M211317EN-H

RESTRICTED

User Guide

IRIS Radar

IRIS

VAISALA

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Table of contents

List of figures

List of tables

1. About This Document

1.1 Version information

This manual provides information about using IRIS Radar software.

Table 1 Document versions (English)

Document code	Description
M211317EN-H	Eighth version. April 2021. Release 9.1.0.
M211317EN-G	Seventh version. November 2017
M211317EN-F	Sixth version. May 2017
M211317EN-E	Fifth version. November 2016

1.2 Related documents

Table 2 Vaisala Weather Radar documentation

Document code	Name
M212338EN	*Weather Radar WRS400 Installation and Configuration Guide*
M211849EN	*IRIS Focus User Guide*
M211850EN	*IRIS Focus Administrator Guide*
M211904EN	*IRIS Focus Release Notes*
M211315EN	*IRIS and RDA Software Installation Guide*
M211318EN	*IRIS Programming Guide*
M211316EN	*IRIS and RDA Utilities Guide*
M211319EN	*IRIS Product and Display Guide*
M211317EN	*IRIS Radar User Guide*
M211452EN	*IRIS and RDA Dual Polarization User Guide*
M211322EN	*RVP900 Digital Receiver and Signal Processor User Guide*
M211320EN	*Radar Control Processor RCP8 User Guide*

Vaisala encourages you to send your comments or corrections to helpdesk@vaisala.com.

1.3 Documentation conventions

WARNING! Warning alerts you to a serious hazard. If you do not read and follow instructions carefully at this point, there is a risk of injury or even death.

CAUTION! Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.

Note highlights important information on using the product.

Tip gives information for using the product more efficiently.

Lists tools needed to perform the task.

Indicates that you need to take some notes during the task.

1.4 Trademarks

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2. IRIS Introduction

2.1 IRIS Radar Overview

IRIS Radar provides tools for operating a radar network and distributing radar products.

- Advanced radar signal processing and control features
- Central definition with automatic warnings
- Comprehensive alignment and calibration
- Comprehensive diagnostic and system monitoring
- Local and remote radar control
- Real-time display for local or networked workstations

2.2 IRIS Users

Table 3 Supported IRIS User Types

User Type	Description
Radar operators	Define and schedule radar tasks and determine how the radar data is output.
Observers	View radar tasks, configurations, and schedules. Send data through outputs. View radar products and RAW data.
System managers	Install and maintain IRIS software and platforms and manage users. Knowledge of platform hardware is recommended.
Operator	A system user that the software uses to access some configuration files.

2.3 IRIS Tasks

A radar task is a set of operating parameter configurations for the radar antenna, transmitter, receiver, and signal processing systems. The data acquired during the task are stored on disk as ingest files, which serve as the data base for radar product generation.

Examples of tasks include:

- Surveillance PPI scan at a single elevation angle.
- Complete volume scan at multiple elevation angles.
- PPI sector scan at either single or multiple elevation angles.
- RHI scan at either single or multiple azimuth angles.

Use the **TASK Configuration** menu to specify the antenna scanning, as well as other radar parameters, such as pulse width, PRF, number of samples to average, and the type of data to process such as Z, V, W, ZDR, RhoHV, or PhiDP).

Use the **TASK Scheduler** menu to execute tasks. The **TASK Scheduler** supports hybrid tasks, made up of multiple sub-tasks.

More information

- Configuring Tasks (page 40)
- IRIS Data Parameters (page 123)
- Task Scheduling Overview (page 63)
- Task configurations (page 114)

2.4 License Types

IRIS requires at least one of the following licenses:

- *IRIS Radar* runs at the radar site, controls measurement, and packs the measured values to files.
- *IRIS Analysis* typically runs on a separate computer. IRIS Analysis reads the files created by IRIS Radar and processes the polar volume measurement to different products, and sends these to displays or archives.

2.5 IRIS System Set-ups

Set-up	Description
IRIS Radar	Runs the radar and signal processing hardware, generates ingest files and raw data for other IRIS sites. Supports the full product set as well as remote control and monitoring.
IRIS Analysis	Receives raw data products from the radar site over the network or from an archive device. Supports the full product set as well as remote control and monitoring.
IRIS Focus	Acts as a radar product generator (RPG) to provide on-demand outputs such as **CAPPI** or **TOPS**. Includes features such as looping, cross-section, track, and alerts. Displays radar products on standard PC (Windows or Linux) running standard browsers.

2.6 IRIS Hardware

2.6.1 Workstation

IRIS runs on computers with a Linux operating system.

The workstation can run the IRIS processes and menus and functions as an output device for IRIS products.

2.6.2 Radar signal processor

Radar signal processor (RVP) software triggers radar measurement by producing the trigger signal for the transmitter using the intermediate frequency digital receiver (IFDR) unit in the receiver. The IFDR also generates the transmit pulses at 60 MHz IF frequency.

After the IFDR unit has digitized the received echo signal into samples (`I` and `Q` data), RVP processes the data in the radar server computer using computations such as:

- Converting the received signal amplitude into calibrated radar reflectivity values.
- Doppler processing to filter out ground clutter and compute radial velocities.
- Polarimetric processing to classify the measured hydrometers and to apply attenuation correction.

The end product of the RVP process is a radar ray, where selected radar data from a certain short time interval is stored as a function of range.

Parameters configure signal processing, such as pulse repetition frequency, range resolution, and Doppler filter parameters. You can select these either directly when running RVP as a standalone or through the IRIS software when IRIS controls the RVP process during automatic weather radar measurements.

2.6.3 Radar control processor

Radar control processor (RCP™) controls and monitors weather radar system sub-units, for example, the pedestal, transceiver, and safety interlock system.

RCP has an Ethernet interface for the subsystems.

Communication and data management

The Ethernet cable from RCP is routed to the CANbus-Ethernet converter inside the transceiver. Data for diagnostics, control, and angle data are transferred within the CANbus channel.

The angle sensors monitor the orientation of the antenna in azimuth and elevation. The elevation angle sensor is on the pedestal arm, and the azimuth angle sensor is inside the pedestal equipment bay.

The angle sensors are optical encoders. The encoder parameters are set at the factory. From the pedestal, the angle data is tranferred through the CAN bus and Ethernet connections to the radar server computer.

Radar control processor software

RCP software steers the radar antenna in the defined measuring direction to read the azimuth and elevation angles from the angle encoders. The angle values are combined with the output of the RVP signal processing to display measured radar data as a function of azimuth, elevation, and time.

RCP software displays status information, such as the status and faults of radar system units as well as the controls for switching the transmitter radiation on and off.

2.6.4 IRIS Network Connections

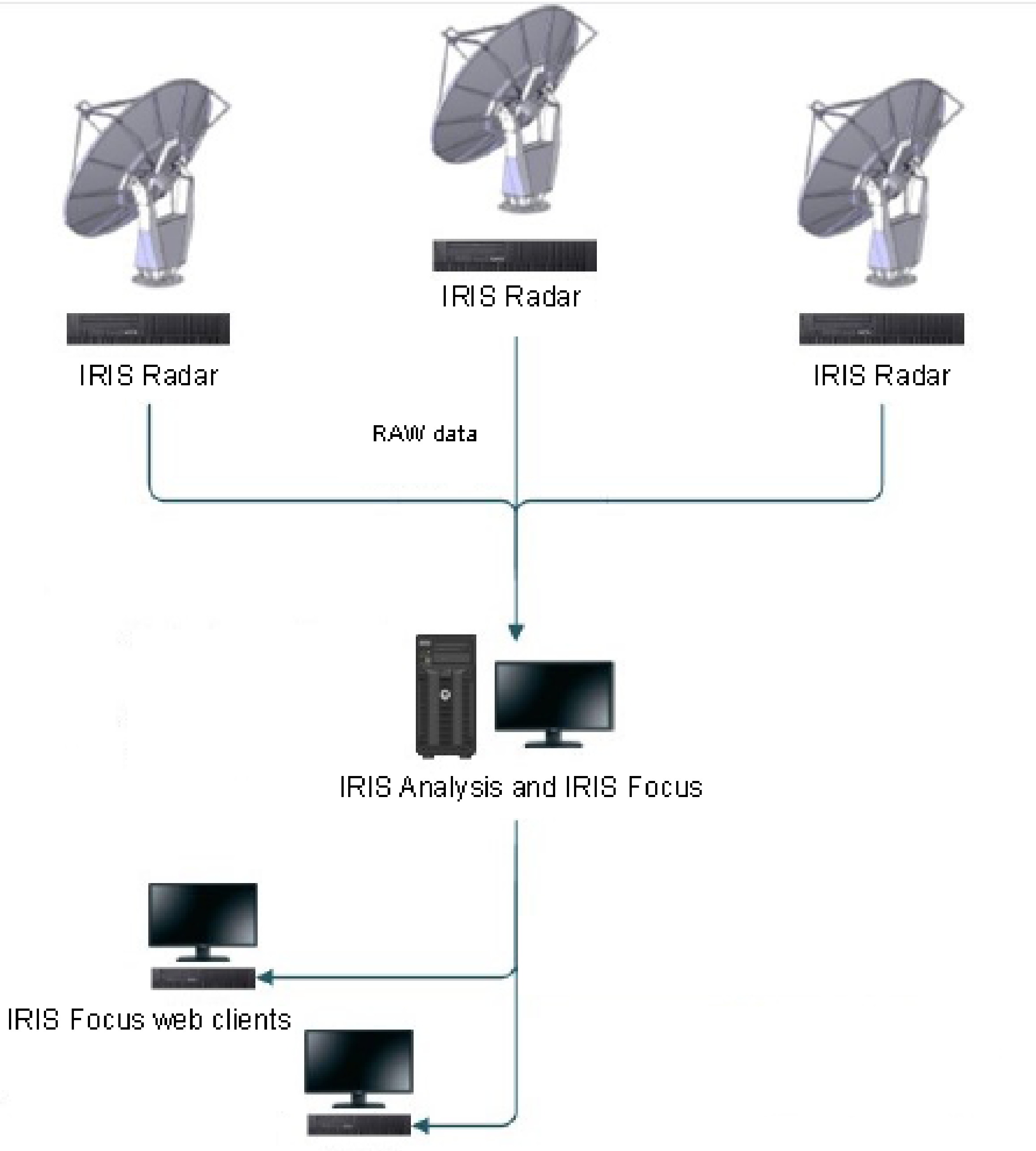


Figure 1 IRIS Network Connections

2.6.5 Color Printer and Output File Formats

An optional color printer provides hardcopies of products, prints tape/DVD disk inventories, and supports other system maintenance and documentation. Color postscript printers are supported.

The output files can be formatted as IRIS Native, TIFF with optimal compression, BMP, GIF, JPG, Postscript, or Compressed serial link format.

2.6.6 Tape Drive and DVD Storage

A DVD is used for IRIS installation.

Archive/retrieve is supported on DAT tape, DVD+RW drivers, and large disk archives (LDAs) on a local or remote hard disk.

2.7 IRIS Architecture

IRIS is made up of processes that convert radar data to output formats for display, printing, or storing on tape or disk.

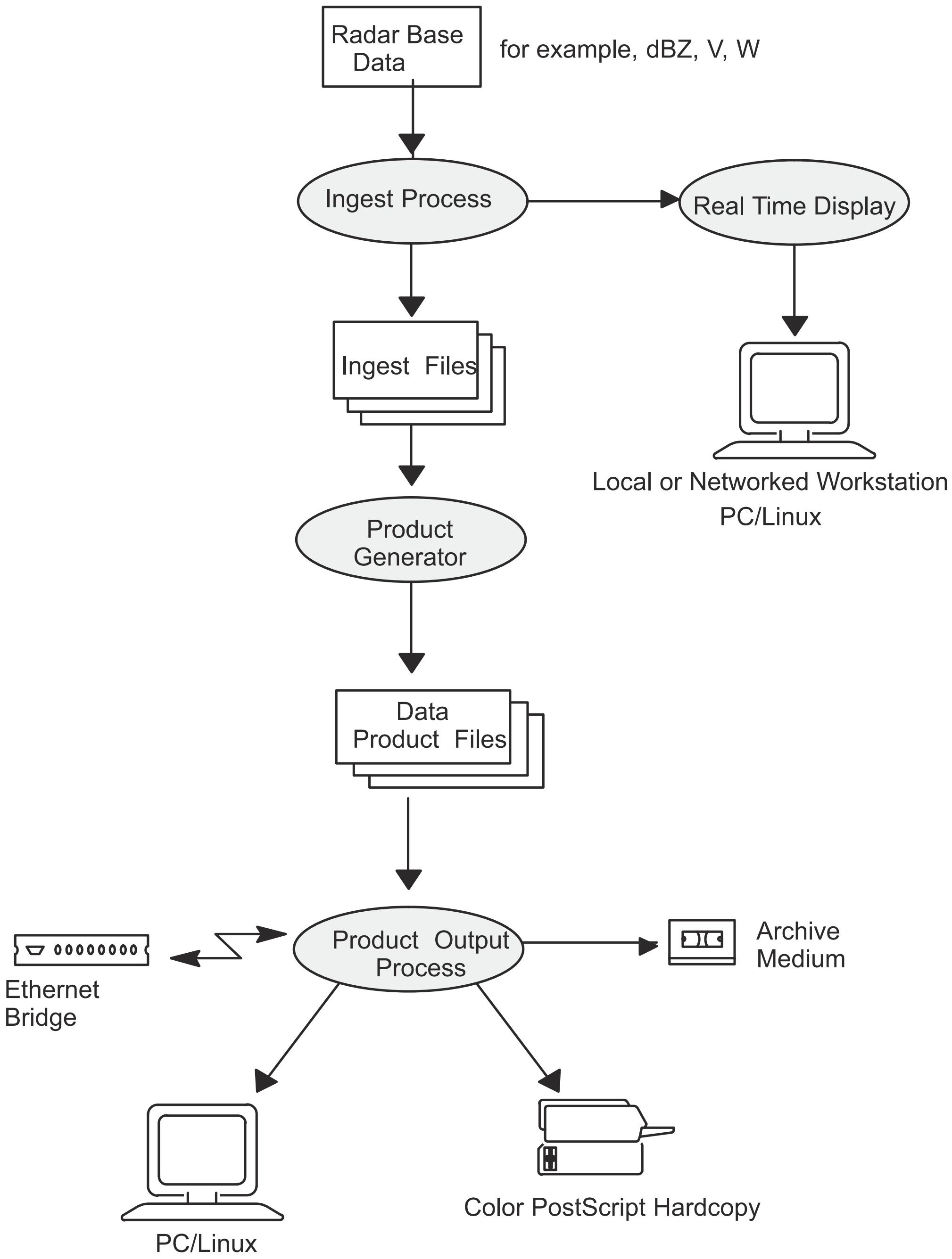


Figure 2 IRIS Processes

2.7.1 Ingest Process

The signal processor sends base data to the IRIS Ingest Process.

The Ingest Process controls the signal processor and RCP for the data acquisition. A task is a set of instructions for performing a scan, such as a single RHI scan or a PPI volume scan at multiple elevation angles. The antenna scanning, signal processor configuration, PRF, pulse width, and so on, make up the parameters of the task configuration.

IRIS executes one task at a time, but up to 8 separately defined tasks can be scheduled to run at different times, and up to 26 tasks can be linked together to form a single hybrid task.

Running the radar comprises defining the task configuration and the task schedule.

IRIS provides menus for performing these operations and allows you to save the results on disk so that task configurations and schedules can be recalled easily.

IRIS can store many hours of volume scans of raw ingest data, depending on the size of the disk that is available.

2.7.2 Real Time Display Output Process

The ingest data from the signal processor are split to the real time display output process which constructs ray-by-ray packets (for example, 1°) that are broadcast over the network using the UDP socket approach.

Radar scan data can be viewed on:

- Networked workstations running the IRIS real time display
- Local workstation where the data are collected.

The broadcast approach allows the simultaneous use of multiple-networked real time displays without burdening the network.

2.7.3 Product Generator Process

Ingest files are the starting point for radar products. They are the input to the product generator, which creates representations of the raw data as product files.

Like tasks, products are configured and scheduled and can be saved to a disk and recalled later for product generation.

The product generator takes the ingest file for the task, computes the product, then stores the result in a product file. Results from one product file can be used to compute another product.

Table 4 Example: CAPPI Product

Product Configuration Defines....	Product Schedule Defines....
• Height of the **CAPPI** surface • Display parameters: maximum range, parameter, pixel resolution, and default color assignment • Which task provides the ingest file for computing the **CAPPI** product	How often IRIS generates the product: • Each time the associated task runs • Only the next time the task runs • Only for selected ingest files

2.7.4 Product Output Process

Product files can be requested by IRIS users or sent automatically to the following output devices:

- IRIS Focus
- IRIS Quick Look Windows (QLW).

- Disk files on networked workstations, where the products are available for local display and manipulation.
- DVDs or Large Disk Arrays for data recording (archiving).
- Printers for hardcopy.

IRIS supports many product file formats.

The Product Output process takes the product file, reformats or compresses it as required by the device, and transmits it over the appropriate interface. Custom reformatting is available through IRIS output pipes, which are open source software routines that can be linked to a network output.

IRIS can record to archive servers or DVD and retrieve any product file. This means that retrieved products are available for display as if they were generated normally. The RAW product allows ingest files to be restored so that they are available for future product generation.

2.7.5 Watchdog Process

To make room for new ingest and product files, a watchdog process automatically deletes files according to their age.

2.7.6 Network Process

IRIS supports working in network environments. For example, the product generation process can run on a different computer on the network to free the primary IRIS host to control the radar (Radar process) and handle user interactions (Product Output process).

You can remotely control and monitor IRIS on another workstation using tools for accessing all aspects of the radar control.

The software architecture supports adding new output devices and products for new applications.

2.7.7 Server and Client Structure

IRIS runs in a host/client structure. There is always at least one host running on an IRIS system, and many clients can connect to it.

This architecture is much more efficient in terms of bandwidth than exporting a window. This allows the menus to be responsive if the network speed is limited.

Server

The IRIS server runs the processes, the radar and signal processor, product generator and output processes. It collects data and creates ingest files as defined by tasks and schedules.

Client

The IRIS client runs the menus — the user interface for viewing products and managing the host. The client menus let users define products and tasks, establish schedules, and monitor the host's activities.

The client runs locally on the user's computer and connects to an IRIS server on the network or on the same computer.

2.8 Viewing IRIS Documentation

To read IRIS product documentation, use the Adobe™ **acroread**™ reader.

For more information on using the reader, select **Help** in the reader window.

1. Launch the **Manuals Menu** by doing one of the following
   - In an **IRIS Menu**, select **Help > IRIS Help**.
   - In IRISNet, select **Manuals > Manuals Menu**.
   - In a terminal window, type: `$ manuals &`
2. Select a document.
   The document is context sensitive. Depending upon where you are in the user interface, the document opens either to the table of contents or to the chapter describing the menu.
3. Use PAGE UP, PAGE DOWN, arrows, links, and search to navigate within documents.
4. Use the **Manuals Menu** to switch between documents.

2.8.1 Printing Online Documentation

If a postscript printer has been configured for the system, you can print the online documentation.

1. Display the chapter that you want to print.
2. Select **File > Print**.
3. In the printer dialog window, select the range of pages that you want to print and the print options.

3. Starting and Stopping IRIS

3.1 Logging into Host Server

Systems configured at the Vaisala factory have the following default usernames and passwords.

The system administrator can change the passwords using the standard Linux password support.

Most users log in to IRIS Radar as either `observer` or `radarop`. Only use the `root` account if you must perform administrative tasks.

Table 5 Default usernames and passwords

Username	Password
`observer`	xxxxxx
`radarop`	xxxxxx
`root`	xxxxxxxx

1. To log on to the host, enter your user name and password.
   After a short pause, the system displays the operating system prompt.

3.2 Starting IRIS Client

IRIS menus can run from the same or a different system than the host, as long as they are connected to the host over a network connection.

1. Log in to the client system
2. On the command line, type **`iris&`**.
   The IRIS menu bar appears.
3. Select **Connect > <host name>**.
   Select either the local host or the remote IRIS host.
4. Select **Menus** and the name of the menu you want to access.

   As you work, you can access the menus list from the menu bar or from within each menu.

3.3 Exiting IRIS Client

1. Select **Exit > Exit**.

4. Using IRIS Menus

4.1 IRIS Menus Overview

IRIS menus provide tools for defining how IRIS collects, processes, and displays radar data.

Multiple users can access the menus. The most recently save configuration is stored.

> **CAUTION!** IRIS does not warn you if other users are editing task configurations or if the radar is being controlled by other users.

Access rights define who can view or edit a menu. For example, an observer may view the **TSC Monitor** menu to see which tasks are currently scheduled, but cannot modify tasks.

Table 6 Access to IRIS Menus

Menu	Description
Archive Menu	Control the IRIS tape, DVD, or LDA operations, including recording and retrieving. Display archive logs that list the contents of a device.
Ingest Summary	List the ingest files on a disk, manually delete files, or set the **Keep** flag so files are not deleted by the **Watchdog** process.
IRIS Menu Bar	Select other menus and exit IRIS.
Messages	View logged error and status messages.
Overlay Menu	Choose which overlay to use when viewing data from a radar site.
Product Configuration	Specify product configuration. Select the task used for product generation and the type of product.
Product Output	Show what products are available on disk and select products for transmission to workstations. Operators can transmit products and overlays to a workstation, printer, or tape/ DVD.
Product Scheduler	Schedule which products to run.
Projection Menu	Configure map projections which are required when compositing multiple radars.
Quick Look Window	Provide easy access to IRIS data for forecasting applications.
Radar Status	Monitor and control hardware components and IRIS configuration.
Real-Time Display	View the PPI or RHI radar scan in real time.
TASK Configuration	Configure radar and signal processing tasks, such as a volume scan.
TSC Editor	Create task schedules to be executed from the **TSC Monitor** menu
TSC Monitor	Schedule task execution. Schedules may be repetitive (for example, every 15 minutes), or a single execution.

4.2 IRIS Menu Title

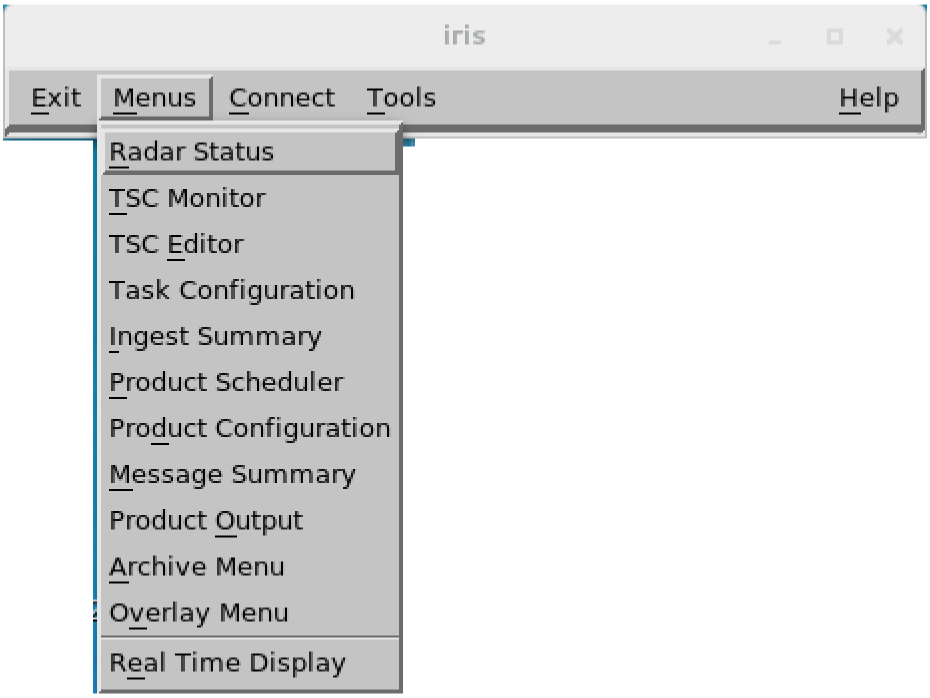
Figure 3 IRIS Menu Title

IRIS menu titles contain the name of the server to which IRIS is connected, the name of the menu, and the name of a configuration file that has been loaded in the menu.

If you have not loaded any configuration files, the DEFAULT configuration file loads.

4.3 Accessing IRIS Menus

1. Select **Menus** and choose a menu from the list.



2. Within each menu, select **File** to perform common operations.

Table 7 File Menu

Menu Option	Description
Open **Load** (Menus with live data such as **Overlay**)	Show a list of configuration files you can load in the menu.
Save as	Save your configuration under the same name or under a new name that you specify.
Delete	Delete the configuration file that is currently loaded in the menu.
Print	Select one of the following options: • **Print > to Printer** sends the output to the Postscript or color printer specified in the **Printer Setup** menu. • **Print > to File** sends the output to a file in your default home directory. The file name consists of a three-letter abbreviation of the menu name, the current date and time, and the *.xwd* file extension. • **Print > Setup** lets you configure the printer on your system.
Close	Return to the IRIS menu bar.

3. Select **Update Now** to sync the information when many IRIS menus are running at the same time.
4. Select **Reset Size** to reset the menu to its default size.

4.4 Entering Information in Menus

Table 8 Enter Menu Information

Mode	Description
Text fields	Enter the text, such as the name of a configuration file or a numeric value, in the field or select the button next to the field to show a list of valid values.
Lists	Select one or more list items: • Left-click the mouse over a single entry. • Click and drag the mouse over a group of entries. • Press CTRL and left-click the mouse to select a single entry without deselecting previous entries. Do this to select a group of entries that are not next to each other in the list. • Press CTRL and click and drag the mouse to selects a group of entries without deselecting previous selections. Do this to select multiple blocks of entries.
Toggle Buttons	Left-click the mouse to toggle these buttons on (the button appears to be pushed in) or off.

