Ranger® R Series Radars

Mid-Range Perimeter Surveillance Radar Operator Manual

R1, R2, R3, R3D, R5, R5D, R4SS-X, R6SS-X, R8SS-X & R20SS

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- If possible, the serial number of the product
- A description of the problem/issue
- Data recordings and/or log files, if available
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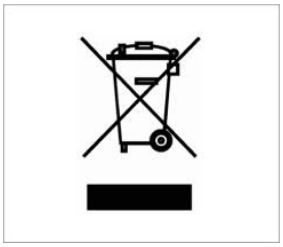

DISPOSAL

Dispose in accordance with the laws and regulations applicable in your jurisdiction.

REVISION RECORD TABLE

Manual Revision	ECO #	Pages	Description of Modification
1.0	13-008	All	PSR Software Version 6.1.0
2.0		All	Insertion of ITAR statement
3.0	14-001	All	Add "FLIR Proprietary Information" to footer
4.0	16-025	All	Added information for R6SS and R6SS-U
5.0	18-010	All	Added 3D, updated R6 variants
6.0	18-016	11, 12	Corrected safety distances Added note for camera connector of 777 PT

The following symbols are used throughout this document:

Caution!
The CAUTION symbol is used to alert the reader to situations where a hazard to personnel safety may arise.

WARNING!

The WARNING symbol is used to alert the reader to situations where equipment damage is imminent if a recommended process is not followed or alert the reader of a process that will alter or reset current configuration of a specific setup.

DANGER!

The DANGER symbol is used to alert the reader to situations where a hazard to personnel may result in serious injury possibly leading to death.

Disclaimer!
Disclaimers provide a means of specifying limitations or other requirements on equipment.

Note
Notes comprise additional information to assist the reader in the use or understanding of the equipment or subject.

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
Doppler	Doppler effect. Also refers to Doppler radar operation mode, where target speed is used to reject fixed clutter.
FastScan	Non-Doppler scanning mode featuring a fast update rate
FCC	Federal Communications Commission (usually refers to the US agency)
FMCW	Frequency Modulated Continuous Wave
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
V_{DC}	Volts of Direct Current
XML	Extensible Markup Language

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1 INTRODUCTION

This manual describes the Perimeter Surveillance Radar (PSR) system operation. The Operator Manual is intended for an audience of technically qualified personnel. For installation and configuration of the radar system, or for more advanced functions, please refer to the installation manual of your specific radar.

Note
Please note that the generic product name "radar" is used throughout this manual for ease of reading. The given information is valid for products Ranger R1, R2, R3, R3D, R5, R5D, R4SS-X, R6SS-X, R8SS-X and R20SS unless noted otherwise. Also, the -X in R4SS-X, R6SS-X and R8SS-X refers to the 3 possible variants of each radar, for example R6SS-X can refer to R6SS, R6SS-U or R6SS-3D.

1.1 SAFETY ISSUES

This equipment generates Radio Frequency energy and is intended for outdoor installations only. Based on limits specified by the Federal Communication Commission (FCC) on Radio Frequency (RF) Emissions, findings from tests conducted conclude that the R1, R2, R3, R3D, R5, R5D, R4SS-X, R6SS-X, R8SS-X and R20SS do not represent any safety hazards and are therefore safe for human exposure, provided the following conditions are met:

Caution!
The installation must provide a separation distance from all persons and must not be co-located or operated in conjunction with any other antennas or transmitters. This safety distance complies with the FCC Limits for Maximum Permissible Exposure (MPE) for general population / uncontrolled exposure.

Safety Distances				
	Output Power	Frequency Band	FCC MPE distance (cm)	
			Controlled Exposure	General Population
R20SS (921-0041-00-R0X)	25 Watts	X	170	400
R20SS (921-0041-22-R0X) R20SS (921-0041-23-R0X)	25 Watts	X	170	400
R20SS (921-0041-30-R0X)	8 Watts	X	90	200
R4SS, R6SS, R8SS (921-0071-XX-R0X)	2/8/25 Watts	X	50 / 90 / 170	100 / 200 / 400
R4SS-U/3D, R6SS-U/3D, R8SS-U/3D (921-0071-XX-R0X)	2/8/25 Watts	X	25 / 40 / 80	45 / 80 / 180
R1,R2,R3, R3D (921-0011-06-R0X)	0.8 Watt	Ka	22	22
R3D (921-0011-06-R06) (Doppler)	0.8 Watt	Ka	22	22
R5 (921-0031-01-R07)	0.56 Watt	Ka	10	20

R5D (921-0031-02-R04) (FastScan)	0.56 Watt	Ka	13	28
R5D (921-0031-02-R04) (Doppler)	0.56 Watt	Ka	25	55

Note: theses distances are for guidance only

DISPOSAL

This product contains a lithium battery. Dispose in accordance with the laws and regulations applicable in your jurisdiction.

WARNING!

The R4SS-X/R6SS-X/R8SS-X/R20SS pan/tilt positioner contains moving parts that can pinch fingers and/or other body parts. Use caution when the pan/tilt positioner is powered on.

WARNING!

When using pan/tilt positioner 960-0037-00, ensure that the camera connector is connected to a cable or properly capped, to prevent water ingress into the unit.

2 PSR SYSTEM OPERATION

This section covers the operation of the PSR Radar System using the **Radar Console Application**.

For details on how to perform radar installation, please refer to the installation manual of your specific radar. For details on how to perform radar configuration, please refer to the Configuration Manual.

WARNING!

All the FLIR radars are intended for outdoor use only. Operating the radars inside, where there is no sufficient air movement, may result in the radar overheating and generating an error.

2.1 RADAR APPLICATION MANAGER

The Radar Application Manager is typically used to start other application including the Radar Console. For details on how to configure Radar Application Manager to monitor specific applications, please refer to the Configuration Manual.

Figure 1 shows the Radar Application Manager main window. The following sections describe each element.

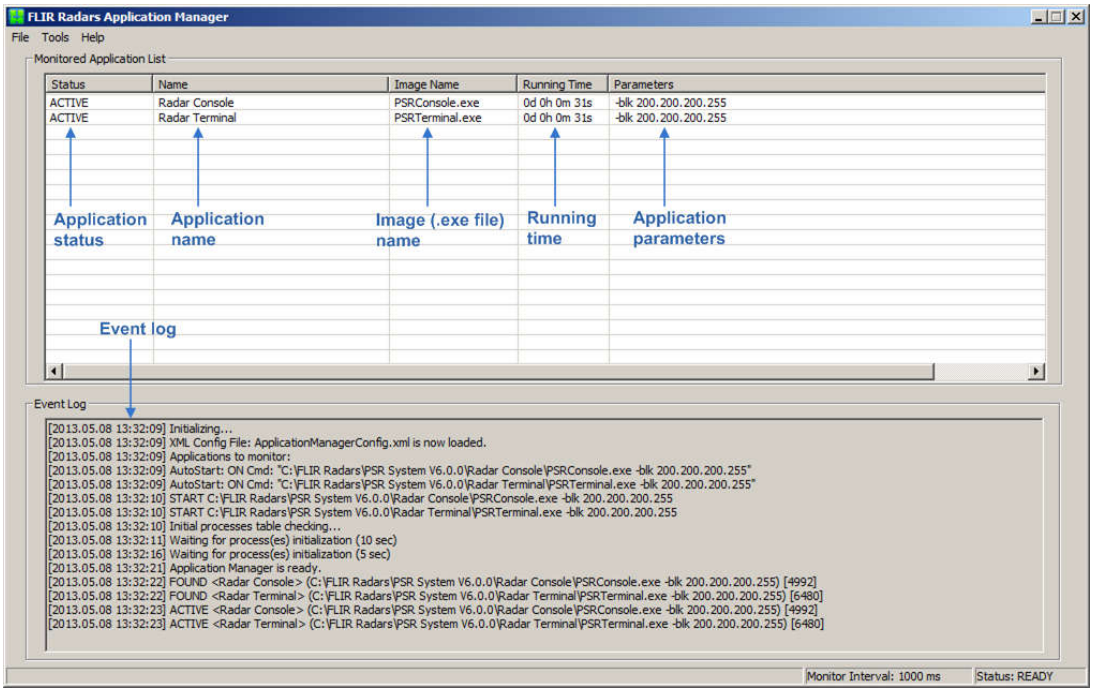

Figure 1 - Radar Application Manager Main Window

2.1.1 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 closes or hangs, the Application Manager will not re-start it. When either application with a status of ACTIVE or UNLINK closes or hangs, its status changes to TIMEOUT.

2.1.2 Application Name

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

2.1.3 Image Name

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

2.1.4 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. Also, this value is reset to zero every day at midnight.

2.1.5 Application Parameters

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

2.1.6 Event Log Window

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

2.2 RADAR CONSOLE

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

2.2.1 Operator Login

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

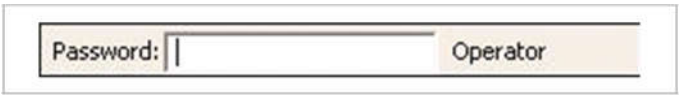

Figure 2 - Login Operator Mode

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

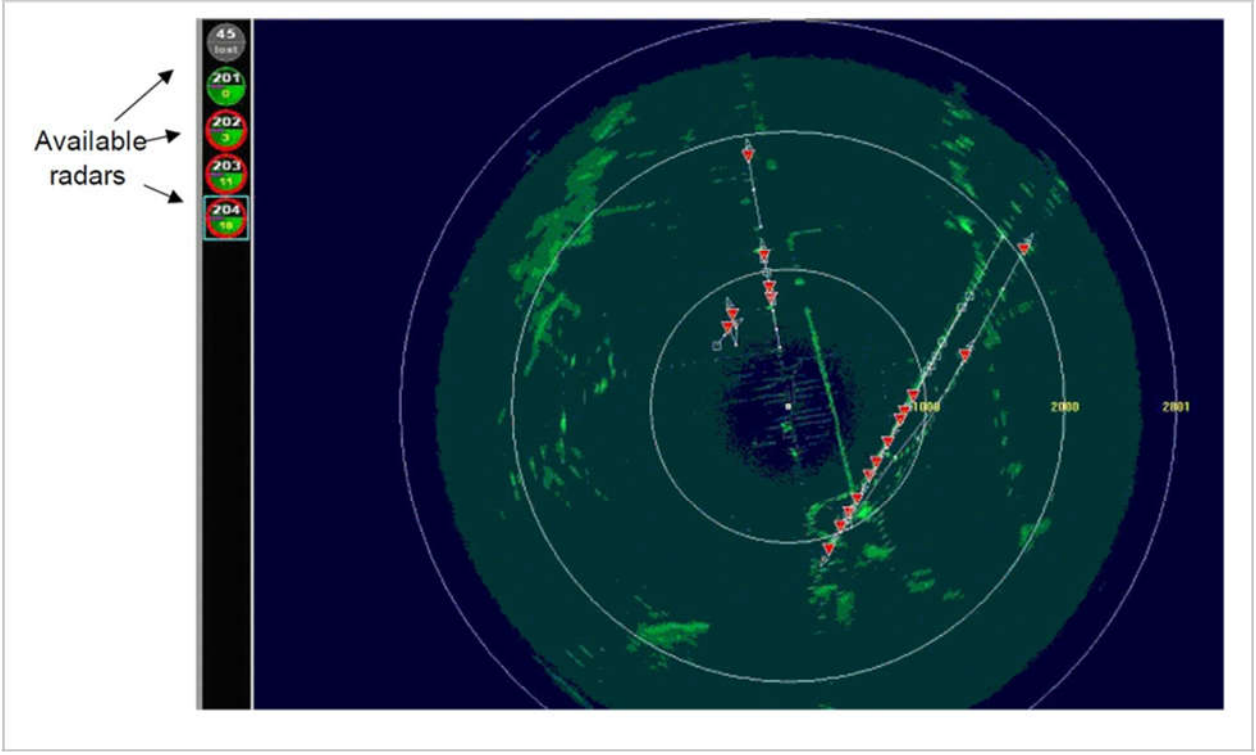

Figure 3 - Radar Console Displaying Available Radars

Table 1 shows the functions that are accessible according to 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	Console		Console (DIRECT)	
		Operator	Admin	Operator	Admin
Edit	Edit / create intrusion zones		x		
View	View intruders / targets	x	x		
	View tracks	x	x		
	View identification number	x	x		
	View radar PPI	x	x	x	x
	Change PPI color palette		x		x
	View radar location	x	x	x	x
	View range rings	x	x	x	x
	Intrusion / contact coverage	x	x		
	View background map	x	x	x	x
	View intrusion / contact zones	x	x		
	View contacts		x		
Tools	Targets / intruders list view	x	x		
	Targets / intruders tree view	x	x		
	Replay radar data		x		x
	Explore Logs directory	x	x	x	x
	Explore Maps directory	x	x	x	x
	Explore Capture directory	x	x	x	x
	Explore Recording directory	x	x	x	x
	Close Log Windows (Console)		x		x
	Erase Logs (Console, Memory)		x		x
	Export Parameters (All)		x		x
	Maintenance Command Dialog		x		x
Setup	Set Logs directory		x		x
	Set Maps directory		x		x
	Set Capture directory		x		x
	Set Recording directory		x		x
	TRaCS License Activation		x		x

	Dialog				
Right mouse click on radar icon	Set radar to XMIT / STBY		x		x
	Reset radar		x		x
	Configure radar parameters	x	x	x	x
	Set unit position from GPS		x		x
	Set Radar Server time from GPS		x		
	Enable / disable ICD-0100		x		
	Enable / disable AXML		x		
	Record targets / intruders		x		
	Record radar data		x		x
	Reset communication statistics		x		x
	Loader		x		

Table 1 - Radar Console Functions vs. Login Level

2.2.1.1 Radar Symbology

This section defines the symbology for the radar icon located in the left-hand column of the radar console. Colors have a specific meaning as well as the information embedded in the icon. Figure 4 provides an icon lexicon describing the various color codes and symbols.

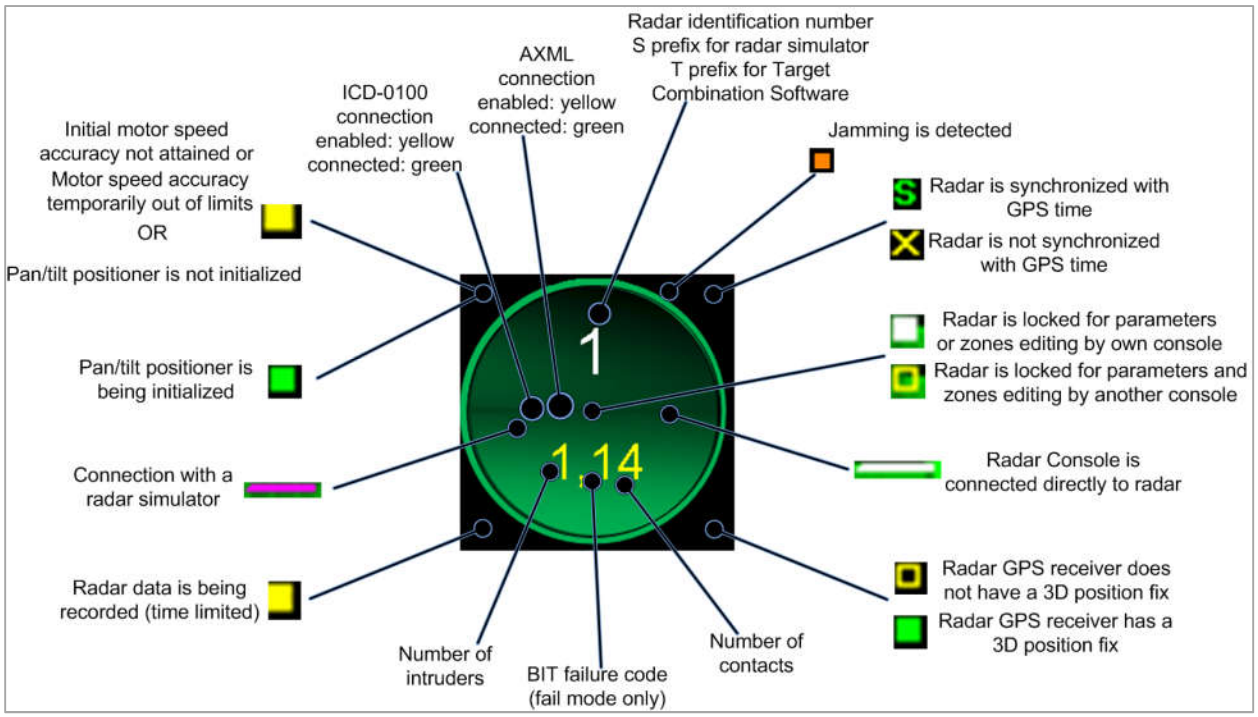

Figure 4 - Radar Lexicon

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.
	Track 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.
	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).
 	Track Combination Software is started and tracking one (1) intruder. Red circle around icon perimeter is blinking (with TRaCS only).
 	Radar is transmitting and tracking three (3) intruders. Icon perimeter (red circle) 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 cannot have 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 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 has a 3D position fix. The radar is in transmit mode and is synchronized with the GPS PPS signal.
	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.
	The radar has AXML connection enabled, but there are no client connected through this connection.
	The radar has AXML connection enabled, and there is a client connected through this connection.
	The radar has ICD-0100 connection enabled, but there are no client connected through this connection.
	The radar has ICD-0100 connection enabled, and there is a client connected through this connection.

Table 2 - Radar Icons and Messages

When right-clicking with the mouse over the radar icon, a menu displays as follows:

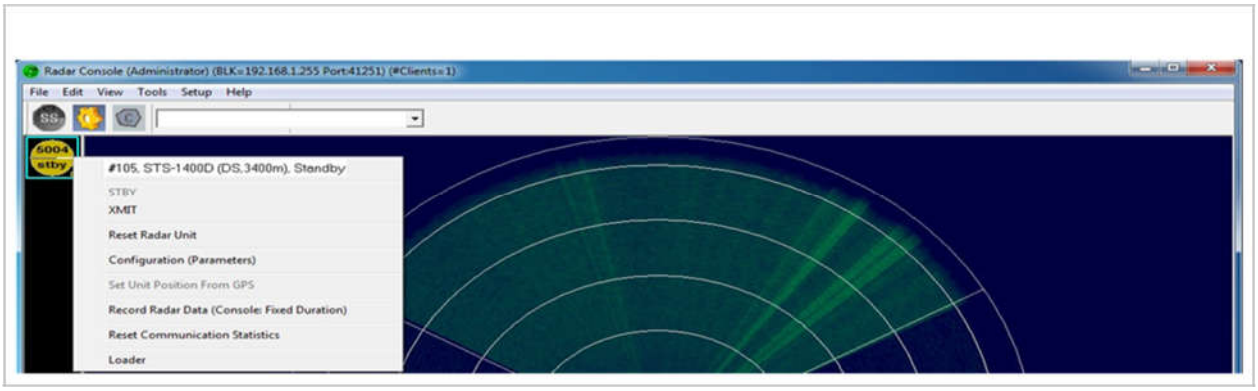

Figure 5 – Radar Control

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

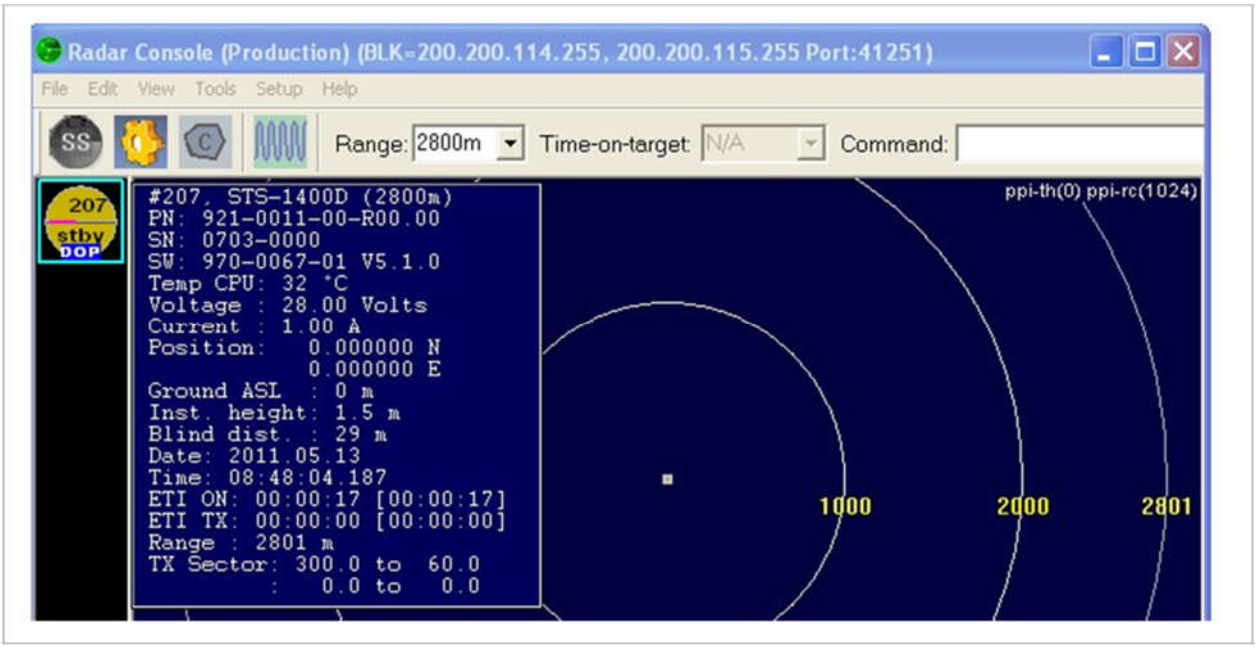

Figure 6 - Radar Information

2.2.2 Radar Mode Change (applies only to R3D and R5D radars)

The R3D and R5D supports a non-Doppler mode, the FastScan mode, and three Doppler modes (short, medium and long time-on-target). Changes of mode, range or time-on-target are made by using an icon and a drop-down list in Radar Console, as shown in Figure 7 and Figure 8. The toggle button (Figure 7) allows the user to conveniently switch between FastScan and Doppler modes.

