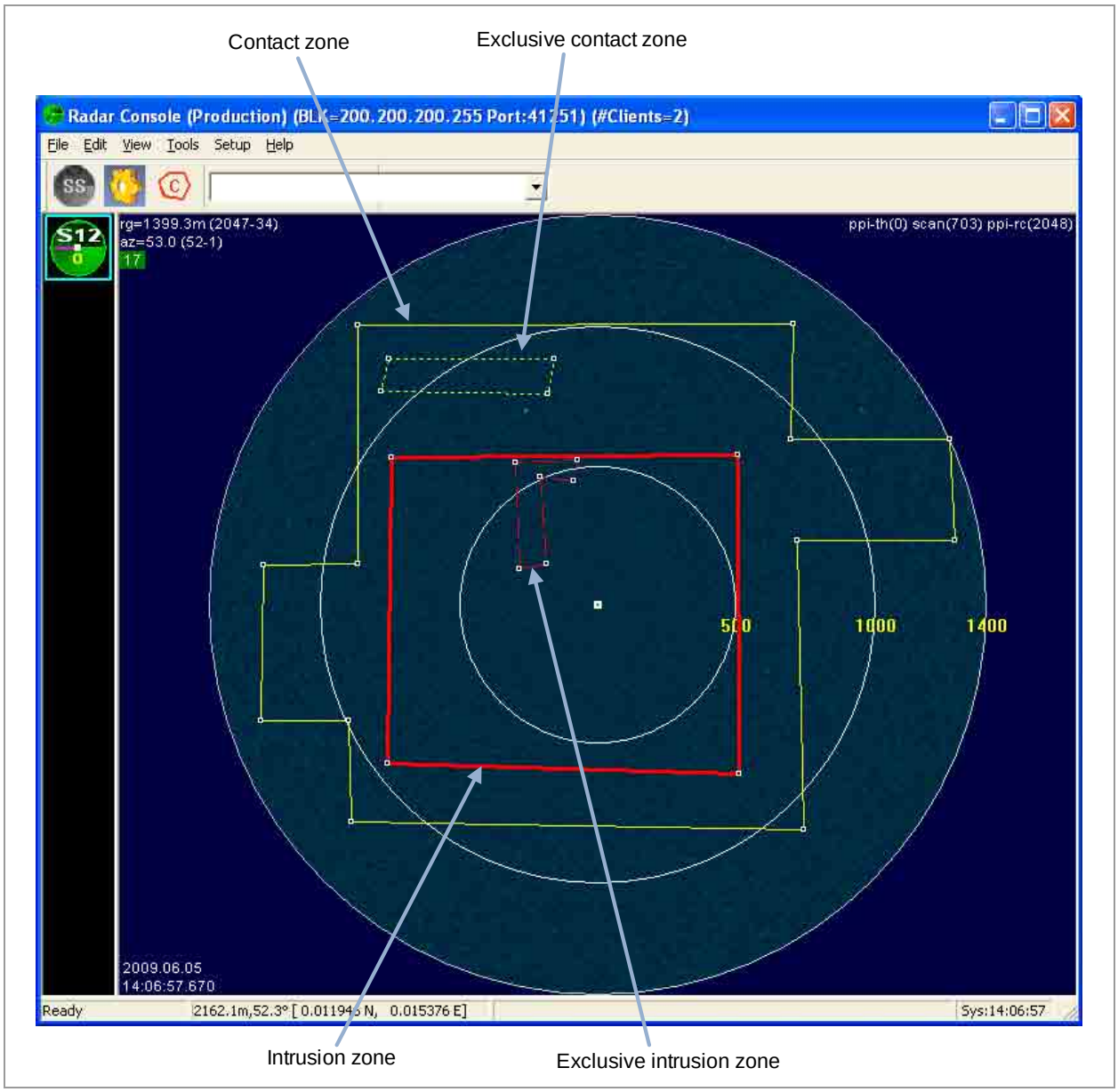

Figure 21 - Zone Edition Context

To modify a zone, the user must **left-click** with the mouse on a vertex of the zone to be modified. The zone will then enter the edit mode, as shown in **Figure 22** and **Figure 23**. Once in the edit mode, the process is the same as the zone creation process.

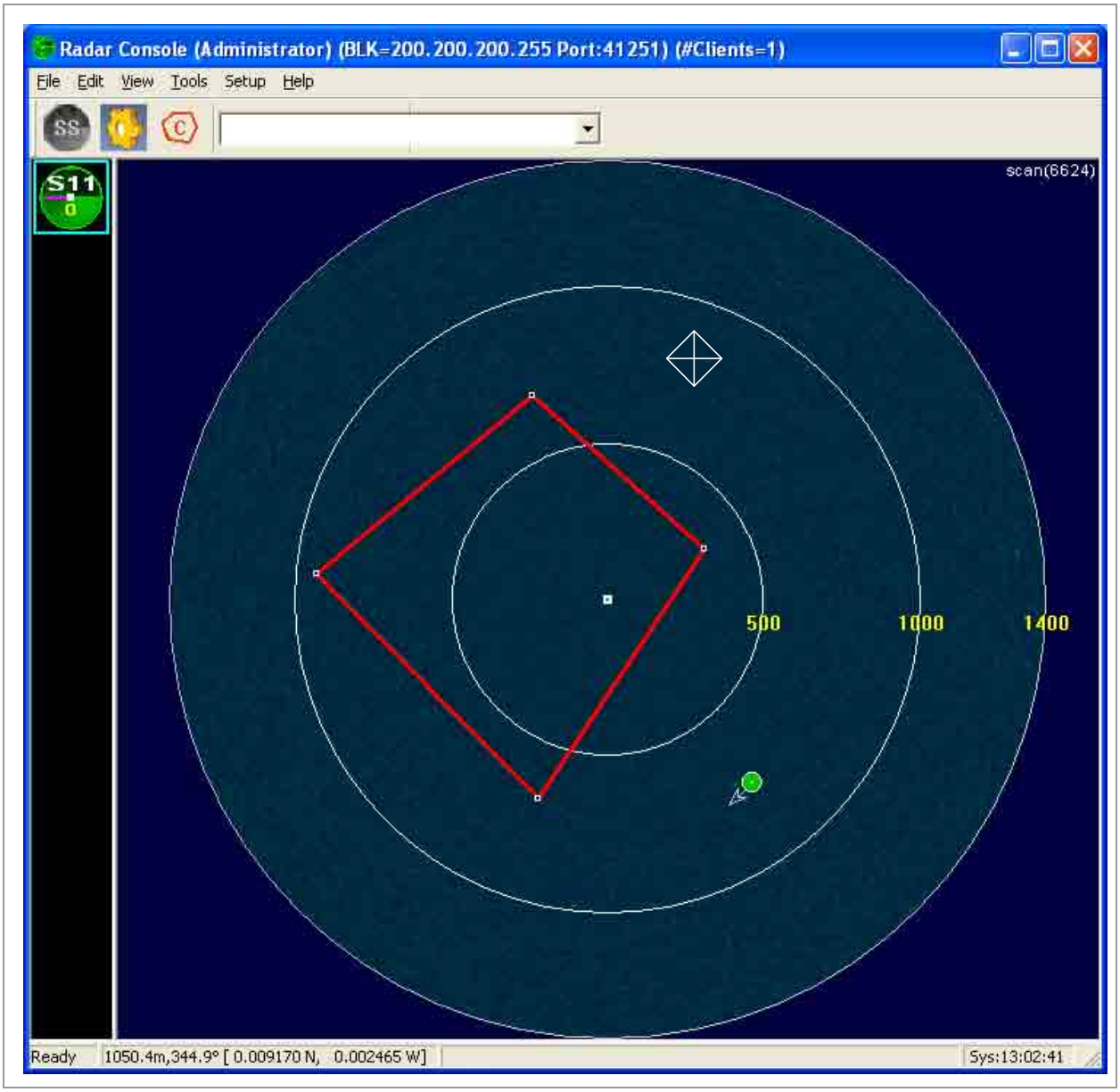

Figure 22 - Modifying a Zone (Step 1 of 2)

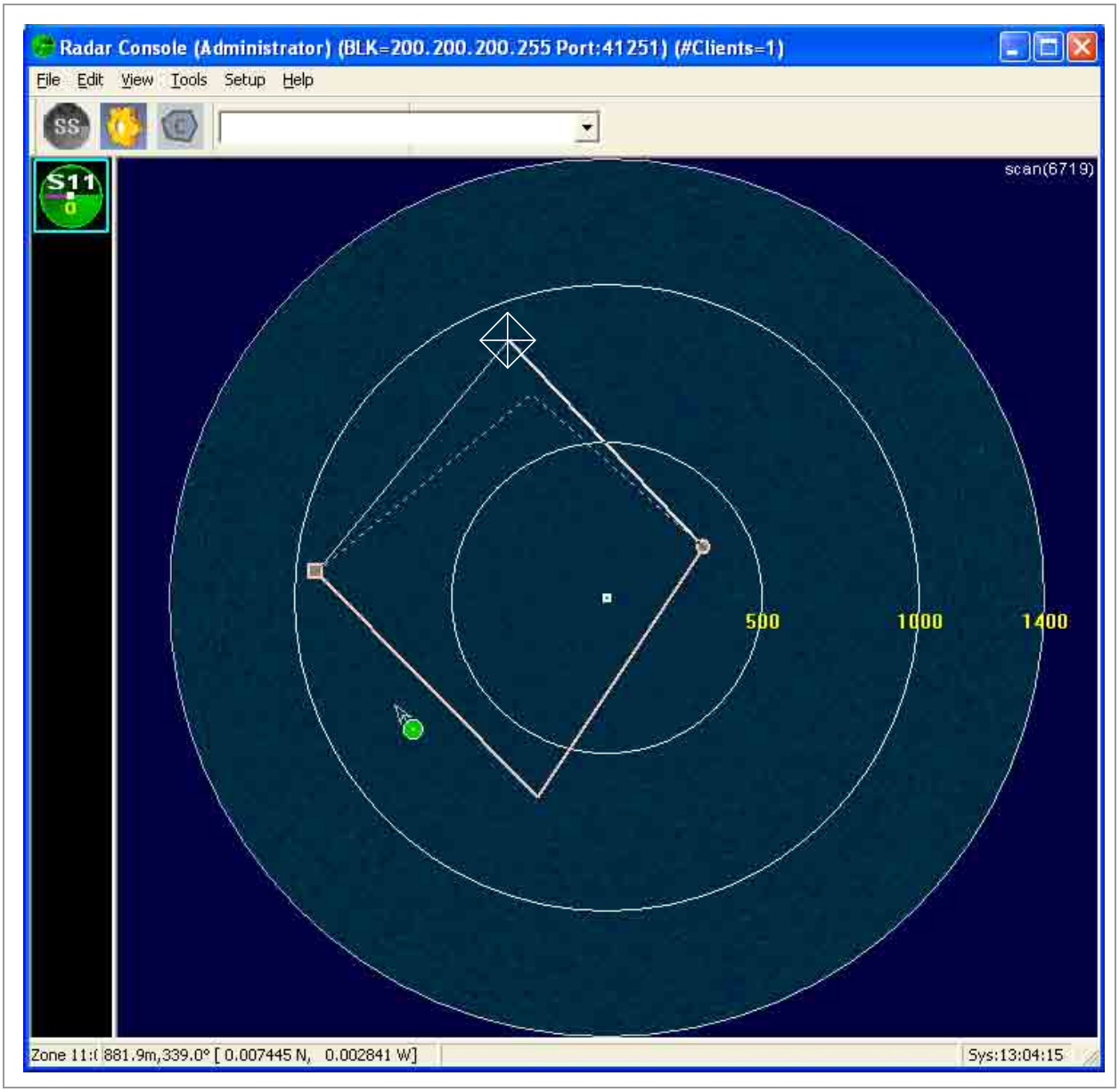

Figure 23 - Modifying a Zone (Step 2 of 2)

After modifying one (1) or more zones, the changes can be committed (saved) or discarded. This is accomplished using the appropriate **Edit Menu** command, as shown in **Figure 22** & **Figure 23**, or by using the commit button .

4.2.2.5 Deleting a Zone

To delete an existing zone, the user must enter the zone edition process. This is accomplished by selecting a **Zone Edition** command in the **Edit Menu** (Edit Intrusion Zones, Edit Intrusion Zones (Exclusive), Edit Contact Zones or Edit Contact Zones (Exclusive)), as shown in **Figure 20**.