4.5 Viewing the Graphical IRIS Menu

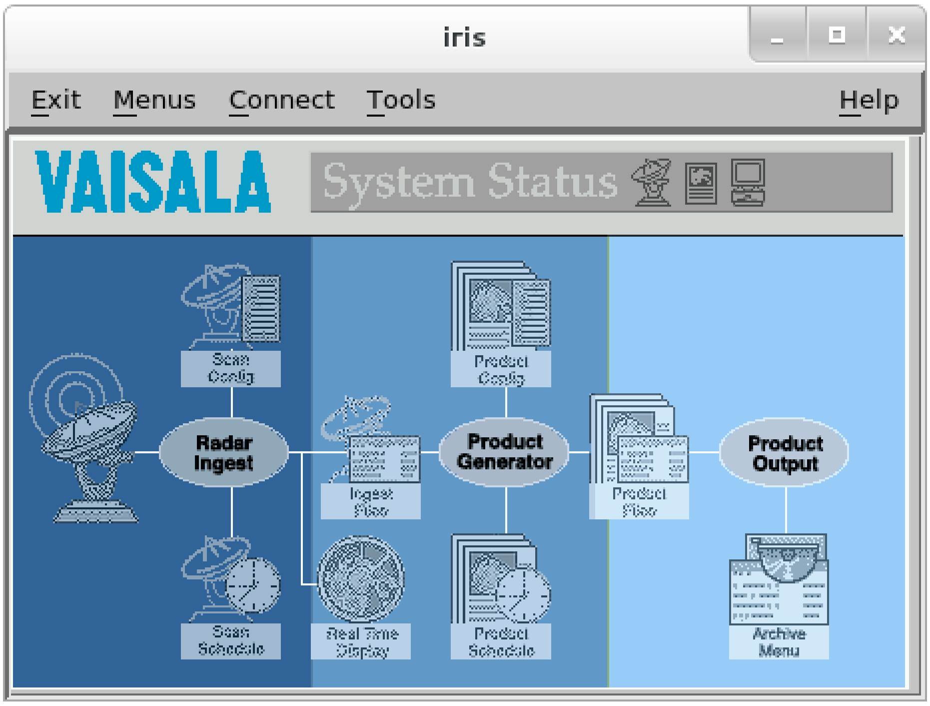


Figure 4 Graphical IRIS Menu Bar

1. To toggle the graphical menu on or off, select **Tools > Display IRIS Image**.

5. Managing Servers

5.1 Customizing the Server List

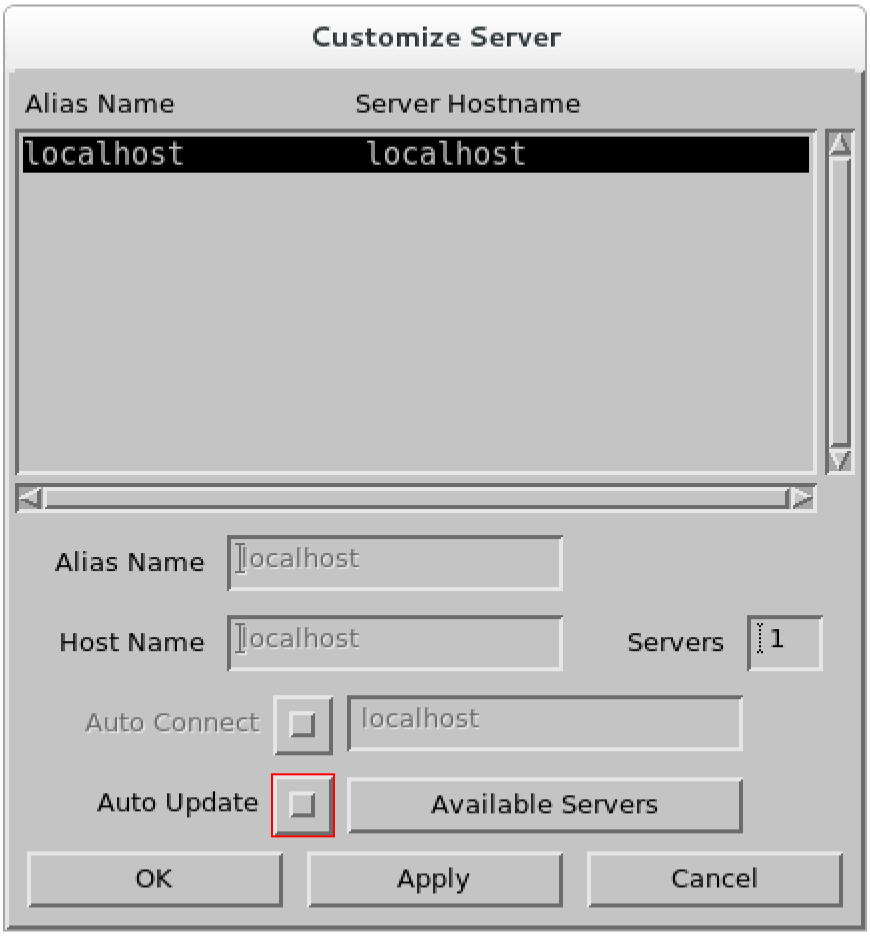


Figure 5 Customize Server List

IRIS client menus run locally on your workstation. You can connect these menus to your local IRIS server or other servers where IRIS is running.

When you run the IRIS menus for the first time, you must define the list of IRIS servers that you want to be able to access.

The server that is running on your local workstation, `localhost`, is listed by default.

1. To increase or decrease the number of servers allowed in the list, enter a number in the **Servers** field.
   If the number of servers is larger than the number of known servers, unused entries are listed as **Button Name** entries.
   If the number of servers is smaller than the number of entries in the list, entries are removed, beginning with the last server in the list.
2. On the IRIS menu, select **Connect > Customize Server**.
   The top of the server menu contains the list of servers. The bottom of the menu contains the fields for adding or changing server definitions.
3. Select a list entry.
   This places the server information in the fields at the bottom of the menu.
4. Type the server details:
   - **Alias**: server name.
   - **Host Name**: server's node name, that is, the network node name of a server where IRIS is installed.
5. Select **OK** to add the server to the list.
   The server list is stored on disk so that the entries you make in one session are available in the next.
6. Select **Apply** to save your changes.

5.2 Connecting to Servers

To activate IRIS menus, you must be connected to a server running an IRIS host. You can connect to only one server at a time.

> If you are an IRIS observer, you can connect a host and view menus but cannot change menus that control the radar or network operation.

1. In the menu bar, select **Connect** and pull down the list of available servers.
   The list contains the names of the servers that you added in Customizing the Server List (page 24).
2. Select a server from the list.
   The IRIS menu bar title changes, displaying the class of use (either **OPERATOR** or **OBSERVER**) and the name of the server node.

5.3 Disconnecting Servers

1. Select **Connect > Disconnect**.

6. Managing Audio Settings

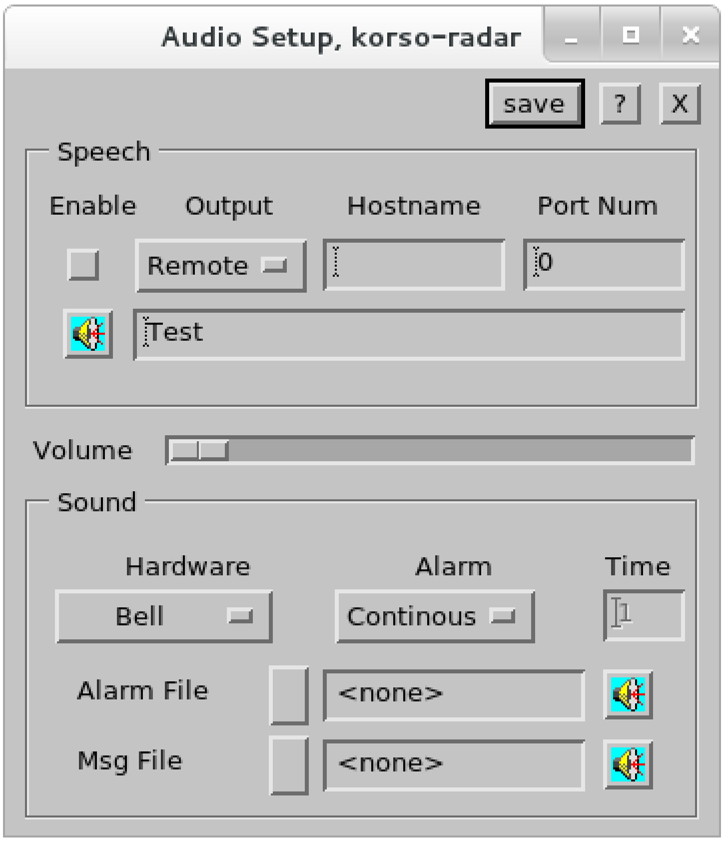


Figure 6 Audio Setup

1. Select **Tools > Audio Setup**.
2. Configure speech options in the **Speech** panel.
   a. Select or deselect **Enable** to enable or disable all speech originating from your local workstation.
   b. Define the sound output settings
      - Select **Local** to output to the sound card in your workstation.
      - Select **Remote** to the specified PC using the specified port number.
        For remote output, enter the **Hostname** of the workstation.
        For remote output, enter the **Port Number**. The recommended value is 30731.
   c. Select **Test** to send the test string on the menu as a spoken output.
   d. Use the slider to control audio volume.

3. Configure sound options in the **Sound** panel.
    a. Under **Hardware**, if you have a sound card, select **Sound Card**.
    If you do not have a sound card, select **Bell**.
    b. Under **Alarm**, select **Continuous** or **Timed** alarm.
    For timed alarm, select the time (in seconds) for how long beep, honk, or other sound you want to hear.
    a. For **Alarm File**, select the *.wav* file you want to hear when IRIS gives an alarm message.
    The loudspeaker icon plays a sample to help you choose. The alarm messages are tagged in the message summary menu with an *s* (*spoken*).
    The options are available only if you have a sound card.
    b. For **Msg File**, select the *.wav* file you want to hear when IRIS gives a non-alarm message.
4. Select **Save**.

7. Using the Radar Status Menu

7.1 Running Radar from the Radar Status Menu

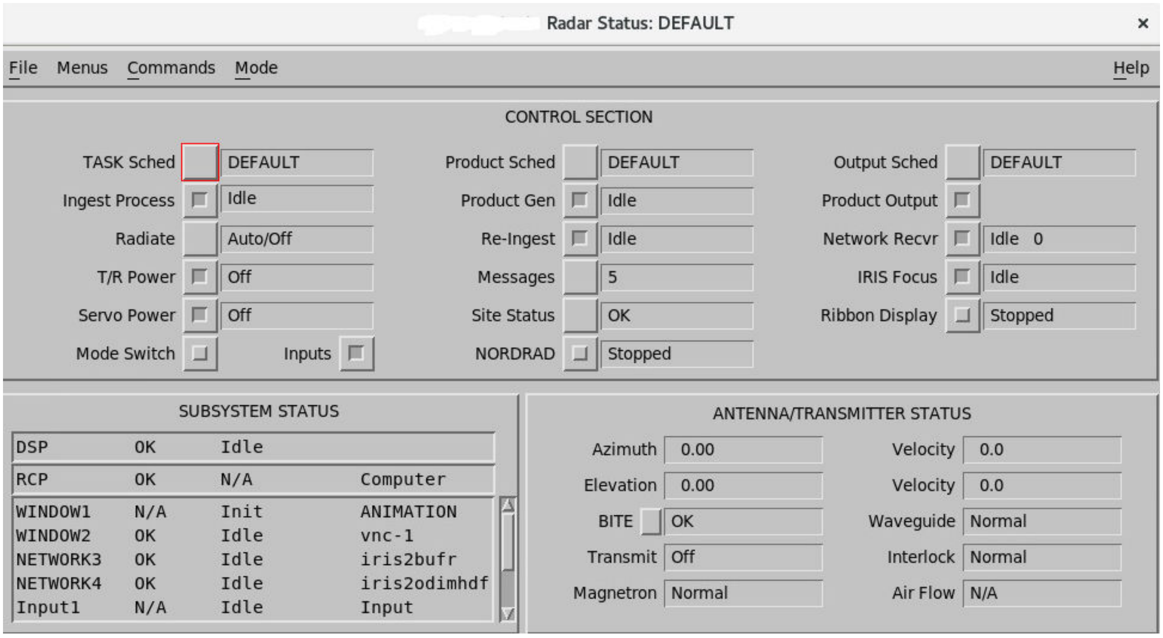


Figure 7 Radar Status Menu

The **Radar Status** menu provides tools for running, configuring, controlling, and monitoring an IRIS radar or analysis system.

Because it involves real-time processes, the **Radar Status** menu is a `radarop` menu. Anyone may view the menu.

> The `DEFAULT` configuration is automatically loaded when IRIS first starts. You must configure it to be either a non-operating state or the desired working state. In most cases, Vaisala recommends the latter.
> On most radars, with `DEFAULT` mode configured as the desired working state, IRIS runs the scheduled tasks automatically and there is no need to perform the following steps.

> The name assigned to the **Radar Status** menu defines a complete mode of operation. To set up a mode of operation, set-up and save the **Radar Status** menu.

1. Make sure IRIS has started.
2. Select **Menus > Radar Status**.
   When IRIS starts, the IRIS `DEFAULT` configuration loads.
3. If you want to use a mode other than `DEFAULT`, select **File > Open** and then a configuration file from the list.

   CAUTION! Do not set the `DEFAULT` IRIS configuration for the **Radiate** switch to come up as **On** or **Auto** if it could represent a hazard to personnel.
   For installations where this could be a problem, create a `DEFAULT` file which starts the radar with **Radiate** and **Antenna Servo** as **Off**, so the antenna does not start scanning automatically when the IRIS command is issued.

4. Check the status of the devices to make sure all subsystems function normally.
   In particular, check that the RCP status is **Computer** and not **Local**. If the status is **Local**, set the mode switch on the radar console so IRIS can control the system.
5. Verify that the **Radar Process** is **On**. Toggle real time display **On** or **Off**, as required.
6. Toggle **T/R Power** and **Servo Power** on.
7. Set **Radiate** to **Auto** or **On**, as required.
   Auto allows IRIS to automatically turn the transmitter off when the system is idle.
8. To check or schedule tasks or products:
   a. If tasks are scheduled and one is running, check that the **Ingest Process** shows the name of the active task, and the antenna speed and position indicators show that the antenna is moving.
   b. Schedule additional tasks or products, if needed.

7.1.1 Control Section

The **Radar Status > Control Section** pane includes tools for:

- Viewing active IRIS mode
- Loading and saving IRIS configurations
- Starting and stopping the major IRIS processes
- Starting and stopping the radar transmitter
- Device resets for selected equipment

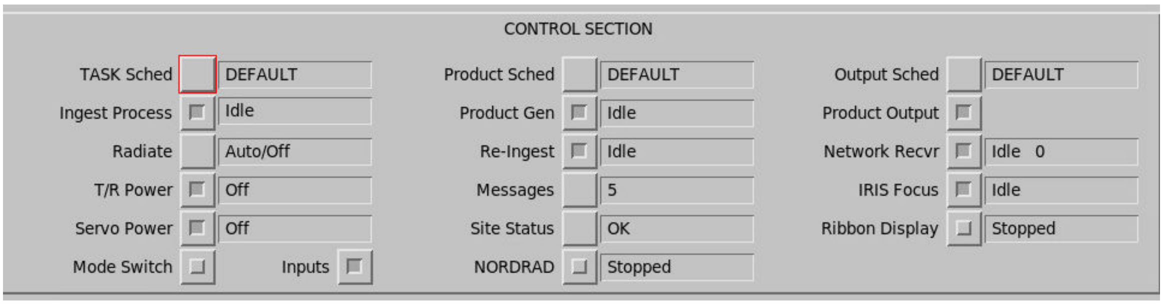


Figure 8 Radar Status Menu Control Section

CAUTION! Set the **DEFAULT** IRIS configuration so **Radiate** and **Servo Power** are off if there is a possible hazard to personnel when IRIS starts.

TASK Schedule

Determines which task schedule is run. Select the button to show a list of available task schedules.

Ingest Process

Provides control and status for the software that runs the radar system and creates ingest files. Toggle this button to start or stop radar operation.

In the **Setup** utility, you can define whether RCP or signal processing (DSP) is reset when ingest process starts up. By default resetting both is enabled.

- Resetting RCP is a convenient way to reset after a shutdown. This also causes the RCP reset output line to toggle, which may be configured to reset other equipment at the radar site.
- When the signal processor resets, it takes a noise sample before resuming data collection. This is a convenient way to force a noise sample.

The text area to the right of the toggle button shows the ingest process status.

Table 9 Ingest Process Statuses

Status	Description
Running	The current task is running normally.
Idle	No task is running, but the radar process is ready to run tasks. Either tasks have not been scheduled, or it is not time for a scheduled task to run.
Stopped	The ingest process is off.

Radiate

Controls the transmitter radiate with the following options:

- **Auto** — For normal operation. IRIS turns the transmitter radiate on and off automatically. For example, if there is no task to be run for five minutes or more, IRIS temporarily turns the radiation off.
- **On** — The transmitter radiate is on at all times during IRIS operation. This is the recommended setting for magnetron radars.
- **Off** — The transmitter radiate is off at all times during IRIS operation. A warning message is generated if you run a task with **Radiate** turned off.

Transmitter radiate status is reported as either **On** or **Off**. See Antenna and Transmitter Status (page 34).

Transmitter (T/R) Power

Controls power to the transmitter cabinet. The status is either **On** or **Off**. When power is turned off, the sensors for some of the Antenna/Transmitter status items do not function properly.

Servo Power

Turns the antenna servo drive power on and off. The status is either **On** or **Off**.

Product Schedule

Determines which products are generated. Select the button to show a list of available product schedules. In most cases, `DEFAULT` is the only product schedule.

Product Generator

Toggles Product Generator process on and off. The status is shown as **Idle**, **On**, or **Off**.

Reingest

The reingest process takes a RAW product file and makes ingest files, which can be processed to make products. The reingest process can be activated either:

- Automatically, whenever a RAW product is restored from tape.
- Automatically, whenever a RAW product is received over the network.

The reingest process can be toggled on or off. The status is displayed as **Idle**, **Running**, or **Stopped**.

NORDRAD

If your system is licensed to receive product output from the Nordic Radar Network System (NORDRAD), you can turn NORDRAD on and off.

The field shows the status of the receive process as **Idle**, **Running**, or **Stopped**.

Messages

Select to open the **Message Summary** menu.

The **Message** field shows the number of messages after IRIS startup.

Site Status

Gets information from **Status** products that are either received over the network or made locally.

These are made automatically at each radar site on a fixed schedule (for example, every 10 minutes) as set in the setup/product utility. See *IRIS and RDA Utilities Guide*.

The **Status** product can then be sent automatically over the network through the **Product Output Menu**. For example in a radar network, each radar may send routine status products to a central maintenance facility.

Select the button next to the field to show a list of all sites and their status.

Output Schedule

Indicates the mode of the product output menu. Select the button to show a list of available output modes.

For example, you may have 2 parallel network connections to the radar site (main and backup network) and in `DEFAULT` mode products are sent through the main network, while in `BACKUP` mode they are sent through the backup network.

Product Output

Controls whether products can be output to display devices or tape. This is a convenient way of stopping all output to all users if a problem develops.

Network Receiver

If your system is configured to receive product output from another IRIS host or workstation, this field shows the status of the receive process, as **Idle**, **Running**, or **Stopped**.

The field also displays the number of IRIS systems to which you are connected. If the number is `0`, you are not currently connected. The other computer may not be running IRIS or the connection may be broken. You can toggle this field on and off to attempt to reestablish a broken connection. Check with your system manager if you are uncertain.

IRIS Focus

If your system is running IRIS Focus server, you must enable the **IRIS Focus** option.

When enabled, this field shows the status of the server process, as **Idle**, **Running**, or **Stopped**.

Mode Switch

Select this button to enable automatic reconfiguration. That is, IRIS automatically changes the configuration in response to a warning product.

Use the **Automatic Mode Switch** menu to define the warning products to check and the configurations to load in the event of a warning.

Inputs

IRIS input process can be polling directories looking for arriving files. This is configured from the Input section on **setup**. The inputs switch turns the inputs on/off.

7.1.2 Subsystem Status

The **Radar Status > Subsystem Status** pane displays the status of the subsystem devices connected to IRIS. The contents vary depending upon the system set-up.

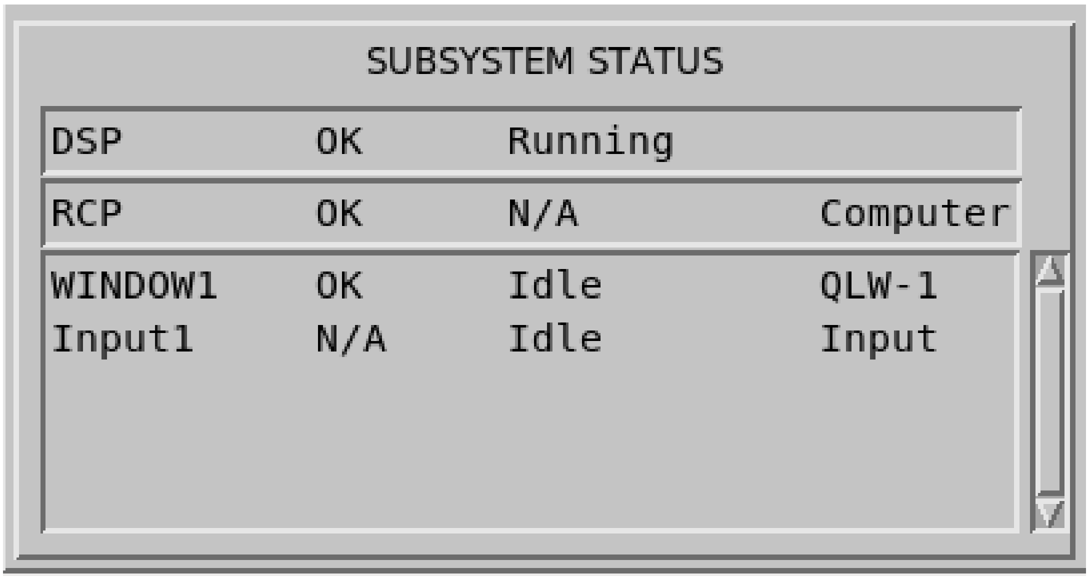


Figure 9 Radar Status Menu Subsystem Status Section

Use the **setup** utility to configure the devices listed under **Subsystem Status**.

Depending on the device, the status is obtained from self-tests invoked when the radar process starts and from watchdog process that monitor the device during normal operations.

Status information displayed with the status message **NA** (not available) indicate that a device has not been installed.

Table 10 Radar Subsystem Status Descriptions

Device Type[1)]	Device Status	Running Status	Additional Information
RCP (Radar Control Processor)	**OK** **Fault** (yellow background) **Error** (red background)	**N/A**	If the status is **OK**, indicates if RCP is controlled by: • **IRIS** • **Computer** - RCP is controlled by the computer, but IRIS does not actively control it. For example, if the ingest process is idle and waiting for the next task to start. • **Local** If RCP overall status is **Fault** or **Error**: • **Dead Ang** (no antenna angle information available) • **DEAD**
DSP (Doppler Signal Processor)		**Idle** - DSP is OK but inactive **Running** **Stopped** **N/A**	<empty>
Windowx (Quick Look Window)	**OK** **N/A** - Device is configured in **Setup** but is not initiated. **NoIRIS** - Used for TDWR output.	**Idle** - device is OK but inactive **Init** - device is initializing **Running**	The alias name of the device as configured in the **Setup** utility **Output** section.
Networkx `Node Name` (Network Output)			
Archivex			
Printerx			

1) *x indicates the number of the output device as configured in the **Setup** utility **Output** section.*

7.1.3 Antenna and Transmitter Status

The **Radar Status > Antenna and Transmitter Status** pane shows the status for the antenna, transmitter and BITE systems, including antenna position and velocity.

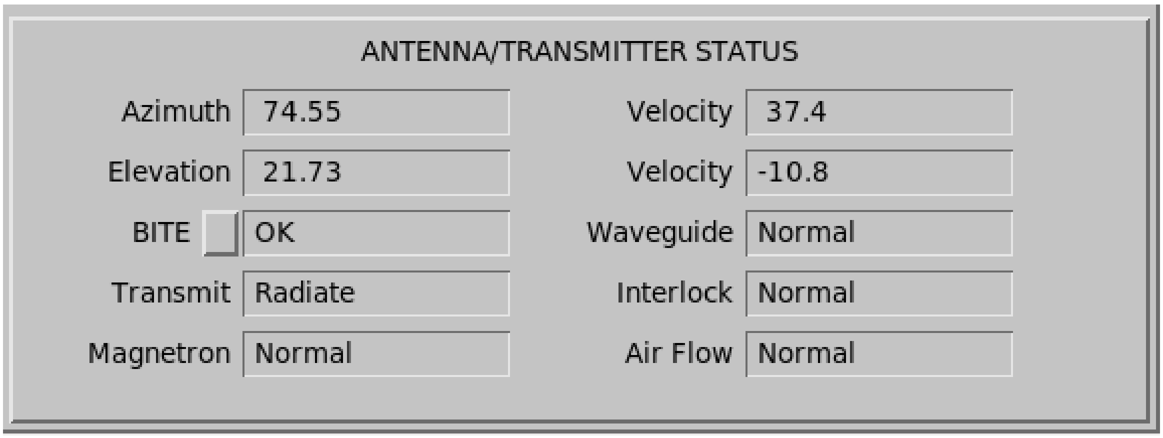


Figure 10 Radar Status Menu Antenna and Transmitter Status Section

Azimuth and Elevation Position and Velocity

The azimuth and elevation values show the antenna position and velocity (in RPM).

For the velocity, clockwise and upward motion are positive values, while counterclockwise and downward motion are negative values.