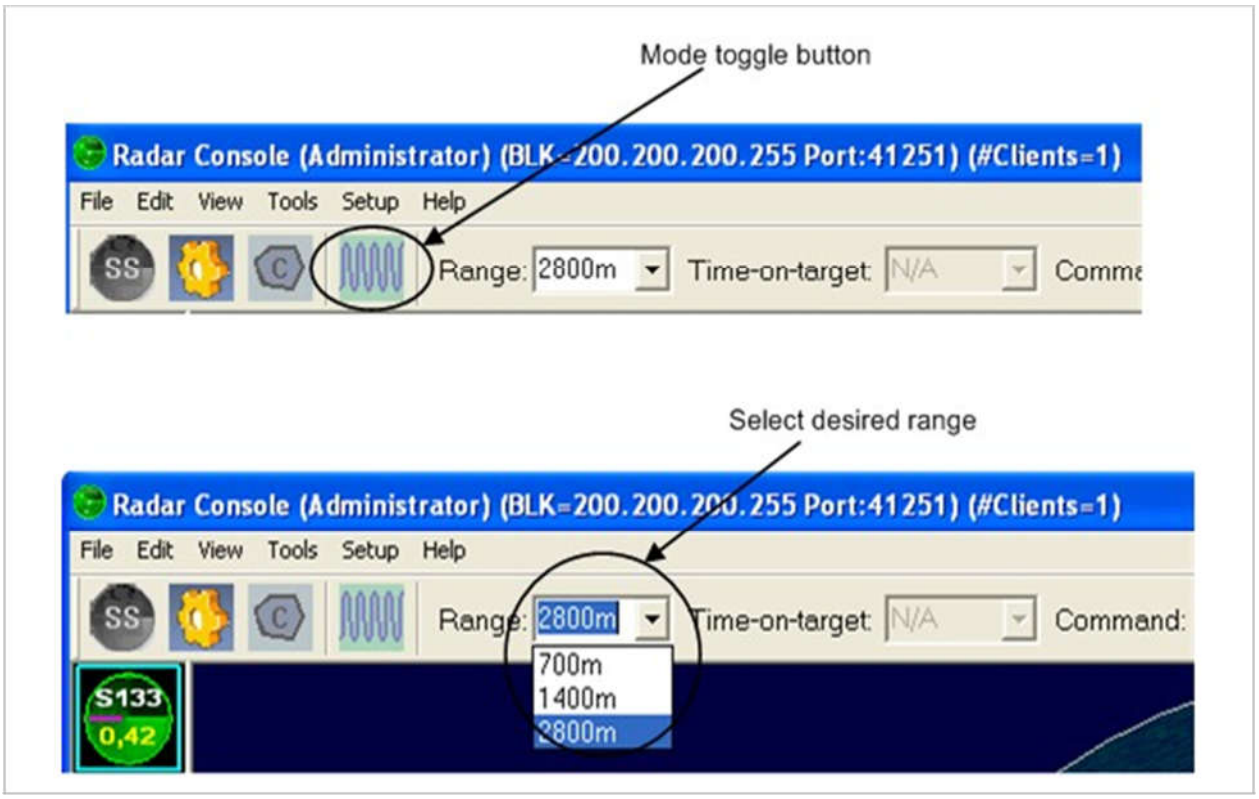

Figure 7 - Changing Range in FastScan Mode

Figure 8 - Changing Range and Time-On-Target in Doppler Mode

2.2.3 Radar Mode Change (applies only to R4SS-X, R6SS-X and R8SS-X radars)

The R4SS-X, R6SS-X and R8SS-X supports a FastScan mode and a regular (static or slow rotation) mode. Changes of mode, range or time-on-target are made by using an icon and a drop-down list in Radar Console, as shown in Figure 9 and Figure 10. The toggle button (Figure 9) allows the user to conveniently switch between FastScan and regular modes.

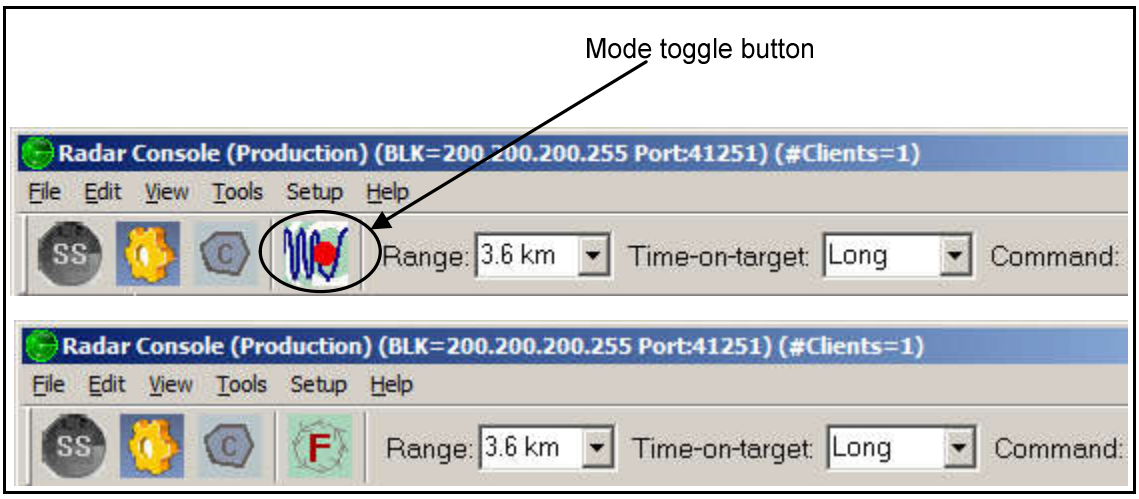

Figure 9 - Changing Mode on a R6SS or R6SS-U

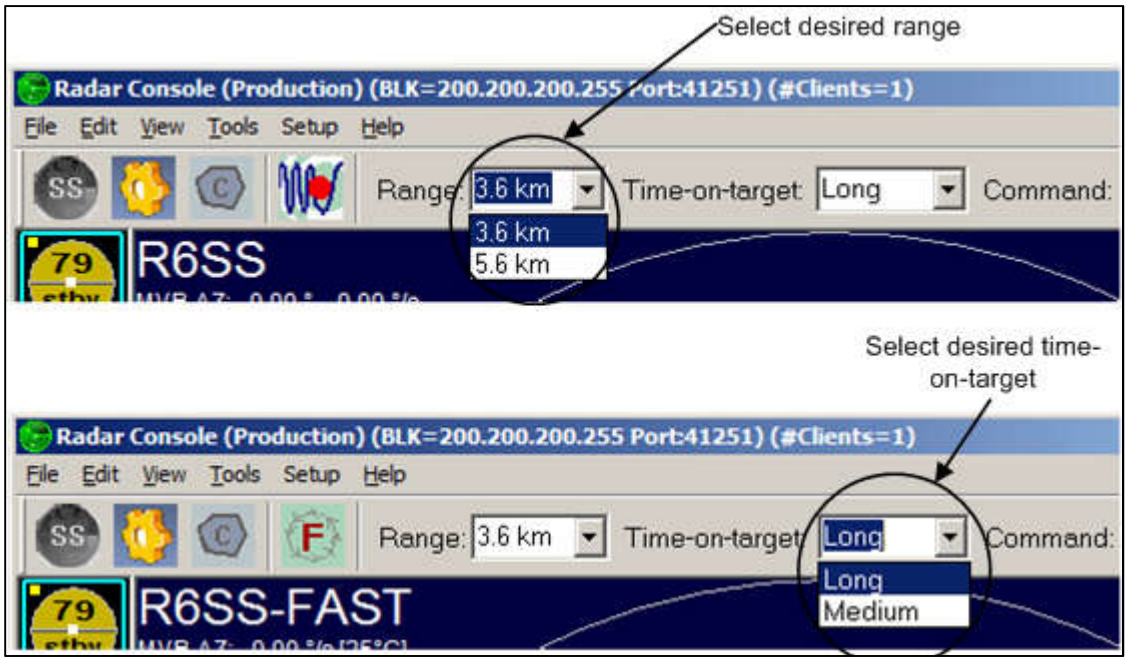

Figure 10 - Changing Range and Time-On-Target on a R4SS-X, R6SS-X or R8SS-X

2.2.4 Regular Scan Mode Change (applies only to R4SS-X, R6SS-X, R8SS-X and R20SS radars)

When equipped with a pan/tilt positioner, the R4SS-X, R6SS-X, R8SS-X and R20SS supports 3 different regular scan modes: fixed, continuous and alternating. In order to access those modes, the radar must first be configured to activate the pan/tilt positioner. The parameter that enables the pan/tilt positioner is called "Moving_base_config" (see Figure 11). Please refer to section 2.2.10 for instructions on how to modify a configuration parameter.

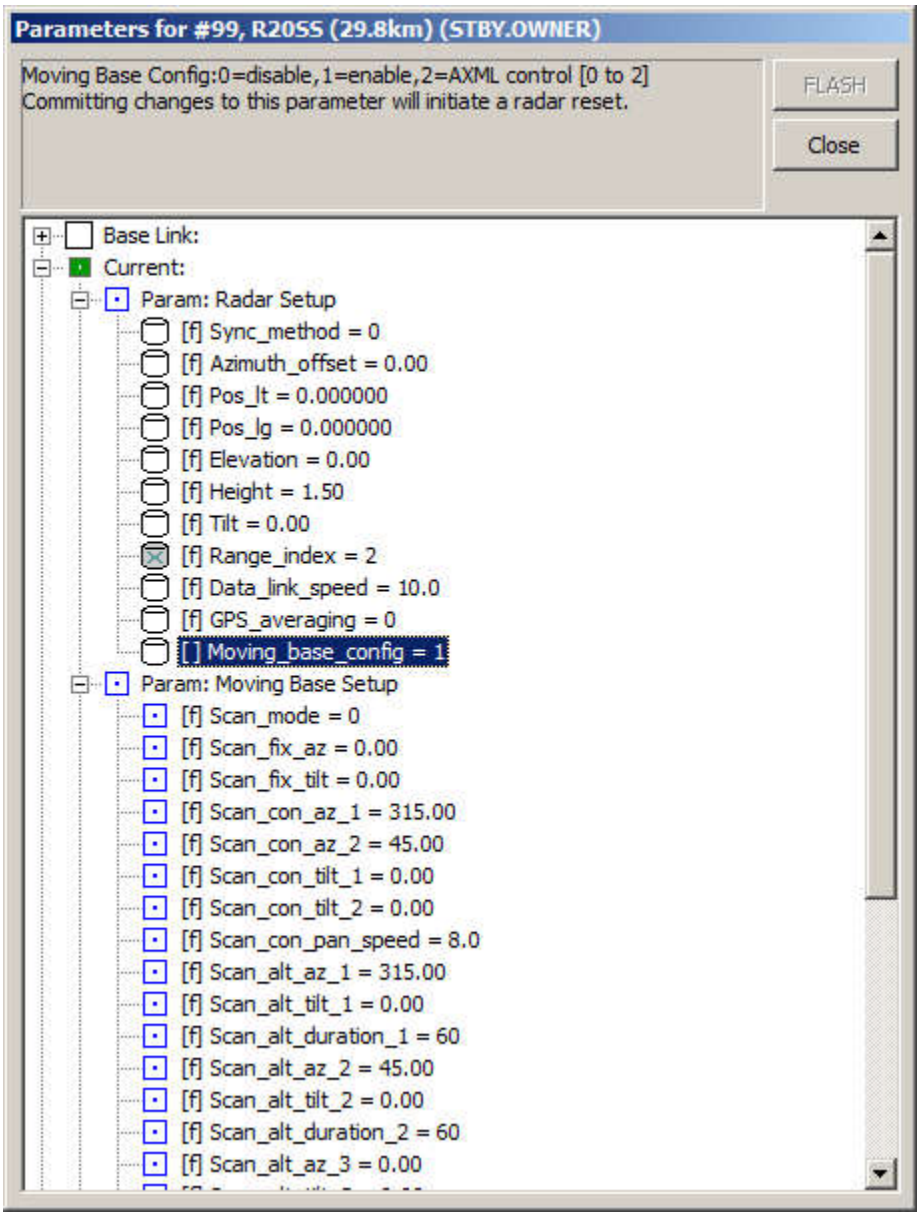

Figure 11 - Pan/Tilt Positioner Enable Parameter

2.2.4.1 Fixed Mode

This mode is used to position the radar at fixed azimuth and tilt angles.

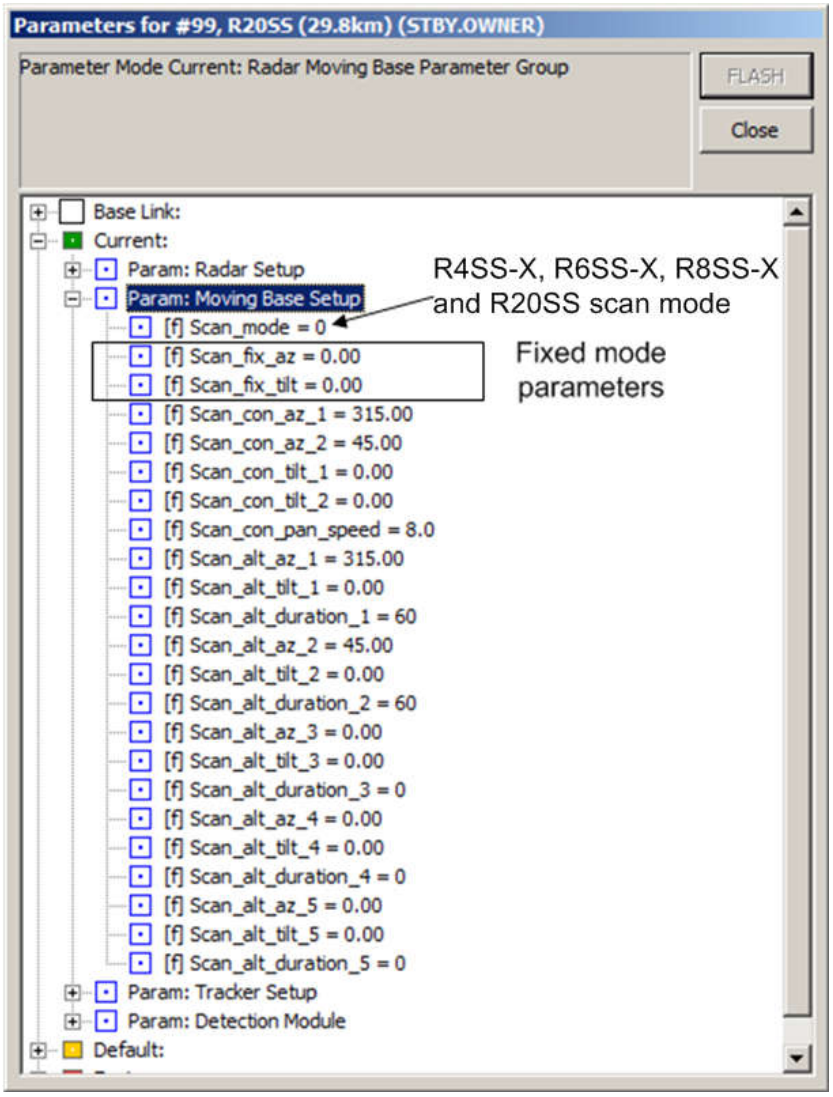

Figure 12 - Fixed Mode Configuration Parameters

2.2.4.2 Continuous Mode

This mode is used to continually scan the radar between two fixed positions in azimuth and tilt angles. The radar azimuth pan speed can also be configured. To enable a continuous rotation, the az_1 and az_2 angles should be set to 0 and 360 respectively. In that case, the tilt angle tilt_1 only will be used.