Once the user is in **Edit mode**, the user can:

- **Delete** all **intrusion** zones using the Edit Menu command
- **Delete** all **contact** zones using the Edit Menu command
- **Delete** all **zones** using the Edit Menu command
- **Delete** the **zones individually** using the mouse cursor

Figure 24 shows the **Delete Zone** commands from the **Edit Menu**.

To **delete a particular zone** using the mouse cursor, **left-click** on any segment of the desired zone to select it and press the Delete keyboard key.

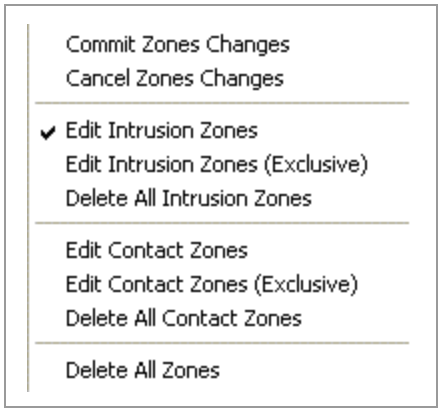

Figure 24 - Edit Menu Commands

After deleting one or more zones, the changes can be committed (saved) or discarded. This is accomplished using the appropriate **Edit Menu** command, as shown in **Figure 24**, or by using the commit button  .

4.2.3 PPI Display

The commands described in the following sub-sections are accessed using the **View Menu**.

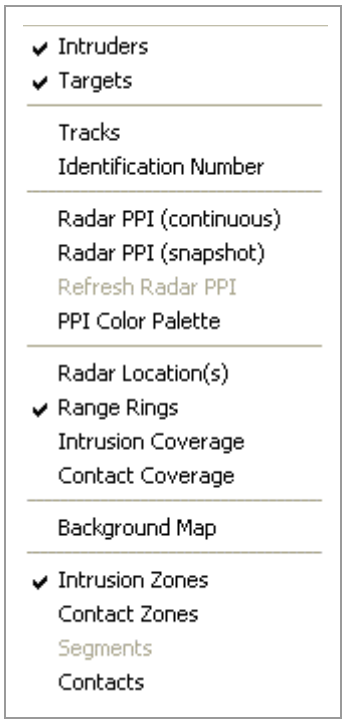

Figure 25 - View Menu Commands

4.2.3.1 Radar PPI (Continuous)

The **PPI** displays radar sectors in a continuous mode as they are received. The **PPI** uses a radial sweep pivoting about the center of the display, resulting in a map-like picture of the area covered by the radar

beam. Targets remain visible until the next sweep. Bearing is indicated by the target's angular position in relation to an imaginary line joining the **PPI**'s origin to the top of the console, as shown in **Figure 26**.

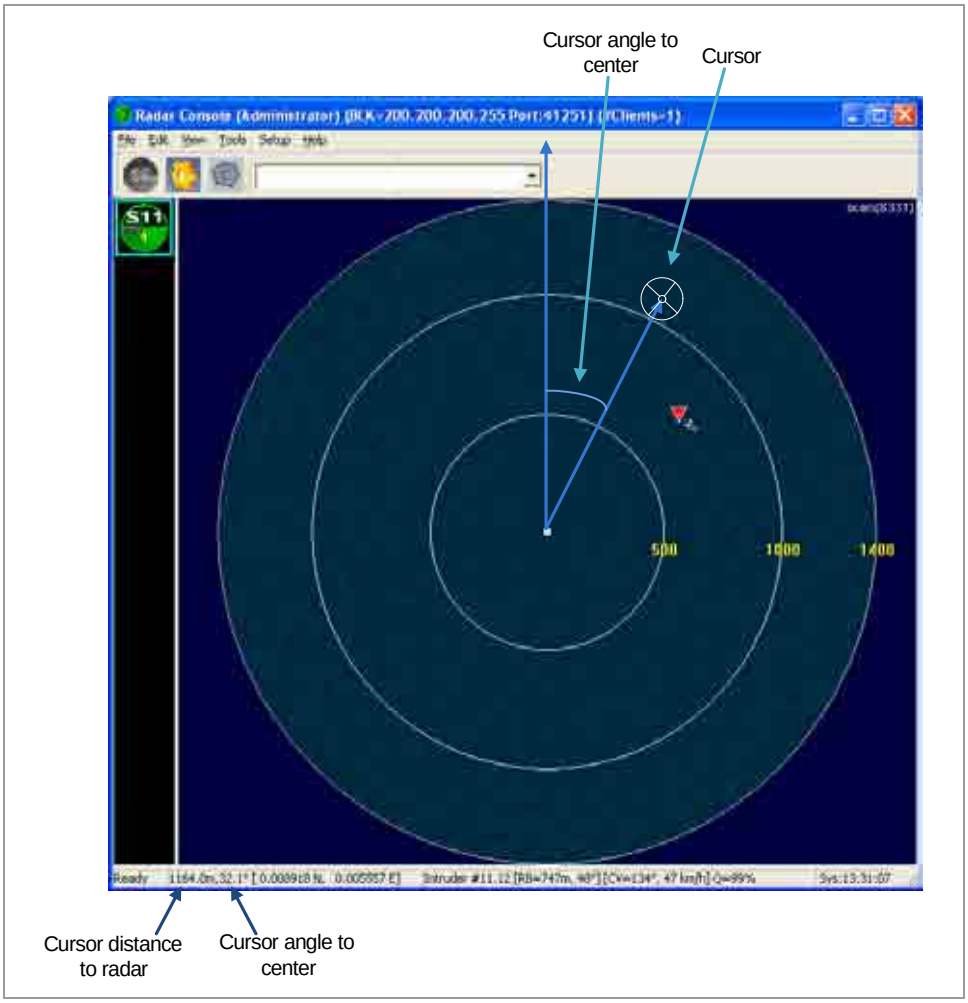

Figure 26 - Cursor Position Indicator

The **PPI** position is displayed as a range and bearing relative to the radar position and as latitude and longitude coordinates. The bearing angle is given relative to North.

NOTE: When activating the **continuous radar PPI**, a warning message is displayed concerning **bandwidth** usage. In the case of networks with limited bandwidth, using this mode may result in the PPI not

being updated uniformly. It is recommended to activate only the **PPI** display when configuring the radar, to help in determining background for defining zones.

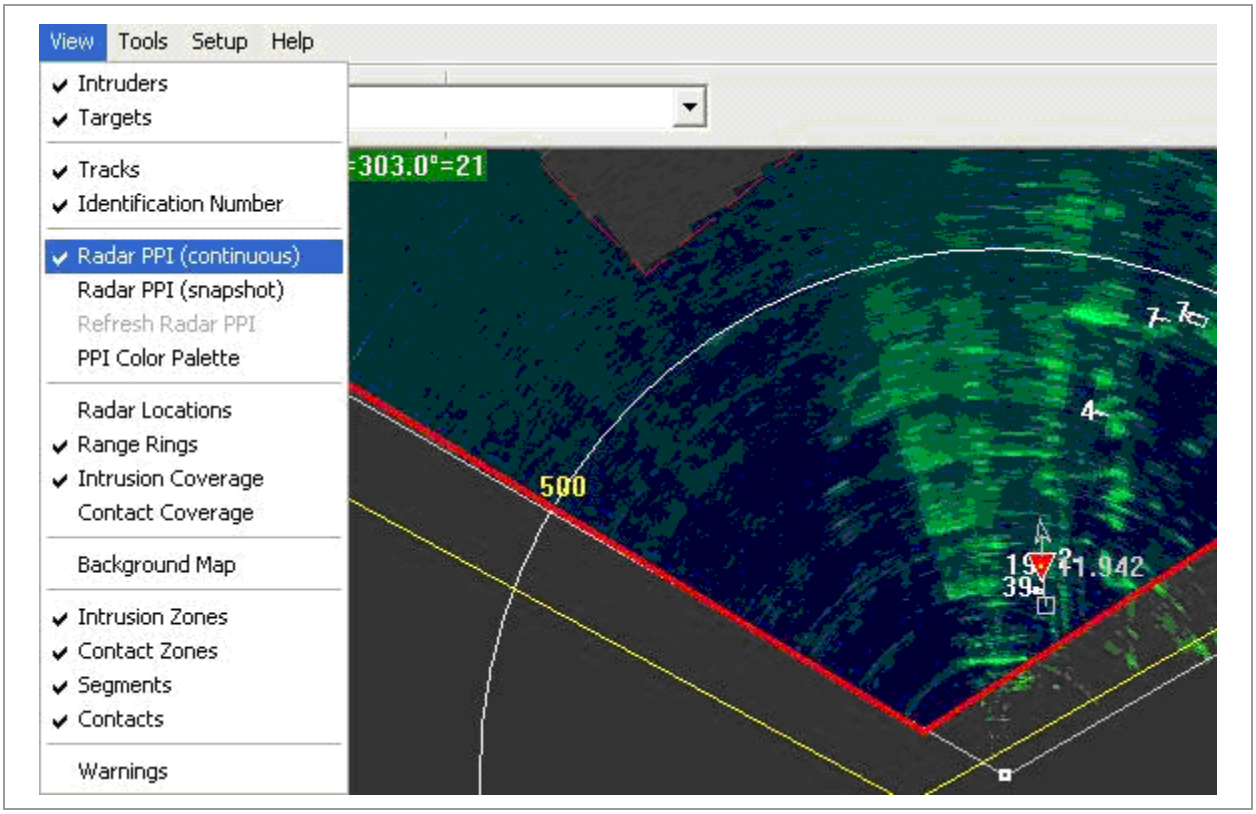

Figure 27 - Radar PPI (Continuous)

4.2.3.2 Radar PPI (Snapshot)

The **Radar PPI (snapshot)** command displays a screen capture of a specific moment in time. This feature is useful to obtain a snapshot of the radar returns in order to use it as a **background** (map-like picture or overlay) for unchanging and known monitored areas. This mode can also be used for troubleshooting.

The **Radar PPI (snapshot)** mode uses very little bandwidth compared to the **Radar PPI Continuous** mode.

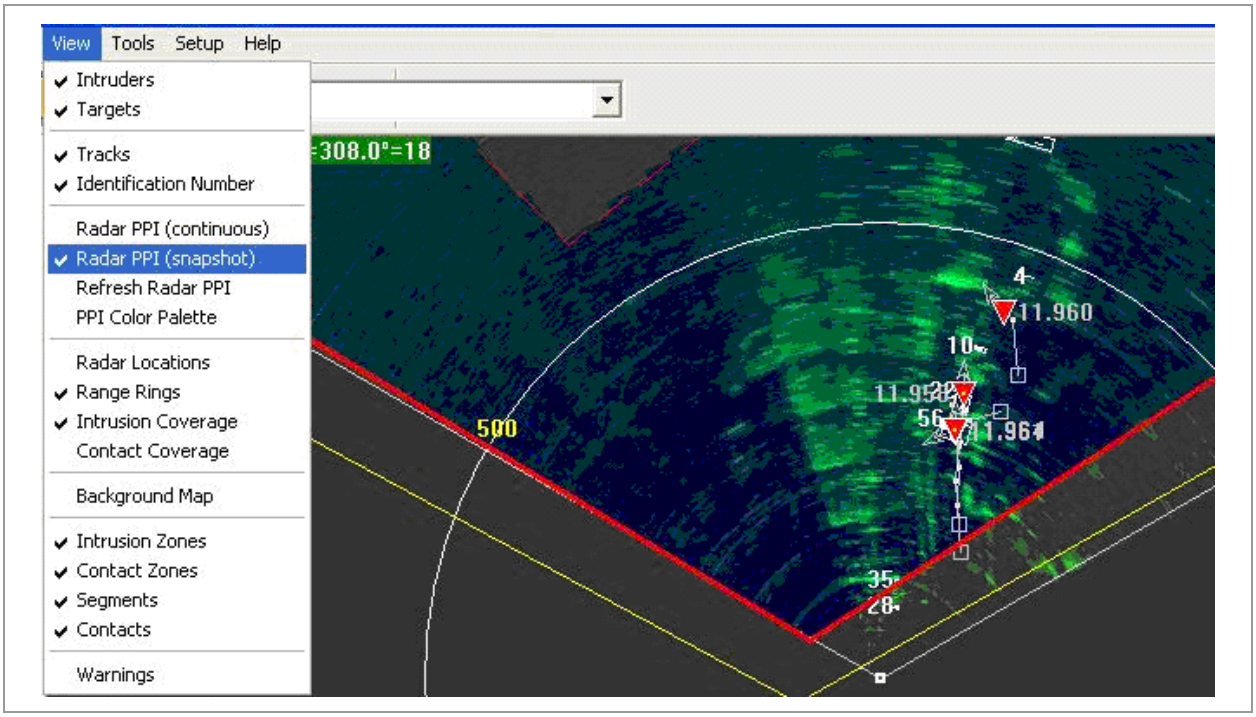

Figure 28 - Radar PPI (Snapshot) Mode

4.2.3.3 Refresh Radar PPI

The **Refresh Radar PPI** command is used in conjunction with the radar PPI (snapshot) mode and is used to refresh the map-like picture overlay at desired time intervals. Each time a PPI update is required, the operator should select this command.