Transmit

Table 11 Transmit Statuses

Status	Description
Off	The transmitter is off.
Not Ready	The transmitter is warming up.
Standby	The transmitter is ready to transmit, but has not been set to radiate using the **Radiate** button.
Radiate	The transmitter is radiating.

Safety Parameters

The safety parameters display the status of safety and monitoring parameters reported by the built-in test equipment. The report contents depend on the installation.

Table 12 Safety Parameter Report Examples

Safety Parameter	Description
Air Flow	Shows whether the cooling air flow in the transmitter is **Normal** or **Fault**.
Interlock	Shows the status of the safety interlock circuit. For example on a high voltage cabinet door, the status is either **Normal** (door closed) or **Fault** (door open).
Magnetron	Shows the magnetron current as **Normal** or **Fault**.
Waveguide	Shows the waveguide pressure as **Normal** or **Fault**.

Safety Parameter	Description
BITE	Shows **OK** or **Fault** for the optional BITE unit.

For information on faults, see the **Bitex** section in *IRIS and RDA Utilities Guide*.

Fault Alarms Sent to IRISnet

The red or yellow fault indicator in IRISnet shows the state of the **Radar Status Menu** on a host.

A red field in **Radar Status** menu causes a cross indicator to the IRISnet icon. The cross is red for critical alarms, and yellow for non-critical alarms.

> The **Site Status** field of **Radar Status Menu** is not indicated in IRISnet.
> Since **Site Status** shows other sites, it would be confusing if a fault in Site A causes an IRISnet Red X on site B just because site B was receiving status products from A.
> If a local fault causes the site status to go red, that fault is indicated elsewhere in the **Radar Status Menu**.

You can set some faults to be critical or non-critical. For example:

- Radar, Product Generator, or Output Processes turned–off (buttons at the top). These are always critical.
- DSP or RCP communication error (sub-system status fields). These are always critical.
- Antenna/Transmitter Status: BITE (configurable in **BITEX** to be null, critical or non–critical)
- Antenna/Transmitter Status: Air Flow, Waveguide, Interlock, Magnetron (configurable in **setup/rcp** to be critical or non–critical).

7.2 Mode Switching

7.2.1 Manual Mode Switching

1. To switch modes manually, do one of the following:
   - Select **File > Change RST** and select the new mode.
   - Load a new configuration in the **Radar Status** menu.

7.2.2 RCP Mode Switching

In RCP mode switching, RCP controls the system mode. This mode is only applicable to a radar system.

Mode switching is normally used for switching between redundant systems due to fault detection.

When RCP mode switching is enabled in IRIS, socket mode switching and status product mode switching are unavailable. RCP can choose one of the following:

- Force the mode to switch. This disables all other choices, so manual mode switching and automatic mode switching are disabled.
- Enable the other choices. In RCP mode switching, the **Automatic Modes Switching** button is controlled by the RCP.
  For more information, see the appendix on dual radar systems in *Radar Control Processor RCP8 User Guide*.

7.2.3 Socket Mode Switching

In socket mode switching, modes are supplied by a socket message. Use this mode to:

- Switch modes based on input from another software system
- Trigger mode switch based on a Bitex status (in this case the input is an IRIS message).

In socket mode switching, RCP can do one of the following:

- Force the mode to switch. This disables all other choices, so manual mode switching and automatic mode switching are disabled.
- Enable the other choices.

In socket mode switching, the **Automatic Mode Switching** button is controlled by the socket.

> This mode is only available when RCP mode switching is disabled.

7.2.4 Status Product Mode Switching

Status product mode switching allows a system to slave its configuration to a master system based on the status products from that master.

Each time a status product arrives from that other system, the mode is forced to match.

This is used as part of a passive IRIS system, or to slave a RPG computer to a RDA computer in redundant systems.

You can change modes through manual mode switching or automatic mode switching.

7.2.5 Automatic Mode Switching

In automatic mode switching, mode transitions can be controlled by warning products.

This is used to change modes based on weather. Between times, you can change modes manually.

You can define up to 16 situations in which the IRIS configuration is automatically switched. For example, you may want to switch configurations automatically when a wind shear is detected.

Because configurations can also be switched when a warning is absent, you can define the conditions under which to automatically switch back to a default configuration. A series of warning products can be chained together, triggering a series of actions, each requiring a different configuration.

1. To enable or disable automatic mode switching, select **Radar Status > Mode Switch**.

Mode Switch is unavailable if RCP mode switching or socket mode switching are enabled.

7.2.5.1 Defining a Series of Automatic Mode Switches

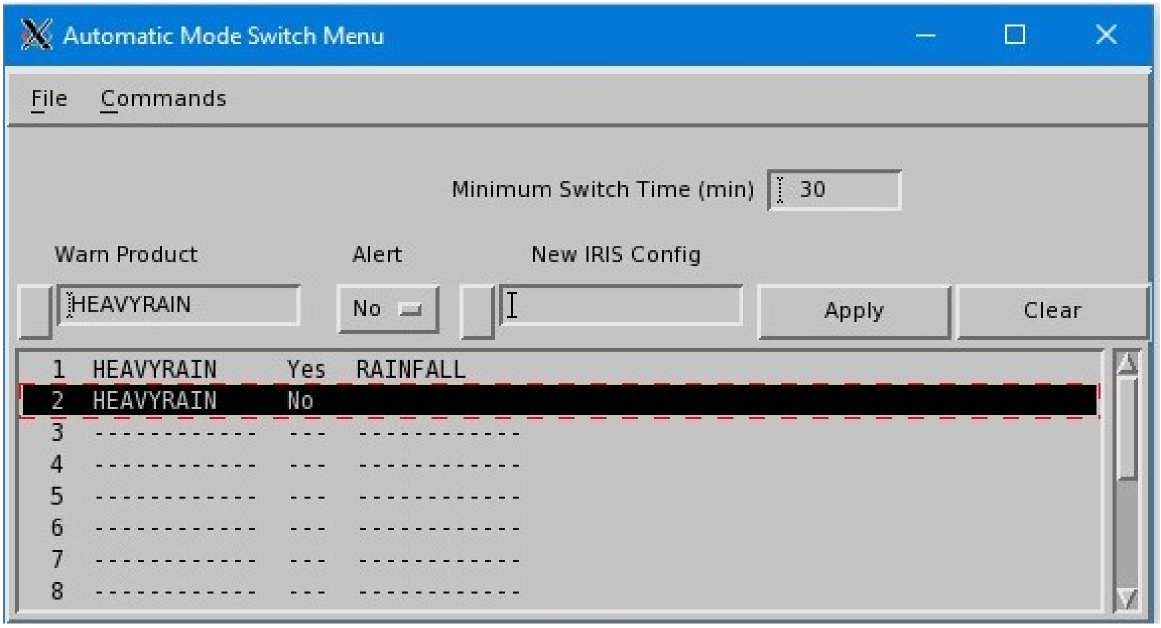


Figure 11 Automatic Mode Switch Menu

1. Select **Radar Status > Mode > Auto Mode**.
2. Enter the information in the fields:
   Minimum Switch Time— Minutes that must pass before the configuration can switch again.
   Warn Product— Enter the name of a warning product directly into this field, or select a product from the list of products. When this warning is encountered (or when it is absent) the IRIS configuration switches automatically.
   Alert— Set to **Yes** if the configuration should switch when the warning is encountered. Set to **No** if the configuration should switch when the warning is absent.
   New IRIS Config— Name of a configuration directly into the field, or pop up a list of configurations to choose from. This configuration is loaded in the **Radar Status** menu when the warning condition is met.
3. Select **Apply** to add the definition to the list;
   Select **Clear** to start again.
4. Repeat Steps 2 - 3 for up to 16 warnings.

5. To discard your definitions, select **File > Reload**.
   This loads the most recently saved definitions.
6. Select **File > Save**.

7.2.5.2 Changing or Deleting a Definition

1. In the **Automatic Mode Switch** menu, select a definition from the list.
   The warning and configuration names are displayed in the fields above the list.
2. To change the definition, enter a new warning product or configuration name if you want.
3. To delete a definition, set the **Alert** field to "- - -" .
4. Select **Apply**.

8. Configuring Radar Tasks

8.1 Configuring Tasks

Use the **TASK Configuration** menu to create or modify radar tasks.

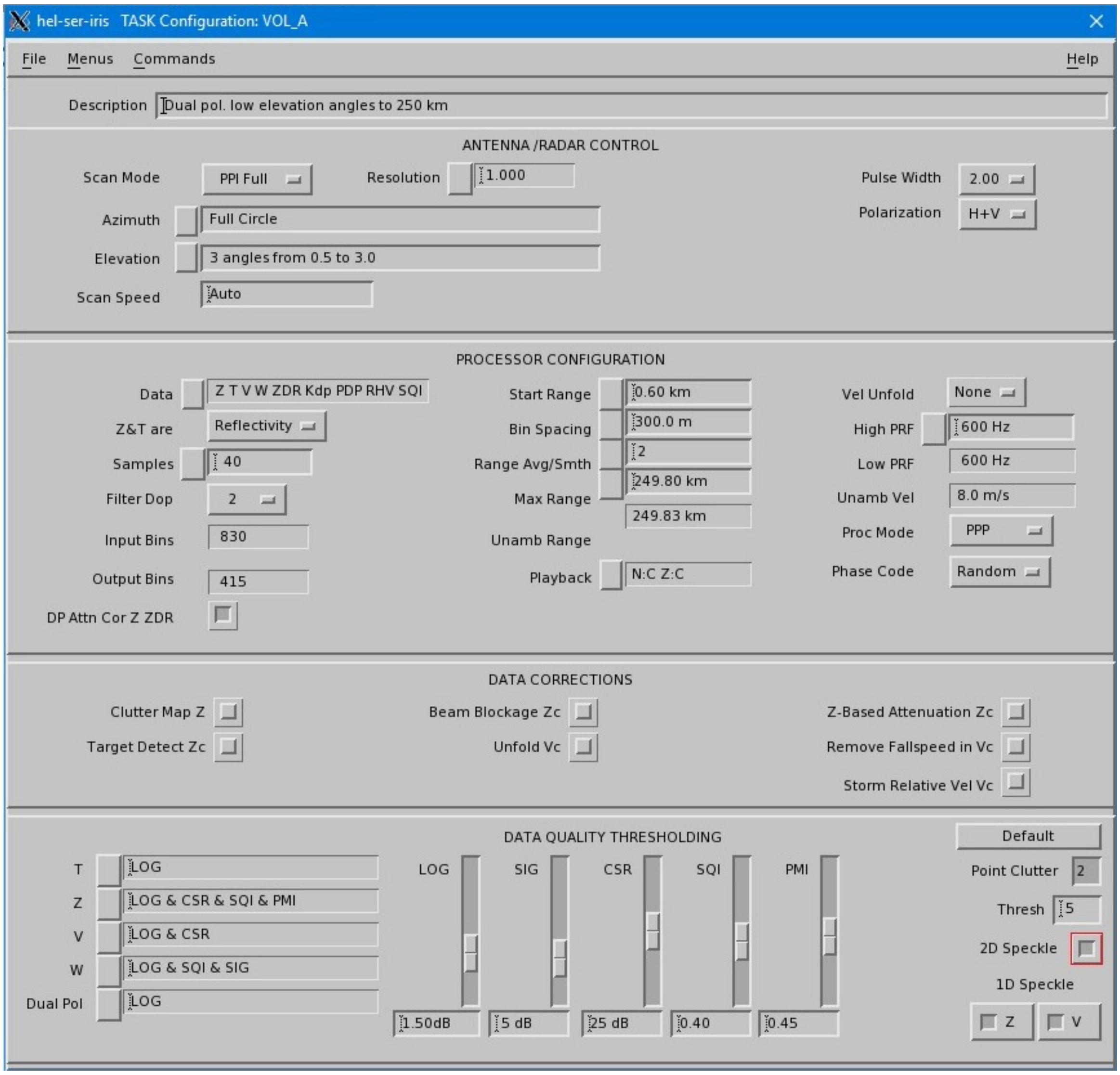


Figure 12 TASK Configuration Menu

Table 13 TASK Configuration Menu Description

Menu Pane	Description
Antenna/Radar Control	Sets up radar and antenna operations. See Antenna and Radar Control (page 42).
Processor Configuration	Sets up the output data, ranges and averaging used by the signal processor. See Processor Configuration (page 46).
Data Correction	Determines corrections made from output data. See Data Corrections (page 52).
Data Quality Thresholding	Sets up the threshold levels and criteria for real time data quality control. See Data Quality Thresholding (page 55).

1. To create a new task, select **Menus > Task Configuration**.
2. Enter a task name and description.
   a. Select a name that summarizes the task. Task names may contain up to 12 characters, no spaces are allowed. Use an underscore instead of a space.
   You can define hybrid tasks with up to 26 subtasks. For hybrid tasks the task configuration file names for these must end in `_A`, `_B` and `_C` to denote the first, second, and third sub-tasks.
   b. Enter a brief task description (less than 65 characters).

   Table 14 Example Task Names

Example Task	Description
`PPI_VOL`	A volume scan.
`RHI_230`	An RHI at azimuth 230.
`SURV_500`	A 500 km surveillance scan.
`PPI_A`	First subtask of a hybrid task.

3. Configure the task using the options in the menu.
4. To edit the configuration of a task, do one of the following select **File > Open**.
   The **TASK Configuration** menu opens showing the task configuration for this task.
   For unscheduled tasks, more than one copy of a task can be in use at any time.
   Note that:
   - If a task is scheduled, it cannot be modified.
   - Only one user can edit a particular task at a time.
5. Select **File > Save As** to save the task configuration.
6. Use **TASK Scheduler** to schedule and execute the task.
   See Task Scheduling Overview (page 63).

More information

- IRIS Tasks (page 9)

8.2 Antenna and Radar Control

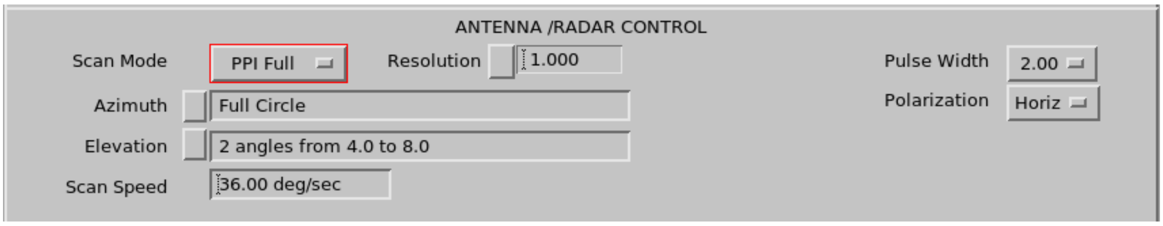


Figure 13 Antenna/Radar Control Pane

Use the **Task Configuration > Antenna/Radar Control** pane to set up radar and antenna operations for controlling tasks and products.

Scan Mode

Use **Scan Mode** to select the following modes.

Table 15 Scan Modes

Scan Mode	Description
PPI Full	The antenna scans continuously in azimuth without stopping during the task. For PPI scans, IRIS holds the elevation constant and scans in azimuth.
PPI Sector	The antenna starts and stops at azimuth boundaries that you specify.
Manual	You control the antenna while the real time display shows live weather updates. Manual scans are used for interactive real time applications, observation of tornado, or microburst signatures.
RHI	The antenna scans in elevation at a specified azimuth. For RHI scans, IRIS holds the azimuth constant and scans in elevation between specified limits.
Exec	Execute any shell command. See Exec Tasks (page 62).

Azimuth and Elevation for PPI and RHI Scans

For PPI Sector and RHI scans, you must specify start and stop limits for the swept antenna coordinate, and a list of discrete angles for the unswept coordinate.

There is a duality between the PPI and RHI scans in that the lists and limits that apply in one case can be carried over to the other case by reversing the roles of azimuth and elevation.

Elevation for PPI Full and PPI Sector Scans

To set up the antenna elevation limits for a PPI Sector and PPI Full scans, enter the list of elevation angles to be used on successive sweeps:

1. Select **Elevation** button to show a window containing up to 40 elevation angles and make your selections.
2. Select **Apply > Exit**. (Select **Clear** to start over.)

When you finish editing, the menu entry shows the number of specified tilt angles and the minimum and maximum angles.

Azimuth for PPI Full Scans

For PPI Full scans, the **Azimuth** field shows **Full Circle**. The antenna scanning is continuous in azimuth.

Azimuth and Elevation for PPI Sector Scans

When a PPI Sector scan runs, the antenna scans back and forth between the azimuth limits at a rate that achieves the requested azimuthal resolution between each processed ray. The first sweep of the scan is performed using the first elevation angle from the elevation list; the second sweep using the second angle, and so on.

To set up the antenna azimuth limits for a PPI Sector scan, enter the start and stop angles, in the **Azimuth** field, type the limits to the nearest whole or 1/10°. The following table shows an example of how the sector is defined clockwise from the first limit to the second limit.

Azimuth First Limit	Azimuth Second Limit	Description
90.0°	270°	Scans the southern half of the radar circle.
270.0°	90.0°	Scans the northern half of the radar circle.

Azimuth and Elevation for RHI Scans

For RHI scans, the set-up procedure is similar to PPI Sector, except that you:

- Enter the start and stop limits in the **Elevation** field.
- Enter the angle list in the **Azimuth** field.

The elevation limits for RHI scans are constrained by the limits specified in the **setup** utility. See *IRIS and RDA Utilities Guide*.

Azimuth and Elevation for Manual Scans

For manual scans, the **Elevation** and **Azimuth** fields show NA because the antenna is controlled interactively.

Resolution

The resolution is the required spacing between successive data rays in the scanned direction.

You can select a resolution from a menu or type the value in the field.

Resolution for PPI Full and PPI Sector Scans

For PPIs, specifying 1.0° resolution means that for every degree of azimuth there is a new set of samples of, for example, the reflectivity at all ranges. The range is limit 0.352 .... 2.000.

During PPI scanning, antenna and signal processing are coordinated so that data are collected at the specified resolution interval. Sampling is the nearest `N*`(Resolution) starting with 0°.

For example, if the resolution is 1.0, rays of data are collected at 0, 1, 2, ... degrees. If the scan speed is set to **Auto**, the PPI antenna scan rate is adjusted automatically to scan as rapidly as possible to achieve the requested resolution.

The **Radar Status** shows the achieved scan rate.

Resolution for RHI Scans

In RHI scans, the elevation angular velocity used for the scan is not constant. A fixed velocity results in too much time being spent at high elevation angles where only the initial 20 km (or so) of the ray contains useful data. Also, too little height resolution would be obtained for low elevation angles and far ranges. To compensate, the elevation velocity for RHI scans is a function of the elevation angle itself — the velocity increases as the angle increases.

For RHI scans, IRIS picks and displays the closest **Resolution** between 0.2, 0.4, 0.6, and 0.8.

The selected resolution represents the desired angular ray spacing at 0° elevation. This generally corresponds to a small elevation velocity near 0°, but by the time the antenna reaches its zenith the elevation velocity is approximately 10 times greater. The RHI velocity algorithm attempts to maintain constant distance spacing along the maximum range and height boundaries of the scan to produce a properly filled data presentation.

Resolution for Manual Scans

For manual scans, IRIS picks and displays the closest **Resolution** among 90, 180, 270, and 360, either continuous or non-continuous.

If you plan to use manual scanning, you must pre-configure scans for the situation. Specify the number of rays of data that you want stored (up to 1024 angles or rays) and how long IRIS should continue to collect data, as follows:

Value	Description
Continuous	The manual scan continues indefinitely until it is halted manually in the task scheduler. New rays overwrite the old ones on disk such that the maximum number of rays is fixed at the requested number. In most cases, use this option so the task does not stop in the middle of the observation.
Non-Continuous	The manual scan stops automatically after collecting a defined number of rays.

For more information, see Scheduling and Running Manual Scan Tasks (page 69).

Scan Speed

Value	Description
Auto	IRIS automatically calculates the scan speed of the antenna to match the sampling to the requested resolution. Recommended for PPI and RHI scans. Type `Auto` or `0` .
Numerical value degrees/sec	Enter the scan speed in degrees per second. Note that 6°/sec is 1 RPM, 12°/sec is 2 RPM, and so on.

When testing a task, observe the actual scan rate in the **Radar Status Menu**.

If you are in the **Auto** mode, you can tune the scan rate by changing the fields in the radar status menu and then retesting. For example, to increase the scan rate in **Auto** mode, you can:

- Increase the PRF
- Decrease the number of Samples
- Decrease the scan Resolution

For more information, see the setup/ingest utility in the *IRIS and RDA Utilities Guide*.

Pulse Width

Some systems support multiple pulse widths.

Select the pulse width in microseconds (for example 1.0 µsec). IRIS picks the closest available value.

Most systems support one or more of 0.50, 1.00, 2.00, and 5.00 µsec.

The PRF is automatically reduced to the maximum permissible value if the new choice exceeds the duty cycle limit of the transmitter.

Polarization

This field is available for dual polarization systems. The following table shows the polarization options.

Table 16 Polarization Options

Option	Description
H, V	Fixed H or V polarization. When the polarization is fixed, you specify which polarization to use for sampling. Typically, horizontal is selected because of the slightly greater returned power from meteorological targets. For a standard radar at fixed horizontal polarization, the field appears as `N/A`.
H+V	Simultaneous transmit/receive in dual pol.
Alt	Alternating, not available on Vaisala radars.

8.2.1 Ship Velocity Correction

If this feature is enabled in the **Setup** utility, this enables or disables a radial velocity correction to account for moving radar platforms.

The velocity correction used in IRIS allows for different types of ship motion sensing:

- Inertial Navigation Unit (INU)
- Gyro System with GPS

See Passive IRIS Overview (page 125).

8.3 Processor Configuration

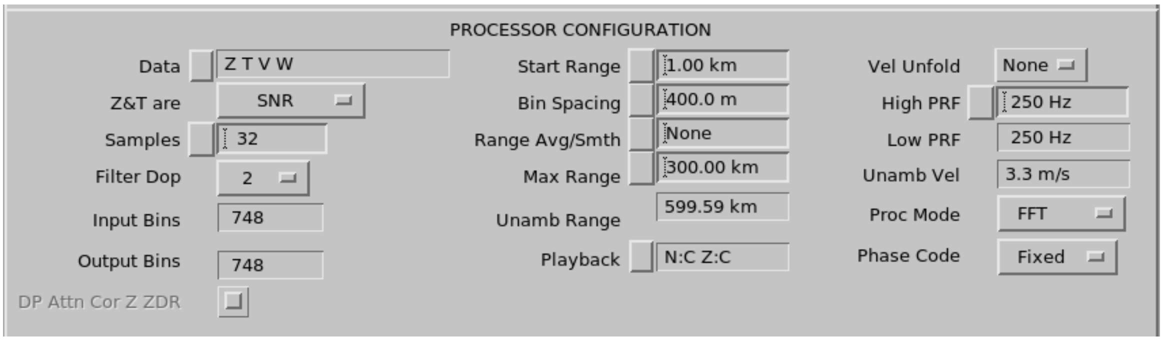


Figure 14 Processor Configuration

Use the **Task Configuration > Processor Configuration** pane to set-up output data, ranges, and averaging used by the signal processor.

Data

Select **Data** to define the types of data output sent by the signal processor and stored in the ingest files.

Data shows data appropriate for you system. You can only select data types appropriate for you task's configuration. You can also select whether to record in 8-bit or 16-bit format.

The number parameters you select affects to the size of your `Ingest` and *Raw* product files.

When you exit the menu, your choices are displayed in the field.

See *RVP900 Digital Receiver and Signal Processor User Guide*.

Table 17 Data Types

Data type	Description
Ah, Av	Integral attenuation for horizontal (H) and vertical (V) channels.
Azdr	Integral attenuation of ZDR (dB) format.
CSR	Doppler channel clutter-to-signal (CSR) ratio of dBT to -dBZ.

Data type	Description
`dBT`, `dBTh`, `dBTv`, `DBTr`	Total power.
`dBZ`	Clutter corrected reflectivity
`dBZt`	Uncorrected reflectivity
`HCLASS`	Hydrometeor classification Estimated hydrometeor type in the precipitation area.
`KDP`	Specific differential phase An indicator of the rate of change of the phase difference between horizontally and vertically polarized pulses of the radar. A greater horizontal shift results in a positive KDP value, and a greater vertical shift results in a negative KDP value. Typical cause for a high KDP area is heavy rain.
`LDRH`, `LDRV`	Linear Depolarization Ratio H to V (or V to H). The ratio of cross-polar to co-polar reflectivity measured in dB.
`LOG`	Log receiver signal-to-noise ratio.
`PHIH`, `PHIV`	Horizontal (V) or vertical (V) differential phase Phase difference for the total round trip between radar and the volume where the signal is reflected. `PHIH` is measured between HH and HV channels. `PHIV` is measured between VV and VH channels.
`PHIDP`	Differential phase The phase difference due to propagation between the HH and VV channels of the radar.
`PMI`	Polarimetric meteo index.
`R`	Rate of accumulation of precipitation in units of mm/hour. For snow, this is usually refers to the liquid equivalent.
`RHOHV`, `RHOH`, `RHOV`	Correlation coefficient between HH and VV (or HH & HV / VV & VH) channels) Higher (>0.95) values indicate uniform precipitation areas and lower values more mixed hydrometeor types, such as melting snow, wet snowflakes, or airborne debris.
`SNR`	Signal to Noise Ratio Generic measurement of signal-noise ratio in dB.
`SQI`	Signal Quality Index A value between 0-1 that measures the signal's Doppler coherency, that is the correlation between the signal and its Doppler lag. • 0 indicates white noise • 1 is the perfect Doppler point target
`T`	Total Reflectivity Total power returned to the radar in reflectivity units. It typically represents the horizontal reflectivity without ground clutter correction.
`TV`, `TE`	Total Vertical (HV Enhanced) Reflectivity Total reflectivity from the vertical polarization channel (TV) and combination of the horizontal and vertical channel (TE).