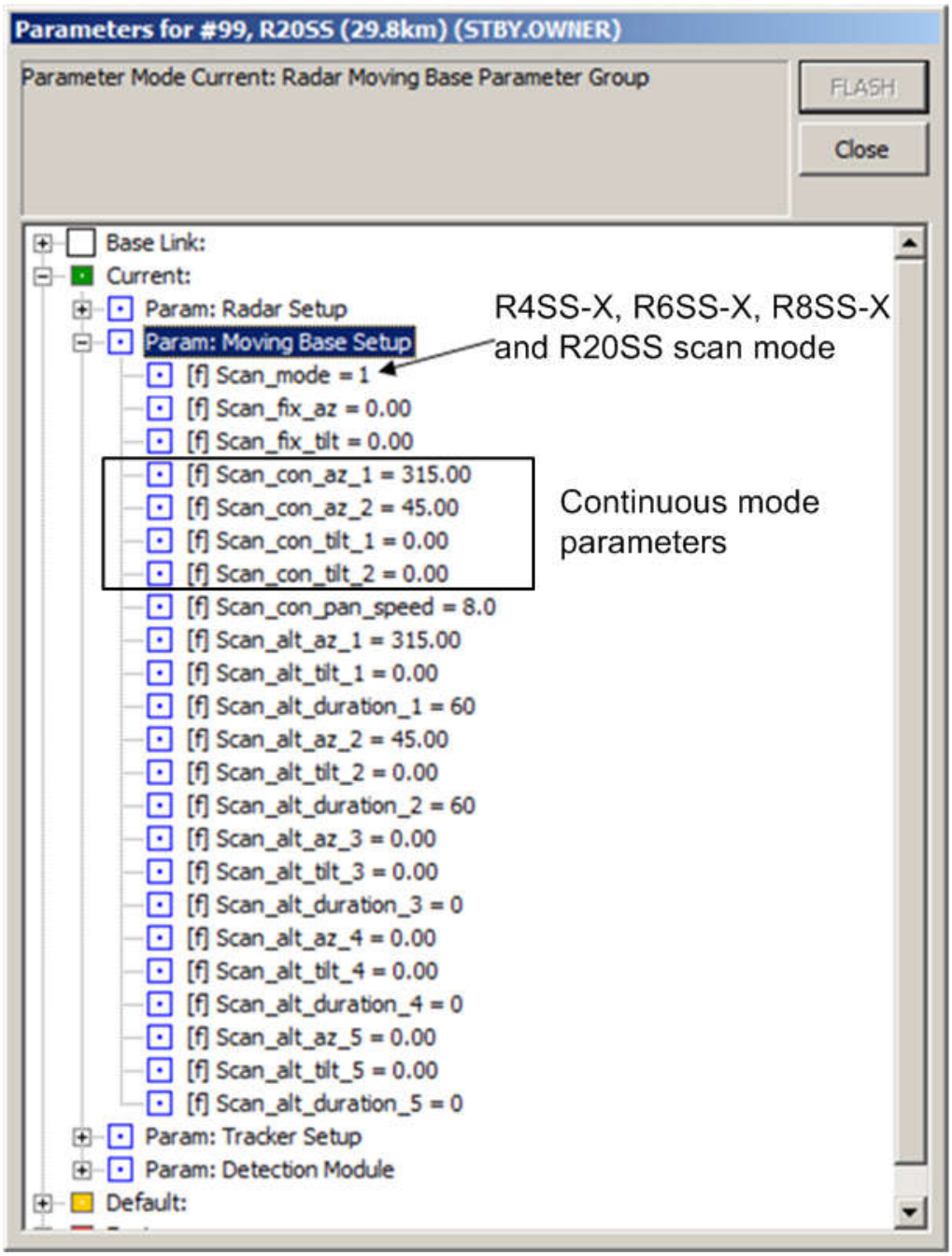

Figure 13 - Continuous Mode Configuration Parameters

2.2.4.3 Alternating Mode

This mode is used to sequentially alternate between up to 5 fixed sectors in azimuth and tilt angles. When covering a 360° area around the radar, it is recommended to use either one of the following:

- **To optimize coverage:** use 5 sectors spaced at 72° intervals, with a minimum duration of 12 seconds per sector
- **To minimize scan time:** use 4 sectors spaced at 90° intervals, with a duration of 11 seconds per sector

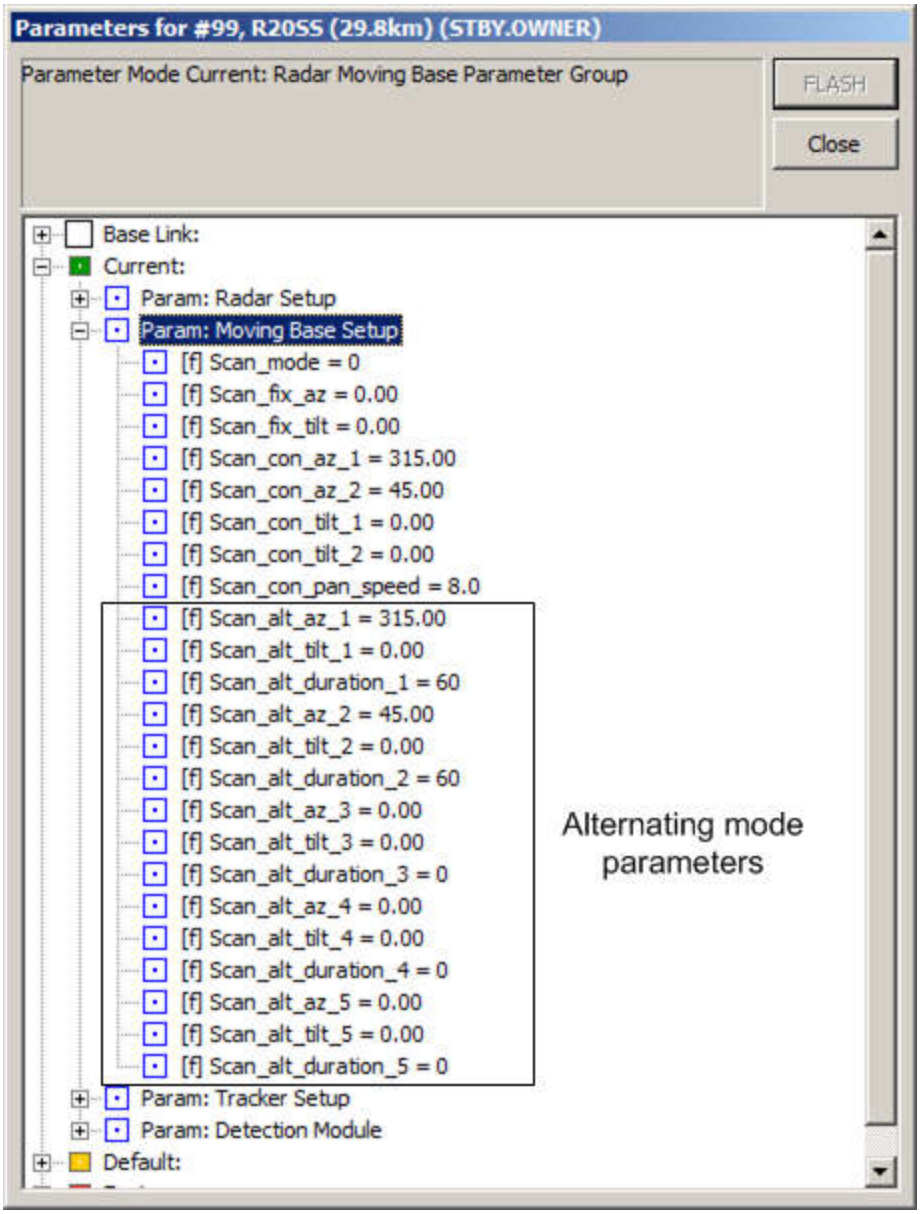

Figure 14 - Alternating Mode Configuration Parameters

2.2.5 Editing Zones

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

2.2.5.1 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 inhibited. The radar uses the contact zones to establish the detection thresholds. FLIR Radars 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 include all areas to be monitered except the problematic ones. Alternatively, you can establish only exclusive contact zones covering the problematic areas.

2.2.5.2 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 > 100 m).

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.

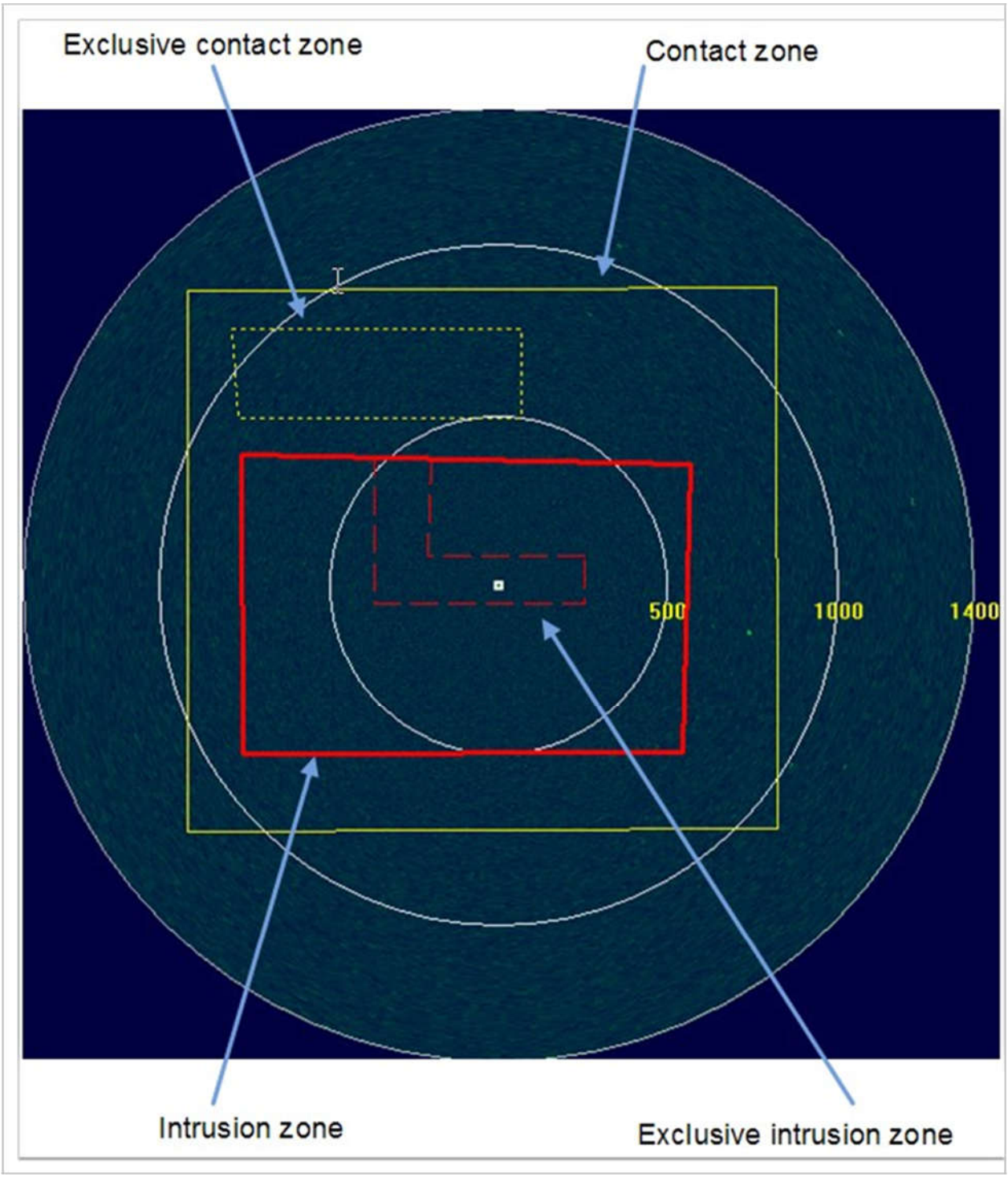

Figure 15 - Contact and Intrusion Zones

2.2.5.3 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 16. The mouse cursor will then change to a diamond (◇) shape.

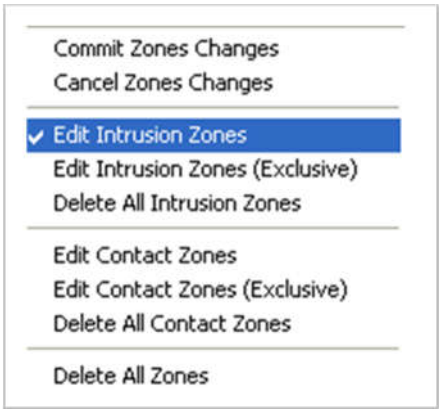

Figure 16 – Edit Menu

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 17 through Figure 20 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 3 can also be used.

Note
The angle between 2 vertexes cannot exceed 120°.

Figure 17 - Creating a Zone (Step 1 of 4)

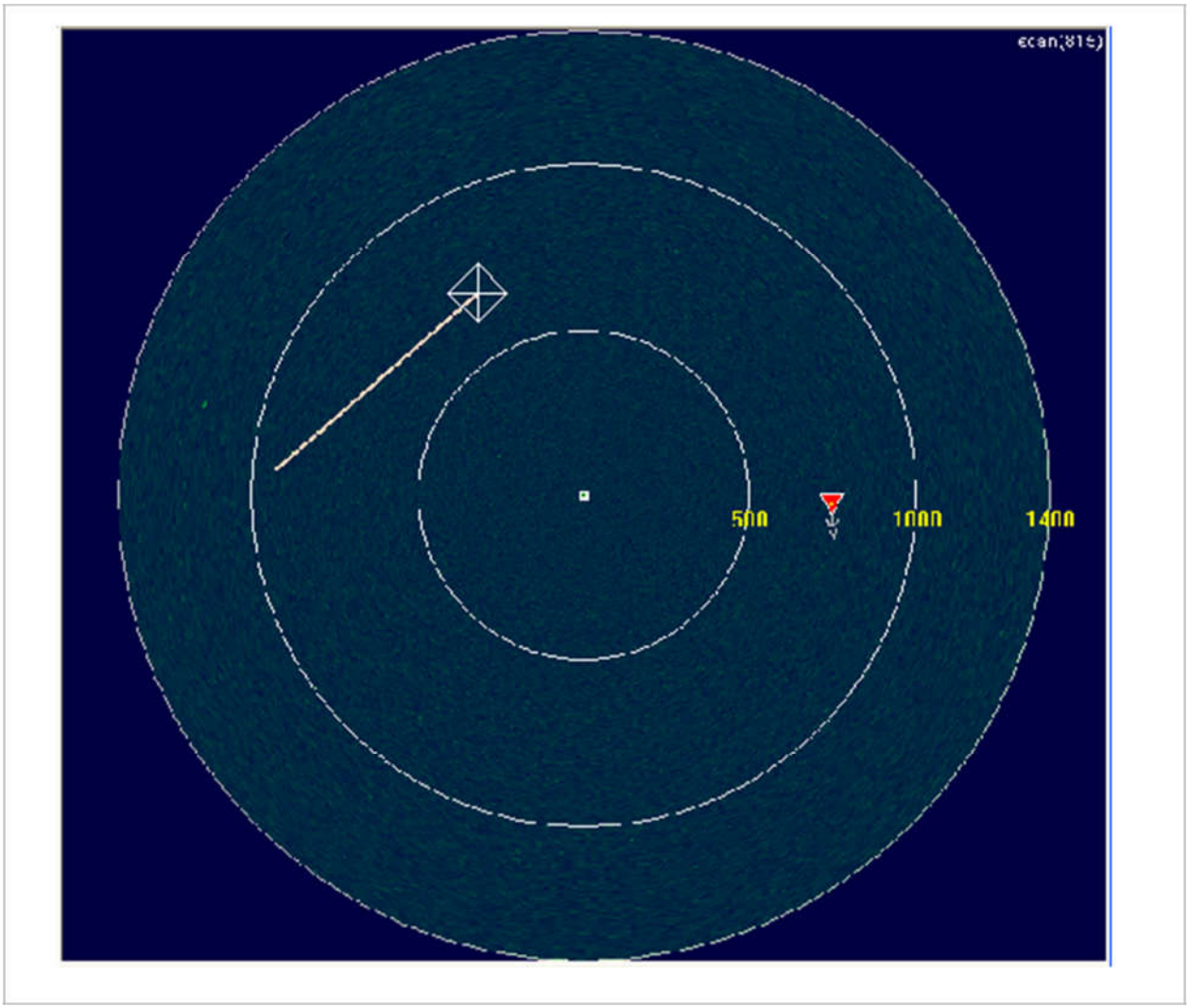

Figure 18 - Creating a Zone (Step 2 of 4)

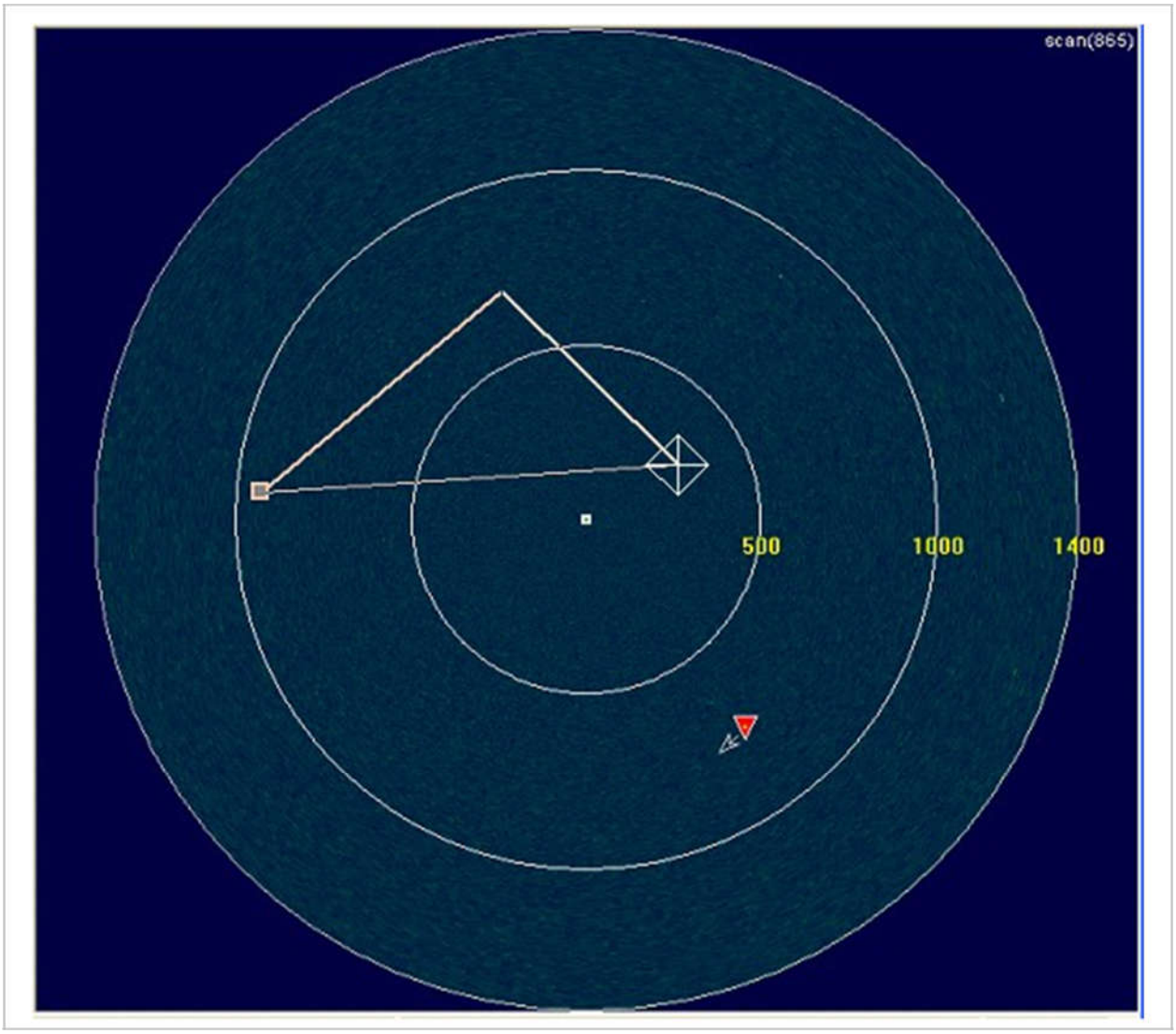

Figure 19 - Creating a Zone (Step 3 of 4)

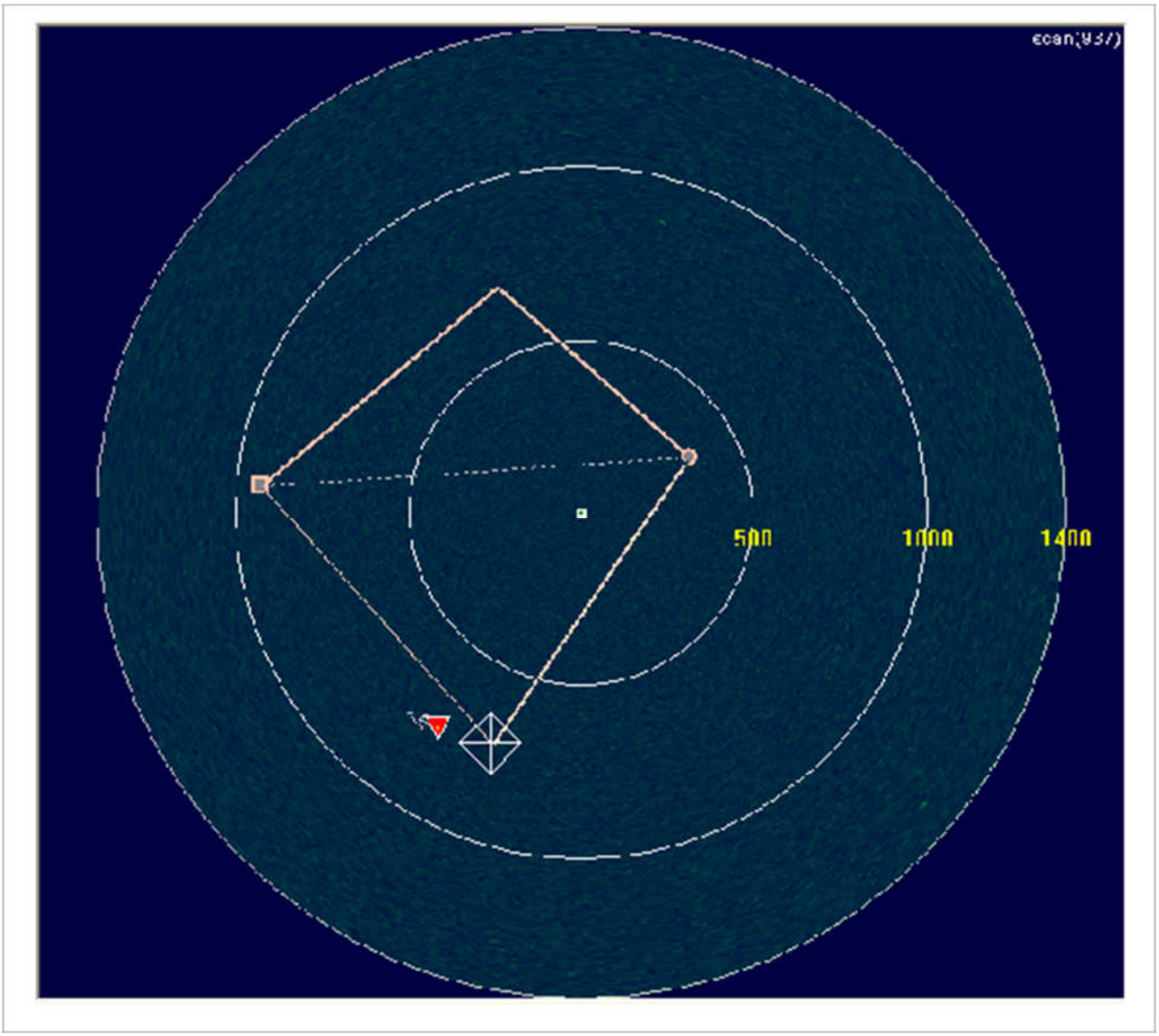

Figure 20 - Creating a Zone (Step 4 of 4)

The user may press the space key to invert the order in which the zone segments are added, as shown in Figure 21. The backspace keyboard key removes the last segment added.