4.2.3.4 PPI Commands

The **PPI** commands are described by selecting the **Quick Key** command of the **Help** menu.

Function	Action
Pan left	Left arrow key
Pan right	Right arrow key
Pan up	Up arrow key
Pan down	Down arrow key

Table 7 - PPI Commands

Function	Action
Zoom in	Page down key
Zoom out	Page up key
Zoom all	Home key
Zoom	Hold right mouse button and move left (zoom in) or right (zoom out) Hold left mouse button, drag mouse and release
Pan	CTRL key and hold left mouse button and move, or hold left mouse button until cursor changes to a hand, then move
Increase PPI intensity	+ key
Des crease PPI intensity	- key
Increase threshold	CTRL key and +
Decrease threshold	CTRL key and -
Restore intensity and threshold	CTRL and home keys

Table 7 - PPI Commands (Continued)

4.2.3.5 Background Map

The **Background Map** command is used to display a background map to give real world context to the location of the zones. Please refer to the **Installation Manual** for instructions on how to configure a background map.

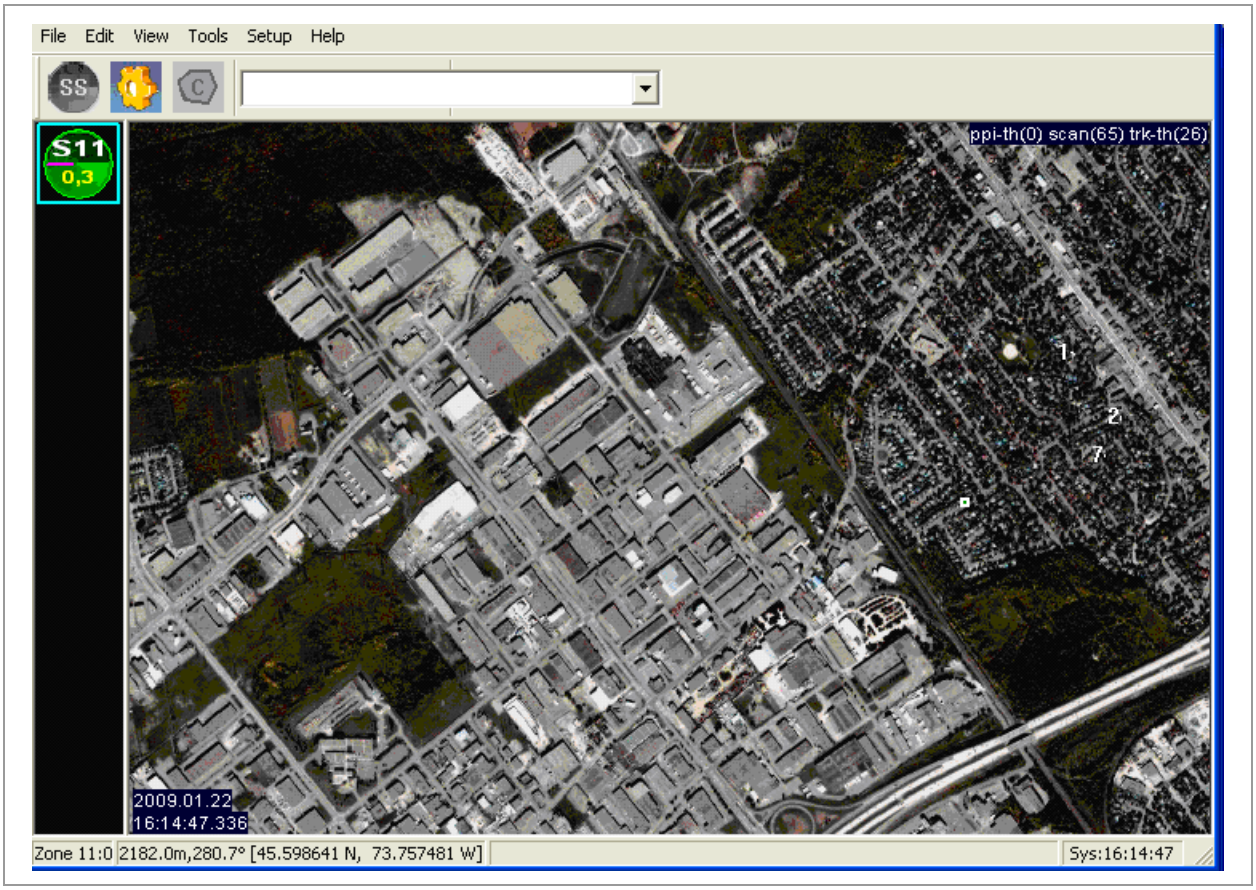

Figure 29 - Background Map

4.2.3.6 PPI Color Palette

The **PPI Color Palette** command is used to display the radar sectors in an alternate set of colors. The PPI color intensity is increased by pressing the **+ (Add)** key or decreased by pressing the **- (Minus)** key.

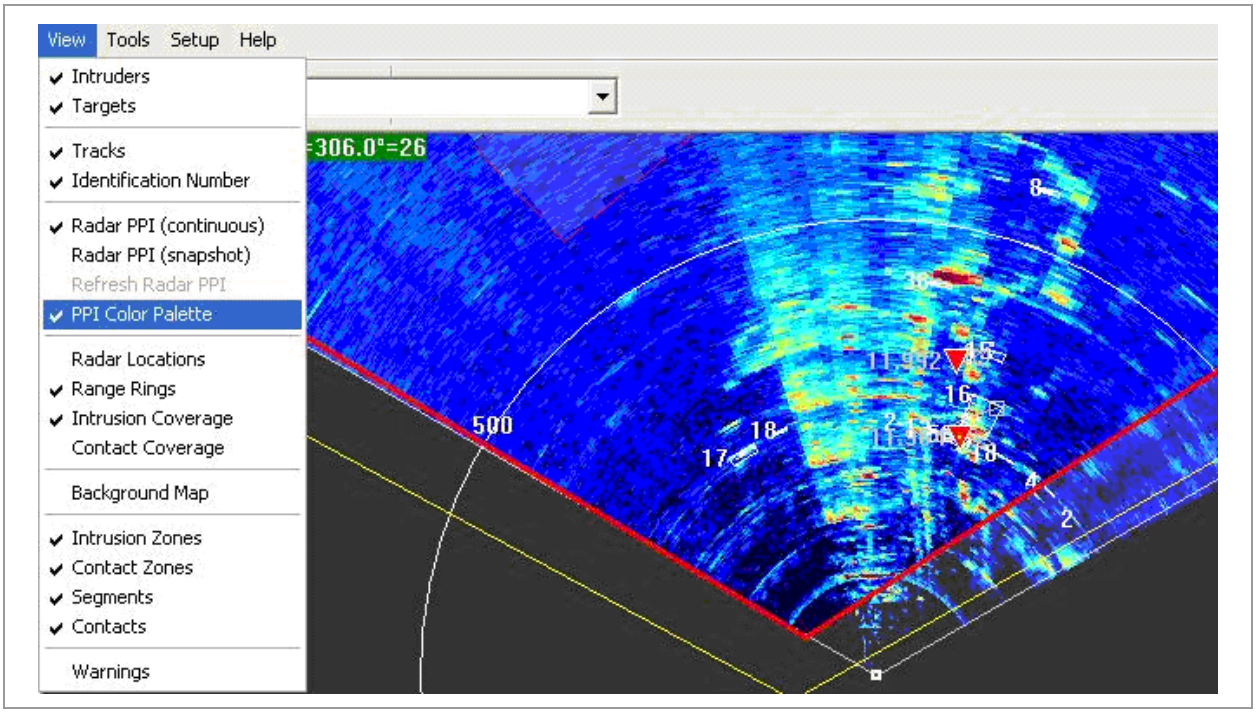

Figure 30 - PPI Color Palette

4.2.3.7 Radar Location

The **Radar Location** command displays a radar icon at the location of the radar currently selected in the left pane of the Radar Console application.

Figure 31 - Radar Location

4.2.3.8 Range Rings

The **Radar Rings** command turns the display of the range rings on or off.

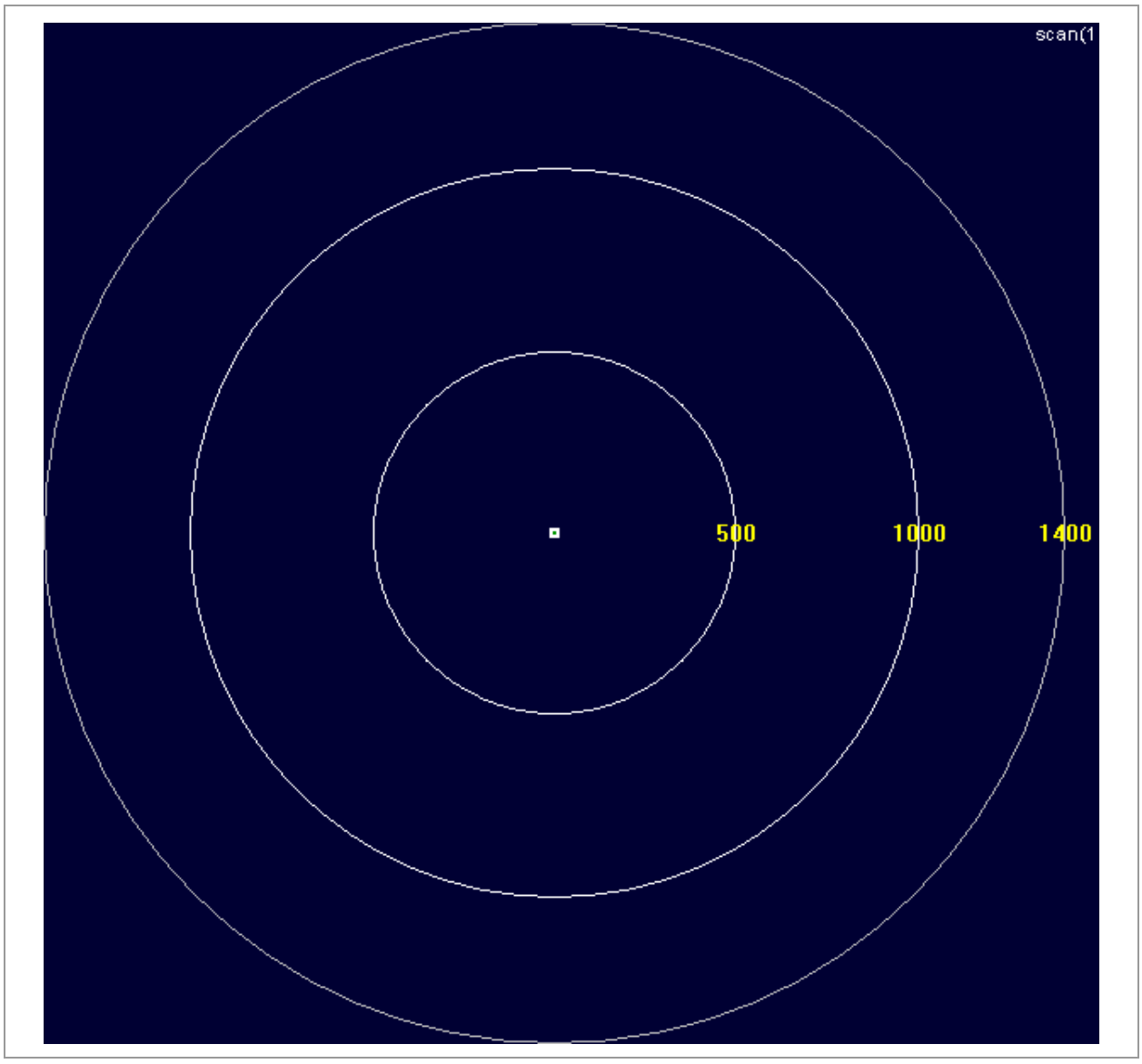

Figure 32 - Range Rings

4.2.3.9 Displaying Zones

When not in edit mode, the intrusion and contact zones display can be enabled or disabled using the appropriate **View Menu** command, as shown in **Figure 33**.