Data type	Description
`V`	Velocity Average radial velocity (towards or away from the radar) of detected hydrometeor areas.
`VC`	Corrected Velocity Same as Velocity, but corrected for effects of range folding and velocity folding.
`V: SHEAR`, `Vc: SHEAR`	Velocity and corrected velocity of wind shear.
`W`	Spectral Width Variability of Doppler velocity values within the measurement area.
`XCOR`	Polar cross-correlation, uncorrected `rhohv`. Because this value is not noise corrected, it is a direct indicator of the PHIDP uncertainty
`Z`	Reflectivity Usually referred to as dBZ, this is the common data type that measures radar signal reflectivity, and is used to estimate precipitation intensity from that. All `Z` measurements are corrected for ground clutter.
`ZV`, `ZE`	Vertical (HV Enhanced) Reflectivity Total reflectivity from the vertical polarization channel (`ZV`) and combination of the horizontal and vertical channel (`ZE`). Corrected for ground clutter.
`ZC`	Corrected Reflectivity Same as `Z`, but corrected for attenuation and beam blockage effects.
`ZDR`	Differential Reflectivity The ratio of SNR in the horizontal channel to the SNR in the vertical channel. Positive values indicate more prominent horizontal echoes and negative values more prominent vertical echoes. Larger hydrometeor sizes are usually identified by high positive ZDR values.
`ZDRC`	Corrected Differential Reflectivity Same as `ZDR`, but corrected for attenuation and beam blockage effects.

T&Z are

Choose how `T` and `Z` are handled:

- Calibrated radar reflectivity factors
  Most common configuration.
- Measured signal-to-noise ratio (SNR)
  Used for diagnostic and troubleshooting purposes and for radar antennae with non-standard beam patterns. Note that when SNR units are selected, the clutter correction is applied to `Z` but not to `T`.

Samples

Specify how many pulses are averaged (from 2 ... 256, continuously selectable) to obtain the final estimates of the radar parameters for each ray in **Samples**.

IRIS requires approximately 40 samples for acceptable averages and reliable clutter cancellation.

In general, the number of samples should be as large as possible, however, the more samples there are, the slower the antenna scan speed must be.

Filter Dop

Use the **Filter Dop** to specify a clutter filter type. Specify an integer between 0 … 7, where 0 is `no filter`. Typically filter 1 is the least aggressive and filter 7 is the most aggressive.

Selecting a clutter filter depends on the scan rate, antenna beam width and the operational objectives. In general, the narrower the filter the better, since a broad clutter filter has a greater adverse effect on the weather echoes. The narrower filter is also less aggressive.

Most users must experiment with the best combination of clutter filters and thresholds. See Optimizing Thresholds (page 58).

To determine which filters best reduce the effects of clutter while doing the least damage to the weather, try different clutter filters on a rainy day and compare Z and T (the corrected and uncorrected reflectivity) on the real time display.

> When optimizing the Doppler filter, do not use the CSR threshold as the Z threshold criterion.

To determine the appropriate filter, use the **Ascope** utility to measure the actual width of clutter Doppler spectra as a function of the scan rate, which can be controlled through the **Antenna** utility). For more information, see *IRIS and RDA Utilities Guide*.

For more information on configuring clutter filters, see *RVP900 Digital Receiver and Signal Processor User Guide*.

Start Range

Start Range specifies the required range of the first data bin to the nearest 1/10 km.

Usually this is set to 0.0 so that sampling starts at the closest possible range. However, when 2 tasks are used to define a sampled volume, it is sometimes useful to have:

- One task sample an inner range at a high PRF.
- One task sample an outer range at a low PRF.

Bin Spacing

Bin Spacing specifies the desired range resolution of the data.

Type the value to the nearest meter or choose from a list of values.

IRIS picks and displays the allowable bin spacing that is closest to your choice. This depends on the processor, with a typical value of 125 meters.

See *IRIS and RDA Utilities Guide* and *TTY Non-Volatile Setups* in *RVP900 Digital Receiver and Signal Processor User Guide*.

Range Averaging, Input Bins, and Output Bins

Range averaging means that the data obtained at the output bins is obtained by averaging 2 … 16 input bins.

Table 18 Range Averaging Choices

Choice	Description
None	No range averaging. The **Input Bins** and **Output Bins** fields are identical. No range averaging is performed, and single-point sampling is done for each of the output bins.
2 ... 5	Range averaging over 2 ... 5 bins. For example: • 2 bins: IRIS doubles the number of input bins by placing new bins halfway between each output bin, then averages the 2 bins together to obtain each final output bin. • 3 bins: IRIS creates 3 times as many input bins as output bins. Data at each output bin is the result of averaging 3 equally spaced input bins. The total number of input bins is limited by the processor. If you specify a range average that results in greater than the processor limits, IRIS reduces the maximum range to be consistent with the limit.

Max Range

Max Range defines the maximum range (km) of data collection.

If fields such as the **PRF**, **Range Averaging**, or **Bin Spacing** change, IRIS attempts to fill in range bins to the full unambiguous range. If this is successful, **Max Range** equals the unambiguous range.

In most cases, Vaisala recommends keeping the **Max Range** less than **Unambiguous Range**.

Max Range turns red if it exceeds the **Unambiguous Range**. A **Max Range** that exceeds the unambiguous range is allowed for users using their own major processing mode. It is also useful to allow the **Max Range** to exceed the unambiguous range by 1 range bin to make the **Max Range** an even value, for example 150 km instead of 149.9 km. In other cases data that exceeds the unambiguous range is nulled.

The following limitation may cause **Max Range** to be less than the **Unambiguous Range**:

Table 19 **Max Range** Limitations

Limitation	Description
Total Number of Range Bins	Limited to 4200.

Unambiguous Range

The display-only **Unambiguous Range** is the maximum range for `first trip` echoes — the maximum range from which an echo can be received before the next pulse is issued. It is affected if the PRF is changed.

Playback

Playback determines the noise floor and calibration level used by the RVP when playing recorded time series data. The options are:

- RVP current noise floor and calibration level
- Values recorded in the time series

The **Playback** value has no effect on the noise floor and calibration level of the RVP during normal operation.

Vel Unfold

For Doppler systems, velocity unfolding (**Vel Unfold**) determines whether dual PRF control and processing are performed.

For more information, see *RVP900 Digital Receiver and Signal Processor User Guide*.

Table 20 Velocity Unfolding Choices

Choice	Description
None	Single PRF operation with no velocity unfolding.
3:2	Dual PRF with ratio of 3:2. This provides 2X velocity unfolding as compared to the unambiguous velocity for the larger PRF.
4:3	Dual PRF with ratio of 4:3. This provides 3X velocity unfolding as compared to the unambiguous velocity for the larger PRF.
5:4	Dual PRF with ratio of 5:4. This provides 4X velocity unfolding as compared to the unambiguous velocity for the larger PRF.

High PRF and Low PRF

Specify **High PRF** and **Low PRF** by entering a value to the nearest whole Hz, or by choosing from a list of values.

The computed **Low PRF** is displayed in the adjacent column (display only).

The maximum and minimum values depend on the duty cycle limit of the transmitter for the selected pulse width. If you enter a PRF that exceeds of these limits, IRIS inserts the limited value.

Unambiguous Velocity

The display-only unambiguous velocity (**Unamb Vel**) changes when you change **High PRF** or **Velocity Unfold**.

Processor Mode

Proc Mode determines the processor mode.

Table 21 Proc Options

Mode	Description
PPP	Pulse pair processing.
FFT	Fast Fourier transform.
RPHASE	Random phase.
DPRT-1	Dual PRT mode 1.
DPRT-2	Dual PRT mode 2.

Mode	Description
BATCH	Batch Mode Processing.
Phase Code	

Phase Code

The transmission phase of a Magnetron transmitter is always **Random**.

For Klystron and TWT amplifier transmitters, the transmission phase may be controlled using a phase shifter. This field allows the signal processor to specify the phase of each pulse.

- **Fixed** is the legacy mode for Klystron and TWT amplifier transmitters.
- **Random** allows a Klystron or TWT amplifier to mimic the pulse phase of a Magnetron, which is useful for second trip echo cancellation.
- **SZ 8/64** is a predetermined phase code algorithm which mitigates range ambiguities and allows for better recovery of weak first trip spectral moment estimates that have been contaminated by stronger second trip estimates.

Attenuation Correction

To enable attenuation correction for dual polarization, select **DP Attn Cor Z ZDR**.

You need a valid dual polarization license code to use the dual polarization attenuation correction function. See *IRIS and RDA Dual Polarization User Guide*.

8.4 Data Corrections

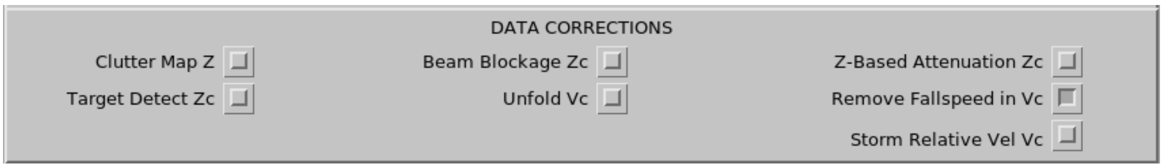


Figure 15 Data Corrections

Clutter Map Z

When no Doppler filtering is available, you can use clutter mapping to remove clutter.

1. Make a volume scan in a weather situation without any precipitation to represent typical clutter in your images.

2. Tag this product as **Clutter Map** in the **Ingest Summary** menu, and turn it on in the task configuration.
   It modifies the Z data to remove any signal weaker than the clutter scan.
   Alternatively, to remove clutter from the `RAIN1` products, tag a `RAIN1` product as clutter map.

Target Detect Zc

Target Detect Zc computes `Zc` with uniform weather removed. Any input signal of more than 2 range bins in a row is smoothed and then only peaks are passed. The goal is to pick out targets against a weather background.

Only use **Target Detect Zc** for target tracking.

Beam Blockage Zc

Because of obstructions to the radar horizon (towers, buildings, mountains) the radar beam can be partially or totally obstructed.

Use **Beam Blockage Zc** to use the Ingest process to compute `Zc` by correcting the measured Z values for partial beam blockage.

Beam Blockage Zc can make corrections up to 10 dB. Larger corrections (for example, more than 90% of the beam power lost) are not practical.

To use beam blockage, you must configure the *`beam_block.conf`* file in the IRIS configuration directory (*`/usr/sigmet/config`*).

For example, configure the file for each elevation angle used in the volume scan:

- Azimuth angle span
- Range at which the blockage starts
- Blockage in dB up to 10 dB
- Elevation angle tolerance

For more information on the file format, see the example *`beam_block.conf`* file shipped with your system.

These feature works best when dynamic angle synchronization is used so that the azimuth rays are collected over the same angle span every time (or example, for 1° resolution, the angle spans would be 0.5 ...1.5, 1.5 ... 2.5, and so on).

The blockage correction is based on the assumption that part of the beam is blocked, and part continues on to reflect from weather targets. Thus all signal returns beyond the blockage have a lower power than the correct value. To correct for this, IRIS adds the appropriate constant to all range bins beyond the blockage. There is no correction to handle complete beam blockage. Up to 2 beam blockages are supported in each direction.

Unfold Vc

Use VVP unfolding to unfold Doppler speeds in individual range bins, when the value is compared to a reference VVP product.

Unfolding for IRIS-corrected velocity, Vc, is especially important for NDOP (Multiple Doppler) product. For more information, see *IRIS Product and Display Guide*.

> You must create a reference VVP product with a product name **UNFOLD** to perform this correction.

Attenuation Zc

Attenuation Zc computes a Zc by correcting for the intervening attenuation.

In the Ingest setups, set a Z attenuation constant and exponent, maximum Z for correction and maximum cumulative correction. For each task, decide if you want to use the attenuation correction.

Values are suggested for X- and C-bands. Vaisala does not recommend the attenuation option for S-band.

If multiple corrections are turned on for `Zc`, the order of operations is:

1. Beam blockage
2. Intervening attenuation
3. Target detection

Remove Fallspeed in Vc

Radial winds are assumed to be caused by the horizontal winds only. The fallspeed of the hydrometeors (of order 1 m/s for snow to 10 m/s for rain) can make a significant contribution to the radial velocity.

To estimate and remove this effect, the water phase (snow or rain) of hydrometeors must be known. If you use this correction, add the height of the melting level to the setup information. This correction is mainly used when making the NDOP product.

See SRI product in the *IRIS Product and Display Guide* for information on setting the melting level dynamically.

Storm Relative Vel Vc

Removes the storm motion from the radial velocities. The source of the storm motion is an `IRIS FCAST` product, which you must configure with a product name **STORM**.

8.5 Data Quality Thresholding

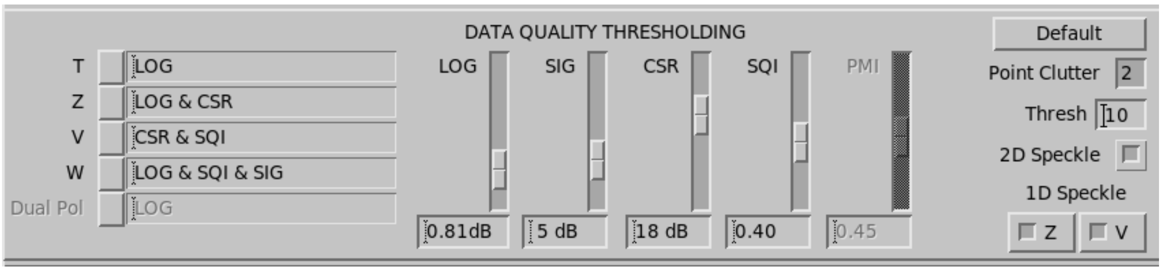


Figure 16 Data Quality Thresholding

The signal processor performs thresholding to ensure clean displays, promote efficient execution and transmission of the products, and reduce the amount of tape and disk space required to hold compressed data and product archives.

Table 22 Thresholding Concepts

Concept	Description
Threshold	IRIS edits data in real time to remove range bins with weak signal power, unreliable estimates of Doppler parameters, or polarimetric parameters that suggest echo is of undesired origin, for example not precipitation.
Parameters	Each threshold parameter has its own user-defined threshold level. See the following table.
Threshold Criteria	The parameter to use as the criterion. For example, the Z values could be discarded when the log receiver signal is weak. Likewise, V values could also be discarded when the log receiver signal is weak. In both cases, LOG is the threshold criterion for thresholding Z and V.
Threshold Levels	Acceptable levels for the signal. Using the same example, the threshold level for the **LOG** may be set at 1 dB above noise. In this case, the velocity and reflectivity are discarded if the LOG receiver power does not meet or exceed 1 dB above noise. This is done on a bin-by-bin basis. For each range bin, the values of the threshold parameters are computed and compared with the user-defined threshold levels. The result is either a "pass" or "fail" for each threshold parameter.

Table 23 Threshold Parameter Levels

Parameter	Threshold Level
`LOG Level (dB)`[1)]	The receiver signal-to-noise ratio. The average LOG channel power (dB) at each range bin is compared to the **LOG** threshold level (typically 1 dB). A LOG level of 0 dB represents the noise floor. If the measured LOG power at a bin is greater than the threshold, the range bin is "passed" for **LOG**.

Parameter	Threshold Level
`SQI Threshold [0,1]`[1]	Doppler channel signal quality index (SQI). A measure of the coherence or Doppler power of the linear channel. The SQI is 0 ... 1, where 0 corresponds to a signal that is "white noise" (no coherent power) and 1 corresponds to a signal that is a perfect point Doppler target (all power is coherent). An SQI greater than approximately 0.4 is required to measure mean velocity and spectrum width. If the measured SQI at a bin is greater than the threshold, then the range bin is "passed" for SQI.
`CSR Threshold (dB)`[1]	Doppler channel clutter-to-signal (CSR) ratio. The CSR compares the ground clutter power to the meteorological signal power in the Doppler channel. The CSR is calculated for each range bin and compared to the user-defined threshold, typically set to 20 ... 40 dB depending on the coherence of the transmitter/receiver system. If the measured CSR at a range bin is less than the threshold level, then the bin is "passed" for CSR.
`SIG Level` [1]	A measure of the power from weather targets, excluding noise. Refers to the weather signal power. That is, the signal to noise ratio corrected for clutter. This is typically set to about 10 dB, and used to threshold widths. This is because the spectrum width cannot be measured from a very weak signal. If the measured SIG at a range bin is greater than the threshold level, then the bin is "passed" for SIG.
`PMI Threshold`[1]	Polarimetric meteo index (PMI), available at polarimetric radars operating in the mode of H+V transmission. Describes the consistency of the data with the hypothesis of precipitation (the default preference). The estimate is obtained from the ratio of the rule strengths of the `HydroClass` pre-classifier class `Meteo` to the maximum rule strengths of the alternative hypotheses `Bio Scatter` and `Ground Clutter / Anomalous Propagation`. As default, the ratio is transformed into a score function that lies smoothly between 0 and 1, where 0 corresponds to a signal that is unlikely `Meteo` (low `Meteo` rule strength) while 1 corresponds to a signal that is likely the preferred class `Meteo`. The value 0.45 is the threshold where the pre-classifier declares the bin `DB_HCLASS` data to `Meteo`, in the default `HydroClass` configuration.

1) *Available in all Doppler processing modes.*

Threshold Levels and Criteria

The threshold criterion controls whether a particular type of data (T, Z, V W, and Dual Pol) should be accepted for each range bin by defining which thresholds to apply to each of these output parameters.

For example, the reflectivity is usually set so that the Z values (and T) is accepted if the LOG test passes. As a further constraint, you can accept the corrected reflectivity values (Z) only if both the LOG and CSR tests pass. This assures not only that the signal is strong enough for a good estimate, but that the ground clutter is not so strong that the estimate is unreliable.

To set the threshold levels, position the cursor on the appropriate level field and type the value or move the slider within the scale until the desired value is displayed in the field.

To change the threshold criteria, enter a value in the field or select an option for each parameter from a list of choices.

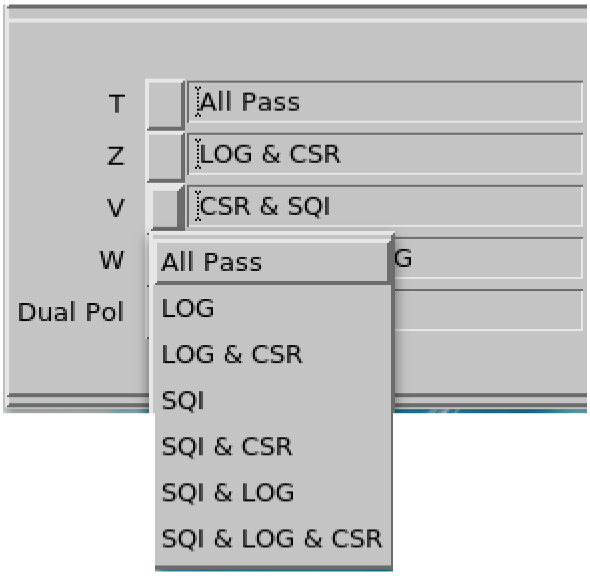


Figure 17 Threshold Criteria Parameter List Example

All Pass means that any value is accepted, and thresholding values are ignored. Polarimetric variables are treated identically to Dual Pol.

Defaults

Select **Defaults** to reset thresholding to the default values.

Point Clutter Filter

Point Clutter is a target that has strong total power in one or two successive range bins but is bordered on either side in by bins of significantly lower power. Meteorological targets rarely appear this way, but aircraft and ships do.

The Point Clutter Filter is effective in removing small, strong targets having some velocity causing standard clutter suppression to not work as well.

The Point Clutter Filter is applied in the signal processor using the autocorrelation data (T_0, R_0, R_1, and R_2) after the Doppler spectrum clutter filtering. A range bin is flagged as containing clutter if its total power (T_0) exceeds that of its neighboring range bins by more than a specified detection threshold (in dB). The neighboring range bins may be configured to be up to 3 bins away from the central bin. This is used with small bin resolutions, such as 25 meters, as some point targets appears in more than one successive range bin. When a range bin is flagged, the averages of the autocorrelation values from its neighbors are assigned to the flagged range bin. In this way point clutter can effectively be removed from data, even when contained in valid meteorological data.

Select **PntCtl** to toggle on or off the Point Clutter suppression feature of the signal processor. The number in the toggle selects how far away the neighboring range bin should be along the radial for the comparison.

The **Thresh** field defines the detection threshold (0 ... 20 dB).

Speckle Filters

A speckle is a range bin that has valid data but is bordered on either side in range by bins with invalid data (empty bins). Meteorological targets rarely appear this way, but towers, aircraft and "lucky noise" do.

IRIS provides buttons for enabling or disabling the **2 D Speckle** and **1 D Speckle** speckle filters.

IRIS includes separate **1 D Speckle** filters:

- **Z** - LOG channel parameters (for Z, T and ZDR)
- **V** - Linear channel parameters (for V and W)

Vaisala recommends toggling off the speckle filters initially and adjusting the number of samples so that there are only a few speckles on the real time display. After the adjustments, you can toggle on the speckle filters for a cleaner display.

> If increasing the number of samples would make the task too slow, you can also adjust the `LOG` or `SQI` threshold level for Z/V until only few speckles remain.

8.5.1 Optimizing Thresholds

When defining thresholds for your system, you must experiment to obtain the best combinations for your application.

Table 24 Thresholding Rules and Tradeoffs

Rule	Tradeoffs
Use large numbers of samples (>50). The more samples, the better the estimates of all parameters.	The antenna must scan more slowly when the number of samples is larger and a slow scan rate may be inconsistent with operational objectives. A scan rate of 1 ... 3 RPM is typical for good estimation, but the slower the better. See Defining the Number of Samples (page 60).
Use a high PRF. Doppler estimates tend to be better when the PRF is high.	The larger the PRF, the shorter the unambiguous range.

Rule	Tradeoffs
Do not use a clutter filter that is broader than necessary to remove the ground clutter. The required filter width depends on the selected scan rate. Use the **Ascope** utility to observe the width of Doppler spectra at close range to estimate the required width of the clutter filter. To simulate IRIS operation, use the **Antenna** utility to scan the antenna while the **Ascope** runs. See *IRIS and RDA Utilities Guide*.	A clutter filter that is too broad can damage weather information without improving the clutter cancellation.

To find the right threshold values for your system, check data from different weather situations (clutter only, rain, snow, convective or widespread precipitation) and verify the situations from independent sources of weather information. Consider making special monitoring products such as low elevation PPIs with color scale down to -20 dBZ, and RAINN products over a long period.

The following table suggests some starting points.

Table 25 Recommended Quality Threshold Starting Points

Parameter	Threshold Starting Point
`T`	`LOG`
`Z`	`LOG & CSR`
`V`	`SQI & CSR`
`W`	`SIG & SQI & LOG`
`Dual Pol`	`LOG`
`LOG LEVEL`	`0.75`
`SQI LEVEL`	`0.4`
`CSR LEVEL`	`18.0`
`SIG LEVEL`	`5.0`
`PMI LEVEL`	`0.45`
`Speckle filters`	`on`

Table 26 Troubleshooting Data Threshold Optimization

If you have this problem...	... first try to change this threshold
Mountains	Filter Dop bigger or CSR smaller
Underestimation of rain over mountains	`CSR` bigger
Doppler snake (no echo at side wind)	Filter Dop smaller
Noise at all elevations	`LOG` bigger

If you have this problem...	... first try to change this threshold
Dots at low elevations	Speckle filter on
Second trip echoes	`SQI` bigger
Vanishing strong showers	`SQI` smaller

8.6 Defining the Number of Samples

Defining the number of samples means balancing 2 factors: the more samples you have, the better the Doppler speed estimate and clutter filters work. However, taking many samples means you cannot move your antennas quickly.

Maximum Number of Samples

You can calculate the maximum number of samples as follows:

```
SAMPLES = PRF * RESOLUTION / SCAN RATE
```

where:

`SAMPLES`
: Number of pulses in per ray

`PRF`
: Number pulses you send per second

`RESOLUTION`
: How long the sector is scanned for a single ray

`SCAN RATE`
: Number of degrees the antenna moves per second

IRIS helps you determine the parameters in this equation, and then determines which parameter it should adjust in each case.

Number of Samples Per Ray

A ray is a collection of pulses (samples) integrated in a single data output from the signal processor.

The RVP signal processor provides several parameters to define what samples are included in a ray. The key parameters that determine the number of samples in a ray are `Angle Syncing`, `Major Mode`, and `Dual PRF Velocity Unfolding`.

The following table shows what constitutes a ray based on the setting of the 3 parameters. In terms of this discussion, the operation of `RPHASE` mode is equivalent to `FFT` mode

> Manual tasks are always done with angle syncing off, regardless of the IRIS setting for angle syncing.