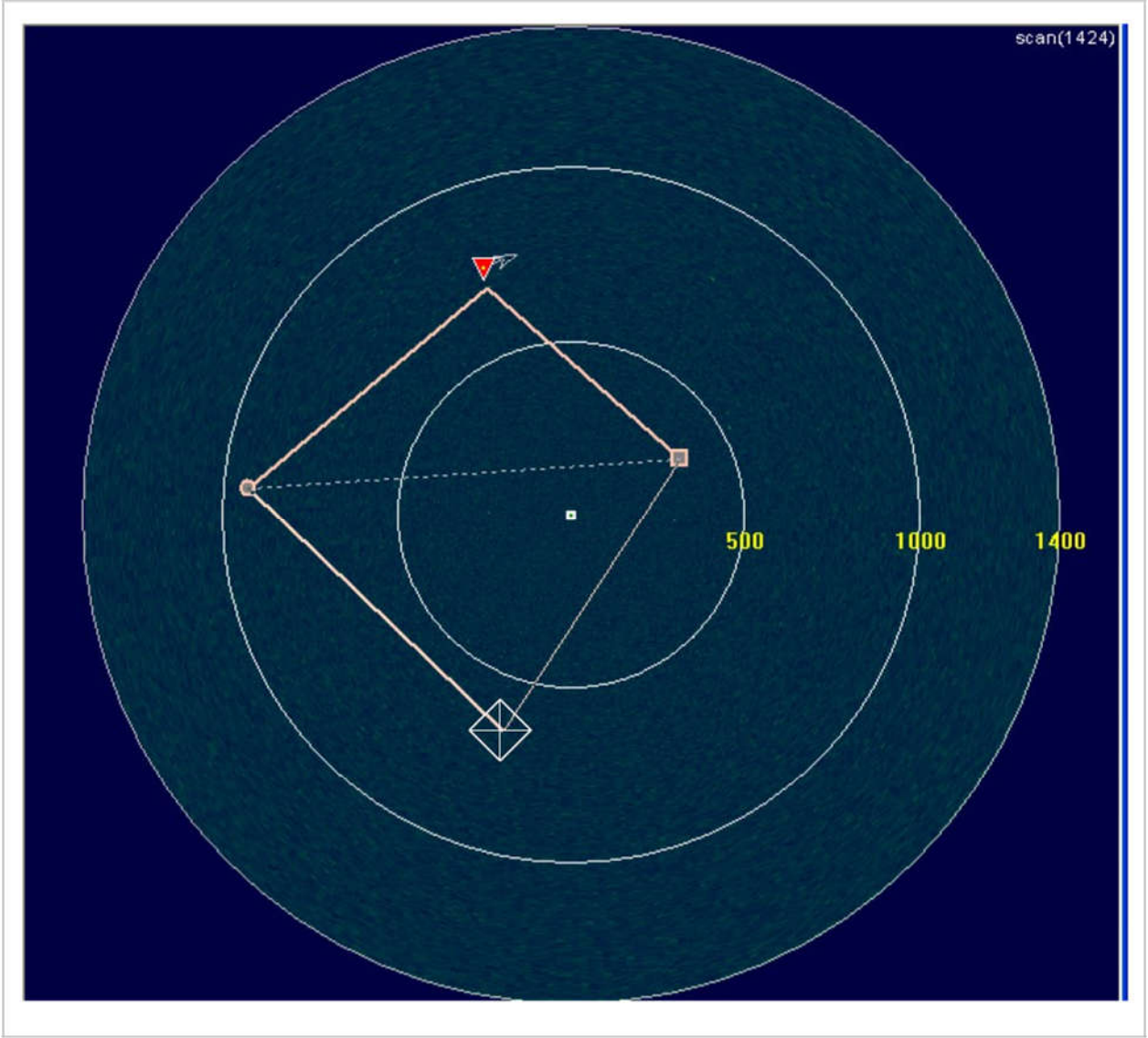

Figure 21 - Changing Segment Adding Order

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 15 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 22, or by using the commit button  .

Figure 22 - Edit Menu Commands

2.2.5.4 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 23.

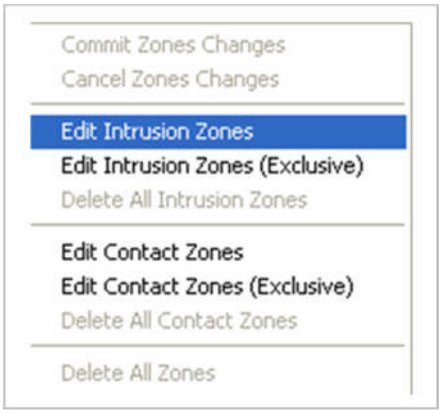

Figure 23 - Edit Menu Commands

Once in the zone edition process, each zone will be displayed with its vertex (control) points, as shown in Figure 24. While editing the zone, the keyboard commands described in Figure 4 can also be used.

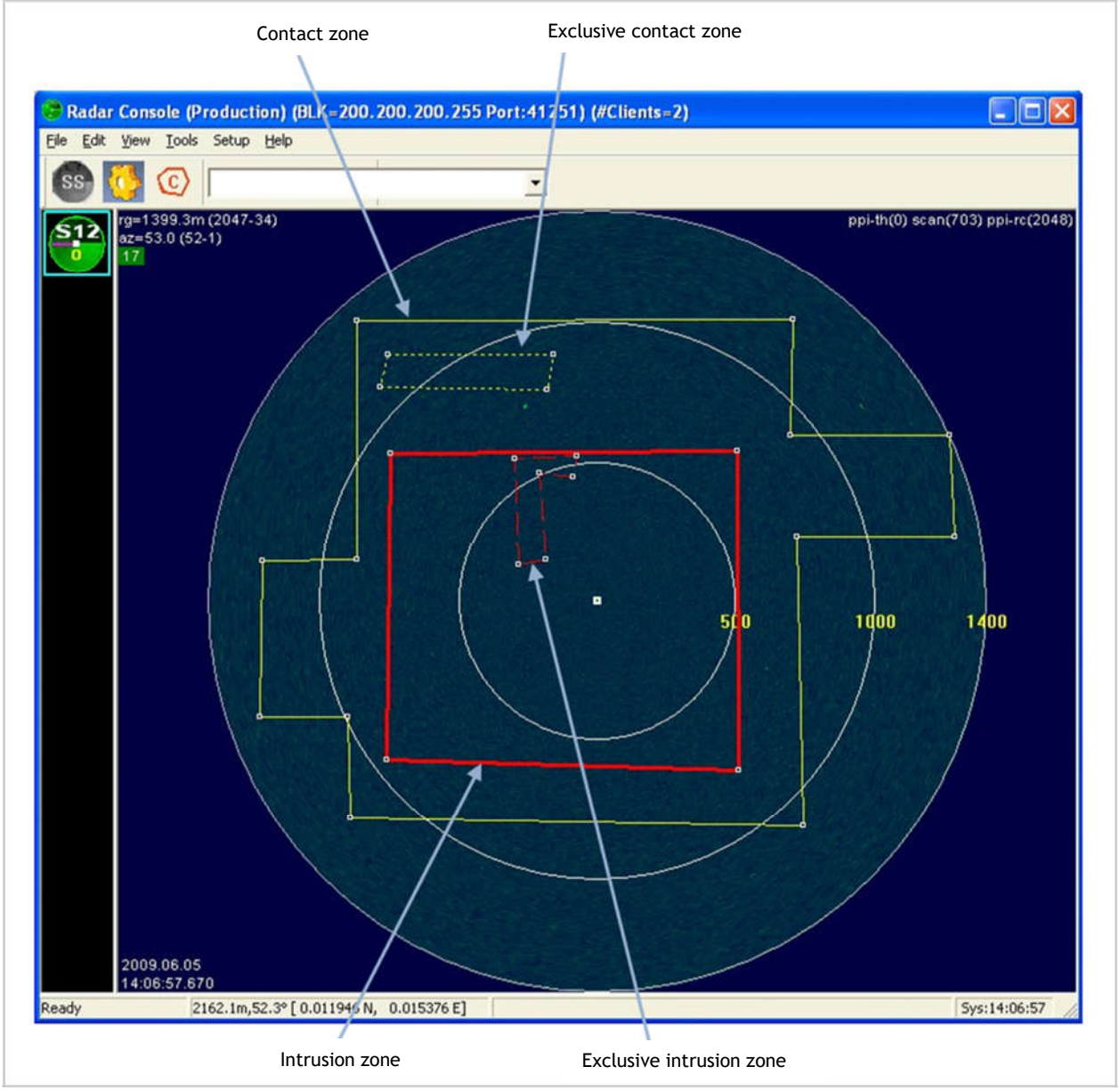

Figure 24 - Zone Edition Context

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 25 and Figure 26. Once in the edit mode, the process is the same as the zone creation process.

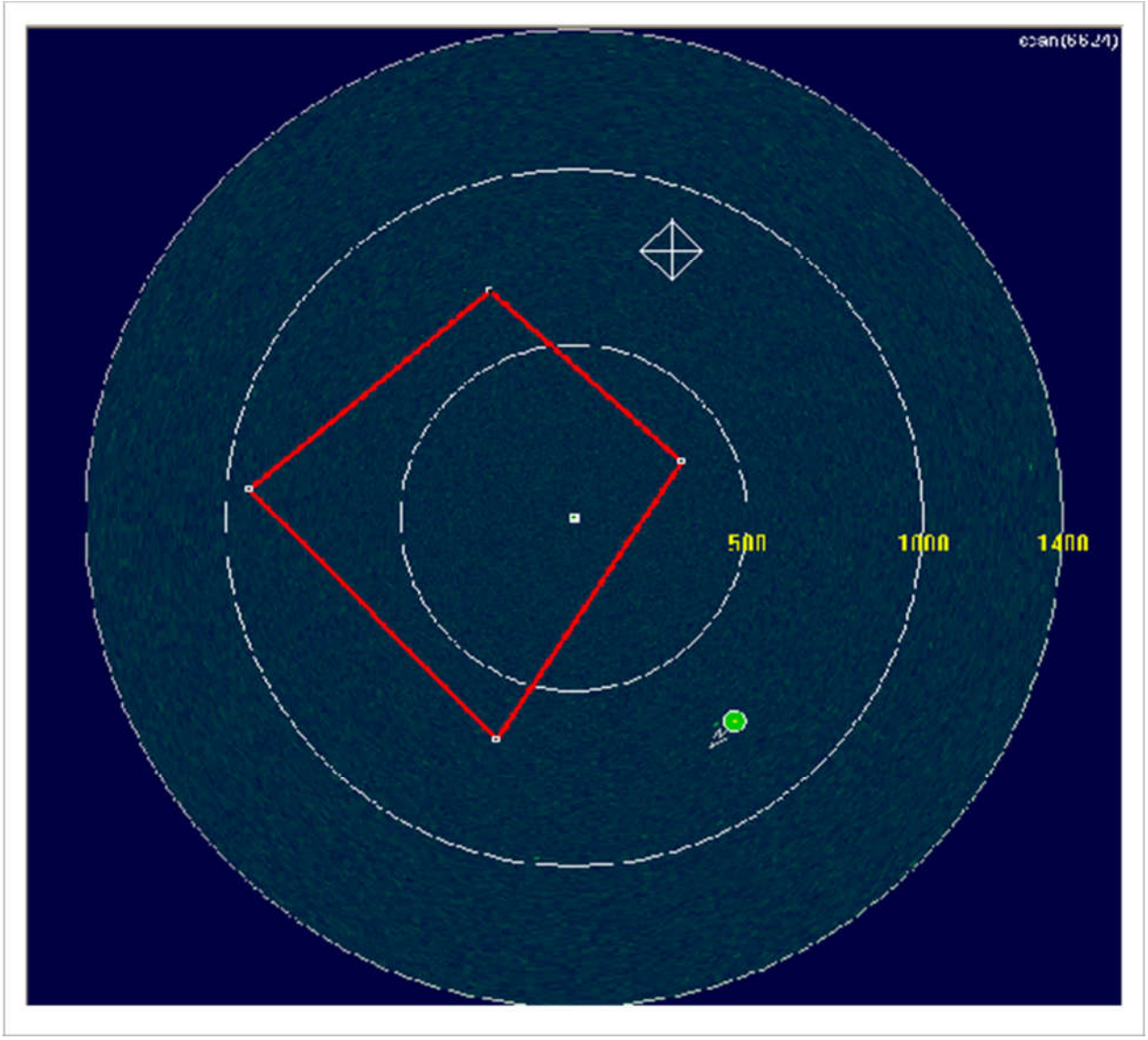

Figure 25 - Modifying a Zone (Step 1 of 2)

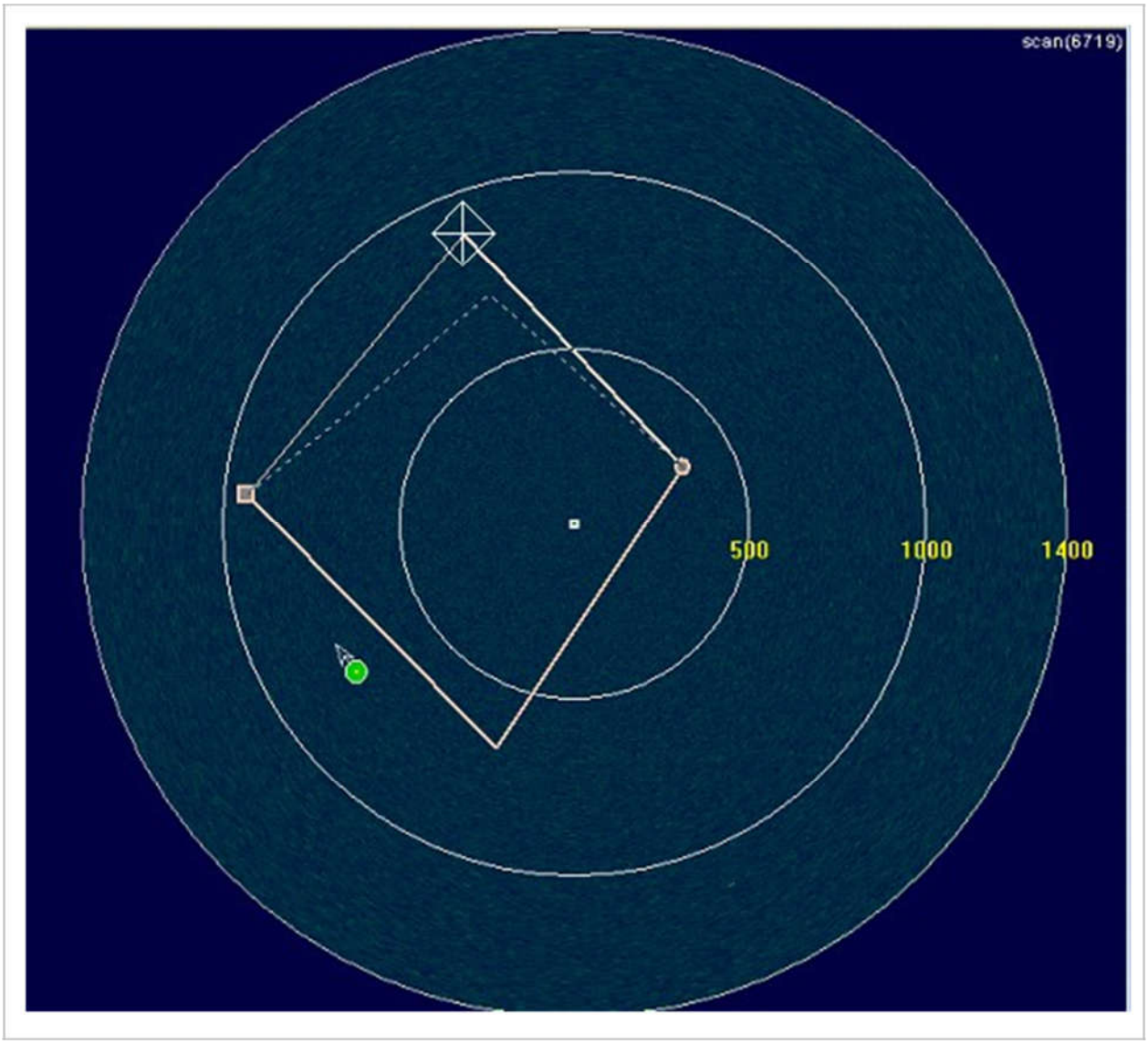

Figure 26 - Modifying a Zone (Step 2 of 2)

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 25 & Figure 26, or by using the commit button  .

2.2.5.5 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 23.

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 27 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.

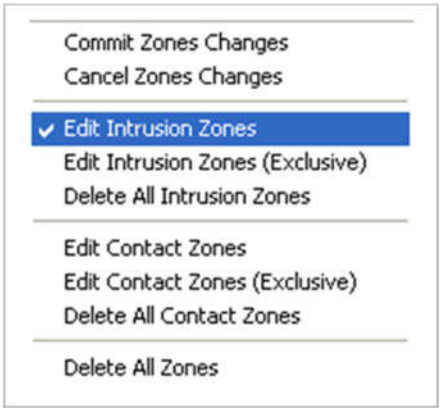

Figure 27 - Edit Menu Commands

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 27, or by using the commit button  .

2.2.6 PPI Display

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

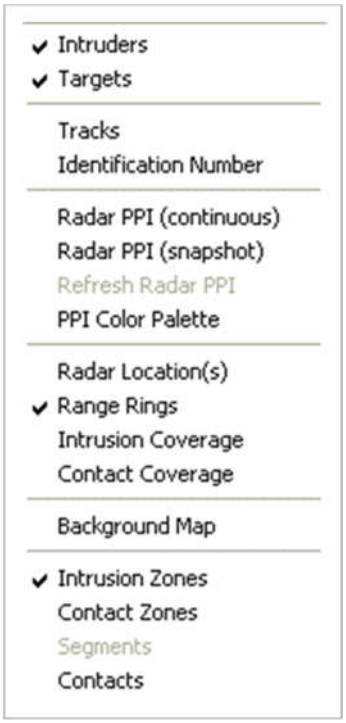

Figure 28 - View Menu Commands

2.2.6.1 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 29.