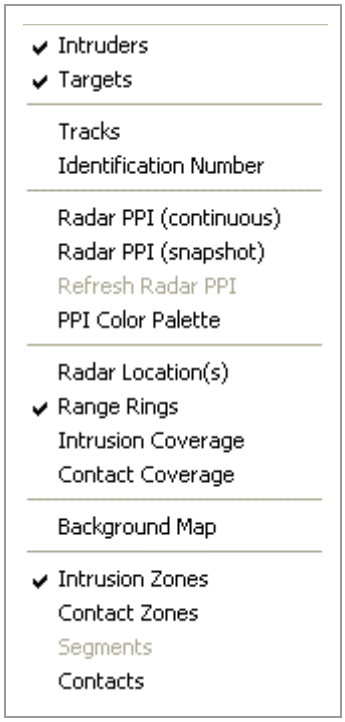

Figure 33 - View Menu Commands

Figure 34 and **Figure 35** show the display of typical **Intrusion** and **Contact** zones.

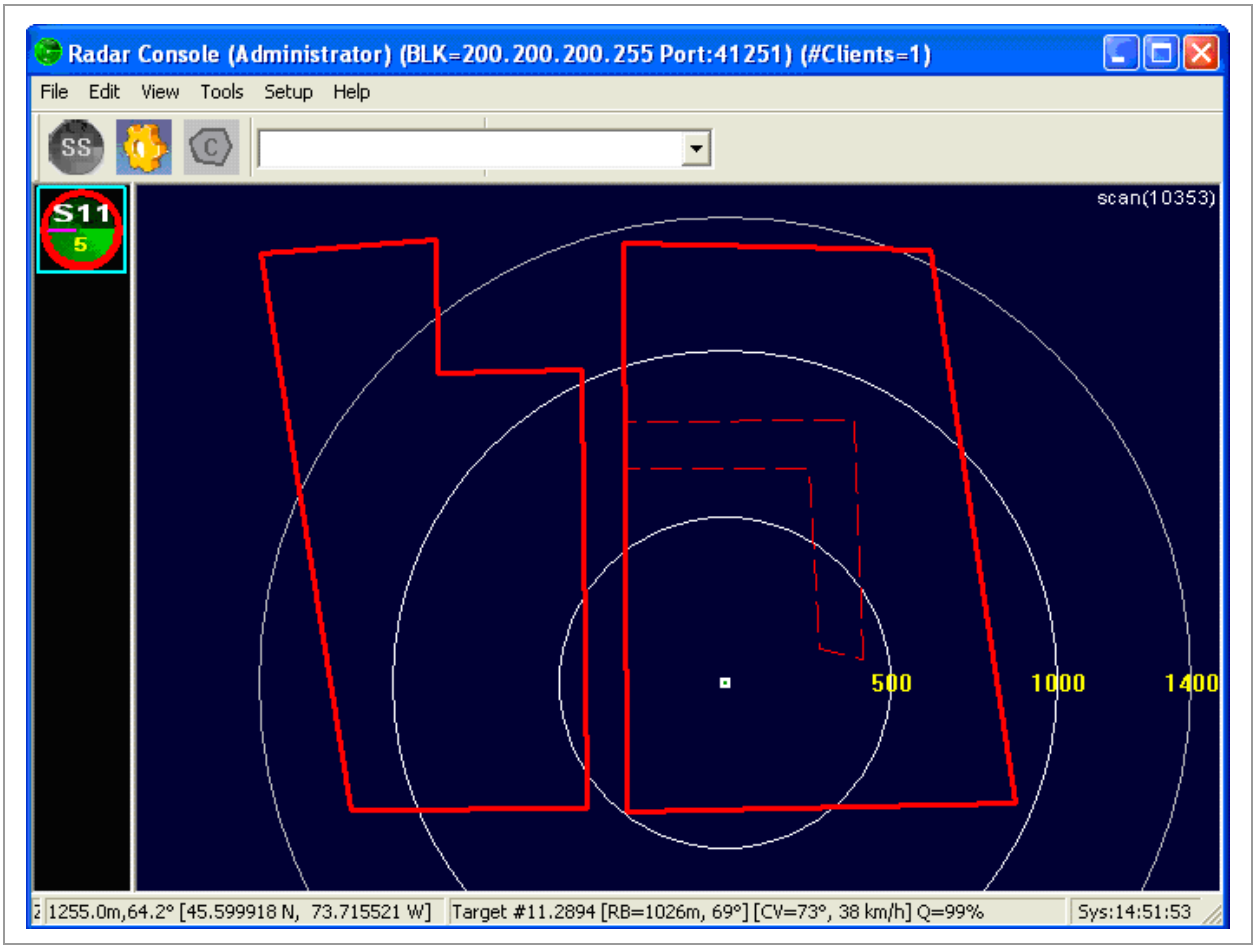

Figure 34 - Intrusion Zones (Red Boundary)

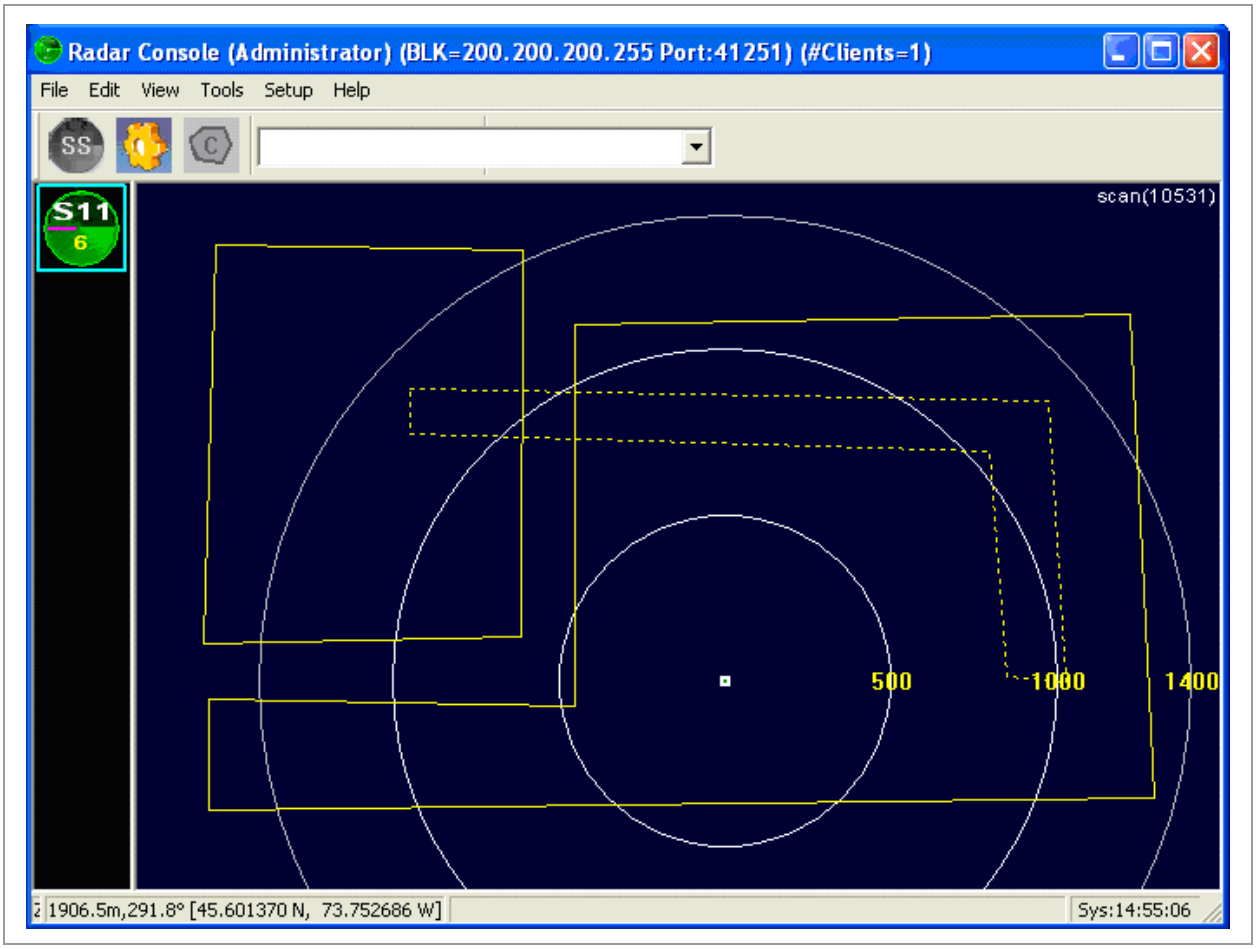

Figure 35 - Intrusion Zones (Yellow Boundary)

The **intrusion zone coverage** is defined as the area covered by the combined intrusion and exclusive intrusion zones. The area in which intruders will be reported is shown in blue. The zone coverage can be

enabled or disabled using the appropriate **View Menu** command, as shown in **Figure 25**. **Figure 36** shows the intrusion zone coverage for the intrusion zones shown in **Figure 34**.

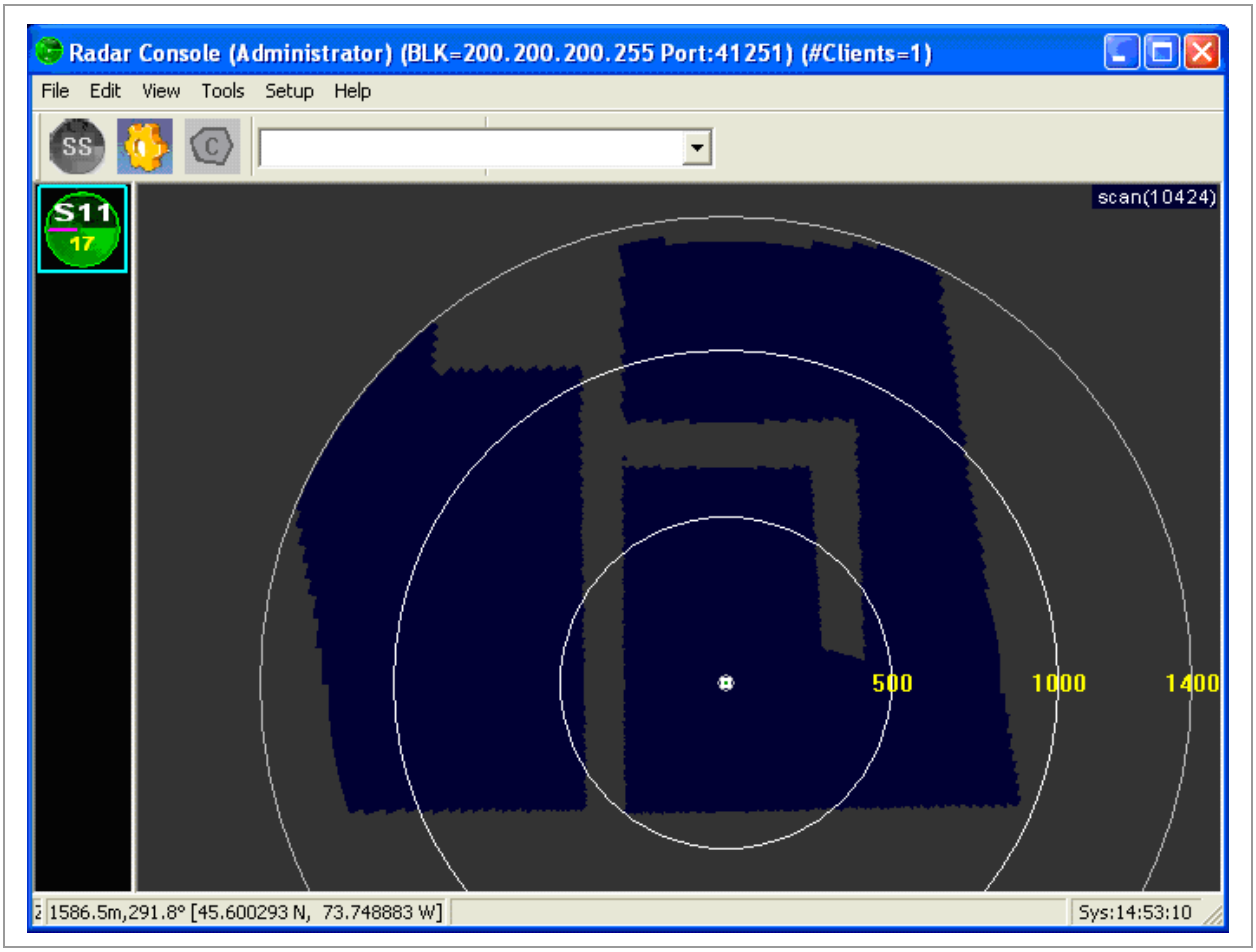

Figure 36 - Intrusion Zones Coverage

The **contact zone coverage** is defined as the area covered by the combined contact and exclusive contact zones. The area in which the radar will look for targets will be displayed in blue. The zone coverage

can be enabled or disabled using the appropriate **View Menu** command, as shown in **Figure 25**.