Table 27 Ray Components Based on Angle Syncing, Major Mode, and Dual PRF Velocity Folding

Ray	Description
ANGLE SYNCING ON PPP MODE SINGLE or DUAL PRF	A ray of data is output by the signal processor every RESOLUTION degrees of antenna motion. Each ray consists of the integration of all pulses during the previous RESOLUTION degree of antenna motion. All radials are RESOLUTION degrees wide. The pulses selected for integration are centered on the position (N * RESOLUTION); where N is the number of this radial. If RESOLUTION = 1.0°, the rays are centered on integer values with ray starting and ending values on 0.5° boundaries. The setting of SAMPLES is ignored.
ANGLE SYNCING ON FFT MODE SINGLE PRF	A ray of data is output by the signal processor every RESOLUTION degrees of antenna motion. Each ray consists of SAMPLES number of pulses. This implies that the width of each radial is not necessarily equal to RESOLUTION. A ray may be wider or narrower depending on the setting of SAMPLES. The pulses selected for integration are centered on the position (N * RESOLUTION); where N is the number of this radial.
ANGLE SYNCING ON FFT MODE DUAL PRF	A ray of data is output by the signal processor every RESOLUTION degrees of antenna motion. The low PRF rays consist of SAMPLES number of pulses, unless there are fewer SAMPLES than pulses available during the previous RESOLUTION degrees of antenna motion. If there are fewer number of pulses available, the ray consists of the integration of all pulses during the previous RESOLUTION degrees of antenna motion. The number of pulses integrated in the PRF rays consists of SAMPLES multiplied by the DUAL PRF RATIO. This implies that the width of a ray may be narrower than RESOLUTION, but never wider. The pulses selected for integration are centered on the position (N * RESOLUTION); where N is the number of this radial.
ANGLE SYNCING OFF PPP MODE SINGLE or DUAL PRF	A ray of data is output by the signal processor every SAMPLES number of pulses consisting of the integration of all of these pulses. IRIS reads all rays. For manual tasks, all rays are stored. For non-manual tasks, the rays with the best angular fit are stored every RESOLUTION degrees of antenna motion. If rays are too infrequent to fit every slot in the scan, some slots have missing rays. If rays are made too frequently to fit every slot, the extra rays are discarded. In the DUAL PRF case, rays made at the low PRF are longer in time (and usually in angular distance) then the rays made at the high PRF.

Ray	Description
ANGLE SYNCING OFF FFT MODE SINGLE PRF	A ray of data is output by the signal processor at the CPU limit of the signal processor consisting of the integration of `SAMPLES` number of pulses. Rays may be partially overlapping. Thus one ray may share many of the same samples with the previous ray. This sharing iterates among all rays. IRIS reads all rays. For manual tasks, all rays are stored. For non-manual tasks, the rays with the best angular fit are stored every `RESOLUTION` degrees of antenna motion. If rays are too infrequent to fit every slot in the scan, some slots have missing rays. If rays are made too frequently to fit every slot, the extra rays are discarded.
ANGLE SYNCING OFF FFT MODE DUAL PRF	A ray of data is output by the signal processor every `SAMPLES` number of pulses consisting of the integration of all of these pulses. IRIS reads all rays. For manual tasks, all rays are stored. For non-manual tasks, the rays with the best angular fit are stored every `RESOLUTION` degrees of antenna motion. If rays are too infrequent to fit every slot in the scan, some slots have missing rays. If rays are made too frequently to fit every slot, the extra rays are discarded. Rays made at the low `PRF` are longer in time (and usually in angular distance) then the rays made at the high `PRF`.

8.7 Exec Tasks

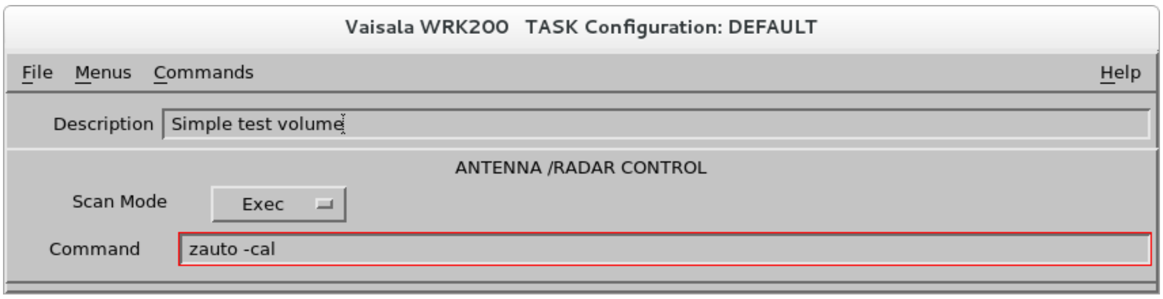


Figure 18 Exec Tasks

Use **Exec Tasks** to execute an arbitrary shell command scheduled by the task scheduler menu.

The signal processor is released from use before this runs. This allows the command to include programs which use the signal processor, such as **zauto**.

9. Scheduling Radar Tasks

9.1 Task Scheduling Overview

The task scheduler configures the automatic operation of the radar, including which radar tasks to run and when to run them. It also runs interactive manual tasks and exec tasks for scheduling maintenance jobs.

The task scheduling menus control real time processes and can be modified by a `radarop`:

- **TSC Monitor** menu, which shows what is currently happening.
- **TSC Editor** menu, which allows editing of task schedules

Task IDs

IRIS assigns a sequential ID number to each task in a schedule.

Members of a hybrid task have the same number, plus an `A`, `B`, or `C` to differentiate them.

Hybrid Tasks

The task configuration can link many individual tasks together to create a hybrid task by naming the subtasks with names such as `any_name_A`, `any_name_B`. If you add the subtasks to the schedule, IRIS also adds the other subtasks. The entire hybrid task is treated as one task in the schedule. For example, in the `any_name` hybrid task, the `_A`, `_B`, and `_C` at the end of the task name denote the additional parts of the task:

- `any_name_A`
- `any_name_B`
- `any_name_C`

In a more realistic example, a volume scan uses a low PRF to get a large, unambiguous range at low elevation angles and a high PRF to get a large, unambiguous velocity at high elevation angles where range folding does not occur. You can link these tasks to scan both the low and high elevation angles in a single hybrid task.

More information

‣ IRIS Tasks (page 9)

9.2 TSC Editor Menu

The **TSC Editor** lists tasks that make up the schedule.

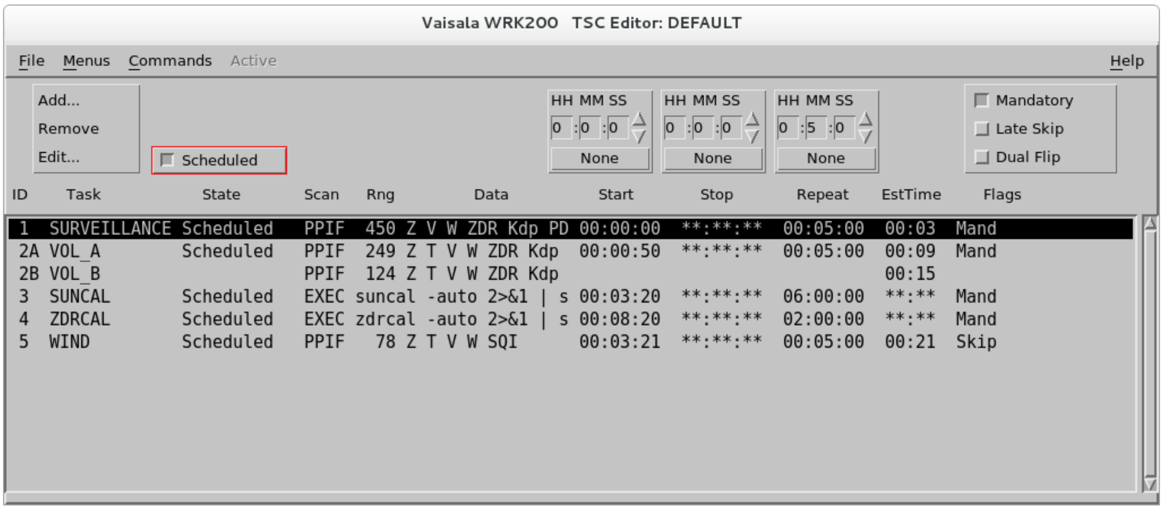


Figure 19 TSC Editor Menu

You cannot delete the DEFAULT configuration, the currently running configuration, or the configuration currently being edited.

1. Select **Menus > TSC Editor**.
2. To open a task schedule, select **File > Open**.
   A list of task schedules appears.
3. To set the state of a task, place the cursor over the **State** field and select one of the following:
   - **Scheduled** - The task runs according to the schedule.
   - **Idle** - The task is on standby and does not run.

   For hybrid Tasks, all are scheduled together so only one state is displayed.
4. Check the scan type being performed by a task (as defined in the task configuration) in the **Scan** field.
5. Check the value of the **Max Range** (as defined in the task configuration) in the **Range** field.
6. Check the first recorded data types (as defined in the task configuration) in the **Data** field.

7. To control when a scheduled task runs, select the **Start**, **Stop**, or **Repeat** fields.
   IRIS can schedule tasks to run at a specific time, or as soon as possible regardless of the clock time.
   See Scheduling Automatic Tasks (page 68).
   - Use the tool above the list to change the times (hours, minutes, or seconds).
     The time is based on a 24-hour clock and are either UTC or local based on a the system set-up.
   - Select **None** to clear the time selection.
     None for **Repeat** time means that it runs continuously without pausing.

   For hybrid tasks, the B and C parts are left blank because a hybrid task is treated as a single task for scheduling purposes.
8. To view the estimated time required to run a task, run the task at least once and select **Menus > TSC Monitor**.
   This is helpful in creating new schedules. For example, if the run time is 00:05:30, do not schedule the task should to run more frequently than every 5 1/2 minutes.
9. Set scan priorities and resolve schedule conflicts with the **Mandatory** and **Skip** options:
   - Set **Mandatory** to **yes** to allow the task to interrupt a non-mandatory task when its scheduled time arrives.
   - Set **Skip** to **yes** to let the IRIS skip the task if the radar is busy with another task when its scheduled time arrives. The task can run late by up to 60 seconds before it is skipped.

   For hybrid task, the B and C parts are left blank because a hybrid task is treated as a single task for scheduling purposes.
   For more information on managing task priority, see Scheduling Automatic Tasks (page 68).
10. For dual IRIS systems that operate 2 different transmitter/receivers through the same antenna, select **Dual Flip**
    For example, when one of the systems finishes the scan, it gives up control of the radar to the other system. In this way, the 2 systems, perhaps operating at 2 different wavelengths, can take turns so that one system runs a task and then the other system runs a task.
    For example, setting the **Dual Flip** flag to **Yes** on system A allows system B to run a task after A has completed its task. If system B does not start a task within 3 seconds, then system A is free to resume its tasks.
11. When you save the currently running configuration, the change takes effect immediately.

9.3 TSC Monitor Menu

The **TSC Monitor** contains a list of the tasks that make up the schedule, with indications of the currently running mode and tools for starting and stopping tasks.

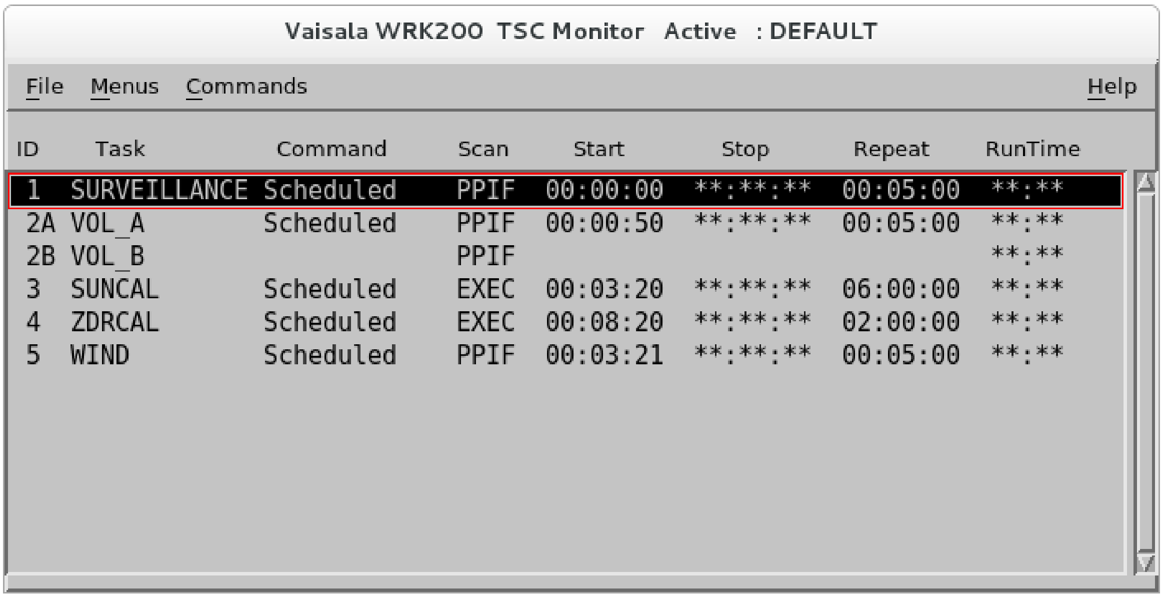


Figure 20 TSC Monitor Menu

1. Select **Menus > TSC Monitor**.
2. To change to a different task schedule, select **File > Change TSC**.
   A list of previously configured task schedules appears. Select an item on the list to change the TSC mode to that configuration.
3. To start or stop tasks, place the cursor over the **Command** select a command.

Table 28 Task Start and Stop Commands

Command	Description
Go (Schedule)	Runs the task according to schedule. Regularly scheduled tasks are typically used for routine IRIS operations. You can create, test, save and recall schedules for different modes of operation.
Go (ASAP)	Runs the task immediately, depending on the priority of other tasks. Use this for interactive operation
STOP (When Done)	Stops a task as soon as it finishes running.
STOP (Right Now)	Stops a task immediately, even if the task is incomplete.
Interrupt/ Reschedule	Stops a task immediately and then reschedules it.

4. To check the status of a task, check the **Command** column.

Table 29 Task Status

Status	Description
Idle	Task has not been activated by the **Go** command.
Scheduled	Task has been activated by the **Go** command, but it is not the task's turn to run.
Running	Task is currently running.
ASAP	Task is scheduled to run as soon as possible. This is the status after issuing a **Go Now** command

For hybrid tasks, the B and C part show only the message **Running** when the task is running. Otherwise, this field is blank.

5. To check how long the task took to run, see **Run Time**.

9.4 Adding Tasks to a Schedule

You can add up to 8 tasks to a schedule.

When scheduling, hybrid tasks are treated as a single task. When one part of the task is added into a schedule, all the other parts are also added.

1. Select the line in the schedule that you want to put the new task after.
2. Do one of the following:
   - Select **Add**.
   - Right-click the **ID** or **TASK** field and select **Add**.
3. Select a task from the list.
   IRIS adds the task to the schedule, filling in the information for the selected task.

9.5 Viewing and Editing Tasks in a Schedule

1. Select **Menus > TSC Editor**.
2. Select the task from the list, and select **Edit**.
3. Make your changes.
4. Save your changes.

9.6 Removing Tasks from a Schedule

1. Select **Menus > TSC Editor**.
2. Select the task and select **Remove**.
   If your remove a hybrid task, all its sub-tasks are removed.

9.7 Scheduling Automatic Tasks

When system operation requires that products be generated regularly, you can schedule a task to run at regular intervals and assign priorities to each task.

1. Set the task start, stop, and repeat times:
   - **Start** specifies the first time after midnight that the task runs.
   - **Stop** specifies the last time after midnight that the task runs.
     If a task should run all day, specify **None**.
   - **Repeat** specifies the interval between successive runs.
2. Adjust the scheduling so that no conflicts occur, that is, so that tasks are not scheduled to run at the same time.
   If, for example, you create new tasks, even well-planned schedules can fall behind, creating scheduling conflicts that must be resolved.
   a. Place the cursor over the task field.
   b. Select **Mandatory > Yes** if the task must run at the scheduled time without interruption.
   c. Select **Mandatory > No** if the task can be interrupted.
      If a task is interrupted, the resulting data is complete up to the time of interruption.
   d. When a **Mandatory** task is running and another task comes up to run, the second task is placed on hold. When this happens, use **Skip** to help get the system back on schedule:
      - Select **Skip > Yes** to skip the late task.
      - Select **Skip > No** to have the scheduled task to run runs as soon as possible after the completion of the current task. In the case of multiple late tasks, IRIS picks the latest to run next, starting with any **Mandatory** tasks.
3. When prioritizing tasks, consider:
   - **Mandatory** tasks always interrupt non-mandatory tasks.
   - **Mandatory** tasks can never be interrupted.
   - If a **Mandatory** task is late and the **Skip** flag is set to **No**, it runs before non-mandatory tasks.
   - If more than one **Mandatory** task with the **Skip** flag is set to **No** is late, the latest task runs first.

   When the **go ASAP** command runs a task immediately, the priority of the task is used to resolve conflicts as described above. The **Skip** flag does not apply because the task runs only once.
4. If a task runs consistently late, analyze and adjust the overall scheduling.

Table 30 24-hour Clock Daily Scheduling Example

Schedule	Task	Start Time	Stop Time	Repeat
Hourly, on the hour, all day		00:00:00	None	01:00:00
5 minutes after the hour, every 15 minutes, all day		00:05:00	None	00:15:00
Two Identical Tasks with Different IDs and Scheduled at Different Times				
First task schedule: • Every 2 hours on the half hour from 02:30 to 8:30 • Hourly for the rest of the day	1	02:30:00	08:30:00	02:00:00
Second task schedule: • Start at 09:30 to start hourly runs after the first task ends at 08:30. • Stop at 01:30 because that is the last possible time the task can run before the first task restarts at 2:30.	2	09:30:00	01:30:00	01:00:00

9.8 Scheduling and Running Manual Scan Tasks

You can insert manual tasks in the schedule the same way as other scan types, except that antenna control is not automatic.

For interactive manual scans, use the **Real time display** and the **Antenna** utility to have interactive control and feedback. IRIS does not take a noise sample before running a manual scan. For more information, see *IRIS and RDA Utilities Guide*.

1. Add the task to the schedule:
   In most cases, use a manual scan task on an ad hoc basis.
   To prevent the manual scan task from interfering with regularly scheduled tasks:
   - Set **Stop** to **None** so the scan can work at any time of day.
   - Set **Repeat** to **None**.
   - Set **Mandatory** to **Non-mandatory**, so it does not interfere with mandatory scans such as a regularly scheduled volume scan.
   - Set **Skip** to **Yes** so that if it is preempted, it does not run.
   - Set **State** to **Idle** so it does not start automatically.

   For information on configuring a manual scan, see Antenna and Radar Control (page 42).

2. To run the scan, select one of the following:
   - **TSC Monitor > Go Schedule**
   - **TSC Monitor > Go ASAP**

   Go Schedule and **Go ASAP** delay the start of the task according to the **Repeat** settings. If **Repeat** is set to **None**, the commands have the same effect.

3. If the TASK configuration is set to **Continuous**, stop the task with the **`Halt`** command.
   In most cases, set the task configuration to **Continuous**, especially for interactive scans with the real time display and the **Antenna** utility.
   If the task configuration is set to **Non-Continuous**, the task stops automatically after it has collected the prescribed number of data rays (up to 720).

9.9 Running A Task

1. In the **TSC Monitor** menu, select, the task you want to run.

2. Place the cursor over **Command** and select either:
   - **Go (Schedule)**
     Runs the task according to schedule.
     The task status changes from **Idle** to either **Scheduled** or **Running**.
   - **Go (ASAP)**
     Runs the task immediately, depending on the priority of other tasks. Use this for interactive operation
     The status changes to **ASAP**, indicating that the task is scheduled to run as soon as possible. The task runs once, and then the status changes to **Scheduled** and is added to the schedule.

9.10 Stopping a Task

1. In the **TSC Monitor** menu, select the task you want to stop.

2. Place the cursor over **Command** and select either:
   - **STOP (When Done)**
     Stops a task as soon as it finishes running.
   - **STOP (Right Now)**
     Stops a task immediately, even if the task is incomplete.

If the task is not running, that is, its status is **Scheduled**, the commands behave the same way.

CAUTION! If you select **Stop (Right Now)**, data may be lost.

9.11 Using Passive IRIS

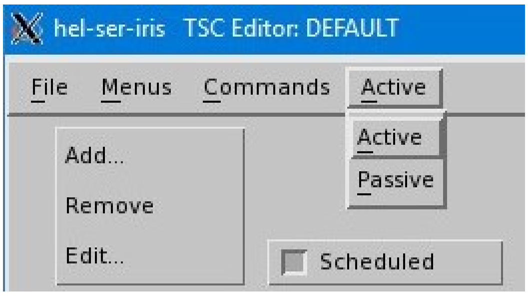
The task scheduler supports running in either active or passive data acquisition modes. The **Setup** utility configuration (setup/ingest/scanning) determines whether your system functions as:

- Active only
  No user configuration required.
- Passive only
  No user configuration required.
  You must load the task schedule with the tasks corresponding to the active system. All tasks must be set as **Scheduled**.
- Active/passive (selectable)
  You can select active or passive operation.

Most systems use active data acquisition where IRIS controls the antenna scanning. In some installations, an external system controls the antenna and IRIS, in passive mode, acquires the data by listening to what the radar is doing and synchronizing to the external control.

1. To check if your system uses active or passive data acquisition, select **TSC Monitor**
   The menu bar shows one of the following:
   - **Active**
   - **Passive**
   - **Active** (selectable)

2. If you system is configured to select whether data acquisition is active or passive, select **TSC Editor > Active** choose either **Active** or **Passive**.



3. If you change the data acquisition mode, select **TSC Editor > Save As** to take the changes into effect.

More information

- Passive IRIS Overview (page 125)

10. Configuring IRIS Products

10.1 Configuring Products

IRIS Radar products provide information that can be used directly for weather nowcasting and forecasting. You configure the products in IRIS Radar.

IRIS products can display radar data in many ways. For example:

- The **CAPPI** product shows the distribution of a radar parameter, such as reflectivity or spectrum width, at a constant altitude.
- The **TOPS** product shows a color contour map of the height of a selected reflectivity surface.
- The **RAIN1** and **RAINN** products show the accumulation of precipitation over selectable time periods.
- The **WARN** product checks other IRIS products to determine if there is significant weather, such as wind shear greater than a threshold amount.

Each product is associated with a configured task. Tasks collect information from signal processors and store the data on disk in ingest files.

For more information, see *IRIS Product and Display Guide*.

10.1.1 Configuring RAW products

1. Select **Menu > Product Configuration**.
2. Select **Type > RAW**.
3. Select the button next to the task name, and select a task from list.

   Vaisala recommends you give a **RAW** product the same name as its associated task.

4. To copy the product files over a slow network connection, select **Make sweep-by-sweep? > On**

5. To filter the **RAW** product to only include some of the data types of the original data, deselect **Include All Data**.
   For example, you might want to send all data to a research customer but skip sending the dual-pol data to a simple display computer.

   > Vaisala recommends that you leave **Include All Data** enabled until a need arises to limit data types.

   > If you use a wild card, you cannot merge data from hybrid tasks into one file.

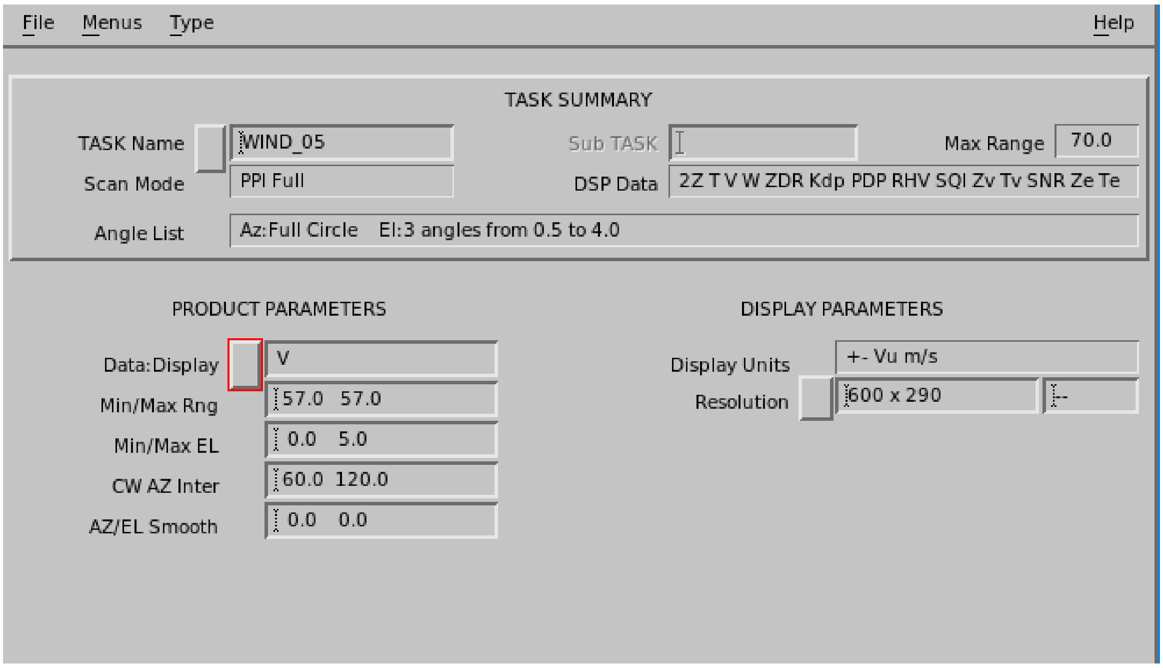
6. Select **File > Save as** and give a name for the *RAW* file.

10.1.2 Configuring PPI products

A **PPI** shows data from one elevation, all azimuths. You can use it at the radar site for quality control.

1. On the IRIS menu, select **Menu > Product Configuration** .
2. Select **Type > PPI**.
3. Select the button next to **TASK name**, and select a task from the list.
4. Select the button next to **Data:Display**, and select a parameter to be displayed, typically **Z** for reflectivity.
5. Enter **Maximum Range** (km) and elevation angle which suit the task you have selected. You can see task information in upper part of the menu.
6. Select **File > Save as** and give a name for the **PPI** file.

10.2 Product Configuration Menu



Most **Product Configuration** menus have the same general format:

Task Summary
: Contains information about the task associated with the product.