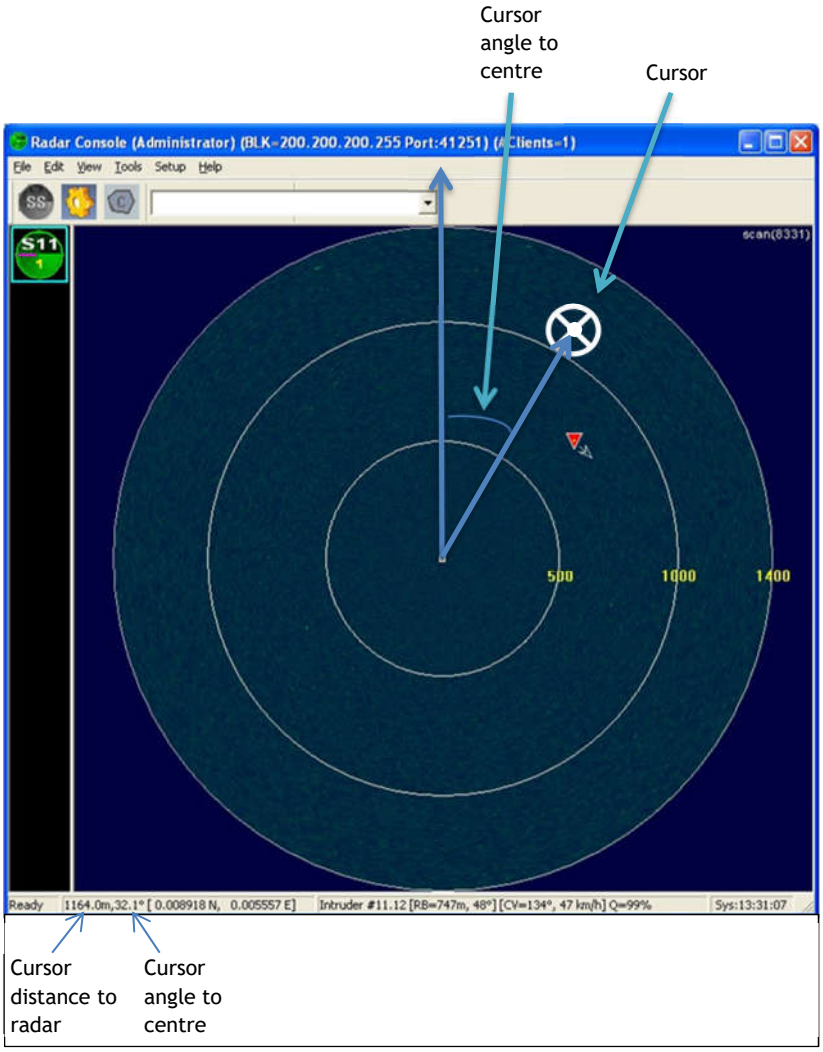

Figure 29 - Cursor Position Indicator

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

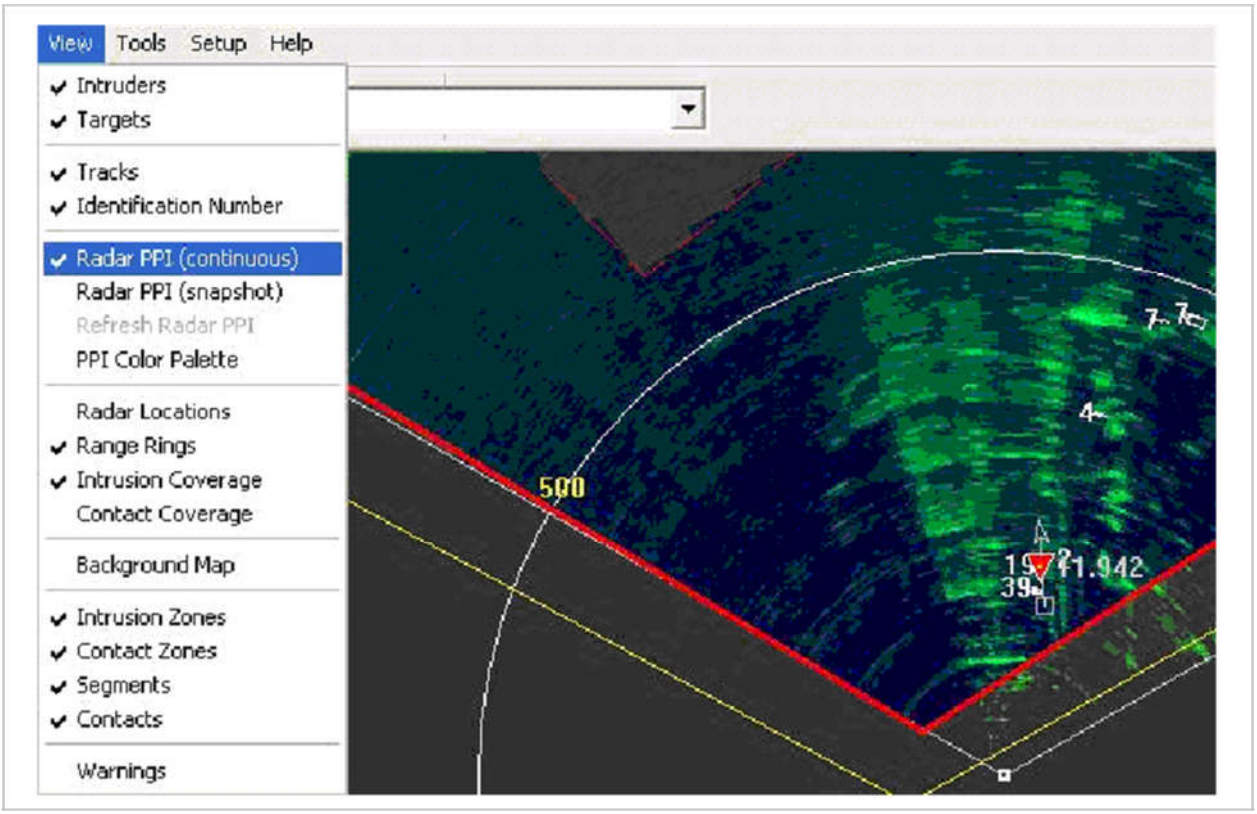

Figure 30 - Radar PPI (Continuous)

2.2.6.2 Radar PPI (Snapshot)

The **Radar PPI (snapshot)** command displays a screen capture of a specific moment in time. This feature is useful for obtaining 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.

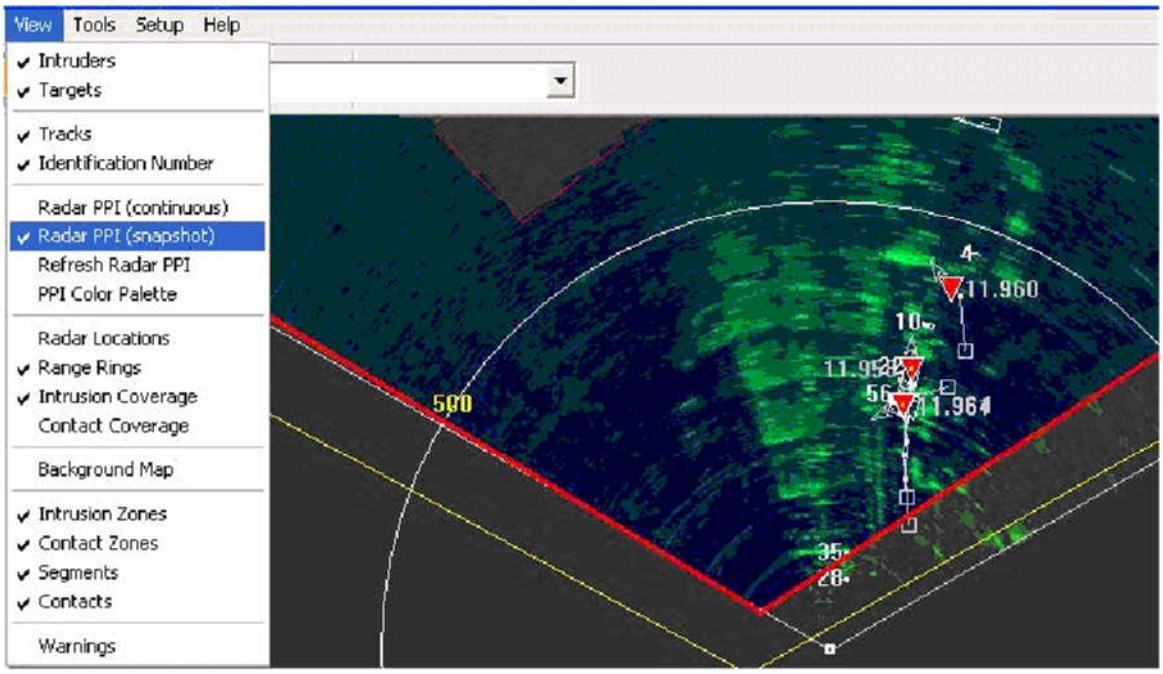

Figure 31 - Radar PPI (Snapshot) Mode

2.2.6.3 Refresh Radar PPI

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

2.2.6.4 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
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
Decrease PPI intensity	- key
Increase threshold	CTRL key and +
Decrease threshold	CTRL key and -
Restore intensity and threshold	CTRL and home keys

Table 3 – PPI Commands

2.2.6.5 Background Map

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

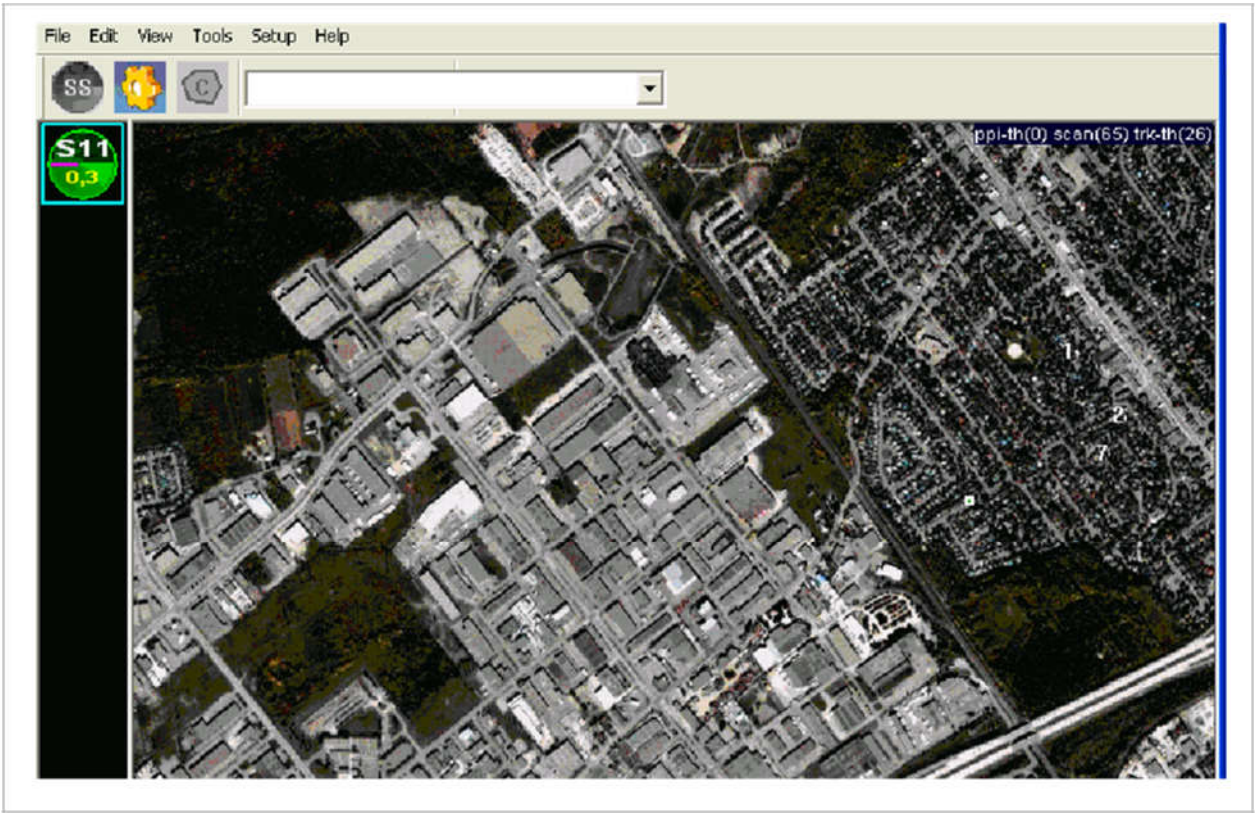

Figure 32 - Background Map

2.2.6.6 PPI Color Palette

The **PPI Color Palette** command displays 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.

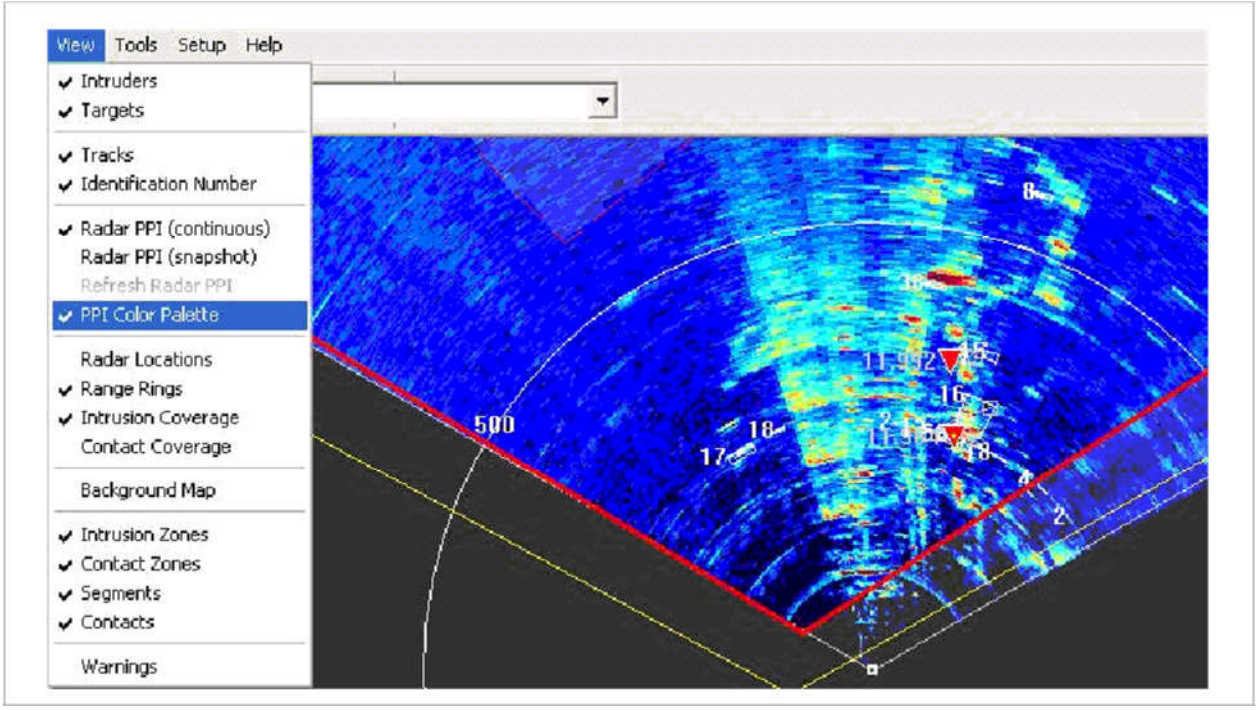

Figure 33 - PPI Color Palette

2.2.6.7 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 34 – Radar Location

2.2.6.8 Range Rings

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

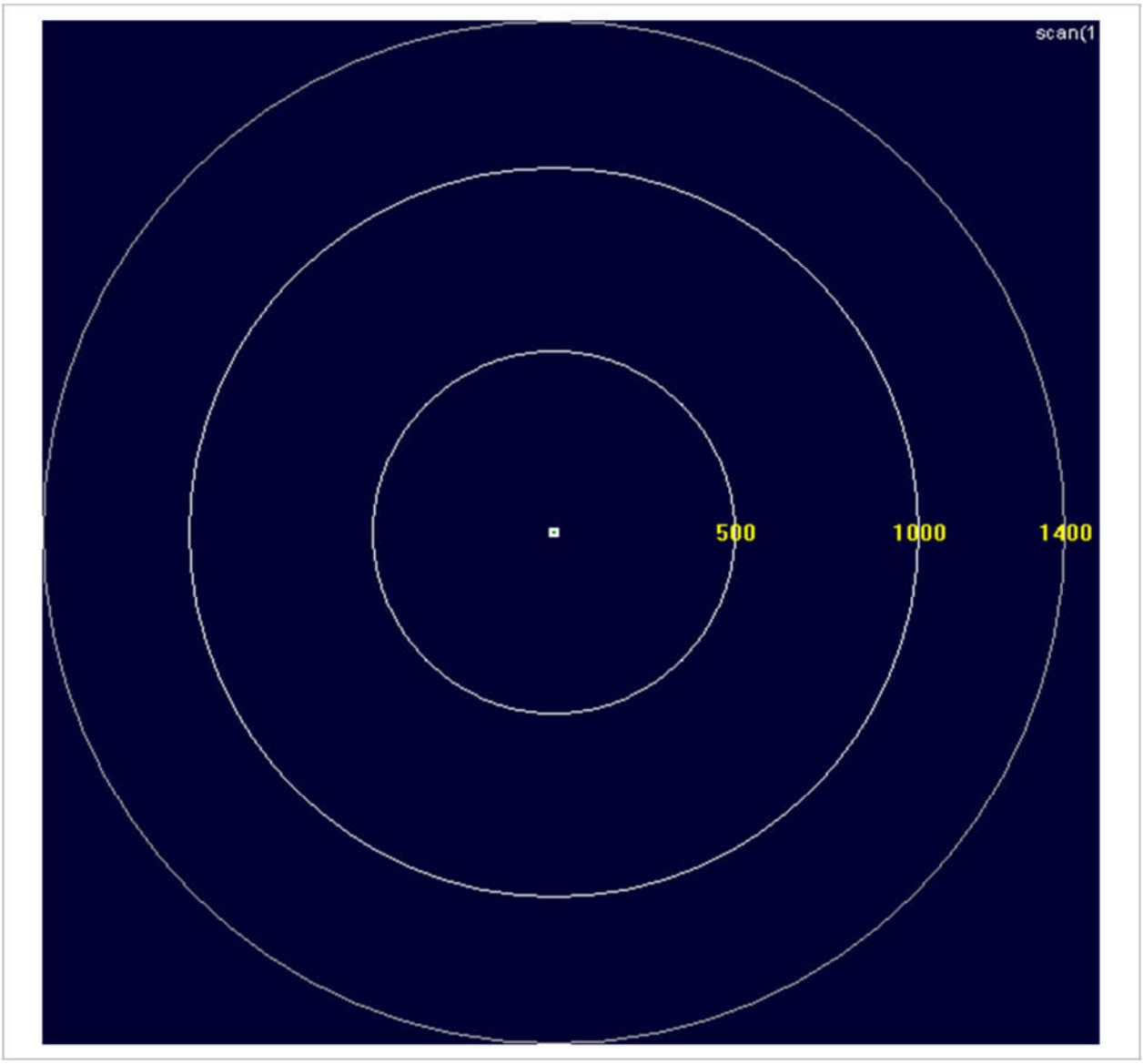

Figure 35 - Range Rings

2.2.6.9 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 36.

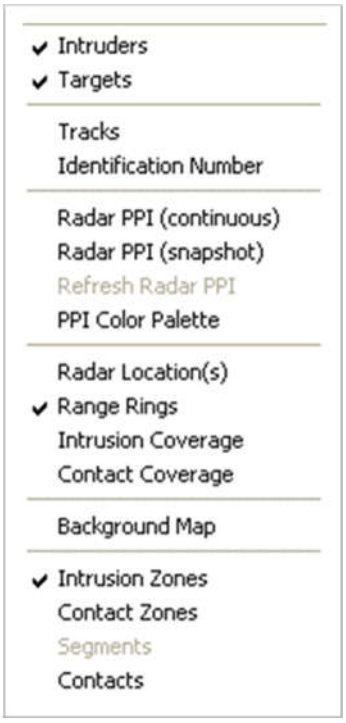

Figure 36 - View Menu Commands

Figure 37 and Figure 38 show the display of typical Intrusion and Contact zones.