Figure 37 shows the contact zone coverage for the zones showed in **Figure 35**.

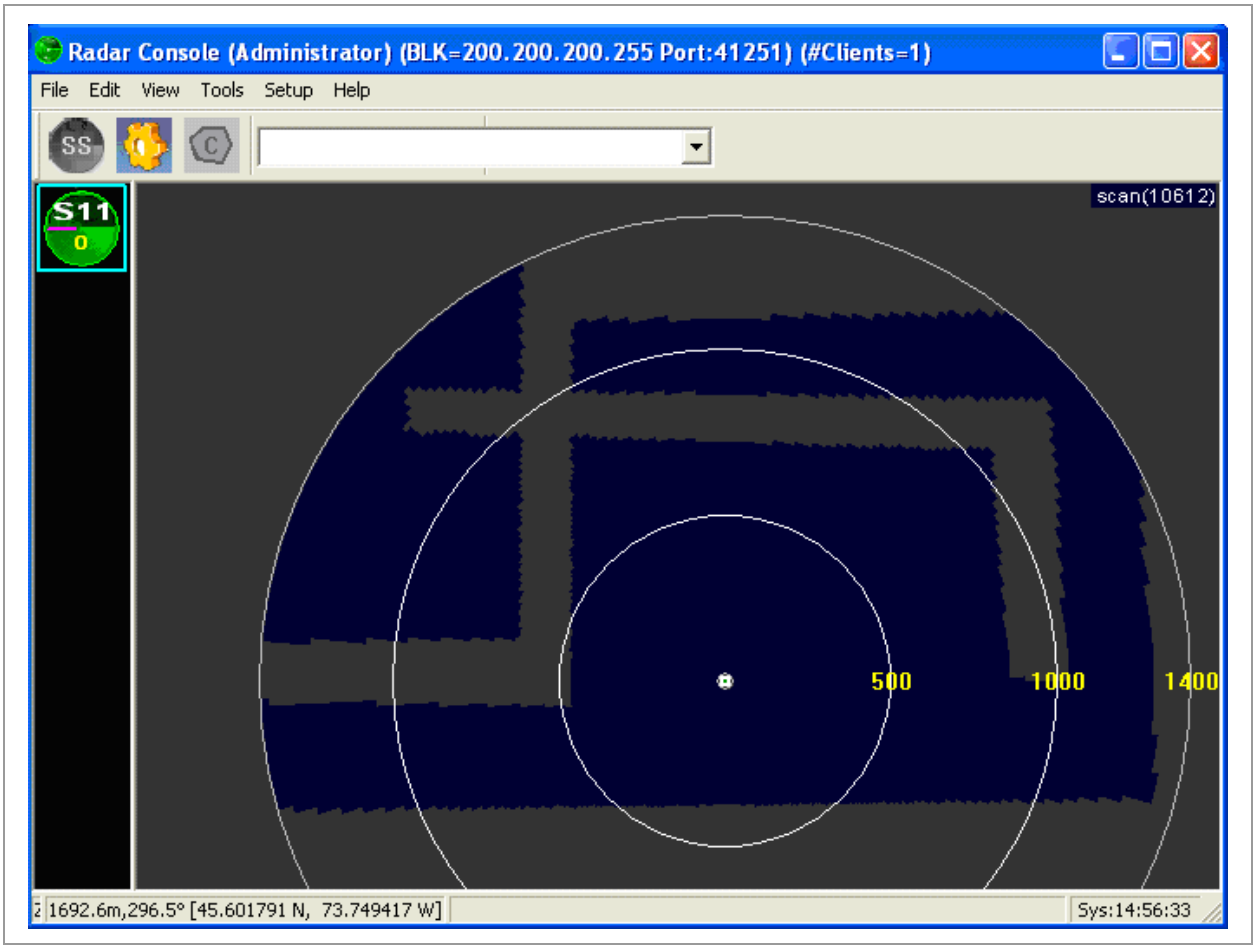

Figure 37 - Contact Zones Coverage

4.2.4 INTRUDERS AND TARGETS

4.2.4.1 Intruder and Target Symbols

An **Intruder** is defined as a radar track detected inside an intrusion zone. A **Target** is defined as a radar track detected inside a contact zone.

The display of intruders and targets is controlled by the **View Menu** - **Intruders and Targets** option.

Intruders and targets are displayed as shown in **Figure 38**. The display of the intruder / target identification number is controlled by the **View Menu** - Identification Number option.

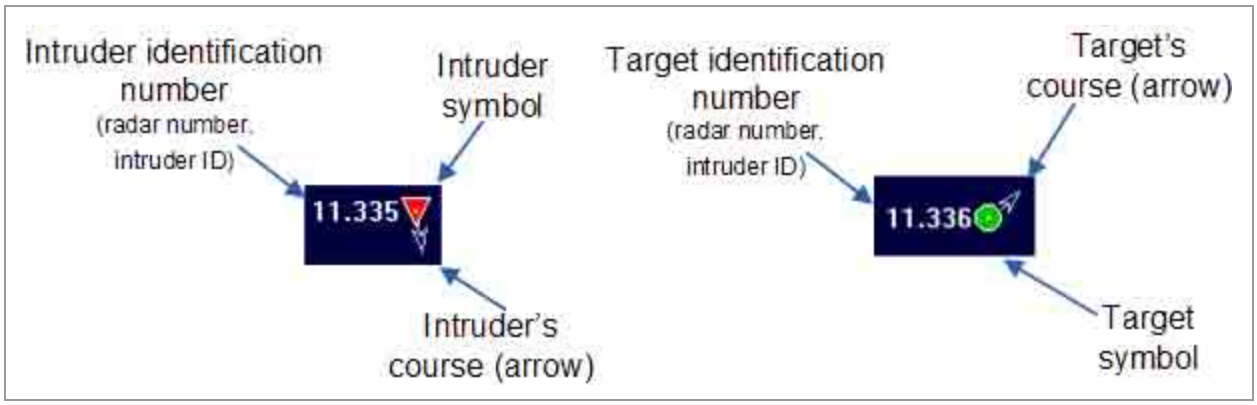

Figure 38 - Description of Intruder and Target Symbols

When an intruder or target is no longer detected, the point in the icon center disappears (e.g. target:). After a few seconds, the symbol changes to . This symbol is then displayed for a configurable period of time before disappearing from the **PPI**. This period is set using the configuration parameters "Target_save_tm" and "Intruder_save_tm".

4.2.4.2 Intruder And Target Tracks

An **Intruder** or **Target Track** is the trace of the intruder's or target's position over a period of time in the past. The period during which the track history is recorded is set by the configuration parameter "Target_hist_tm" and the distance interval at which the track position is recorded is configured by the configuration parameter "target_hist_int"

The display of tracks is controlled by the **View Menu Tracks** command.

Hovering the mouse cursor over an intruder or track symbol will display the following information:

- Type (intruder / target)
- Identification number
- Range
- Bearing
- Course
- Speed
- Quality

The information is continuously updated at the bottom of the **PPI** as shown in **Figure 39**. It continues to be displayed until the target no longer exists.

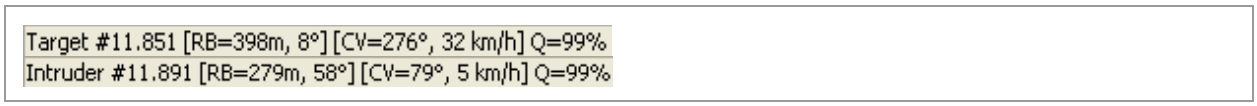

Figure 39 - Selected Intruder / Target Status Line Information

There are two alternate ways to **display** intruders and targets information: the **List View** and the **Tree View**. They are enabled via the **Tools** menu **Targets/Intruders List View** (**Figure 40**) and **Targets/Intruders Tree View** (**Figure 41**) commands.

In the **Targets/Intruders List View,** left clicking with the mouse on any column will sort the targets and intruders based on the selected column. This view is limited to a total of twelve (12) targets and intruders. If there are more, they won't be listed in this view. For a complete view, use the **Targets/Intruders Tree View** (**Figure 41**).

Active targets display dialog (All Units)

	Id	Range (m)	Bearing (deg)	Course (deg)	Velocity (km/h)	Latitude	Longitude
1	11.924	1380	338	5	11	45.606535	-73.736546
2	11.926	414	337	290	6	45.598427	-73.732069
3	11.927	1084	33	30	5	45.603178	-73.722433
4	11.928	357	66	91	4	45.596328	-73.725839
5	11.929	582	31	261	9	45.599486	-73.726161
6	11.944	1272	69	15	7	45.599070	-73.714762
7	11.946	305	294	66	1	45.596112	-73.733574
8	11.953	164	49	276	11	45.595971	-73.728413
9	11.959	364	292	40	5	45.596230	-73.734325
10	11.964	1082	21	21	35	45.604069	-73.724962
11	11.969	168	47	17	0	45.596033	-73.728422
12	11.975	1013	289	251	70	45.598028	-73.742241

Figure 40 - Targets/Intruders List View

The Tree View format is the same as presented at the bottom of the PPI.

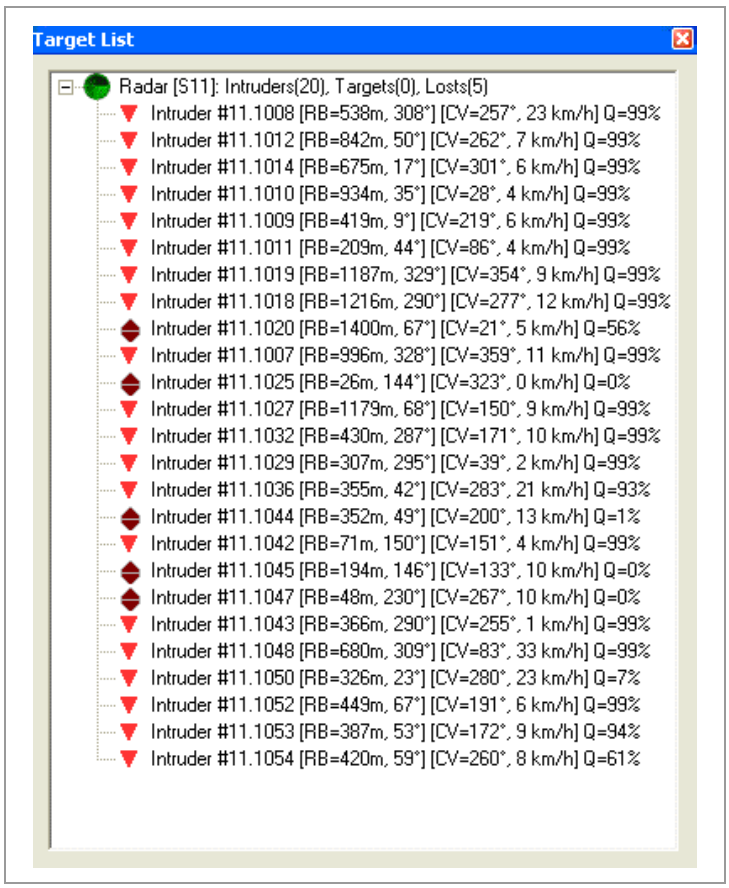

Figure 41 - Targets / Intruders Tree View

4.2.4.3 Contacts

Radar contacts are low level detections that eventually become targets and intruders.

Display of contacts is enabled and disabled using the **View Menu Contacts** command.