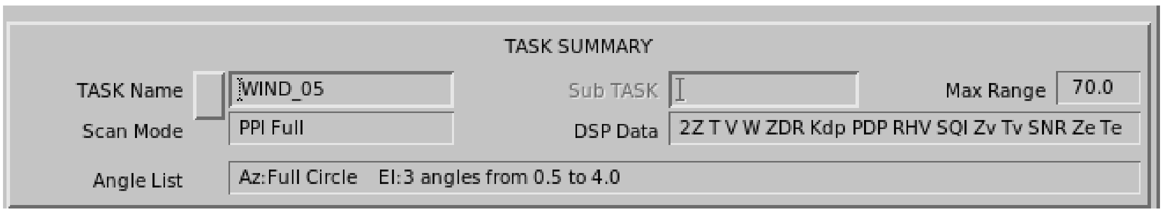
Map Projection
: Specify geographical map projection, if desired.

Product Parameters
: Specifies the data, range, and other product-specific options.

Display Parameters
: Select your default color scale, which can be overridden at display time.
In case of `HClass` data types, select the classification method projected in the product. This cannot be overridden at display time.

1. Select **Menus > Product Configuration**.

10.2.1 Associating Products with Tasks



Each product is associated with a task, which provides the ingest data for the product.

TASK Summary information, taken from the associated task, shows the key task configuration parameters.

When associating a task with a product, the system must consider *matched resolution sampling* and constructing *volume scans* for a product.

1. Select **TASK Name** to show a list of tasks.
   Note that certain product types require different types of task associations.

Product Type	Description
Running a product from ingest data	Enter a task name, including wildcard characters. The question mark (?) matches a single character; the asterisk (*) matches any string of characters.
Volume scan product from hybrid tasks	In the task name section: • Specify the input tasks with an underscore and single letter. • Specify the sub-task suffix letters in the **Sub Task** box. Type a "*" to indicate all subtasks. • Type individual letters such as **ABC**, **AB**, **BC**, or **AC** to select which portions of the hybrid to include. • Type "–" to indicate a range of letters, for example "`A–DF`" means `ABCD` and `F`.
RAW products	Always made from a single task. You must make a separate **RAW** product for each sub task. If you are retrieving **RAW** data from tape or receiving a **RAW** product over the network, there is no task configuration file on your disk. In this case, type the task name directly in the field, exactly as it appears in the **Ingest Summary** menu or the **Tape** menu.
RHI products	Include `RHI` in **RHI** task names to distinguish them from **PPI** scans.

2. To optimize product appearance and system performance, define the matched resolution sample.
   For best results, the range bin spacing and number of bins in the task should match what is needed for the product. This is called a *matched resolution sample*. The match does not need to be exact because IRIS uses interpolation algorithms.
   For best performance, match the range bin spacing, number of bins and maximum range in the task configuration, to the desired pixel resolution, pixel scale and maximum product range in the product configuration.
   For example, if you are making a low resolution product (240 × 240) to a range of 120 km (74.6 mi), and you want a single pixel to represent 1 km (0.6 mi) of data, configure the task configured with at least 120 range bins spaced 1000 m (3280 ft 10 in) apart.
   Note that 170 bins can be displayed to the corners of the product. For a medium resolution product with 1 km (0.6 mi) bin spacing, the best match is for tasks with 240 to 340 bins spaced 1 km (0.6 mi) apart. Note that IRIS can make products for any range bin spacing that can be specified in the **TASK Configuration** menu, for example, 500 m (1640 ft 5 in) or 250 m (820 ft 3 in) spacings can be used as well.

3. If needed, construct a volume scan.
   Some products require volume scan tasks, either **PPI Full** or **PPI Sector** scans taken at multiple elevation angles. Volume scan products include:
   - **BEAM**
   - **CAPPI**
   - **MAX**
   - **TOPS**
   - **VIL**
   - **XSECT**
   - **VVP**
   - **WIND**

   For these products, multiple elevation angles are required in the associated task. There is a tradeoff between the number of elevation angles, the quality of the product and the task scan time. More elevation angles produce higher quality products at the expense of taking more time to complete the volume scan.
   A typical volume scan is shown in the following figure. In this example, the height resolution is 1 km (0.6 mi) at 60 km (37.3 mi) range, for heights less than 10 km (6.2 mi). A 1° beam is 1 km (0.6 mi) wide at 60 km (37.3 mi), so this scheme matches the antenna resolution. If close range work is important, you must add higher elevation angles to cover the upper regions.

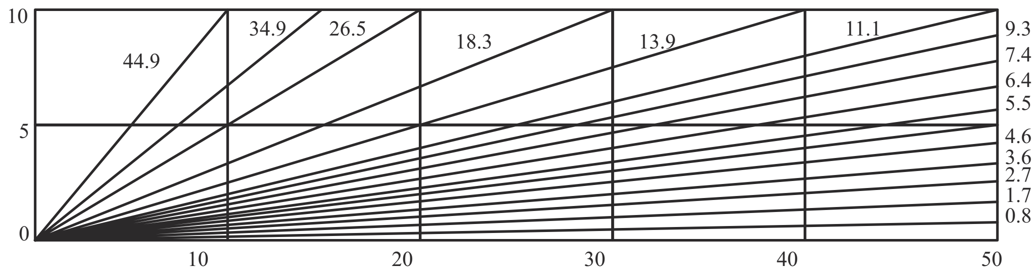


Figure 21 Example of 15-tilt Volume Scan

When constructing a volume scan task configuration, it is a good idea to do a drawing such as the one in the example, with a 1:1 vertical:horizontal scale so that you get a true picture of the sampling geometry.

> The example is corrected for earth curvature, as are all IRIS products.
> Also, because of beam widening effects, the accuracy of all products degrades with range. For example, the beam width at 120 km (74.6 mi) range is 2 km (1.2 mi) across for an antenna with a 1° beam. This is a fundamental limitation of radar sampling.

10.2.2 Configuring Map Projections

You can specify the type of map projection that is used for display. This is useful for combining data from other sources or for generating displays that are not centered on the radar.

Composites, for example, must use a projection so that the data from several radars can be mapped to a single display.

Table 31 Supported Map Projections

Projection	Description[1)]
Azimuthal equidistant (AED)[2)]	Choose this for a standard radar display map where azimuth lines are straight and angles are not distorted. This projection has the property that the distance in the map horizontal direction is the same as the distance in the map vertical direction. This means that lines of constant azimuth (radar rays) are straight and circles can be used to represent lines of constant range. Because of this, the AED projection is particularly convenient for radar applications. For radar applications, the radar is usually placed in the center of the map and the radar location serves as the map reference point. Note that lines of latitude and longitude are not straight in this projection. (Page 191) In IRIS Focus this is used to display single radar data.
Mercator[2)]	Choose this for true Mercator projection mapping where latitude and longitude lines are straight and intersect at right angles. Additionally, a line of constant bearing from a point is straight so it is useful for navigation. Mercator has the advantage that it is a known standard, so it is easier to combine data from different sources onto a Mercator projection. It has the disadvantage that at high latitudes, the horizontal and vertical scales are different (large distortion). (Page 38) In IRIS Focus this is used to display composite radar data.
Equidistant cylinder	Used for the digital terrain maps in IRIS (for example, inserted in the **Overlay** utility). (Page 90)
Gauss conformal	Same as Universal transverse Mercator except omitting the 0.9996 scale factor. (Page 48)
Gnomonic	All great-circle arcs are straight lines. (Page 164)
Lambert conic	Scale is true along 2 standard parallels. (Page 104)
Perspective	Often used for satellite images. We assume that the satellite is at geosynchronous height. (Page 169)
Polar stereographic	Useful near the North Pole. This is essentially the AED projection with the reference point at the North Pole. (Page 154)

Projection	Description[1]
Universal transverse Mercator (UTM)	A projection just like Mercator with the axis reversed at a selectable longitude. The horizontal dimension is compressed by a factor of 0.9996. By convention the reference longitudes should be multiples of 6°. Used by the military, and is good for regions with long North-South extent. (Page 48)

1) *Page numbers refer to the projection equations from Map Projections – A Working Manual, U.S. Geological Survey Professional Paper 1395.*
2) *Available in IRIS Focus*

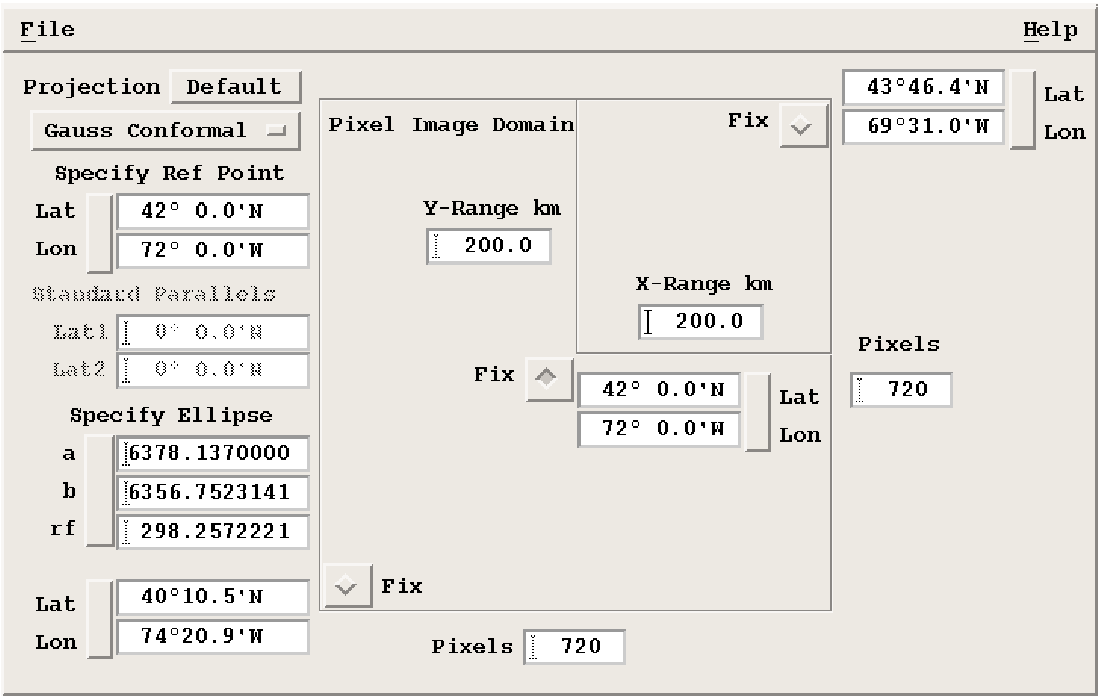
1. To configure a standard radar display centered on the radar:
   - For the projection type, select **Projection Configuration > Azimuthal Equidistant**.
   - For the **Projection Name**, select **<NONE>**.

   Most of the time you do not need to create or use special projection files.
   If you want the radar off-center, you must configure a projection file as described starting from step 3.
   If you have already configured and saved a projection, go to step 2.

2. To use a pre-configured projection, select **Projection Configuration > Projection Name**.

   - A list of available projection files on the system is shown.
   - In the example, the radar **Max Range** and **Output Pixel Resolution** are desensitized since they are defined by the projection file that is selected.
   - Select **<NONE>** for the **Projection Name** in which case the radar is defaulted to be at the center of the screen. Additionally in the case of an AED projection, the radar is defined to be the map reference point. In this case, the **Max Range** and **Resolution** fields are configurable in the **Product Configuration Menu**.

3. To configure your own projection, select **Setup > Projection Configuration**.
   The **Projection Configuration Menu** opens.



4. Select the **Projection** to define the projection type.

> You must first define the projection. The list of available projection files under **File** is given only for the selected projection type.

5. Select **File > Open** command to give a list of existing Mercator or AED files depending on the selected projection.
6. Select **Reference Point**.
   - For AED projections: The reference point is the location from which all azimuths display as straight lines. Usually set to the radar location.
   - For Mercator projections: The map cannot cross the line 180° away from this longitude, so set it near your location. The latitude defines the range scale.
   - For Polar Stereographic: The is the longitude line which you wish to have vertical in the map. Effectively this rotates the map. Again the latitude defines the range scale.
   - For UTM: Only a longitude is selected. This is the center meridian of the UTM strip. By convention these are spaced every 6°, starting at 3°. Use a value near your longitude.
   - For Lambert Conic: Also define 2 standard parallels.
7. Select **Save** to name your projection.
   The name of the open projection file is displayed in the menu title bar (`AED_200_KM` in the example).

8. Fix a corner or center location.
   To configure a projection, you must know the latitude and longitude of either the NE or SW corner or the center of the display.
   Select **Fix** at the location that you know and then input the LAT/LON coordinates.
   With **Fix** selected, you can change other parameters of the projection geometry without losing you coordinate information.
9. Specify the projection coverage area (region of the projection) in one of 2 ways:
   - Specify the latitude and longitude of one of the 2 unfixed points.
   - Specify the distance North (**Y-Range**) and the distance East (**X-Range**) from the center.

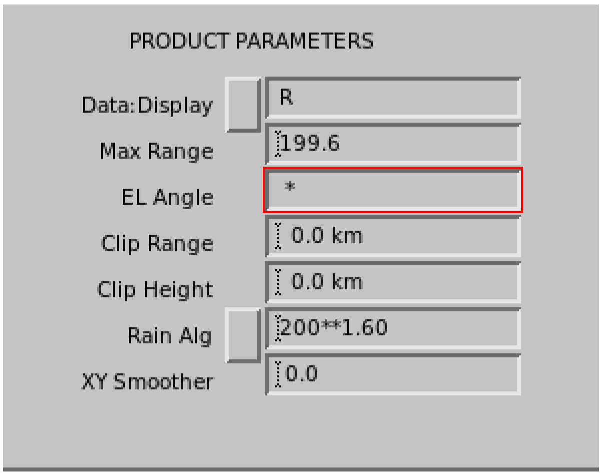
   The projection menu acts as a spread sheet. When you change a parameter, the other parameters adjust to reflect the change.

   > The spreadsheet algorithm converges on a correct solution even for strange projections. One example where it may not converge is for an AED projection where the **Reference Point** is several thousand kilometers from the center of the projection region.
   > If you encounter a problem with the spreadsheet, check the reference point and select **Default** to load some valid numbers.

10. Specify the pixels.
    The number of pixels that are used to represent data in the projection is specified for the X- and Y-directions of the output display.
    If you have specified the other aspects of the projection, input the correct number of X-pixels (horizontal direction). The number of Y-pixels adjust automatically.
    If you adjust the number of Y-pixels, then other parameters of the spread sheet change, such as the LAT/LON of the unfixed points and the **Y-Range**.
11. Fine-tune the spread sheet.
    Since all of the projection geometry parameters are linked through the spread sheet algorithm, when you change one parameter, other parameters adjust automatically.
    This means that you may need to compromise. The spread sheet makes it easy to experiment with different compromises.
    For example, if you want a 480 × 480 pixel Mercator display, both the X- and Y-ranges cannot in general be made equal (for example, 100 km (62.1 mi)). In this case, the compromise can be, for example, an X-range of 100 km (62.1 mi) and a Y-range of 99.5 km (61.8 mi) to get a perfect 480 × 480 display.

10.2.3 Product Parameters

In **Product Parameters**, define the data taken from the task and how to display the data.



Data : Display

Select **Data:Display** to show a list of valid display parameter options. The available choices vary depending on the product type.

This parameter specifies from which data parameter the product is derived. For example, `Z`, `V`, `W`, `ZT`, or `ZDR`. This information comes from the task associated with the product. Some data parameters can be displayed in more than one way.

Table 32 Data Types

Data type	Description
`Ah`, `Av`	Integral attenuation for horizontal (H) and vertical (V) channels.
`Azdr`	Integral attenuation of ZDR (dB) format.
`CSR`	Doppler channel clutter-to-signal (CSR) ratio of dBT to -dBZ.
`dBT`, `dBTh`, `dBTv`, `DBTr`	Total power.
`dBZ`	Clutter corrected reflectivity
`dBZt`	Uncorrected reflectivity
`HCLASS`	Hydrometeor classification Estimated hydrometeor type in the precipitation area.
`KDP`	Specific differential phase An indicator of the rate of change of the phase difference between horizontally and vertically polarized pulses of the radar. A greater horizontal shift results in a positive KDP value, and a greater vertical shift results in a negative KDP value. Typical cause for a high KDP area is heavy rain.
`LDRH`, `LDRV`	Linear Depolarization Ratio H to V (or V to H). The ratio of cross-polar to co-polar reflectivity measured in dB.
`LOG`	Log receiver signal-to-noise ratio.

Data type	Description
PHIH, PHIV	Horizontal (V) or vertical (V) differential phase Phase difference for the total round trip between radar and the volume where the signal is reflected. PHIH is measured between HH and HV channels. PHIV is measured between VV and VH channels.
PHIDP	Differential phase The phase difference due to propagation between the HH and VV channels of the radar.
PMI	Polarimetric meteo index.
R	Rate of accumulation of precipitation in units of mm/hour. For snow, this is usually refers to the liquid equivalent.
RHOHV, RHOH, RHOV	Correlation coefficient between HH and VV (or HH & HV / VV & VH) channels) Higher (>0.95) values indicate uniform precipitation areas and lower values more mixed hydrometeor types, such as melting snow, wet snowflakes, or airborne debris.
SNR	Signal to Noise Ratio Generic measurement of signal-noise ratio in dB.
SQI	Signal Quality Index A value between 0-1 that measures the signal's Doppler coherency, that is the correlation between the signal and its Doppler lag. • 0 indicates white noise • 1 is the perfect Doppler point target
T	Total Reflectivity Total power returned to the radar in reflectivity units. It typically represents the horizontal reflectivity without ground clutter correction.
TV, TE	Total Vertical (HV Enhanced) Reflectivity Total reflectivity from the vertical polarization channel (TV) and combination of the horizontal and vertical channel (TE).
V	Velocity Average radial velocity (towards or away from the radar) of detected hydrometeor areas.
VC	Corrected Velocity Same as Velocity, but corrected for effects of range folding and velocity folding.
V: SHEAR, Vc: SHEAR	Velocity and corrected velocity of wind shear.
W	Spectral Width Variability of Doppler velocity values within the measurement area.
XCOR	Polar cross-correlation, uncorrected rhohv. Because this value is not noise corrected, it is a direct indicator of the PHIDP uncertainty
Z	Reflectivity Usually referred to as dBZ, this is the common data type that measures radar signal reflectivity, and is used to estimate precipitation intensity from that. All Z measurements are corrected for ground clutter.

Data type	Description
ZV, ZE	Vertical (HV Enhanced) Reflectivity Total reflectivity from the vertical polarization channel (ZV) and combination of the horizontal and vertical channel (ZE). Corrected for ground clutter.
ZC	Corrected Reflectivity Same as Z, but corrected for attenuation and beam blockage effects.
ZDR	Differential Reflectivity The ratio of SNR in the horizontal channel to the SNR in the vertical channel. Positive values indicate more prominent horizontal echoes and negative values more prominent vertical echoes. Larger hydrometeor sizes are usually identified by high positive ZDR values.
ZDRC	Corrected Differential Reflectivity Same as ZDR, but corrected for attenuation and beam blockage effects.

Product Maximum Range

If you select a custom **Map Projection Name** (other than <NONE>), you cannot configure this field in the product output menu. This is because the maximum range is determined by the projection configuration.
See Configuring Map Projections (page 77).

This is the maximum range configured for the product, which must be less than or equal to the data range. The maximum range is the range in the E-W / N-S direction centered on the radar. This means that the range to the corners of the resulting display is greater.

Rain Alg

You can choose the algorithm for rainfall estimation from a selection that varies from traditional **Z-R relation R(Z)** to advanced algorithms for rainfall estimation that use dual-polarization algorithms: **R(KDP)**, **R(KDP,ZDR)** , **R(Z,ZDR)**, **NSSL2005**.

The parameters are set in the *qpe.con* file located at */usr/sigmet/config/* directory.

Table 33 Algorithms for **Rain Alg**

Algorithm	Description
Z-R relation R(Z)	This algorithm defines **R-Z** using the traditional definition: Z= AR**B.
R(KDP) **R(KDP,ZDR)** **R(Z,ZDR)**	These algorithms compute **R** using the various dual-polarization parameters.

Algorithm	Description
NSSL2005	This algorithm uses a rain intensity -based classifier, and different equation for each intensity. For more information on NSSL2005 QPE, see: *Ryzhkov, A. V., et. al. Rainfall Estimation with a Polarimetric Prototype of WSR-88D. J. Appl Meteor., 44, 502-515.*

XY Smoother

The **XY Smoother** can significantly improve the appearance of products for presentation and improve data compression. The smoother performs image processing to average the color contours and interpolate over small gaps or missing pixels in the final Cartesian image.

Specify the length of the smoother in km.

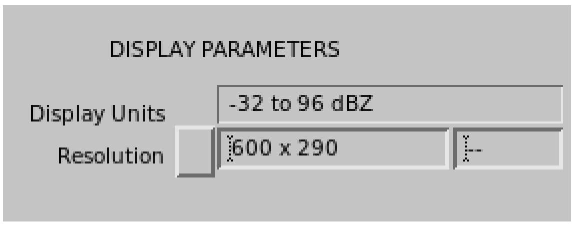
CAUTION! Smoothing requires substantial CPU resources. The internal limit on the smoother length is 60 pixels, much longer than you probably want to use.

To produce many smoothed products in a regular operation, Vaisala suggests the following:

- Use low resolution products together with smoothing.
  It is faster to make a low resolution product and smooth it than to make a medium resolution product and smooth it.
  In many cases, the results are nearly identical, so there is no benefit in smoothing high or medium resolution products.
- Use the minimum smoothing length to get the desired effect. Do not over-smooth and do not use a length that is larger than you need.
  Larger smoothing lengths require more computation.

10.2.4 Display Parameters

The display parameters determine how the product appears.



Display Units

Most data types are numerical. **Display Units** shows the range of values and the units for the product's output values.

For example, the Echo Tops algorithm outputs values in km to the nearest 100 m (328 ft 1 in) spanning the range of 0 to the maximum data height defined with the **setup** utility or 25.5 km (15.8 mi), whichever is less.

The following table shows the values that you can assign to the display units.

Table 34 Display Units

Display Parameter	Maximum Display Range, Display Units, or the Classifier method
`dBZ`	-32 ... 96 dB mm^6/m^3
`dBZt`	-32 ... 96 dB mm^2/m^3
Rain	0 ... 255 mm/hr or 0 to 10.2 inches/hr
`Liq`	0 ... 1000 mm
`Vel`	$-V_u$ to V_u m/s
`Width`	0 ... V_u m/s
`ZDR`	-8 ... +8 dB
`TOPS`	0 ... 25.5 km or height configured in **Setup**
`VIL`	0 ... 65.0 mm
`WIND`	Configured in **Setup**
`SHEAR`	+-25 m/s/km
`HClass`	`Meteo`, `Precip`, `Cell`, `Meteo+Precip`, and `Meteo+Cell` The first **Classifiers** field lets you to choose which classifier outcomes are projected in the product. The selector lists the available classification algorithms and their merged combinations.

Color Scale, Levels, 1st Level/Step

The color scale relates numerical data values to colors.

The **Scale** field lets you choose whether to use a uniform scale with a start value and a constant step, or a custom color scale that has been preconfigured for your system:

- Custom color scales are defined with the **Color Setup** utility. See *IRIS and RDA Utilities Guide*.
  Each color scale has a name that has been defined in **Color Setup**.
  Names can reflect scales that are appropriate for different seasons such as `Summer` or `Winter`.
  If in doubt, select **Default** which is usually configured to be a reasonable scale. The number of scale steps are filled-in automatically since this is also part of the custom color scale.

- When you choose a uniform color scale, you pick the number of level steps (2 ... 16). You must also set the following fields:
  - The **1st Level** field sets the numerical value used to label the right side of the first level in the color scale for the product.
  - The **Step** field sets the spacing between the color levels. The numbers in the color legend in the product are spaced by this value.

The color scale also associates the classification data to the class descriptors (class identifiers with class legends). Sets of class legends can be customized as **Classifier** sets in your system (with the **HydroClass Name Editor** in the **Color Setup** utility), to match the available classifier methods.

The following table shows the units you use for the **1st Level/Step**, depending on the display parameter.

Table 35 Display Parameter Formats

Display Parameter	1st Level/Step Format
`dBZ`	+ - XX Whole dBZ
`dBZt`	+ - XX Whole dBZ
Rain	+XXX.X mm/hr
`Liq`	+XXX.X MM
`Vel`	+- X.X m/s
`Width`	+ XX.X m/s
`ZDR`	+- X.X dB
`TOPS`	+ XX.X km
`VIL`	+ XX.X mm
`WIND`	NA
`SHEAR`	+- XX.X m/s/km

For the mean velocity, selecting a level step of 0 causes the velocity to be displayed for the entire unambiguous interval between $-V_u$ to $+V_u$.
Selecting an odd number of levels produces a legend with a band centered on 0 velocity. Selecting an even number of velocity levels does not produce a legend with a band centered on 0 velocity, but rather a color break exactly at 0 velocity.

When choosing a uniform color scale, you have more flexibility to choose colors. The associations of the class identifiers with class legends is fixed by the **Color Setup**.

The following figure shows 2 examples of the display configuration parameters, one for `ZT` and one for velocity, and the resulting color legends that would appear with the product.

In the case of `ZT`, the example shows that the bottom of the scale "thresholds" such that data less than -20 dBZ are not displayed, while the top end "saturates" since the top color includes all values greater than 50 dBZ. When you select uniform scales, the behavior (saturation vs thresholding) of the end of the scales cannot be changed. This behavior is inherited from the custom color scale named `Default`, which is configured in **Color Setup**.

In the velocity example, by entering 0 for level step, the display automatically spans the full Nyquist interval. Note that both ends are set to saturate for velocity.

The format of the color legends, with regard to how the numerical legend labels relate to the color band boundaries, is configured in the **Color Setup** utility for each parameter. This utility offers considerable flexibility for defining how the color legends are constructed for each data parameter. See *IRIS and RDA Utilities Guide* .