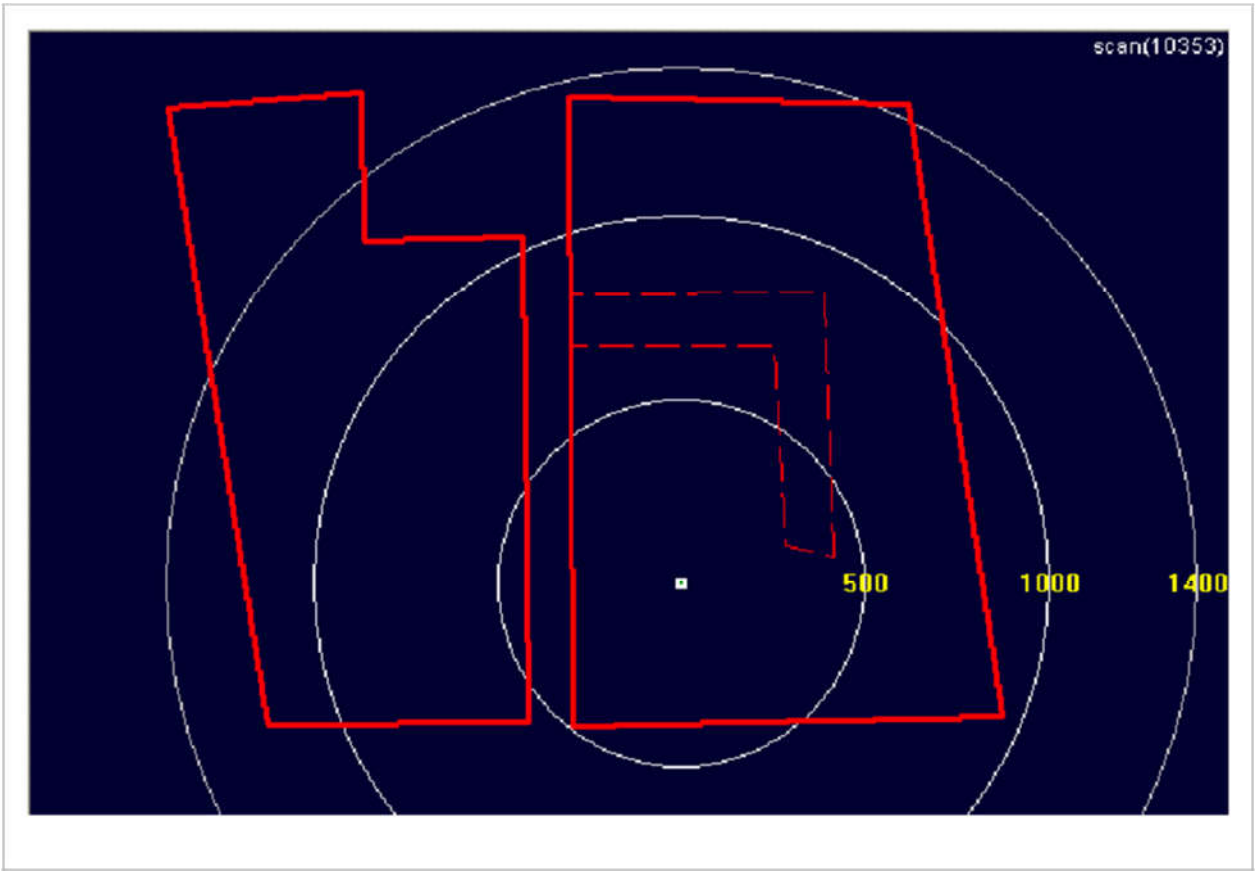

Figure 37 - Intrusion Zones (Red Boundary)

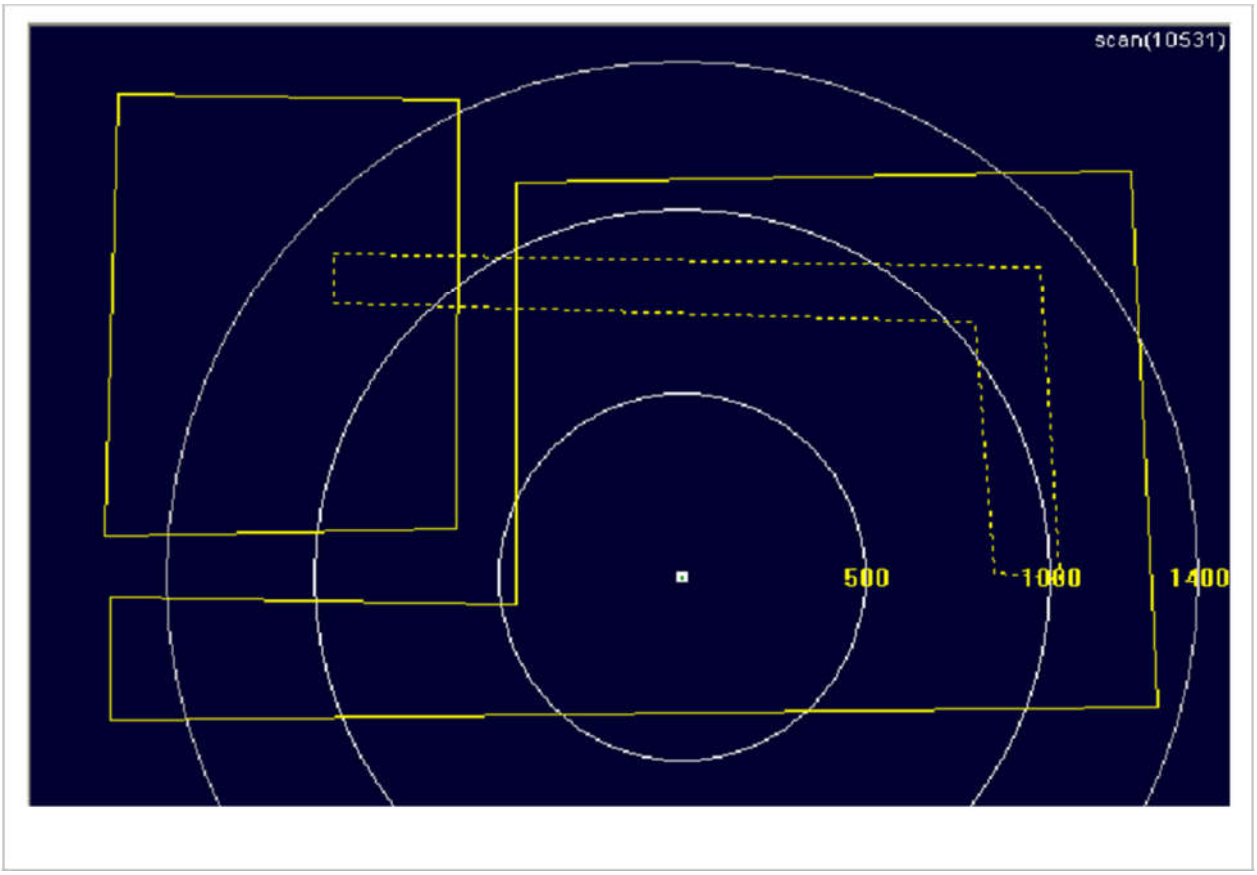

Figure 38 - Contact Zones (Yellow Boundary)

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 28. Figure 39 shows the intrusion zone coverage for the intrusion zones shown in Figure 37.

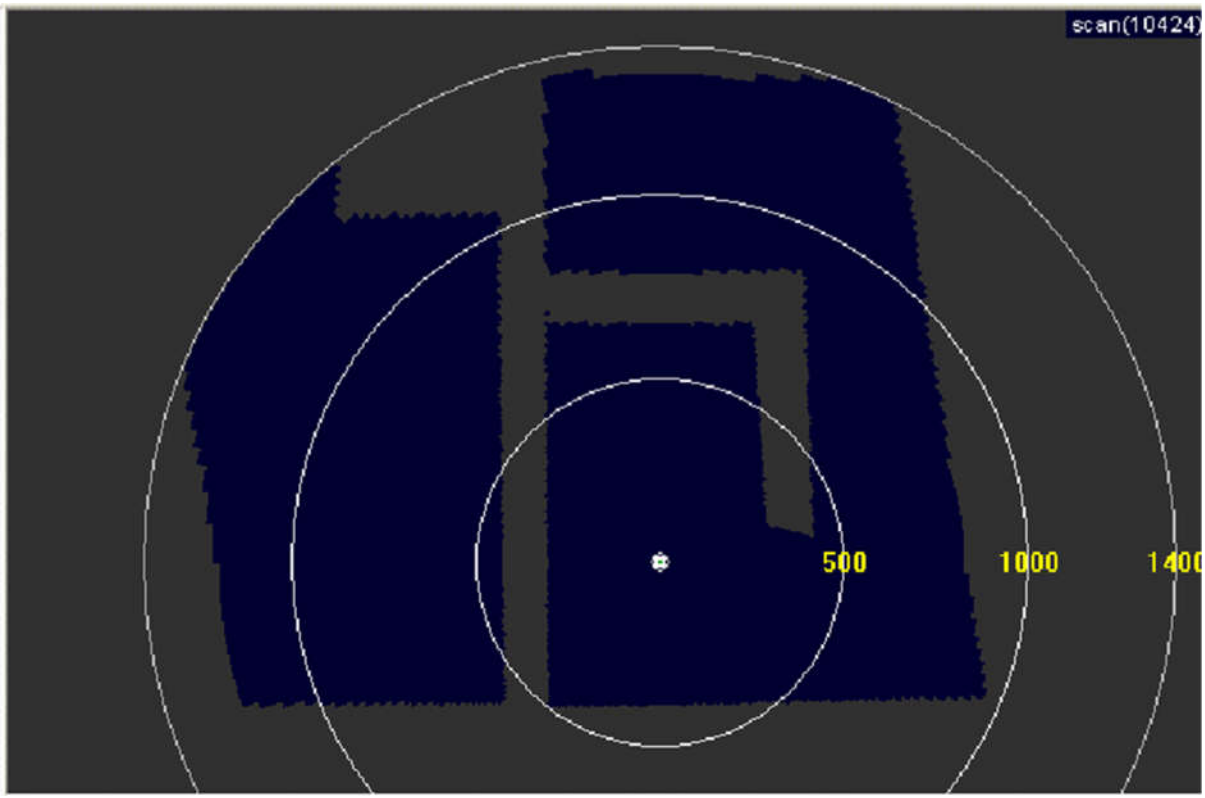

Figure 39 - Intrusion Zones Coverage

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 28. Figure 40 shows the contact zone coverage for the zones shown in Figure 38.

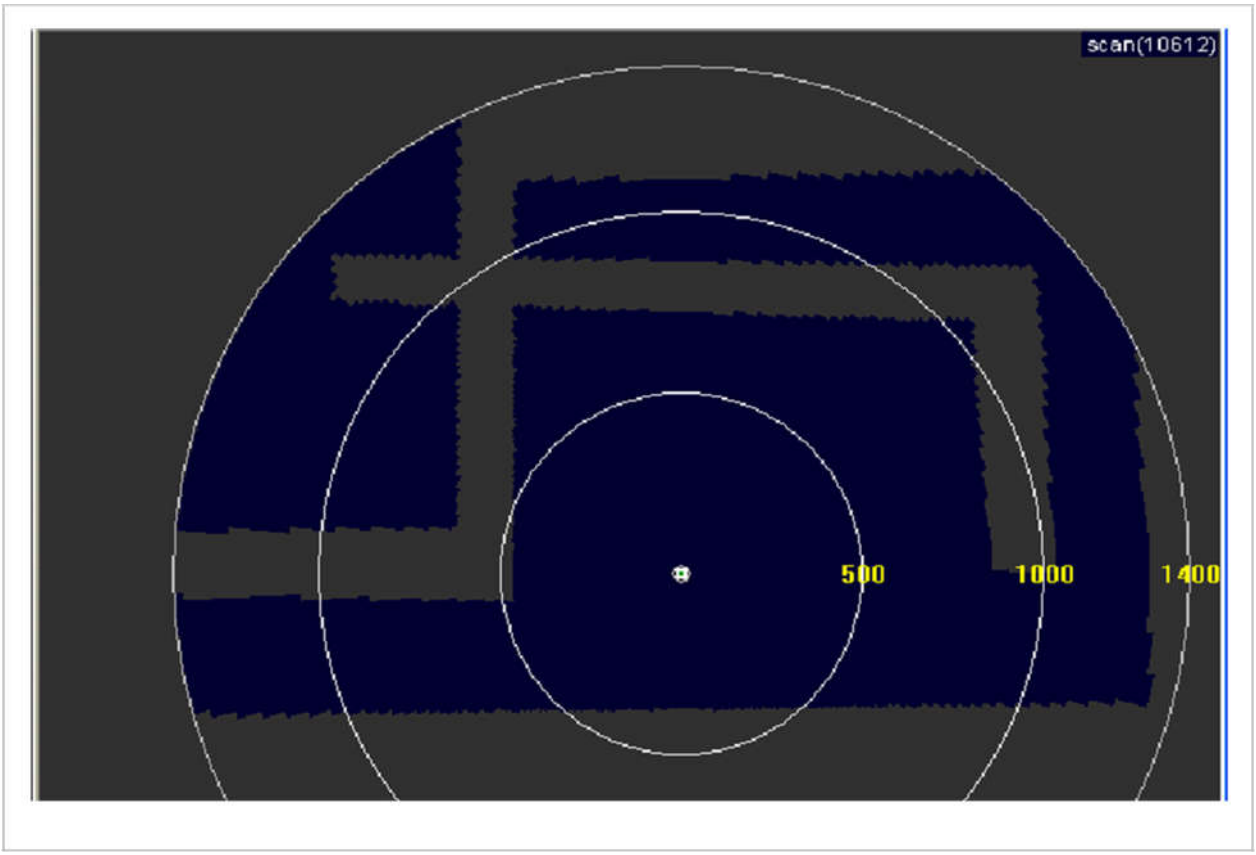

Figure 40 - Contact Zones Coverage

2.2.7 Intruders and Targets

2.2.7.1 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 41. The display of the intruder / target identification number is controlled by the **View Menu -> Identification Number** option.

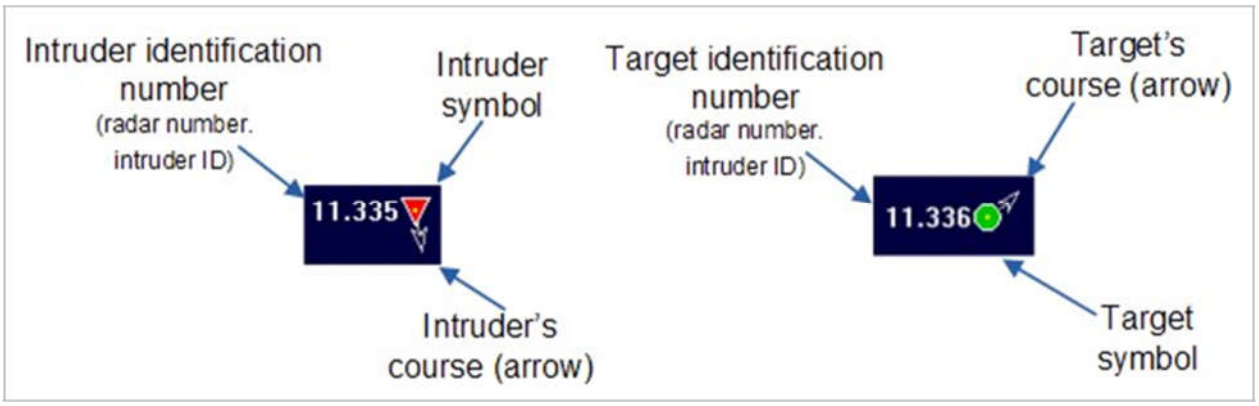

Figure 41 - Description of Intruder and Target Symbols

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".

2.2.7.2 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 42. It continues to be displayed until the target no longer exists.

Figure 42 - Selected Intruder / Target Status Line Information

There are two alternate ways to **display** information on intruders and targets: the **List View** and the **Tree View**. These are enabled via the **Tools** menu **Targets/Intruders List View** (Figure 43) and **Targets/Intruders Tree View** (Figure 44) 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 will not be listed in this view. For a complete view, use the **Targets/Intruders Tree View** (Figure 44).

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 43 - Targets/Intruders List View

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

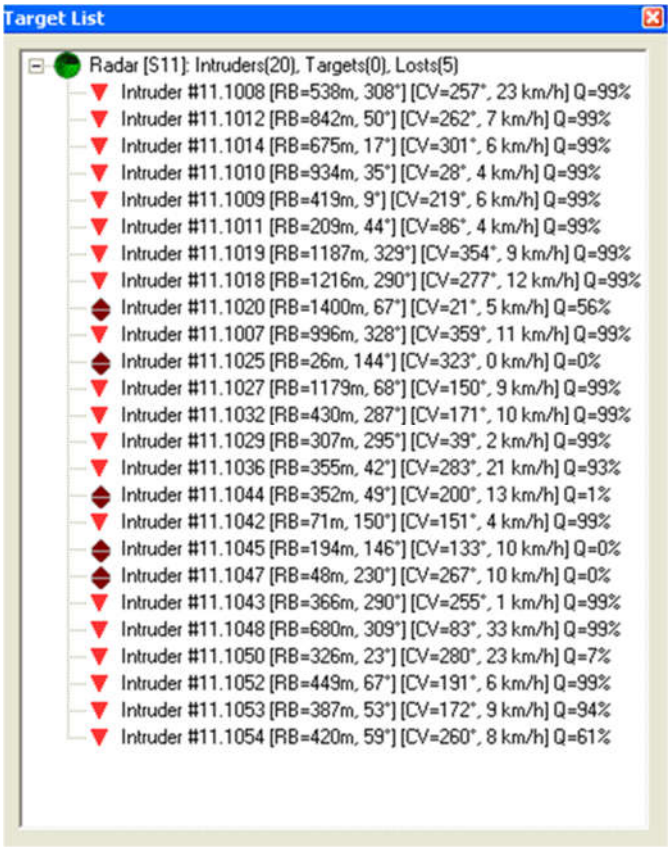

Figure 44 - Targets/Intruders Tree View

2.2.7.3 Tracks Recovery (R20SS, R4SS-X, R6SS-X and R8SS-X only)

The system allows to coast and eventually recover a track that is no longer detected during a certain period, because of the following conditions:

- The radar is temporarily not covering the zone in which the track is found or
- The track is partially obstructed by vegetation or obstacles

The coast and recovery mechanism can be enabled or disabled, via a system parameter. Figure 45 shows the parameter that controls the activation of the coast and recovery mechanism.

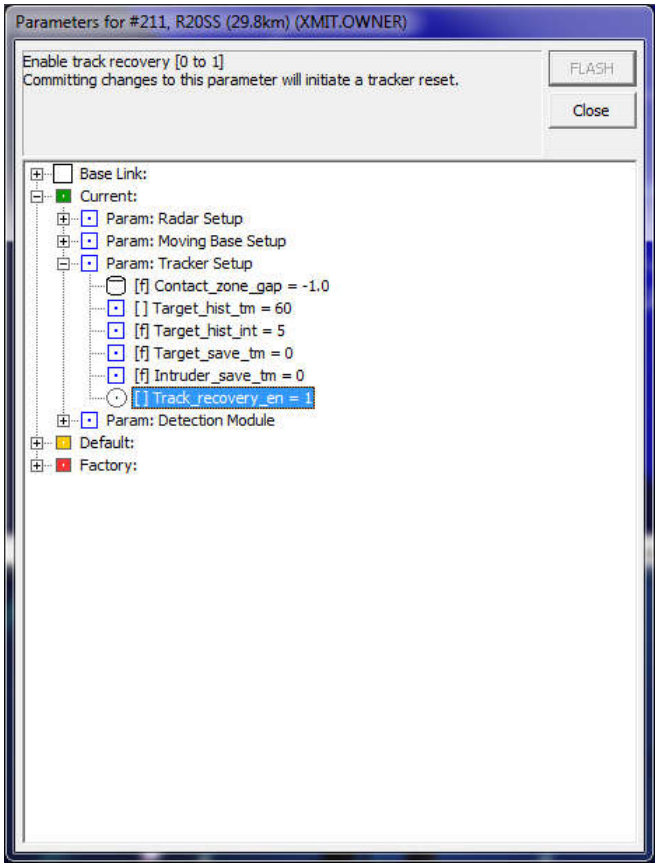

Figure 45 - Track Recovery Enable Parameter

The following example shows some tracks (211.39 and 211.38) that are coasted (Figure 46) because they are temporarily outside the radar field-of-view, and then get recovered (Figure 47).