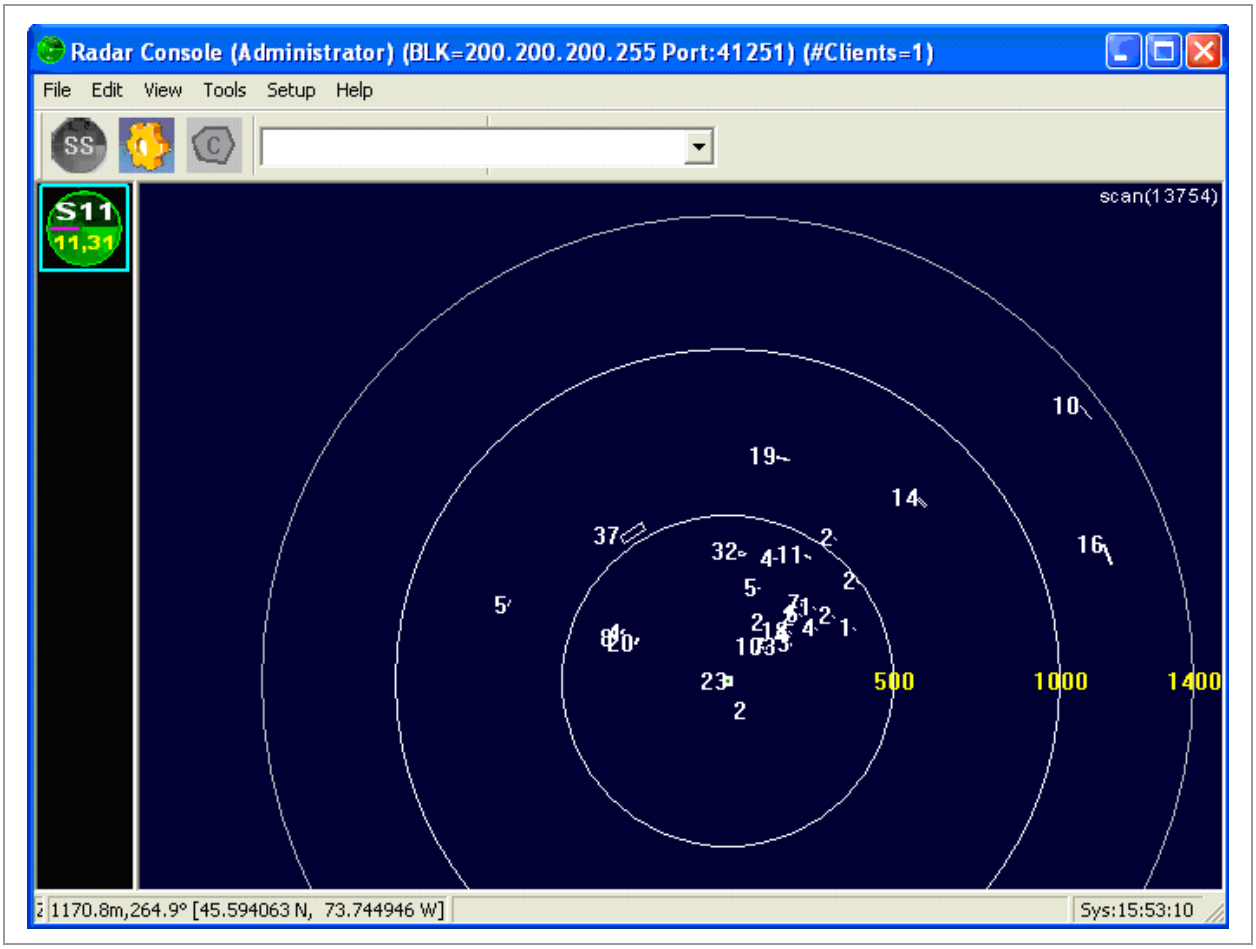

Figure 42 - Radar Contacts

4.2.4.4 AXML Output

The Amphitech **eXtensible Markup Language (AXML)** is an output format following the XML standard.

This output is used to communicate with the **ICx Cameleon© Command & Control software**, or other third-party applications.

4.2.4.5 ICD-0100 Output

The PSR system can output ICD-0100 data. Please refer to the ICD-0100 Operator's Manual for information on configuration and use of the ICD-0100 data link.

4.2.5 Recording Data

4.2.5.1 Recording Intruders and Targets Data

The **Recording of Intruders and Targets Data** is enabled and disabled by **right clicking** on the radar icon and selecting **Record Targets/Intruders Log (Server)**, as shown in **Figure 43**. When enabled, a log file is created by the Radar Server application.

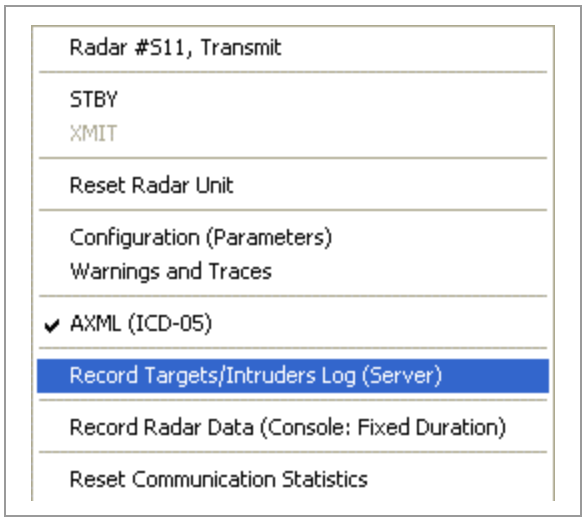

Figure 43 - Record Targets/Intruders Log Command

The Radar Server creates **log files** with the following format 2009.01.23 Radar #XX Targets Logs.txt, where #XX is the radar identification number. **Figure 44** shows an example of a targets/intruders log file.

```
2009.01.23 13:19:33.574 LOG ************************   NEW RECORDING SESSION   ************************
2009.01.23 13:19:34.793   11   1294 + new  X Intruder # 11.01294 [RB= 943m, 292°] [CV=298°,  14 km/h] Q= 99% [45.598118 N,  73.741237 W]
2009.01.23 13:19:36.871   11   1305 + new  X Intruder # 11.01305 [RB= 158m,  16°] [CV= 89°,   5 km/h] Q= 99% [45.596365 N,  73.729448 W]
2009.01.23 13:19:36.871   11   1308 + new  X Intruder # 11.01308 [RB= 158m, 148°] [CV=146°,  24 km/h] Q= 99% [45.593788 N,  73.728938 W]
2009.01.23 13:19:38.105   11   1297 + new  X Intruder # 11.01297 [RB= 613m,  28°] [CV=334°,   7 km/h] Q= 99% [45.599871 N,  73.726317 W]
2009.01.23 13:19:38.105   11   1299 + new  X Intruder # 11.01299 [RB= 996m,  54°] [CV=254°,   9 km/h] Q= 99% [45.600218 N,  73.719630 W]
2009.01.23 13:19:39.043   11   1293 + new  X Intruder # 11.01293 [RB= 841m,  36°] [CV= 15°,   6 km/h] Q= 99% [45.601091 N,  73.723611 W]
2009.01.23 13:19:39.043   11   1295 + new  X Intruder # 11.01295 [RB=1059m, 322°] [CV= 36°,  11 km/h] Q= 99% [45.602506 N,  73.736360 W]
2009.01.23 13:19:39.043   11   1296 + new  X Intruder # 11.01296 [RB= 518m,  17°] [CV=230°,   5 km/h] Q= 99% [45.599461 N,  73.728098 W]
2009.01.23 13:19:42.262   11   1292 + new  X Intruder # 11.01292 [RB= 805m, 320°] [CV=  3°,  13 km/h] Q= 99% [45.600521 N,  73.736670 W]
2009.01.23 13:19:42.262   11   1306 + new  X Intruder # 11.01306 [RB= 428m,  30°] [CV=280°,  38 km/h] Q= 99% [45.598334 N,  73.727259 W]
2009.01.23 13:19:42.262   11   1310 + new  X Intruder # 11.01310 [RB= 135m, 148°] [CV=328°,  16 km/h] Q= 99% [45.593974 N,  73.729085 W]
2009.01.23 13:19:44.371 LOG ************************ CLOSING RECORDING SESSION ************************
```

Figure 44 - Targets/Intruders Log File Example

4.2.5.2 Recording Radar Data

The **Recording of Radar Data** is enabled and disabled by **right clicking** on the radar icon and selecting **Record Radar Data (Console: Fixed Duration)**, as shown in **Figure 45**.

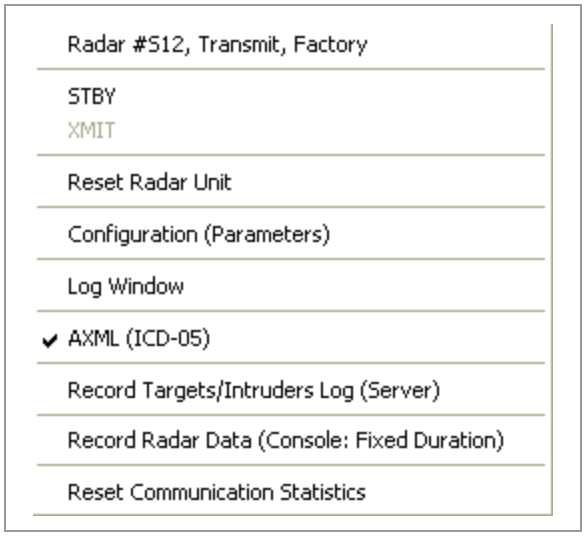

Figure 45 - Record Radar Data Menu

When selecting the command **Record Radar Data (Console: Fixed Duration)**, the user will be prompted to enter duration for the recording (from 1 to 60 minutes). The recording of radar data may be required during the radar installation phase, in order to allow **ICx Radar Systems** to assist a customer in establishing an optimal radar configuration.

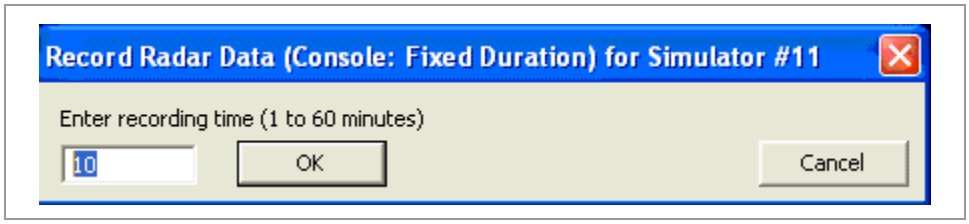

Figure 46 - Record Radar Data Duration

4.2.5.3 Radar Control: STBY / XMIT Commands

The radar is set in **transmission** and **standby** mode by **right clicking** with the mouse on the desired radar icon, and **selecting** STBY (standby) or XMIT (transmit). **Figure 47** shows the menu used for **Standby and Transmit** commands.

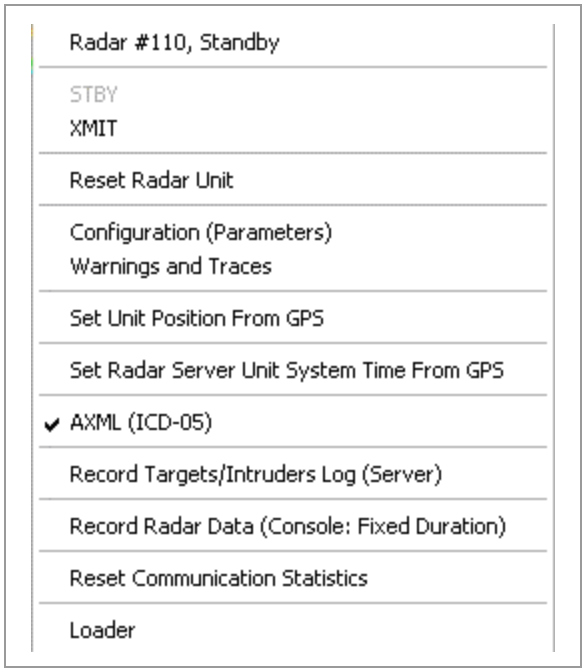

Figure 47 - Radar Standby and Transmit Commands

The **Reset Radar Unit** command is used to reset the radar. This command is accessed the same way as **Standby and Transmit** commands (see **Figure 47**). During the reset (approximately 30 seconds), the radar will not transmit RF energy or detect targets.

The **Loader** command is used to load new radar firmware. When this command is selected, the user will be prompt to select the radar firmware file (see **Figure 47**).

4.2.6 Radar Operations

4.2.6.1 Set Unit Position from GPS

When a radar unit is equipped with a **GPS** receiver, it is possible to set its position using the **GPS** position. Radar assemblies version 2.0 or more are equipped with a **GPS** receiver. Refer to section 3.1.2 to determine the radar assembly version. To set the position, right click with the mouse on the radar icon and select the **Set Unit Position from GPS** command.