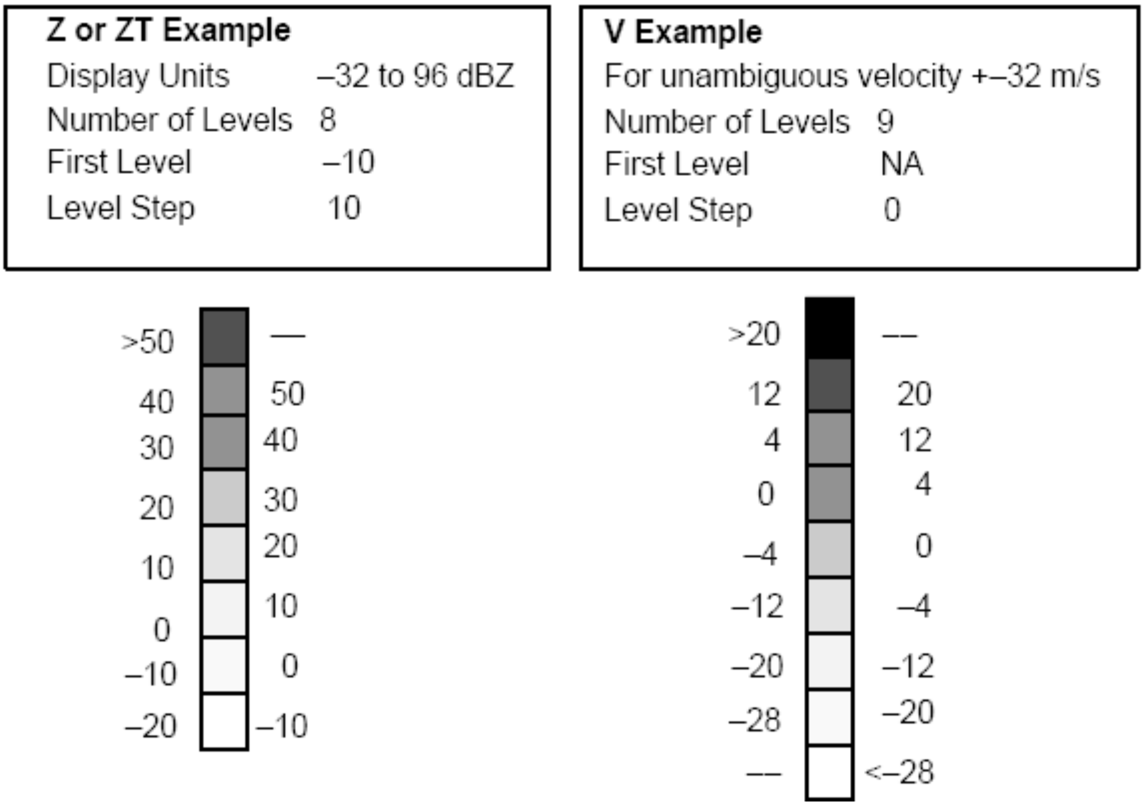


Figure 22 Color Legend Format Example

Product Picture Resolution

If you select a custom **Map Projection Name** (other than **<NONE>**) you cannot configure this field in the product output menu. This is because the resolution is determined by the projection configuration.
See Configuring Map Projections (page 77).

IRIS can produce product pictures in virtually any resolution, from 16 × 16 to 3100 × 3100 pixels. IRIS products are produced specifically for the display resolution that is requested, optimizing the match between the display pixels and the actual radar data. This means that high resolution products are not merely low resolution products with replicated pixels. Likewise, low resolution products are not produced by degrading a higher resolution product. When you request a high resolution product, you get the best possible image that can be generated from the original data. If a low resolution product is requested, the product is computed efficiently by calculating the product only at the requested resolution. In addition to efficient generation, low resolution products can be transmitted over a communications link and displayed more rapidly because they contain fewer pixels.

The **Resolution** field in the **Product Configuration** menus show the X-Y number of pixels. These can be changed by entering different numbers of pixels, or by popping up a menu of the default low, medium or high picture resolutions. The defaults are shown in the following table for both PPI (square image region with legends to the right) and RHI formats (rectangular image region with legends beneath). The defaults are optimized to the resolution of the standard IRIS display devices.

Table 36 Default Picture Resolutions

Default Resolution RHI (Rectangular) Format[1]	PPI (Square) Format[2]			
	X-Pixels	**Y-pixels**	**X-Pixels**	**Y-Pixels**
Low	240	240	288	136
Medium	480	480	600	290
High	720	720	840	530
XHigh	940	940	1060	750

1) *Rectangular image region with an optional legend beneath.*
2) *Square image region with an optional legend to the right.*

Regardless of the product type, IRIS determines the best way to display your product in either **PPI** or **RHI** format. If your image does not exactly match the pixel size of a target display device, IRIS adjusts it to make a best fit. For example, if you output a low resolution image to a high or medium resolution printer, IRIS doubles the pixels so that the display fills the image area. Likewise, IRIS shrinks an image if it has more pixels than can be displayed on an output display device.

If you want the impact of the large screen, but you do not want to burden IRIS with creating high resolution products, specify 360 × 360 display resolution. IRIS doubles these numbers to fit exactly in the large display window.

Likewise, 240 × 240 images are tripled to fit exactly in a large display, or doubled to fit in a medium display.

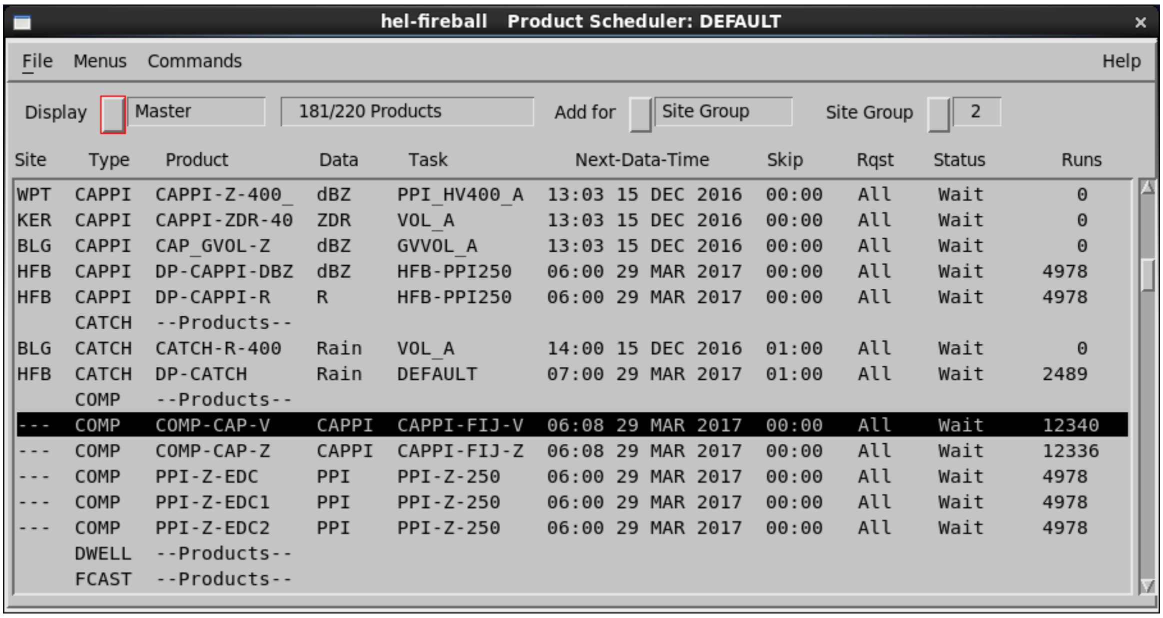
For more information on data formats, see *IRIS Programming Guide*.

11. Scheduling Products

11.1 Product Scheduler Menu

The **Product Scheduler** menu tells IRIS when to generate a product for automatic or manual operation.

Because the product generation affects host computer resources, this menu can be viewed but not controlled by an IRIS observer.



Site	Type	Product	Data	Task	Next-Data-Time	Skip	Rqst	Status	Runs
WPT	CAPPI	CAPPI-Z-400_	dBZ	PPI_HV400_A	13:03 15 DEC 2016	00:00	All	Wait	0
KER	CAPPI	CAPPI-ZDR-40	ZDR	VOL_A	13:03 15 DEC 2016	00:00	All	Wait	0
BLG	CAPPI	CAP_GVOL-Z	dBZ	GVVOL_A	13:03 15 DEC 2016	00:00	All	Wait	0
HFB	CAPPI	DP-CAPPI-DBZ	dBZ	HFB-PPI250	06:00 29 MAR 2017	00:00	All	Wait	4978
HFB	CAPPI	DP-CAPPI-R	R	HFB-PPI250	06:00 29 MAR 2017	00:00	All	Wait	4978
	CATCH	--Products--							
BLG	CATCH	CATCH-R-400	Rain	VOL_A	14:00 15 DEC 2016	01:00	All	Wait	0
HFB	CATCH	DP-CATCH	Rain	DEFAULT	07:00 29 MAR 2017	01:00	All	Wait	2489
	COMP	--Products--							
---	COMP	COMP-CAP-V	CAPPI	CAPPI-FIJ-V	06:08 29 MAR 2017	00:00	All	Wait	12340
---	COMP	COMP-CAP-Z	CAPPI	CAPPI-FIJ-Z	06:08 29 MAR 2017	00:00	All	Wait	12336
---	COMP	PPI-Z-EDC	PPI	PPI-Z-250	06:00 29 MAR 2017	00:00	All	Wait	4978
---	COMP	PPI-Z-EDC1	PPI	PPI-Z-250	06:00 29 MAR 2017	00:00	All	Wait	4978
---	COMP	PPI-Z-EDC2	PPI	PPI-Z-250	06:00 29 MAR 2017	00:00	All	Wait	4978
	DWELL	--Products--							
	FCAST	--Products--							

Figure 23 **Product Scheduler**

Site column

Shows the site for each scheduled product. A product runs only if data from that site comes to IRIS, either from the radar, over the network, or from a tape.

If the **Display** field is set to **Master** (the **Master Schedule**), there is only one product entry, regardless of the number of sites scheduled.

Right-click the mouse to show a menu on the site column listing all sites with a * symbol next to each site for which the product is scheduled.

Select an entry to add or remove the * tag. This makes the **Master Schedule** convenient to use for adding or deleting sites from the schedule.

Product column

Shows the name of the product.

Data column

Shows the data parameter configured for the product.

Task column

Shows the name of the associated task.

Next-Data-Time

Scheduling operates under the concept of data time, the time when a task starts collecting data. For an on-time task schedule, the data time corresponds to the time when a task is scheduled to start.

When you schedule a product, set the **Next-Data-Time** field for the product generator to process only associated tasks with data times later than the next data time.

Skip

The **Skip** time breaks the day into equal intervals of time starting from midnight. A product is generated, at most, once for each skip time interval. The first occurrence of data from the associated task is used for each interval.

Request

Schedules a product according to whether the schedule affects **All**, **Next** occurrences of the product. You can also stop the product's schedule.

Status

Shows the current status of each product as **Running** (product is being generated) or **Wait** (product is waiting for either the associated task to run, for its turn to run pending the completion of other products, or the product is not scheduled to run).

After a product is generated, the status changes from **Running** to **Wait**.

When the **Master Schedule** is displayed, **Status** shows the status of the site which is either currently running or ran most recently.

Runs

A counter (`000` to `999`) showing how many times the product has run since it was loaded in the menu.

If the number of runs exceeds `999`, the counter restarts at `000`.

If you stop a product, the counter is not reset. The counter resets if you delete a product and reload it into the schedule. If you load a new schedule, the counters for all products are reset.

When the **Master Schedule** is displayed, the **Runs** field reflects the total number of runs for all sites that are scheduled.

11.2 Scheduling Products

1. Select **Menu > Product Scheduler**.
   A list of available product types appears.

2. In **Display**, on the top of the menu, specify which sites are displayed.

Value	Description
All Sites	Show the schedule for all sites.
Master	Show the **Master Schedule**, with one entry for each scheduled product. If a product is scheduled to run at multiple sites, the entry shows the site that ran most recently.
Site Group	Show the products that are configured for all sites in the group. The **Site Group** is a subset of sites that is defined in the **Site Group** field.
Single Sites	Show the products configured for a single site (select the site name). Use this if your system supports one site.

The adjacent text field shows how many products match the display selection.

3. In **Add for**, on the top of the menu, specify the sites for which the product is added.

Value	Description
All Sites	Add the product for all sites.
Site Group	Add the product for all sites defined by the **Site Group**. Tag with * the members of the site group. If you have a single site system, make your site the only member of the **Site Group**.
Single Sites	Add the product only for that site. Use this if your system supports one site.

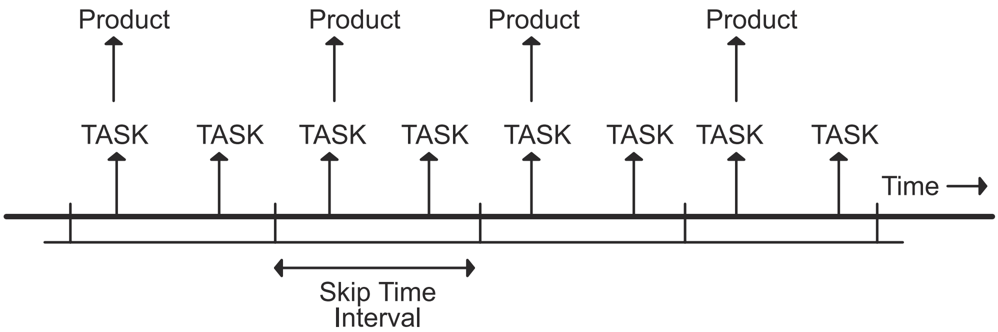
4. To edit the products configured in the product schedule, right-click the **Product** field and select one of the following:

Value	Description
Add	Add a product to the schedule. The product is generated on an on-going basis when the task collects data, subject to the **Skip** time.
Remove	Remove the selected product from the list for the site that is displayed. If the **Master Schedule** is displayed, then the product is removed for all sites.
Edit	Opens the **Product Configuration** menu for the selected product.

5. To generate data only from future tasks:
    a. Right-click the **Request** field
    b. Select **All** or **Next**.

Value	Description
All	All associated task data collected after the next data time are processed. The product is generated on an on-going basis when the task collects data, subject to the **Skip** time.
Next	Only data from the next occurrence of the task, after the next data time, are processed. The product is generated only once. The **Skip** time is ignored.

6. If you use **All** requests, you can set the **Skip** field so that the product generator does not process every occurrence of the associated task.
   By default, an **All** request causes data from every task to be processed. The **Skip** time breaks the day into equal time intervals starting from midnight.
   A product is generated, at most, once for each skip time interval. The first occurrence of data from the associated task is used for each interval.
   For example, a **Skip** time of `00:15` (15 minutes) means that the product is generated no more frequently than every 15 minutes, regardless of how often the associated task runs.
   In the following figure, the **Skip** field for an **All** request is set so that there are 2 occurrences of the task in each interval. Only the first occurrence is used to generate the product.

   The default value of the **Skip** field is `00:00`, indicating no tasks are skipped.
   When the **Master Schedule** is displayed, a change in the **Skip Time** is applied to all of the sites.

   You must consider the task schedule when specifying the **Skip** time.

   During operation, the **Next-Data-Time** field changes to show the next possible time that the product can be generated. This depends on the **Skip** time and the request (**All** or **Next**) as follows:

Skip and Request Values	Description
Next Any Skip Time	After completing a **Next** request, the **Next-Data-Time** field is reset to the data time (plus 1 second) of the task that was just processed. This means that issuing another **Next** request processes the next occurrence of the associated task. The **Skip** time is ignored.
All Skip Time = 00:00	The product is generated for every occurrence of the associated task. The **Next-Data-Time** field is reset to the data time (plus 1 second) of the task that was just processed (identical to the **Next** request case). This is the same as issuing a series of **Next** requests.

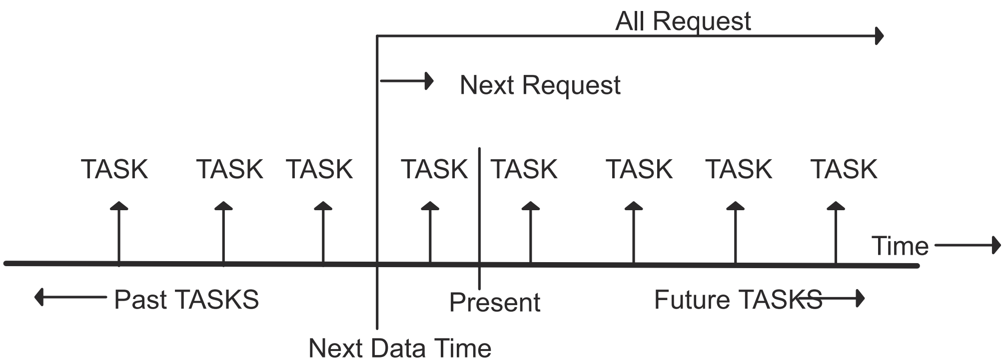
Skip and Request Values	Description
All Skip Time >00:00	The **Skip** field determines the earliest time that a new product can be generated. After completing a product, the **Next-Data-Time** field is reset to the beginning time of the next skip time interval.

7. To generate data only from future tasks, right-click the **Request** field.

Request Field Options	Description
All	All associated task data collected after the next data time are processed. The product is generated on an on-going basis when the task collects data, subject to the **Skip** time.
Next	Only data from the next occurrence of the task, after the next data time, are processed. The product is generated only once. The **Skip** time is ignored.
Stop	Stops the selected product's schedule.

When the **Master Schedule** is displayed, a change in the **Request** is applied to all of the sites.

8. To generate products from old data, right-click the **Next-Data-Time** field.
This allows you to generate products from task data received from another IRIS host or retrieved from tape.
The following example shows how **Next-Data-Time** interacts with **All** and **Next** request options.



When a product is first loaded into the schedule, or an entire new schedule is loaded, the **Next-Data-Time** field defaults to the current time.

a. In the **Next-Data-Time** column, right-click the time stamp.

b. Select **Next > Product > Time buttons** to go back in time.

9. Select **File > Save** and give a name for the product scheduler.

11.3 Adding a Product to Schedule

1. Select the header or product for the type of product you want to enter.
2. Position the cursor over the **Product** field and select **Add**.
   IRIS displays a list of products of that type.
3. Select a product.
   The product is added to the schedule.

11.4 Removing a Product from Schedule

1. Select the product you want to remove.
2. Place the cursor over the **Product** field and select **Remove**.
   You can remove products only. IRIS does not remove product headers from the schedule.

11.5 Editing Product Configuration

1. Select the product you want to edit.
2. Position the mouse cursor over the **Product** field and choose **Edit**.
   IRIS opens the **Product Configuration** menu with the selected product loaded into it.
3. Edit the product as needed.
4. Select **File > Save**.
5. Exit the **Product Configuration** menu.
   IRIS returns you to the updated **Product Scheduler** menu.

11.6 Stopping Product Generation

1. Select the product you want to stop.
2. Position the mouse over the **Product** field and choose **Stop**.
   If the product is waiting to be generated, the **Stop** request unschedules the product from the **All** or **Next** states.
   If the product is being generated when you make the **Stop** request, no product output file is produced.

11.7 Tips for Running Radar Products

Optimize System Performance

You can configure an almost unlimited number of products in IRIS. The system manager must carefully plan the product mix and performance capabilities for your installation.

Table 37 System Performance Considerations for Generating Radar Products

Consideration	Description
CPU capabilities	You can improve performance by off-loading product output processes to a different machine. Consider generating products on a separate IRIS Analysis system.
Product mix	Avoid wasting computer resources by making products that no one will look at. For example, people do not usually look at 12 **CAPPI** products. A mix of **CAPPI**, **VIL**, and **TOPS** may be more appropriate.
Output devices	Consider the trade-off between output devices and product mix. If you are driving many remote nodes, you can generate fewer products.
High resolution displays	Do not create if not required. Medium and low resolution products run more quickly. Prefer low resolution products for serial line remote displays because the update rates are faster.
High resolution sampling	Do not use in your task configurations if not required. If you want to use high resolution sampling (in azimuth and range), do not sample at ranges greater than you need for your application.
Custom products	If users want to request many custom products, consider purchasing a separate workstation for running display software. This means you can to obtain **RAW** data from the IRIS host and process products on the separate workstation.

Immediate Products

Most IRIS products are volume scan products that require a series of **PPI** products.

Immediate products can run before a volume scan is complete because they are based on a single sweep of data. Use immediate products for applications where rapid feedback is required. For example, **PPI**, **RHI**, or **SHEAR**.

Making Products from Retrieved Data and `Keep` Flags

When **RAW** product files are restored from a tape, they are automatically reingested to reconstruct the ingest files required for product generation.

Because the data from tape are old, they are first on the list to be deleted by the system Watchdog process. To avoid this, do the following in the **Ingest Summary** menu:

- Before retrieving files from a tape, delete some unneeded ingest files.
- After the files are restored, tag the reingested files with `Keep` flags so they are not deleted when real time files come in.

For information on space reserved for ingest files, see **Setup** in *IRIS and RDA Utilities Guide*.

12. Managing IRIS Radar Passwords

12.1 Changing the **observer** Password

You must be a **root** user to change the **observer** password.

1. Open a terminal window and switch to **root** user by typing:

```
su - <root password>
```

2. To change the **observer** password:

   a. Type the command:

   ```
   passwd observer
   ```

   b. Type the new password and press **ENTER**.

   c. When prompted, type the new password again and press **ENTER**.
   If the new password is considered to be too weak, you will get a message about a bad password.
   Note that weak passwords are accepted by the system.

3. Close the terminal screen and logout.

12.2 Changing the **radarop** Password

You must be a **root** user to change the **radarop** password.

1. Open a terminal window and switch to **root** user by typing:

```
su - <root password>
```

2. To change the **radarop** password:

   a. Type the command:

   ```
   passwd radarop
   ```

   b. Type the new password and press **ENTER**.

   c. When prompted, type the new password again and press **ENTER**.
   If the new password is considered to be too weak, you will get a message about a bad password.
   Note that weak passwords are accepted by the system.

3. Close the terminal screen and logout.

12.3 Changing the **root** Password

You must be a **root** user to change the **root** password.

1. Open a terminal window and switch to **root** user by typing:

```
su - <root password>
```

2. To change the **root** password:

   a. Type the command:

   ```
   passwd
   ```

   b. Type the new password and press **ENTER**.

   c. When prompted, type the new password again and press **ENTER**.

   If the new password is considered to be too weak, you will get a message about a bad password.
   Note that weak passwords are accepted by the system.

3. Close the terminal screen and logout.

13. IRIS Radar System Administration

13.1 Starting, Stopping, and Restarting IRIS Software

IRIS starts automatically on boot-up. If necessary, you can start, stop, or restart IRIS manually using the following commands

Check that power is applied to the radar and all IRIS devices.

> **CAUTION!** When IRIS starts up, it tries to execute default operating tasks.
> If there is a danger to personnel from radiation, set your radar console switch in the **Local** position so that IRIS cannot take control.
> You can also configure a mode named DEFAULT that does not start the radar antenna and transmitter. See Running Radar from the Radar Status Menu (page 28).

1. Login as `radarop`.
2. To start IRIS manually, in the operating system prompt, type:

   ```
   sudo systemctl start iris
   ```

   The IRIS startup process starts.
3. To stop IRIS manually, in the operating system prompt, type:

   ```
   sudo systemctl stop iris
   ```

4. To restart IRIS manually, in the operating system prompt, type:

   ```
   sudo systemctl restart iris
   ```

When start-up is complete, the operating system prompt reappears, and IRIS is ready to use.

If you have trouble with your system, run:

```
sudo journalctl -u iris.service
```

13.2 Rebooting the IRIS Host

The host server usually runs 24 hours a day. If it is turned off, or if there is a power failure, the system manger or an operator designed by the system manager must boot the system.

Most systems, and unattended systems, are configured to reboot automatically when the power is turned on. This can take several minutes to complete. If you expect your system to reboot automatically, but it does not, check the BIOS configuration.

1. To reboot the local machine, login as `radarop` or `observer`.

   > To reboot a remote machine, you must be logged in as `root`.

2. To reboot the server safely, type:

```
reboot
```

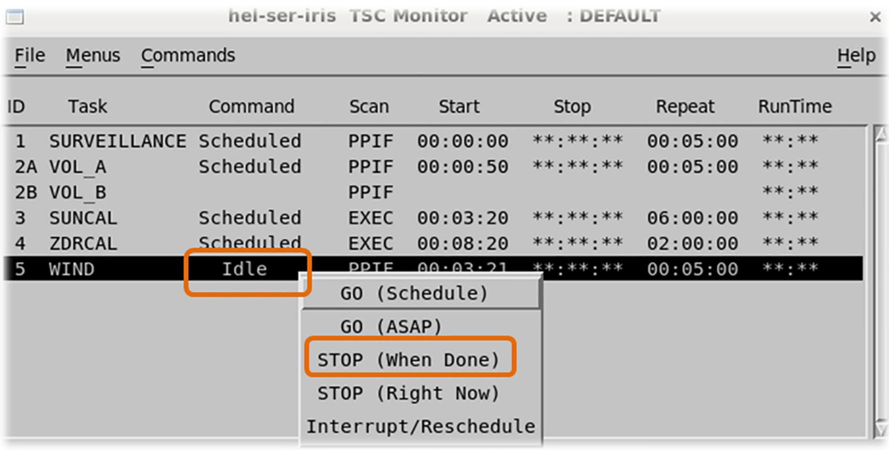
3. Press **ENTER**.

13.3 Shutting Down IRIS Host from the Operating System

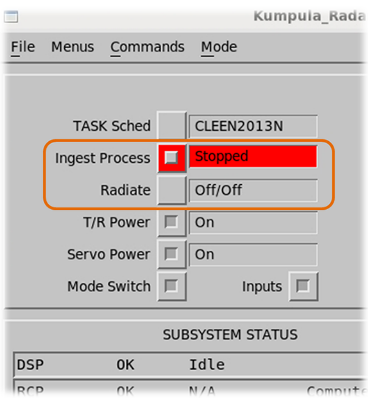
Typically, IRIS is stopped only for maintenance reasons, such as before halting or rebooting the server.