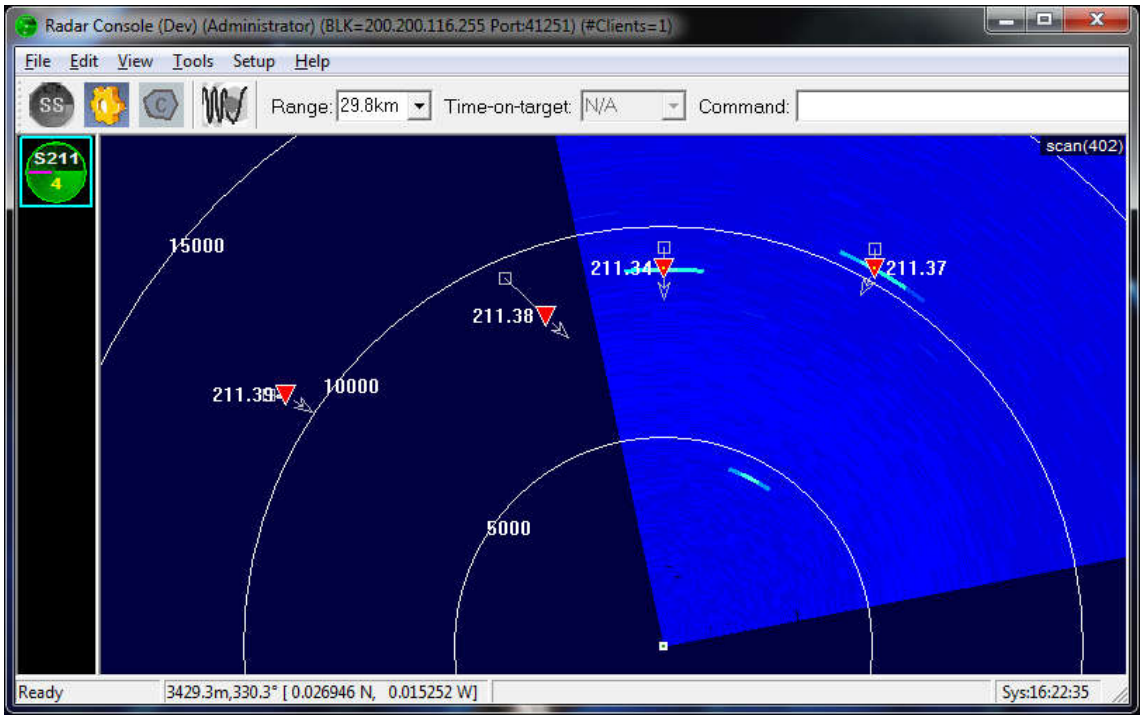

Figure 46 - Tracks Being Coasted

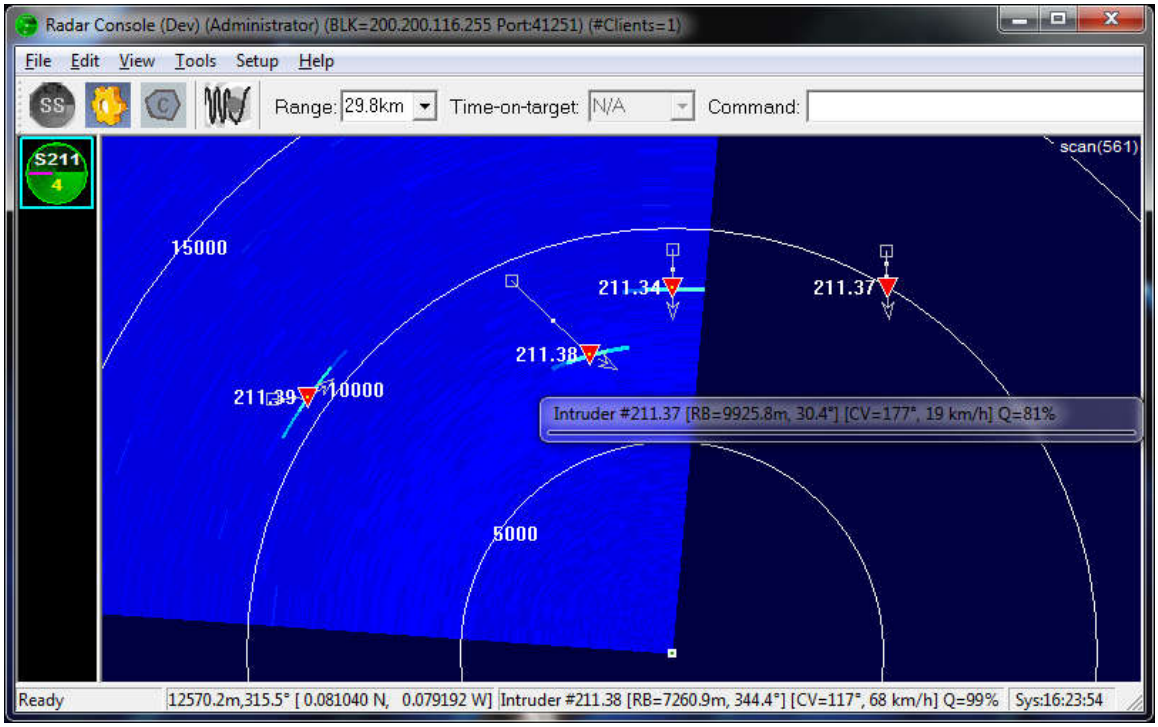

Figure 47 - Track Being Recovered

2.2.7.4 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.

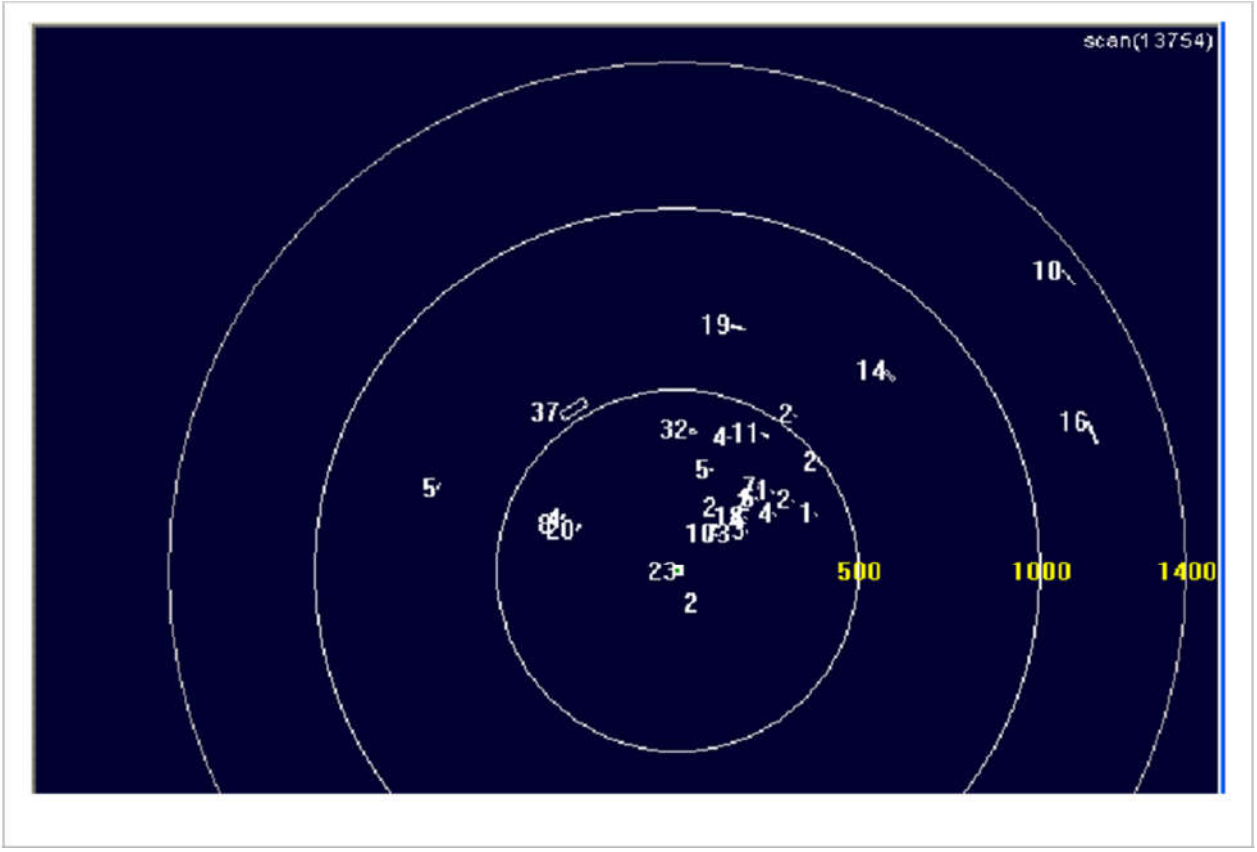

Figure 48 - Radar Contacts

2.2.7.5 AXML Output

The **Application eXtensible Markup Language (AXML)** is an output format following the XML standard. This output allows you to communicate with the **FLIR Cameleon© Command & Control software**, or other third-party applications.

2.2.7.6 ICD-0100 Interface

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

2.2.8 Recording Data

2.2.8.1 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 49. When enabled, a log file is created by the Radar Server Application.