NOTE: The longer the user waits before setting the GPS position, the better the precision will be on the radar position, as the radar continually averages the GPS position an accurate value. ICx Radar Systems recommends a wait of 24 hours in order to obtain good precision.

4.2.6.2 Reset Communication Statistics

The radar communication statistics information can be reset by right clicking with the mouse on the radar icon and selecting the **Reset Communication Statistics** command.

4.2.6.3 Log

The **Log** window shows a list of all warnings and traces associated with a radar. This window is shown either by pressing the "**w**" keyboard key or by right clicking on the radar icon and selecting the **Log** command (see **Figure 48**). Each entry has a date, time and a type ([T] for trace and [W] for warning) associated with it.

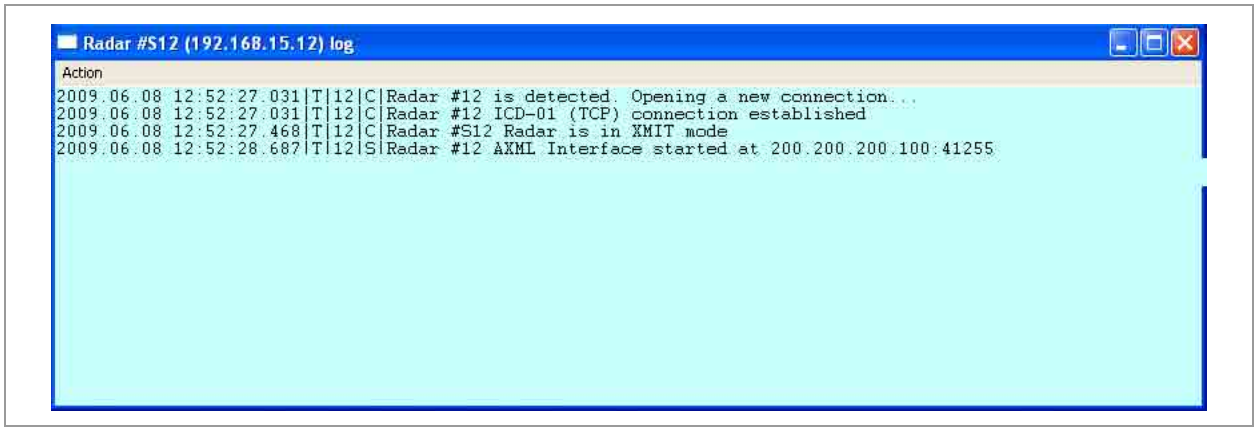

Figure 48 - Logs Window

The **Radar Console** application generates logs files. These files are located in the directory specified by the **Set Logs Directory (Console)** command from the Setup menu, as shown in **Figure 49**.

Figure 49 - Setup Menu

There is a **log file** for each connected radar, and the **filename** includes the radar's serial number. **Figure 50** shows a logs file example. Each entry contains the date, the time, a type ([T] for trace and [W] for warning) and a message.

```
2009.01.23 09:12:02.495 ************************ NEW SESSION ************************
2009.01.23 09:12:02.495 [T] C|Radar #11 is detected. Opening a new connection...
2009.01.23 09:12:02.557 [T] C|Radar #11 ICD-01 (TCP) connection established
2009.01.23 09:12:03.541 [T] C|Radar #S11 Radar is in XMIT mode
```

Figure 50 - Logs File Example

4.2.7 Radar Configuration Parameters

Radar Configuration Parameters control various aspects of the radar operation. There are four (4) groups of configuration parameters.

Group	Description
Base Link	Contains the radar identification and communication parameters.
Current	Contains the set of parameters that are currently used.
Default	Contains the default set of parameters.
Factory	Contains the factory set of parameters.

Table 8 - Configuration Parameters Groups

4.2.7.1 Parameters Access

Depending on the login level, only certain parameters can be modified by the operator, as shown in **Table 9**. In the Function column, the parameter description and parameter name are shown.

Menu Item	Parameter Name	Operator	Administrator
Base Link	ID		✓
	IP		✓

Table 9 - Radar Configuration Parameters Access vs. Login Level

Menu Item	Parameter Name	Operator	Administrator
Param: Radar Setup	Sync_method		✓
	Chirp_slot		✓
	Azimuth_offset		✓
	Pos_lt		✓
	Pos_lg		✓
	Elevation		✓
	Height		✓
	Tilt		✓
	TX_sector_1_start_cw TX_sector_1_stop_cw		✓
	TX_sector_2_start_cw TX_sector_2_stop_cw		✓
	Range_index		✓
	Data_link_speed		✓
	GPS_averaging		✓
Param: Tracker Setup	Contact_zone_gap		✓
	Target_hist_tm		✓
	Target_hist_int		✓
	Target_save_tm		✓
	Intruder_save_tm		✓
Param: Detection Module	RD_target_up_az		✓

Table 9 - Radar Configuration Parameters Access vs. Login Level (Continued)

4.2.7.2 Parameters Description

Parameter Name	Description
ID	Radar identification number. Can be any number between 1 and 999
IP	Radar IP address. Refer to the installation manual to determine how to set this value properly.

Table 10 - Configuration Parameters Description

Parameter Name	Description
Sync_method	Synchronization method and chirp slot used. Refer to the Installation Manual to determine the appropriate synchronization method and time slot. Synchronization methods are: 0 (none) 1 (manual, chirp slots [0..3]) 2 (GPS, chirp slots [0..7])
Chirp_slot	
Azimuth_offset	Azimuth offset value of the unit. Refer to the installation manual to determine the azimuth offset.
Pos_lt	Radar location. The radar installation manual describes methods to obtain the radar location.
Pos_lg	
Elevation	
Height	Radar installation height above ground.
Tilt	Tilt angle value of the antenna. Refer to the installation manual for instructions on how to optimize the antenna tilt angle for a given environment.
TX_sector_1_start_cw TX_sector_1_stop_cw	Transmit sectors 1 and 2 start and stop values. Refer to the Installation Manual to set the number of transmit sectors (1 or 2), and their positions.
TX_sector_2_start_cw TX_sector_2_stop_cw	
Range_index	Allows to change the radar range between 700, 1400 and 2800 meters.
Data_link_speed	Maximum data link speed between the radar and the Radar Server application. This optional parameter can be set to optimize PPI data transfer on a slow wireless network.
GPS_averaging	If set, and if unit is equipped with a GPS receiver, average the GPS position to determine the unit location. This does not affect unit's position but starts GPS position averaging computation. GPS position on unit status is display as [AVG] when computation is completed.
Contact_zone_gap	When this parameter has a value of -1, detection zones are independent of the intrusion zones. When this parameter is non zero, the user cannot edit detection zones as they are automatically managed by the system. The system will automatically create detection zones around the intrusion zones, with the size determined by the value of the zone gap parameter.
Target_hist_tm	Length of time in the past to keep a track's trajectory. This parameter only affects PPI display and not XML data output.

Table 10 - Configuration Parameters Description (Continued)

Parameter Name	Description
Target_hist_int	Interval at which a track position is recorded. This parameter only affects PPI display and not XML data output.
Target_save_tm	Length of time during which lost targets are displayed on the PPI.
Intruder_save_tm	Length of time during which lost intruders are displayed on the PPI.
RD_target_up_az	Radar scan start azimuth angle. Refer to the installation manual to determine the optimum update azimuth.

Table 10 - Configuration Parameters Description (Continued)

4.2.7.3 Parameter Operations

To access the **Radar Configuration Parameters**, either right click with the mouse on the radar icon and select the Configuration (Parameters) option (see **Figure 51**), or select the  icon. The parameters will appear as follows.

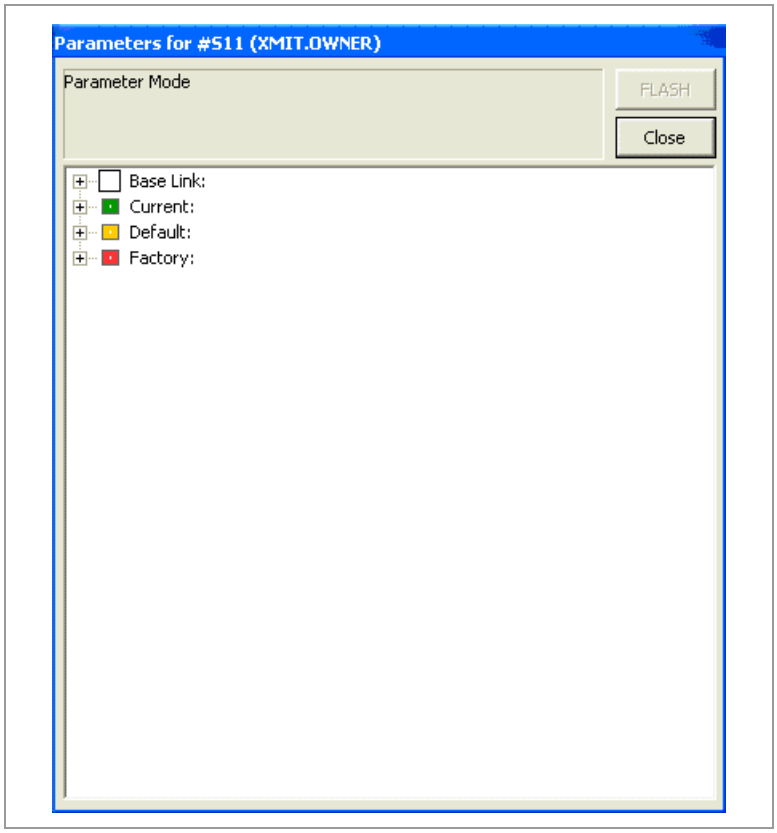

Figure 51 - Parameters Window

Each parameter can be modified by opening the parameter group, then sub-group (if applicable) and typing the new value, as shown in **Figure 52**.

NOTE: The parameters from the Base Link group cannot be modified at the same time as parameters from other groups. Since they cause a reset, other changes would be lost.

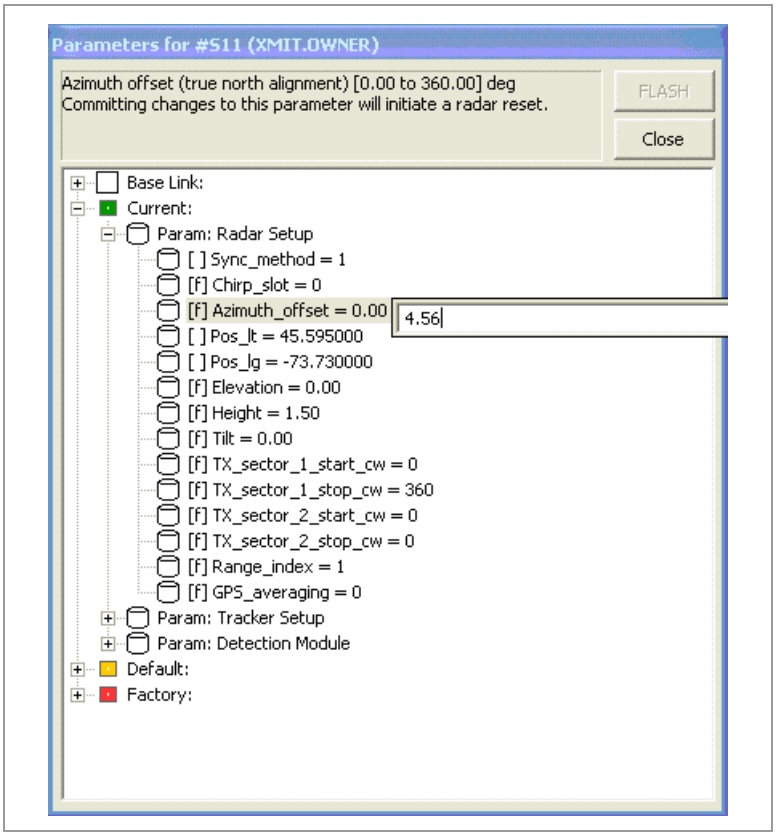

Figure 52 - Changing Parameters Values

Once the new value is entered, the user presses **enter**. When all the parameter values have been changed, the values must be programmed in the unit by pressing the FLASH button, or by **right clicking** on the parameter group and selecting the "**Send changes to the unit (FLASH)**" command.