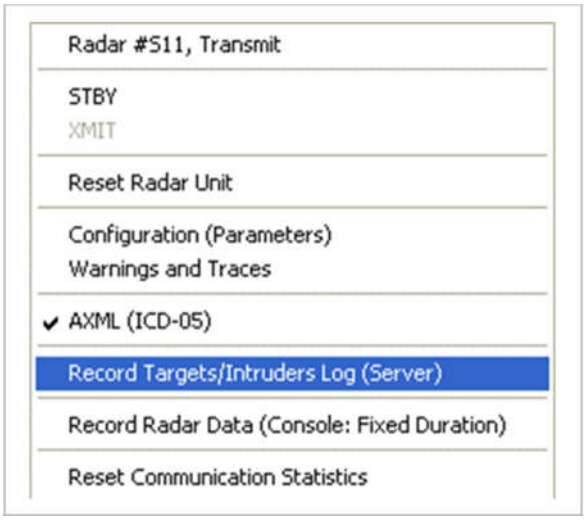

Figure 49 - Record Targets/Intruders Log Command

The Radar Server creates log files with the following format: YYYY.MM.DD Radar #XX Targets Logs.txt, where #XX is the radar identification number. Figure 50 shows an example of a targets/intruders log files:

```
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% [45.602508 N,  73.738360 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 50 - Targets/Intruders Log File Example

2.2.8.2 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 51.

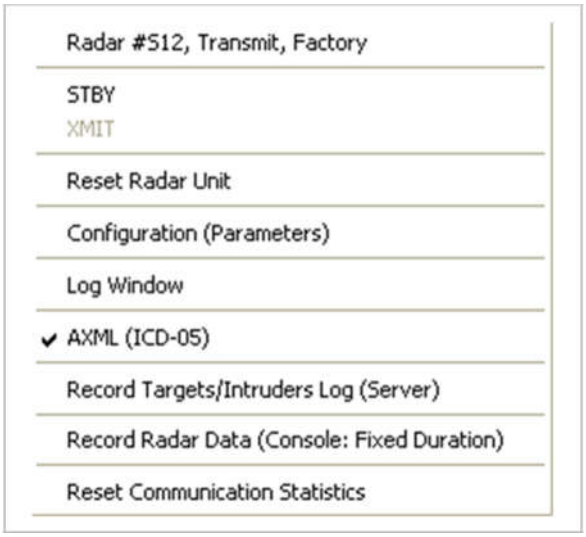

Figure 51 - Record Radar Data Menu

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 FLIR Radars Inc. to assist a customer in establishing an optimal radar configuration.

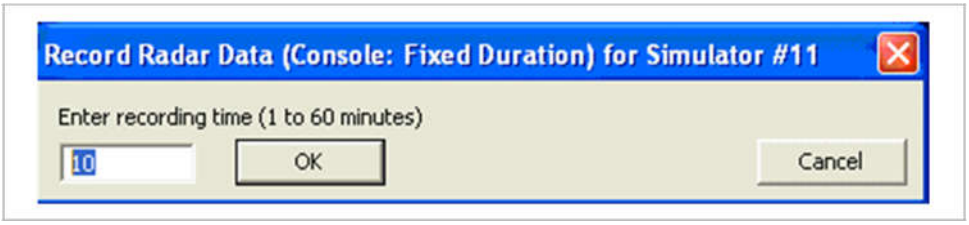

Figure 52 - Record Radar Data Duration

2.2.8.3 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 53 shows the menu used for **Standby** and **Transmit** commands.

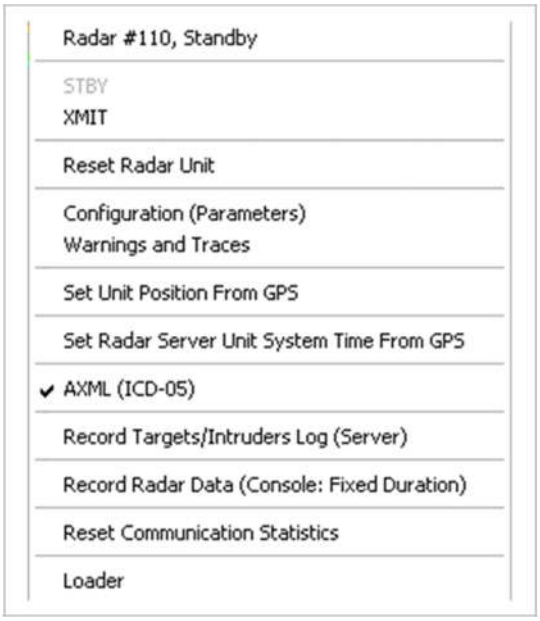

Figure 53 - Radar Standby and Transmit Commands

The **Reset Radar Unit** command allows you to reset the radar. This command is accessed the same way as **Standby** and **Transmit** commands (refer to Figure 53). During the reset (approximately 30 seconds), the radar will not transmit RF energy or detect targets.

The Loader command allows you to load new radar firmware. When this command is selected, the user will be prompt to select the radar firmware file.

2.2.9 Radar Operations

2.2.9.1 Set Unit Position from GPS

The radar unit is equipped with a **GPS** receiver, and it is possible to set its position using the **GPS** position. To set the position, right-click with the mouse on the radar icon and select the **Set Unit Position from GPS** command.

Note
If the **Set Unit Position from GPS** command is grayed out, the radar GPS has not yet acquired enough satellites to obtain its position, or the GPS signal is not received by the radar.

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 to get an accurate value. FLIR Radars Inc. recommends waiting 24 hours in order to obtain a good accuracy.

2.2.9.2 Set Unit Position and Orientation from GPS

The radar unit is equipped with tri-axis magnetometer and accelerometer sensors. These sensors allow the radar to find its orientation relative to the geometric North. To set the radar orientation, right-click with the mouse on the radar icon and select the **Calibrate Radar (Position and Azimuth Offset)** command.

If this command is selected, it is not necessary to select the **Set Unit Position from GPS** command, as this command will set both the radar orientation and position simultaneously.

Note
If the **Calibrate Radar (Position and Azimuth Offset)** command is grayed out, the radar GPS has not yet acquired enough satellites to obtain its position, or the GPS signal is not received by the radar.

2.2.9.3 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.

2.2.9.4 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 (refer to Figure 54). Each entry has a date, time and a type ([T] for trace and [W] for warning) associated with it.

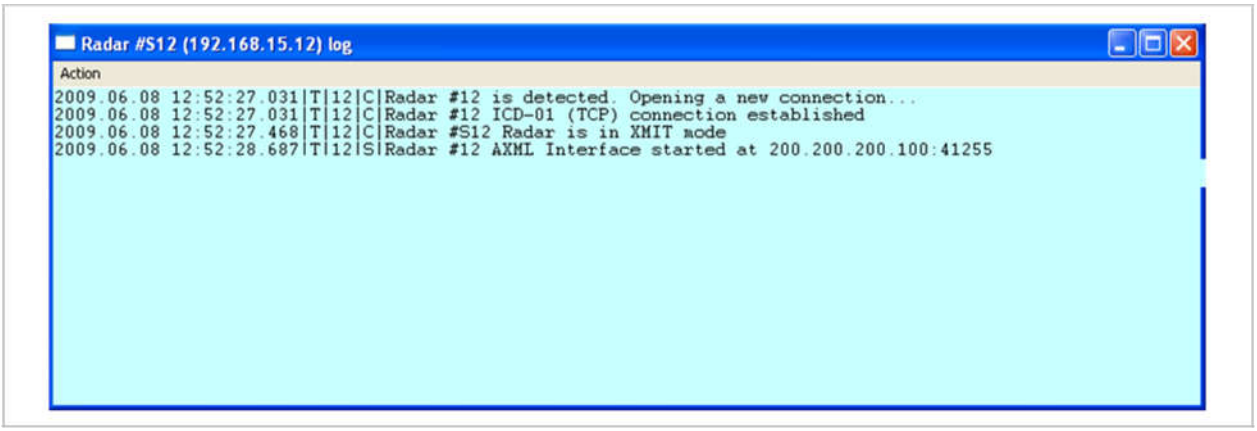

Figure 54 - Logs Window

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 55.

Figure 55 - Setup Menu

There is a **log file** for each connected radar, and the **filename** includes the radar serial number. Figure 56 shows a log 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 56 - Logs File Example

2.2.10 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 4 - Configuration Parameters Groups

2.2.10.1 Parameters Access

Only certain parameters can be modified by the operator, depending on the login level. The Operator login level does not allow parameter modifications, but the Administrator login level allows parameter changes shown in Table 5. Table 6 lists the name and description of all parameters.

Menu Item	Parameter Name	R1, R2, R3, R5	R3D, R5D	R20SS, R4SS-X, R6SS-X, R8SS-X
Base Link	ID	x	x	x
	IP	x	x	x
	Netmask			x
Param: Radar Setup	Sync_method	x		x
	Chirp_slot	x		x
	Azimuth_offset	x	x	x
	Pos_lt	x	x	x
	Pos_lg	x	x	x
	Elevation	x	x	x
	Height	x	x	x
	Tilt	x	x	x
	TX_sector_1_start_cw TX_sector_1_stop_cw	x		
	TX_sector_2_start_cw TX_sector_2_stop_cw	x		
	Freq_slot			x
	Data_link_speed	x	x	x
	GPS_averaging	x	x	x
	Moving_base_config			x
Param: Moving Base Setup	Scan_mode			x
	Scan_fix_az			x
	Scan_fix_tilt			x
	Scan_con_az_1			x
	Scan_con_az_2			x
	Scan_con_tilt_1			x
	Scan_con_tilt_2			x
	Scan_con_pan_speed			x
	Scan_alt_az_1			x
	Scan_alt_tilt_1			x
	Scan_alt_duration_1			x
	Scan_alt_az_2			x
	Scan_alt_tilt_2			x

	Scan_alt_duration_2			x
	Scan_alt_az_3			x
	Scan_alt_tilt_3			x
	Scan_alt_duration_3			x
	Scan_alt_az_4			x
	Scan_alt_tilt_4			x
	Scan_alt_duration_4			x
	Scan_alt_az_5			x
	Scan_alt_tilt_5			x
	Scan_alt_duration_5			x
Param: Doppler Mode Setup	Sync_method		x	
	Chirp_slot		x	
	TX_sector_start_cw		x	
	TX_sector_stop_cw		x	
	Doppler_TX_sector_clip_dis		x	
Param: ICD-0100 Setup	Connect IP	x	x	x
	Connect port	x	x	x
	DeviceName	x	x	x
	DeviceType	x	x	x
	Base	x	x	x
	Sector	x	x	x
	Radar Raw Sector Data	x	x	x
	Radar Raw Sector Data Port	x	x	x
Param: Tracker Setup	Contact_zone_gap	x	x	x
	Target_hist_tm	x	x	x
	Target_hist_int	x	x	x
	Target_save_tm	x	x	x
	Intruder_save_tm	x	x	x
Param: Detection Module	RD_target_up_az	x	x	x

Table 5 - Radar Configuration Parameters Access vs. Login Level

2.2.10.2 Parameter Descriptions

Parameter Name	Description
ID	Radar identification number. Can be any number between 1 and 65535.
IP	Radar IP address. Refer to the Configuration Manual to determine how to set this value properly.
Netmask	Radar netmask. Refer to the Configuration Manual to determine how to set this value properly.
Sync_method Chirp_slot	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) • 2 (GPS)
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 (for FastScan mode). 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	
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, averages 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 displayed as [AVG] when computation is completed.
Moving_base_config	For the R20SS, enabling this parameter allows the use of the pan/tilt positioner.
TX_sector_start_cw	Transmit sector. Used in Doppler mode only.
TX_sector_stop_cw	
Dopplex_TX_sector_clip_dis	Disable TX sector clipping (long time-on-target mode only).

Scan_mode	Scan mode used with the pan/tilt unit.
Scan_fix_az	Azimuth position used in fixed mode.
Scan_fix_tilt	Tilt angle used in fixed mode.
Scan_con_az_1	Azimuth of position 1, in continuous mode.
Scan_con_az_2	Azimuth of position 2, in continuous mode.
Scan_con_tilt_1	Tilt angle of position 1, in continuous mode.
Scan_con_tilt_2	Tilt angle of position 2, in continuous mode.
Scan_con_pan_speed	Pan speed used in continuous mode.
Scan_alt_az_1	Azimuth of position 1, in alternating mode.
Scan_alt_tilt_1	Tilt angle of position 1, in alternating mode.
Scan_alt_duration_1	Duration spent at position 1, in alternating mode.
Scan_alt_az_2	Azimuth of position 2, in alternating mode.
Scan_alt_tilt_2	Tilt angle of position 2, in alternating mode.
Scan_alt_duration_2	Duration spent at position 2, in alternating mode.
Scan_alt_az_3	Azimuth of position 3, in alternating mode.
Scan_alt_tilt_3	Tilt angle of position 3, in alternating mode.
Scan_alt_duration_3	Duration spent at position 3, in alternating mode.
Scan_alt_az_4	Azimuth of position 4, in alternating mode.
Scan_alt_tilt_4	Tilt angle of position 4, in alternating mode.
Scan_alt_duration_4	Duration spent at position 4, in alternating mode.
Scan_alt_az_5	Azimuth of position 5, in alternating mode.
Scan_alt_tilt_5	Tilt angle of position 5, in alternating mode.
Scan_alt_duration_5	Duration spent at position 5, in alternating mode.
Connect IP	ICD-0100 IP address of the command & control.
Connect port	ICD-0100 IP port of the command & control.
DeviceName	ICD-0100 device name. Can contain a description of a unit.
DeviceType	ICD-0100 device type.
Base	ICD-0100 military base or other user defined site where the unit is located.
Sector	ICD-0100 sector on the base where the unit is located.
Radar Raw Sector Data	ICD-0100 enable / disable for raw sector data.
Radar Raw Sector Data Port	ICD-0100 port for raw radar sector data.
Contact_zone_gap	When this parameter has a value of -1, detection zones are Independent of the intrusion zones (recommended). 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 trajectory. This parameter affects the PPI display only, and not the XML data output.
Target_hist_int	Interval at which a track position is recorded. This parameter affects the PPI display only, and not the XML data output.
Target_save_tm	Length of time during which lost targets are displayed on the PPI. This parameter affects the PPI display only, and not the XML data output.
Intruder_save_tm	Length of time during which lost intruders are displayed on the PPI. This parameter affects the PPI display only, and not the XML data output.
RD_target_up_az	Radar scan start azimuth angle. Refer to the Installation Manual to determine the optimum update azimuth.

Table 6 - Configuration Parameter Descriptions

2.2.10.3 Parameter Operations

To access the Radar Configuration Parameters, either right click with the mouse on the radar icon and select the Configuration (Parameters) option (refer to Figure 57), or select the  icon. The parameters will display as follows.

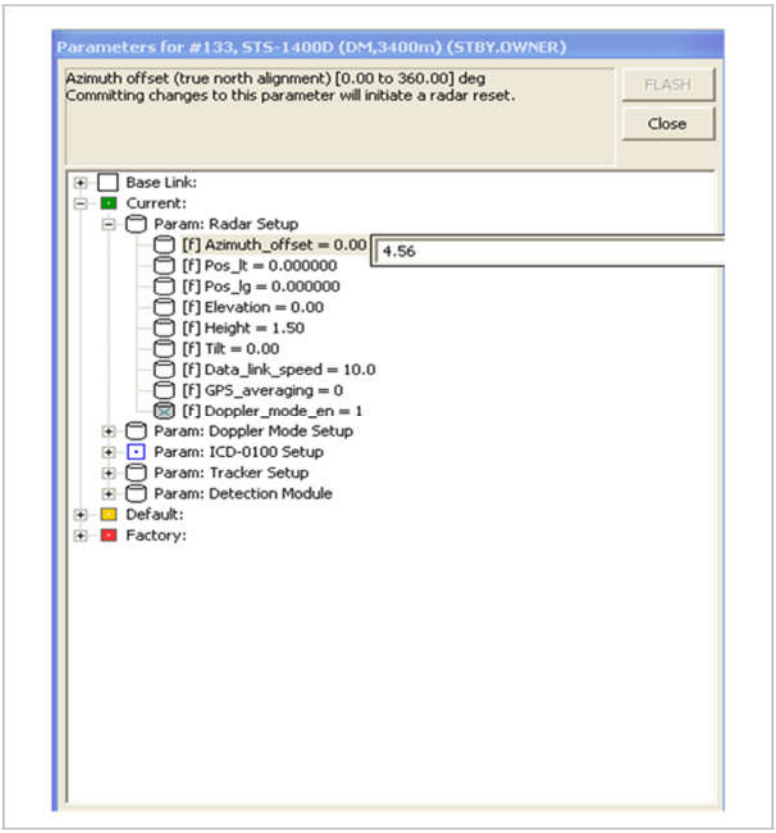

Figure 57 - Parameters Window

Each parameter can be modified by opening the parameter group, then sub-group (if applicable) and typing the new value, as shown in Figure 58.

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.

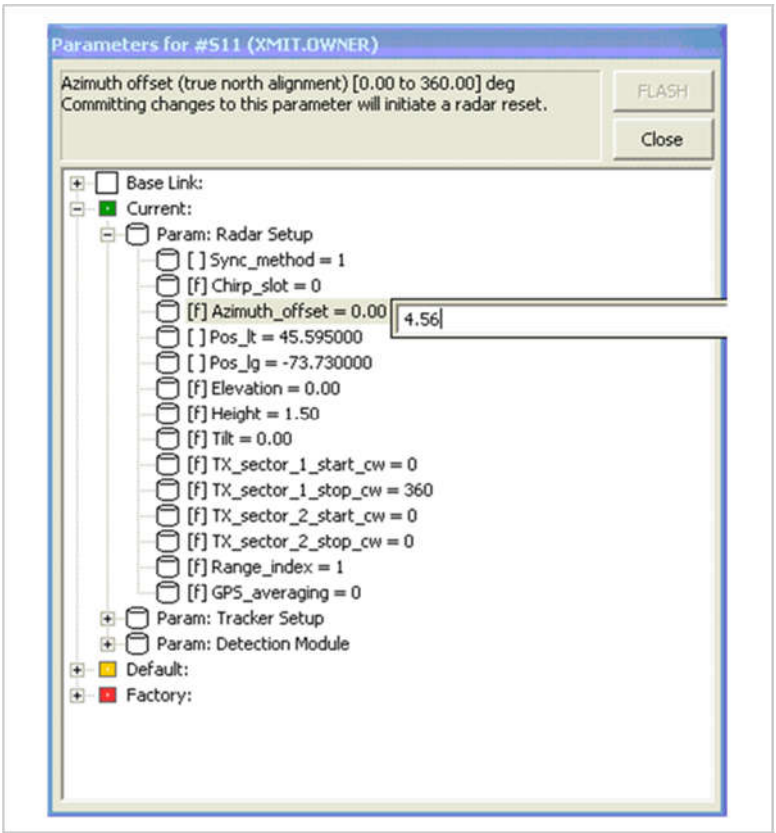

Figure 58 - Changing Parameter Values

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.

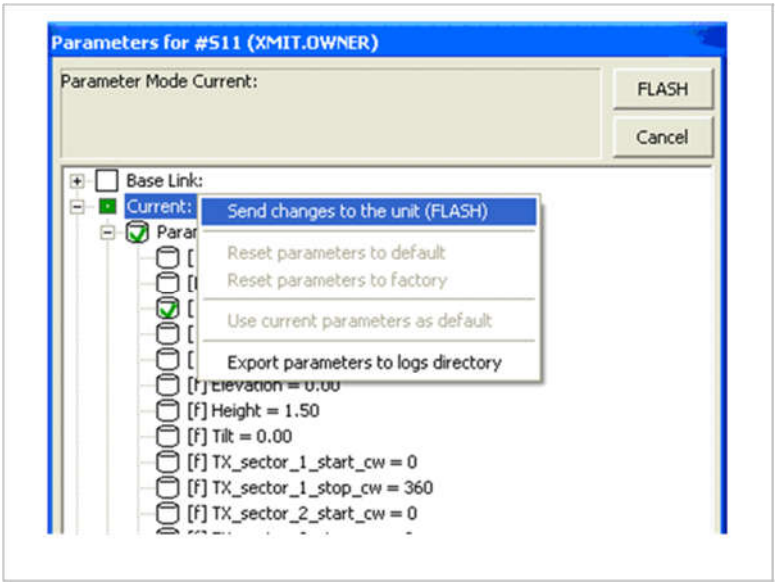

Figure 59 - Programming Unit Parameters

When **right clicking** on the **Current Parameters** group, commands are displayed, as shown in Figure 60. These commands allow you to:

- Reset the current parameters to the default values
- Reset the current parameters to the factory values
- Use current parameters as default values

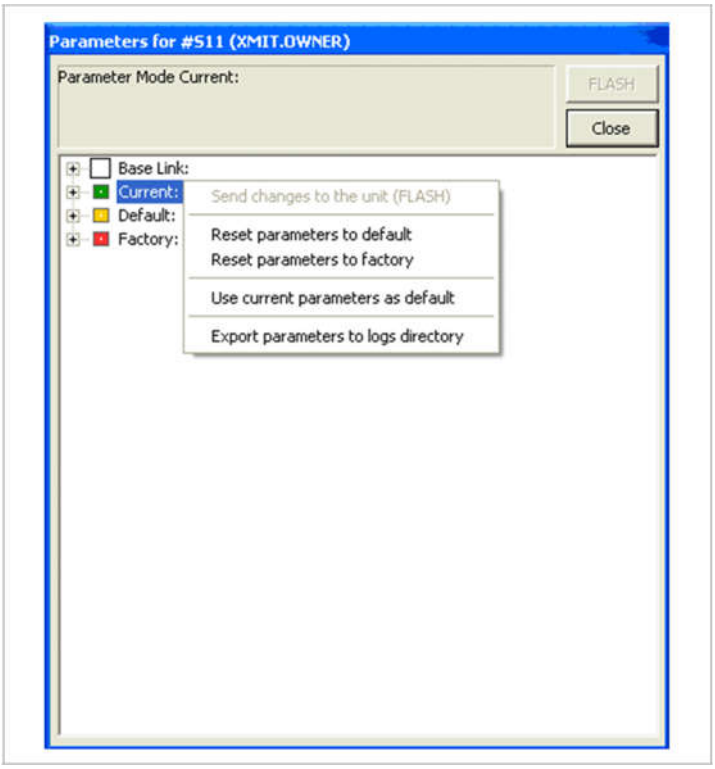

Figure 60 - Current Parameter Group Commands

When **right clicking** on the **Default Parameters** group, commands are displayed, as shown in Figure 61. These commands allow to:

- Restore the default parameters to the factory values.

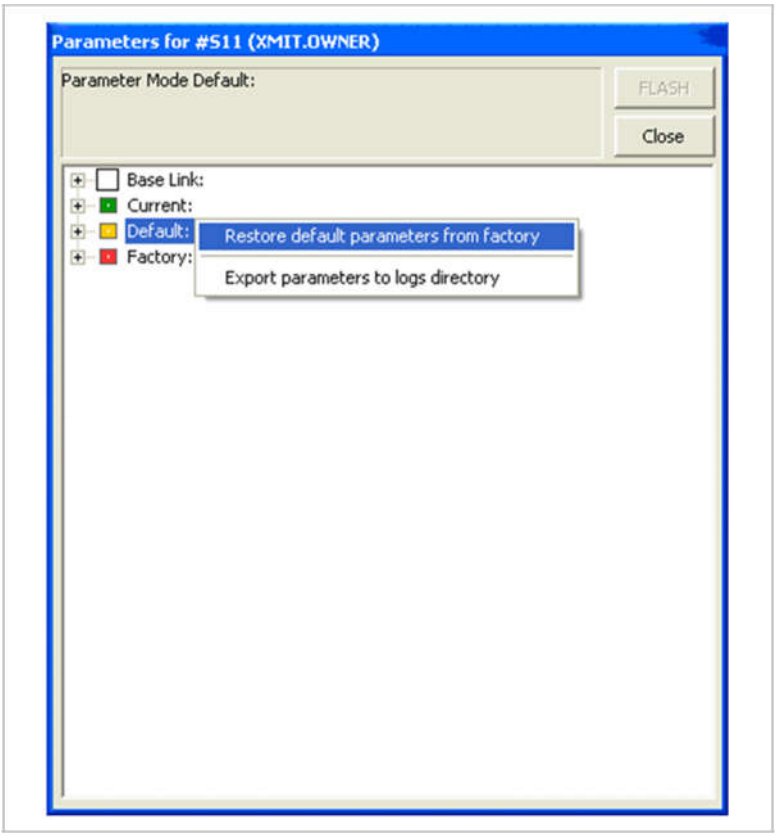

Figure 61 - Default Parameter Group Commands

2.2.10.4 Exporting Radar Parameters

The Export Parameters to Logs Directory command allows you to save the configuration parameters of a radar after it has been properly configured. If a radar must 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 62)
Step 3 Select Current (Figure 63)
Step 4 Left click on Current (Figure 64)
Step 5 Select Export parameters to logs directory (Figure 64)
Step 6 Click on Save (Figure 65)
Step 7 Click on Close
Step 8 Repeat steps 2 through 7 for each radar

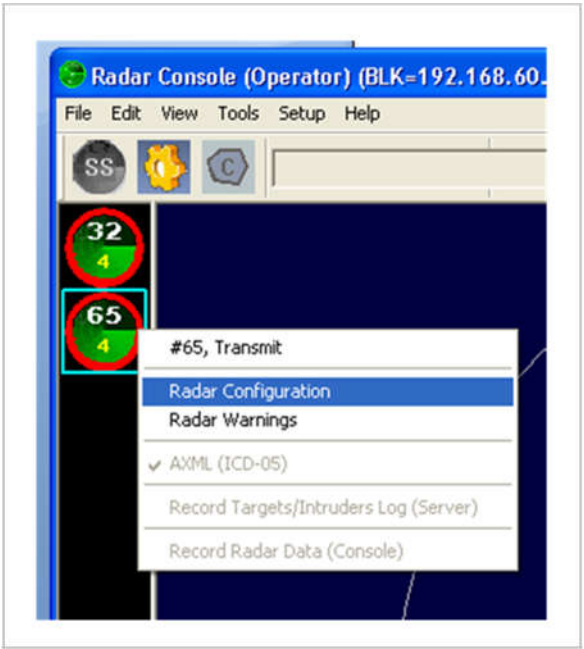

Figure 62 - Exporting Radar Parameters (Step 2)

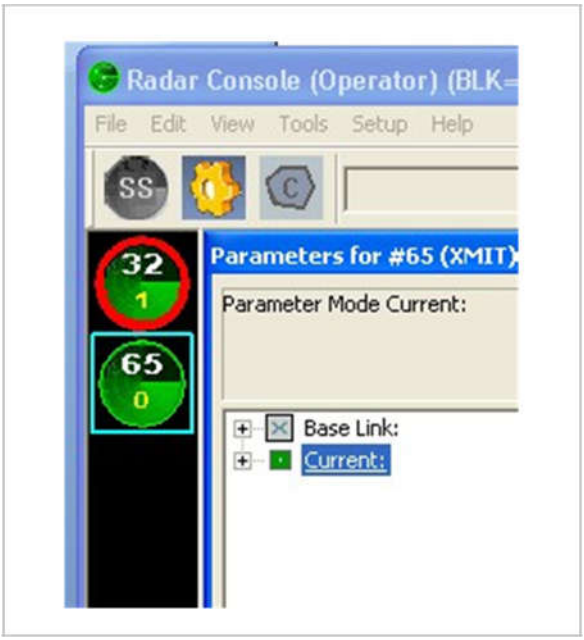

Figure 63 - Exporting Radar Parameters (Step 3)

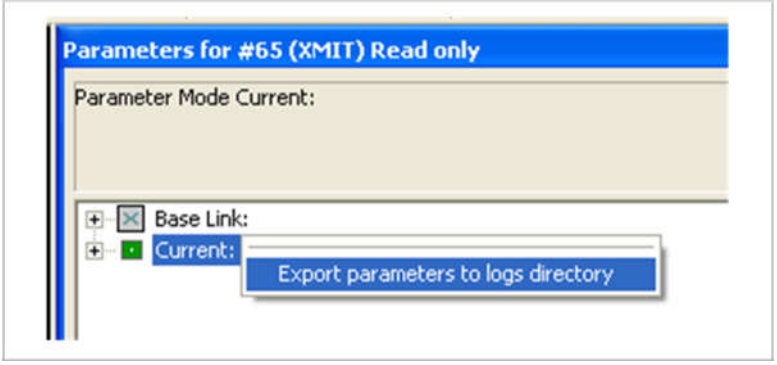

Figure 64 - Exporting Radar Parameters (Steps 4 and 5)

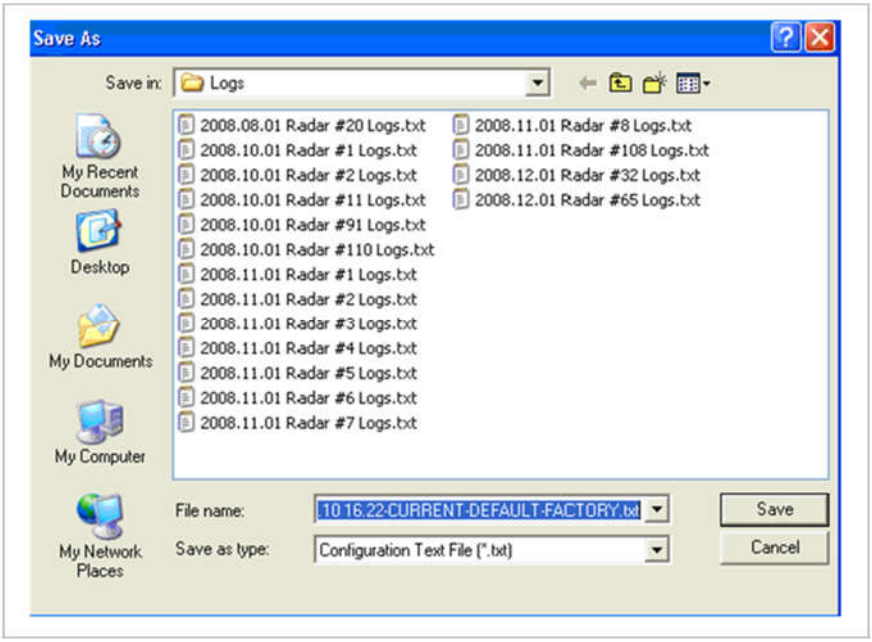

Figure 65 - Exporting Radar Parameters (Step 6)

Note
These parameters are archived in the same directory as the log files.

3 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. We will return your call shortly.


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