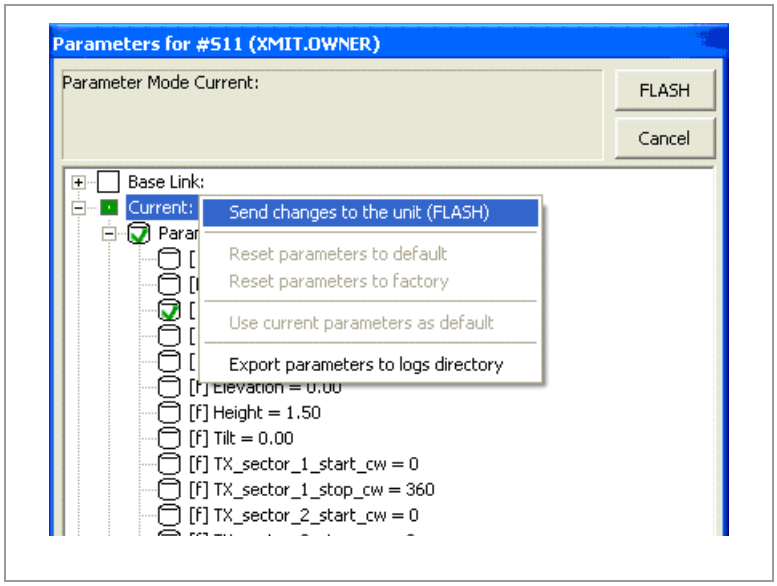

Figure 53 - Programming Unit Parameters

When **right clicking** on the **Current Parameters** group, commands are displayed (as shown in **Figure 54**). These commands allow to:

- Set the current parameters as the default ones
- Set the current parameters to the default values
- Set the current parameters to the factory values

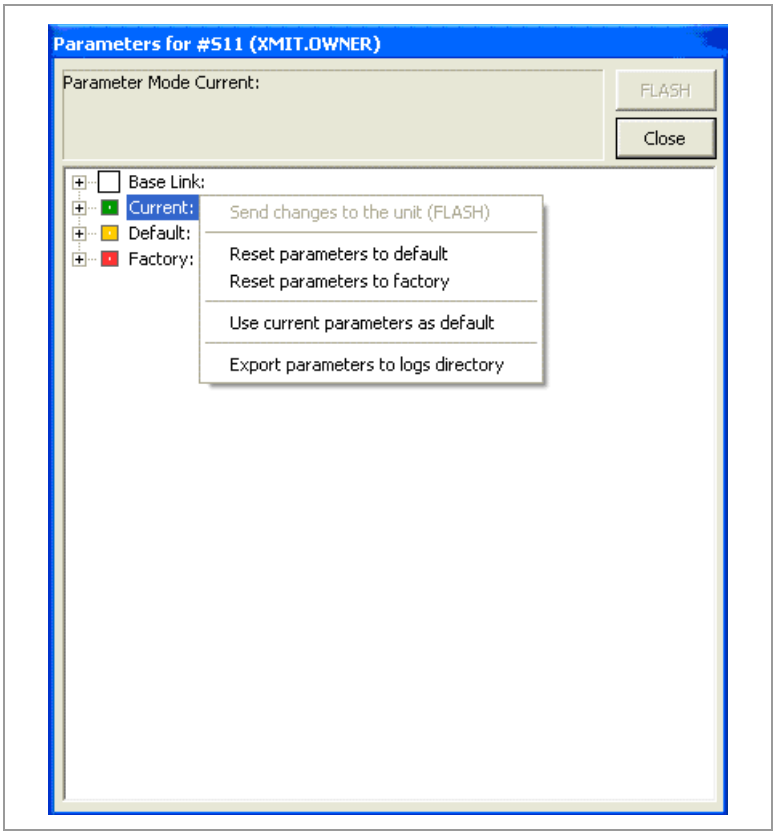

Figure 54 - Current Parameter Group Commands

When **right clicking** on the **Default Parameters** group, commands are displayed, as shown in **Figure 54**. These commands allow to:

- Restore the default parameters to the factory values.

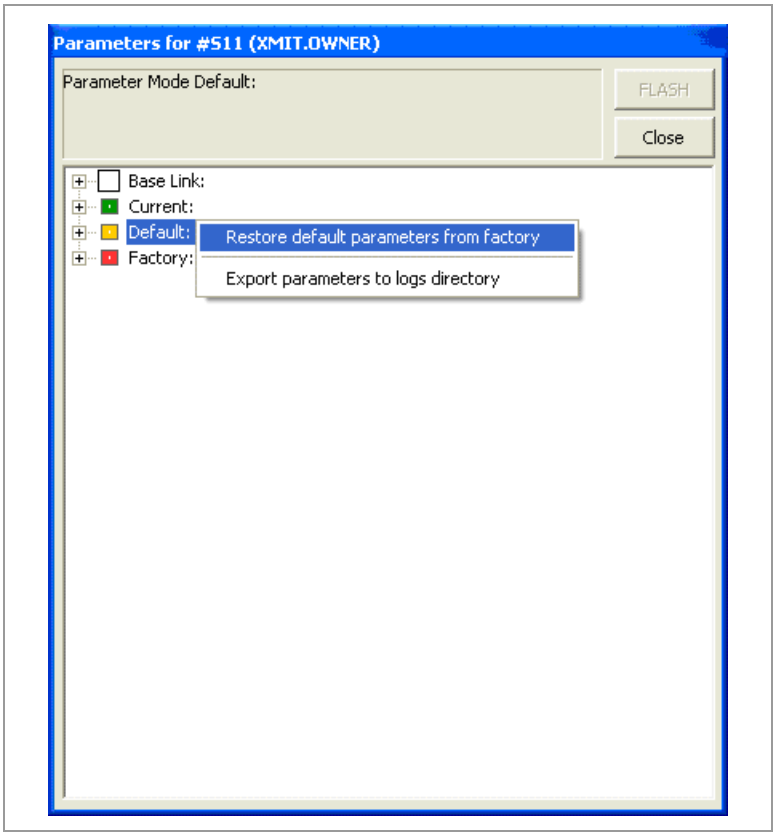

Figure 55 - Default Parameter Group Commands

4.2.7.4 Exporting Radar Parameters

The **Export Parameters to Logs Directory** command is used to save the configuration parameters of a radar after it has been properly configured. If a radar needs to be replaced, this information can be used to configure the new unit.

To Export Parameters:

Step 1: In Radar Console **log** in as Operator or Administrator

Step 2: In Radar Console, **select** a radar and **right click** on it. **Select** Radar Configuration (**Figure 56**)

Step 3: **Select** Current (**Figure 57**)

Step 4: **Left click** on Current (**Figure 58**)

Step 5: Select **Export** parameters to logs directory (**Figure 58**)

Step 6: Click on **Save (Figure 59)**

Step 7: Click on **Close**

Step 8: **Repeat** steps 2 - 7 for each radar

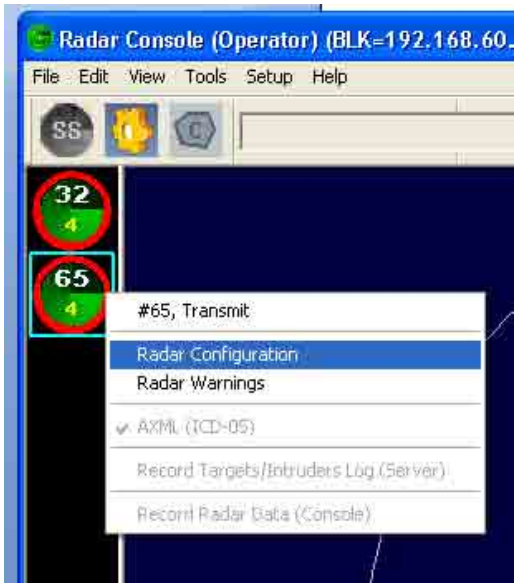

Figure 56 - Exporting Radar Parameters (Step 2)

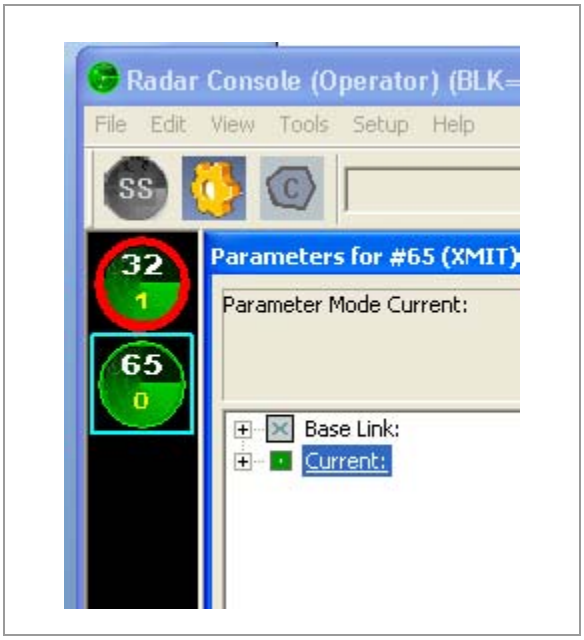

Figure 57 - Exporting Radar Parameters (Step 3)

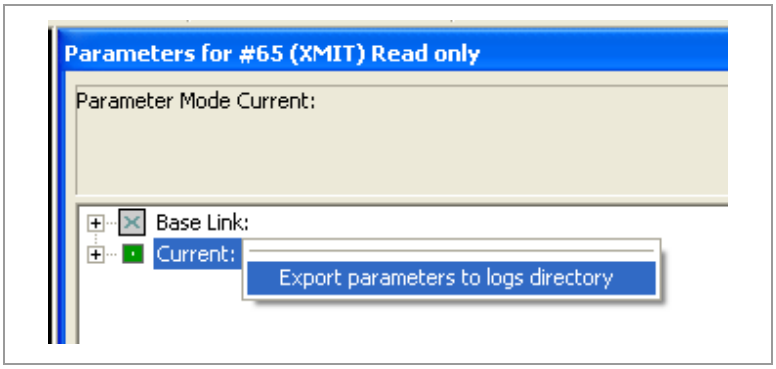

Figure 58 - Exporting Radar Parameters (Steps 4 & 5)

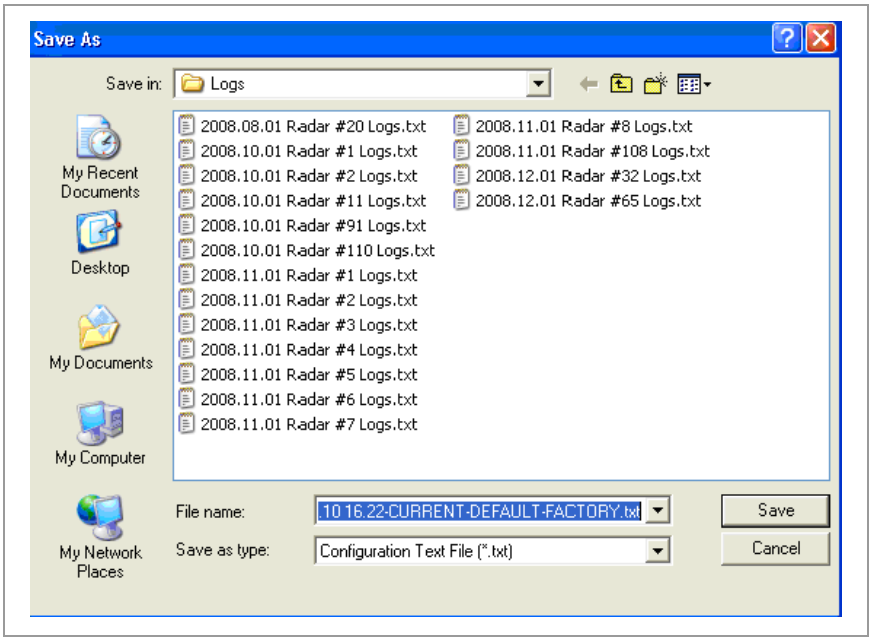

Figure 59 - Exporting Radar Parameters (Step 6)

NOTE: These parameters are archived with other log files when using the *PSRSystem_zip_logs* command from the *Tools* folder of the ICX Radar Systems start menu.

5 TROUBLESHOOTING

In the event of a radar failure, follow this procedure:

Step 1: Try re-initializing the system

Step 2: If the error persists, gather the following information:

- Physical installation
- Network topology
- Software version
- Radar serial number
- Conditions under which the error occurred
- Any relevant application/system logs

Step 3: Contact Customer Support

Step 4: If you need to leave a message, leave a clear contact name and number as well as date and time reporting this support call. ICx will return your call shortly.