1. Login as `radarop`.
2. In a terminal window, type: `iris&`
   The **IRIS Menu** opens.
3. Connect to `localhost`, or to a configured radar hostname.

4. To avoid interrupting the current radar measurement and creating an incomplete data file, finish the current measurement:
   a. On the **Task Scheduler** menu, select **STOP (When Done)** for all tasks.



   b. Wait until the tasks are finished and the **Ingest Process** status in the radar status screen changes to **Idle**.
5. Open the radar status screen by selecting **Menus > Radar Status** from the upper menu bar.
6. On the radar status screen, select **Ingest Process** to change the status field to **Stopped**.



7. Set **Radiate** to **Off/Off**.
8. Close the **IRIS Menu** bar.
9. In the operating system prompt, type:

```
qiris
```

10. If necessary, shutdown the server from the command line, by typing:

```
poweroff
```

IRIS goes through a shutdown procedure to leave the radar and antenna in a safe, non-operating state. IRIS clients are disconnected.

13.4 Stopping IRIS Processes

IRIS starts automatically on boot-up. If necessary, you can start, stop, or restart IRIS manually using the following commands

1. Login as **radarop**.
2. To stop IRIS, type:

```
qiris
```

3. To stop RCP8, type:

```
sudo systemctl stop rcp8
```

4. To stop RVP, type:

```
sudo systemctl stop rvp900
```

5. To stop the antenna library, type:

```
qant
```

6. To check if any processes are left hanging, use the **ps_iris** command.
   See ps_iris Command (page 105).

13.5 Starting IRIS Processes

IRIS starts automatically on boot-up. If necessary, you can start, stop, or restart IRIS manually using the following commands

1. Login as **radarop**.

2. To start RCP8, type:

```
sudo systemctl start rcp8
```

3. To start RVP, type:

```
sudo systemctl start rvp900
```

13.6 ps_iris Command

Use the **ps_iris** command to list currently active IRIS, antenna, and utility processes, including information about their owner UID, PID, time start time, and total CPU time.

To stop a process, use the `PID` as an argument to the `kill` command.

For example:

```
Detached Processes:
   USER     GROUP PID  PPID  NI PRI %CPU TIME %MEM    VSZ COMMAND
   operator users 3353   1    0  19  0.0 0:02  0.0 168216 server IRIS_SERVER
   operator users 3355   1    4  15  0.0 0:00  0.0 142236 sserver IRIS_SSERVER
   operator users 3399   1   -8  27  0.0 0:49  0.0 136788 ingfio IRIS_INGFIO
   operator users 3407   1    4  15  0.0 0:00  0.0 136768 network IRIS_NETWORK
   operator users 3411   1    8  11  0.4 7:17  0.0 143124 product IRIS_PRODUCT
   operator users 3413   1    8  11  0.0 0:00  0.0 157800 reingest
IRIS_REINGEST
   operator users 3415   1    4  15  0.0 0:00  0.1 180620 output IRIS_OUTPUT001
   operator users 3418   1    4  15  0.0 0:01  0.0 156556 output IRIS_OUTPUT002
   operator users 3420   1    0  19  0.0 0:02  0.0 136776 input IRIS_INPUT01
   operator users 3423   1    0  19  0.0 0:09  0.0 138996 watchdog
IRIS_WATCHDOG
   operator users 23970  1   -8  27  0.0 0:08  0.0 142164 ingest IRIS_INGEST
```

```
Antenna Processes:
   USER     GROUP  PID  PPID  NI PRI %CPU   TIME %MEM    VSZ COMMAND
   operator users  1756   1    0   19  0.0  0:04  0.0 115676 ant_logd ANT_LOGD
   operator users  1789   1   -15  34  0.0  0:51  0.0 115684 ant_rcvd ANT_RCVD
   operator users  1793  1789 -15  34  0.0  1:10  0.0 115684 ant_rcvd ANT_RCVD
   operator users  1823   1   -15  34  0.0  1:08  0.0 115680 ant_xmtd ANT_XMTD
```

```
Stand-alone Utilities:
   USER     GROUP      PID  PPID  NI PRI %CPU   TIME %MEM    VSZ COMMAND
   radarop  radarop  23933 23923   0  19  0.0   0:00  0.0 116244 audio
iris_audio
   operator users     4321  4319   4  15  0.0   0:00  0.0  12636 clntRecv
CLNT_RECV_WINDOW -pipe 8
   radarop  radarop  23923  4163   0  19  0.0   0:04  0.0 189464 iris
   radarop  radarop  23934 23923   0  19  0.0   0:00  0.0 116236 iris_clnt_rcv
7 1073741826
   operator users     3330     1   0  19  4.6  67:30  0.0 699324 /rcp8 -
console /dev/null
   operator users     2021     1   0  19  9.4 138:57  0.4 796880 /rvp9 -daemon
   operator users     2297  2021   -  50 12.0 176:43  0.3 275560 rvp9proc
RVP9_PROC-0
   operator users     2347  2021   -  50 11.8 172:44  0.3 275556 rvp9proc
RVP9_PROC-1
```

14. Troubleshooting

14.1 Checking event logs

Table 38 IRIS, RCP8, and RVP event logs

Command	Description
`# systemctl - u iris`	IRIS startup messages.
`less /usr/iris_data/log/IRIS_ERROR.LOG`	IRIS errors and messages.
`# systemctl -u rcp8`	RCP logs
`less /usr/iris_data/log/rvp9.log`	RVP logs

14.2 Error Handling

When running IRIS, you may encounter errors, for example, mistakes that you make, such as trying to enter an IRIS menu before connecting to a server, or errors in the IRIS software.

When possible, IRIS tells you how to fix user errors. If you encounter software errors are more difficult to fix, contact Vaisala for assistance. Provide as much background information as possible.

When an error occurs, IRIS takes the following actions:

- Displays a pop-up message indicating the cause of the error and possible fixes.
- Adds the message to the **Message List**, including information about the cause of the error.
  Include this information if you report the error to Vaisala. The list spans IRIS sessions.

14.3 Viewing the Message List

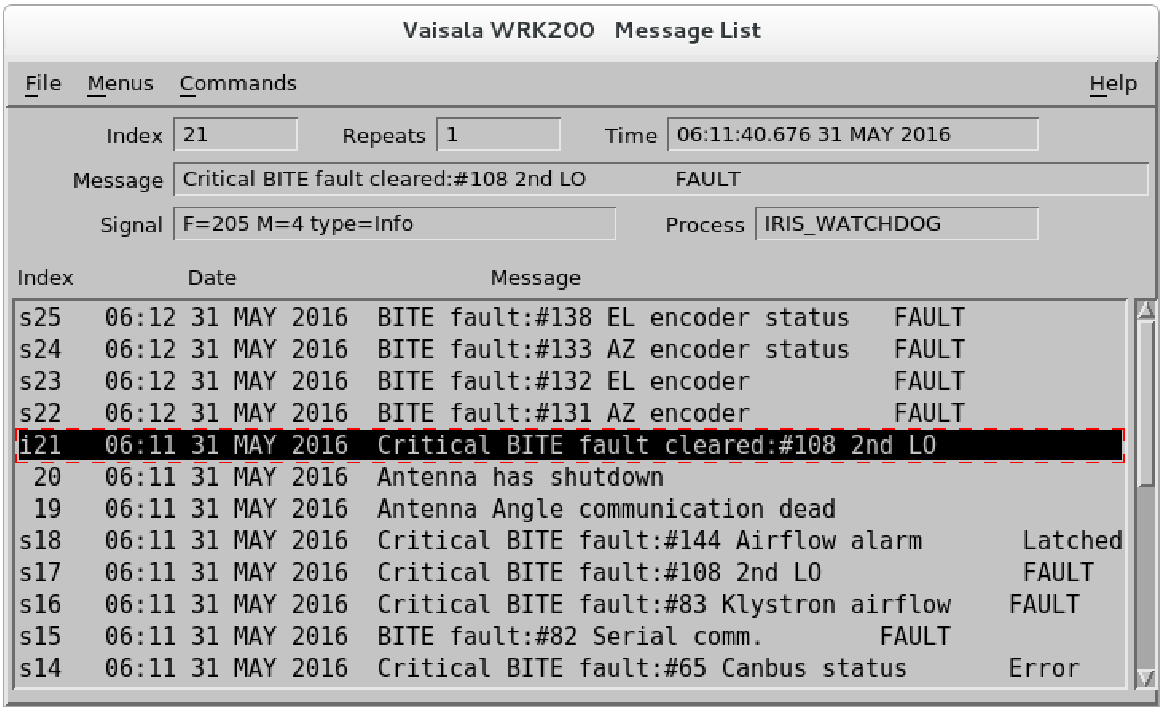


Figure 24 Message List Menu

Table 39 Message List Sections

Section	Description
Message Summary	Information about the cause of the error, such as the signal that was generated and the code module that handled the error.
Message List	List of messages in chronological order with no duplicates.

1. On the IRIS menu bar, select **Menus > Message Summary**.

> Alternatively, select **Radar Status**. In the **Control** section, select **Messages**.

The fields in the message summary area are blank.

2. To display summary information about a message, select the message in the list in the lower pane.
   IRIS fills in the summary information.

Field	Description
Index	Every message is assigned a number in the order in which it occurred. For repeating messages, the **Index** field shows the number of the latest occurrence of this message.
Repeats	Shows the number of times the message has occurred.
Time	Shows the time of the most recent occurrence of the message.
Date	The date and time of the most recent occurrence of the message.
Message	Contains the message text.—the same text that is displayed in the Message menu.
Signal	Every error generates a signal, or error condition code. The **Signal** field shows the name of the generated signal. This information is useful if you report a software error to Vaisala.
Process	Shows the name of the code module that trapped and processed the error. This information is useful if you report a software error to Vaisala.

14.4 Reacting to IRIS Messages

Figure 25 IRIS Message

1. Select **OK** to dismiss the **IRIS Message** and continue with IRIS operations.

14.5 Authorizing Remote X-Windows on Your Node

1. To allow IRIS systems running on other nodes to send output to your screen, enter the command:

```
$ xhost  +<host>
```

   Where `<host>` is the remote hostname, or IP address.

2. Check that this works as you intend.
3. Add the appropriate command at the end of one of the following files:
   - To authorize the windows as soon an anyone logs in: */etc/profile.d/sigmet.sh*
   - To support just one user authorizing the windows: home directory *.bash_profile*

14.6 Correcting File Ownership and Protection

Sometimes, when starting or program or trying to access calibration files, users cannot access some files or receive an error message saying they do not have privileges to do an operation.

This is because the file ownership and protection settings are incorrect.

Do not change the file protection manually. Always use `instiris -setown` to fix the protection of your files.

1. To correct the file ownership and protection, type:

```
# instiris -setown
```

   The script goes through the */usr/sigmet* directory tree, changing the ownership of the files to `operator` and setting the protection as follows:
   - Directories—`rwxrwxr-x`
   - All files, except executable files—`rwrw-r--`
   - Executable files—`rwsrwsr-x`

14.7 Replacing Failed CentOS RAID Disks

RAID1 is automatically configured on the server. However, in some cases, you may need to remove, recover, and add new devices to RAID.

In most cases, this requires removing the failing disk and installing a new one.

> While you can do this while powered up, if the system allows you to power down, do so.

1. To check the status of the RAID1 disk, type:

```
cat /proc/mdstat
```

   When RAID1 is working correctly, the terminal prints, for example:

```
Personalities : [raid1]
md126 : active raid1 sda[1] sdb[0]
      125032448 blocks super external:/md127/0 [2/2] [UU]
md127 : inactive sdb[1](S) sda[0](S)
      4520 blocks super external:imsm
```

   - `[UU]` indicates that both disks are operational.
   - If there is a problem with one of the disks, the `[UU]` string is `[_U]` or `[U_]`.

2. Check if disk `sda` or `sdb` has failed.
3. To remove the disk from RAID configuration, type:

> Take care when removing the failing disk.
> Remove only the disk identified as failing. In the following example, it is `sdb`.

```
mdadm --manage /dev/md/imsm0 --remove /dev/sdb
```

   The terminal prints:

```
mdadm: hot removed /dev/sdb from /dev/md/imsm0
```

4. Power down computer, replace the failing disk, and reboot
5. To create the partition on the replacement disk, type:

```
sfdisk -d /dev/sda | sfdisk /dev/sdb
```

6. To verify the partition, type:

```
fdisk -l
```

7. To add a new disk to the raid array, type:

```
mdadm --manage /dev/md/imsm0 --add /dev/sdb
```

8. To check the recovery process, type:

```
cat /proc/mdstat
```

The terminal prints:

```
[root@wes-install ~]# cat /proc/mdstat

Personalities : [raid1]

md126 : active raid1 sdb[2] sda[1]

      125032448 blocks super external:/md127/0 [2/2] [UU]

md127 : inactive sdb[1](S) sda[0](S)

      4520 blocks super external:imsm

 unused devices: <none>
```

14.8 Making Quick Look Windows (QLW) Appear

For any problem that prevents the window from starting, IRIS prints:

```
OUTPUT, Error in open_display call.
```

The **Radar Status** menu also indicates **Error** and **Exit** next to the window process.

If you cannot identify the problem from the error message:

1. Check that the workstation is turned on and the network is up and running.
2. Login as **`radarop`**.
3. Open the **Radar Status** menu and toggle the **Product Output** process off/on
4. In the command prompt of the workstation where the window should appear, check the user rights by typing:

   ```
   xhost+
   ```

5. Restart IRIS on your workstation by typing:

   ```
   sudo systemctl restart iris
   ```

   CAUTION! This command restarts all IRIS processes.

   IRIS tests each process and restarts any that have stopped.
6. If the IRIS Quick Look Window (QLW) does not appear after typing **`siris`** in a terminal window.

   a. Log in as **`root`**.

   b. In the first line of the *`/etc/hosts`* file, add the host name to the first line of the file:

   ```
   127.0.0.1 <host-name> local host...
   ```

Appendix A. Task Configuration Examples

A.1 Task configurations

You can customize and add to the default task configurations.

Note the following guidelines when creating or modifying tasks:

1. As it is not possible to get the best velocity and reflectivity data at the same time, default tasks are divided as follows:
   - Long-range surveillance with coarse spatial resolution for detecting weak echoes (`SURVEILLANCE` task).
   - Medium-range polarimetric volume with good spatial resolution for high quality reflectivity and polarimetric data (`VOL_A` and `VOL_B` tasks).
   - Short-range volume with good spatial resolution for high quality velocity data (`WIND` task).
2. To maximize signal processing data quality, all tasks use 2-byte data in the radar server computer.
   By default, all RAW products are truncated into a 1-byte form for transmission. If the bandwidth allows, use 2-byte data in RAW products.
3. After installing and calibrating the radar system or if you change the default task processing parameters, you must adjust the quality threshold values.
   For example, if you increase the number of samples, enter a slightly decreased LOG value to improve measurement sensitivity.
4. The tasks use Doppler filter number 4, which is a Gaussian adaptive (GMAP) filter with a 0.4 m/s width.
   Depending on the clutter conditions, test a weaker filter (number 3 or smaller) or a stronger filter (number 5 or greater) to find the optimal filter for your radar site. All the tasks use a CSR threshold of 40 dB.
   Depending on the clutter conditions, you can test a stronger value (less than 40 dB). Before finalizing the setting, measure with real weather to verify that the weather echoes near zero velocity do not vanish (Doppler snake).
5. *Dual pol.*: To benefit from the enhanced sensitivity of the polarimetric signal processing, use the `Ze` data moment to generate echo products.

More information

- IRIS Tasks (page 9)

A.1.1 SURVEILLANCE

The `SURVEILLANCE` task is optimized for long-distance detection of precipitation echo. It uses the longest available pulse width of the weather radar system.

Dual-polarization systems use the enhanced reflectivity `Ze` along with a large number of processed samples to significantly improve the sensitivity when compared with single polarization systems. Samples are collected from a large contributing area using a wider azimuthal spacing of the radar rays (2°) and a range averaging over several consecutive range bins.

The default configuration has a maximum range of 450 km. Use it in warm climates. In cooler climates, lower the maximum range to, for example, 350 km in summer or 250 km in winter. Shorter ranges allow for higher pulse repetition frequencies (within the range) and more pulses can be configured within the constant run time.

The LOG threshold is optimized for tropical conditions with a clear margin of noise uncertainty, even in conditions of extreme rain. In cooler climates, with a calibrated radar, the LOG threshold can be as low as 1.2 dB.

The following figure shows the task configuration details for a dual polarization system. Blue circles indicate items with different values in single polarization systems.

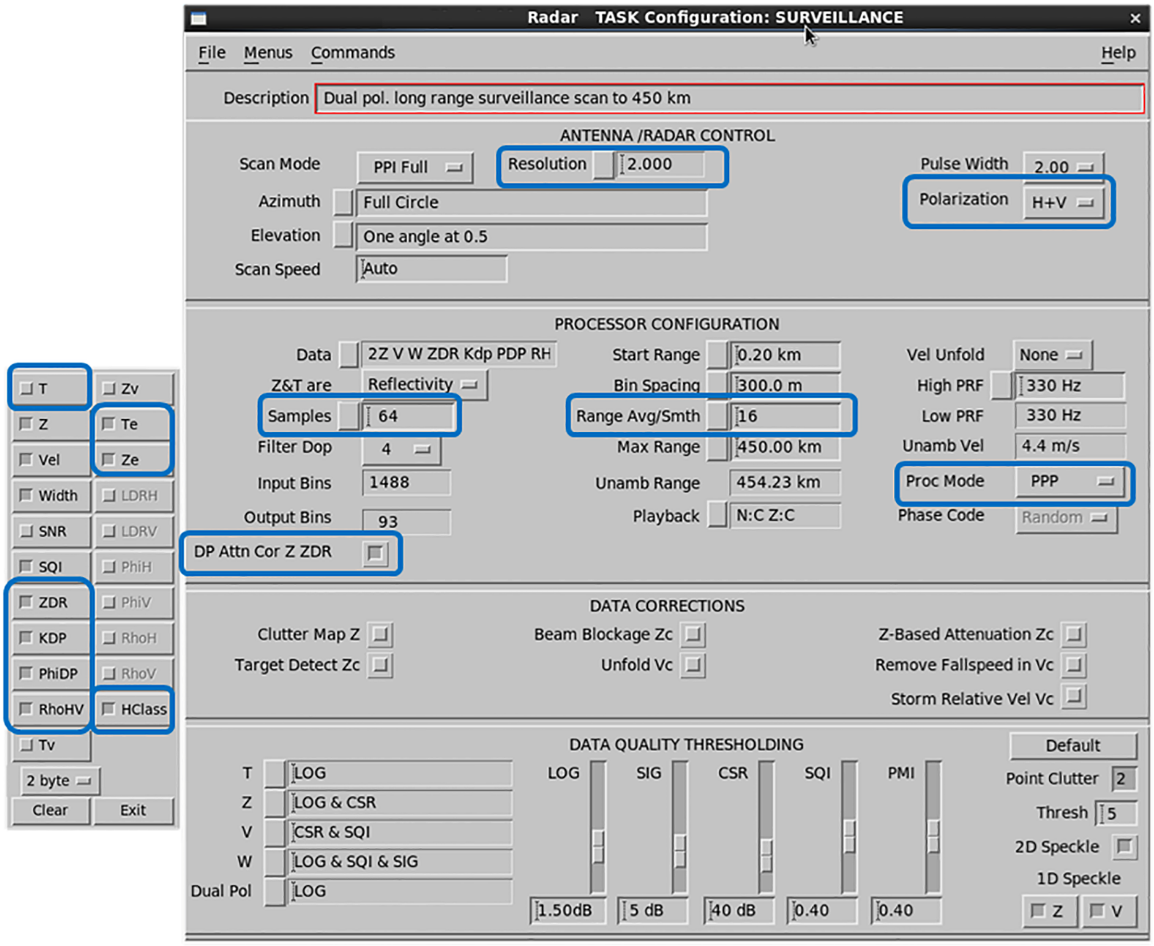


Figure 26 SURVEILLANCE task configuration: dual-polarization

Azimuth resolution	1.00°
Polarization	Horiz
Samples	35
DP Attn Cor Z ZDR	disabled
Range Avg/Smt	2
Proc mode	FFT
Measured data moments	T, Z, Vel, Width, SQI

A.1.2 VOL_A

The VOL_A task is the lower part of the hybrid volume scan VOL_A and VOL_B. It is optimized for precipitation observations and measurements within a range of 250 km. Use a single pulse repetition frequency mode for the maximum quality of Z and dual polarization moments.

Dual polarization systems use the enhanced reflectivity **Ze** to improve sensitivity. The Z data fields are quality-controlled for maximum rejection of non-meteorological echo. The Z data presents the true fields of precipitation. The combined observations of KDP and Z are used in quantitative rainfall estimates.

In difficult conditions with moving clutter, sea clutter, and interference, you can raise the PMI threshold to as high as 0.55. Try a higher SQI value with some loss of precipitation in the melting layer and in strong convection.

The following figure shows the configuration details of the task for a dual polarization system. Blue circles indicate items with different values in single polarization systems.

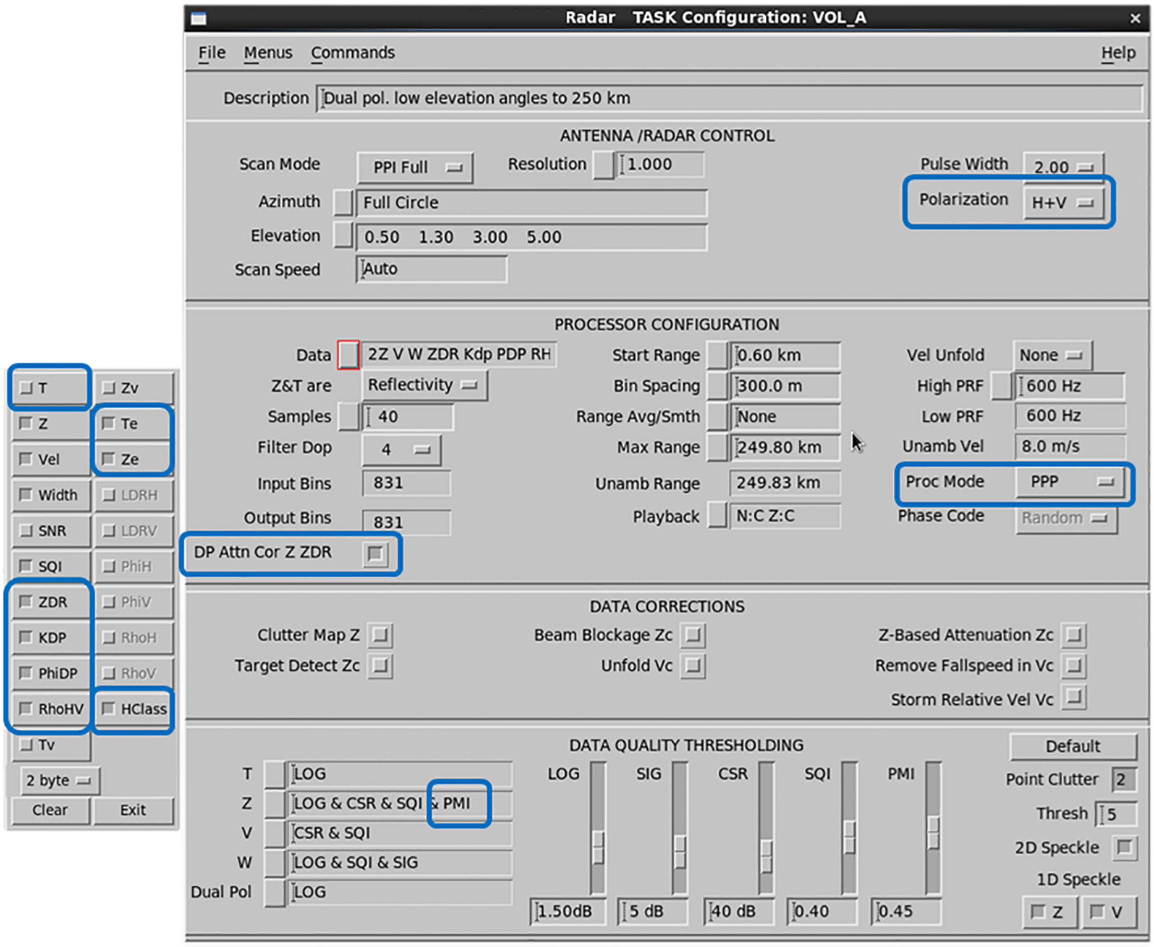


Figure 27 VOL_A task configuration - dual polarization

Polarization	Horiz
DP Attn Cor Z ZDR	disabled
Proc mode	FFT
Measured data moments	T, Z, Vel, Width, SQI

A.1.3 VOL_B

The VOL_B task fills the higher elevations of the hybrid volume providing observations of standard and dual polarization moments for volume products, such as CAPPI.

The task uses high pulse repetition frequency and delivers high quality radial winds in the range of +/- 16 m/s. Due to a high pulse repetition frequency, high elevations, and the modest ranges in use, narrow precipitation spectra are possible. The quality of standard and dual- polarization moments is good. The hybrid volume data of VOL_B offer inputs for a variety of meteorological products.

At higher elevation angles:

- The system is less likely to detect second trip echoes or non-meteorological targets and thus, SQI and PMI thresholding is not used for Z data fields by default, unlike in VOL_A.
- Enhanced reflectivity **Ze** is not selected like for short measurement ranges of high elevations as it does not bring significant sensitivity improvements.

The following figure shows the configuration details of the task for a dual polarization system. Blue circles indicate items with different values in single polarization systems.

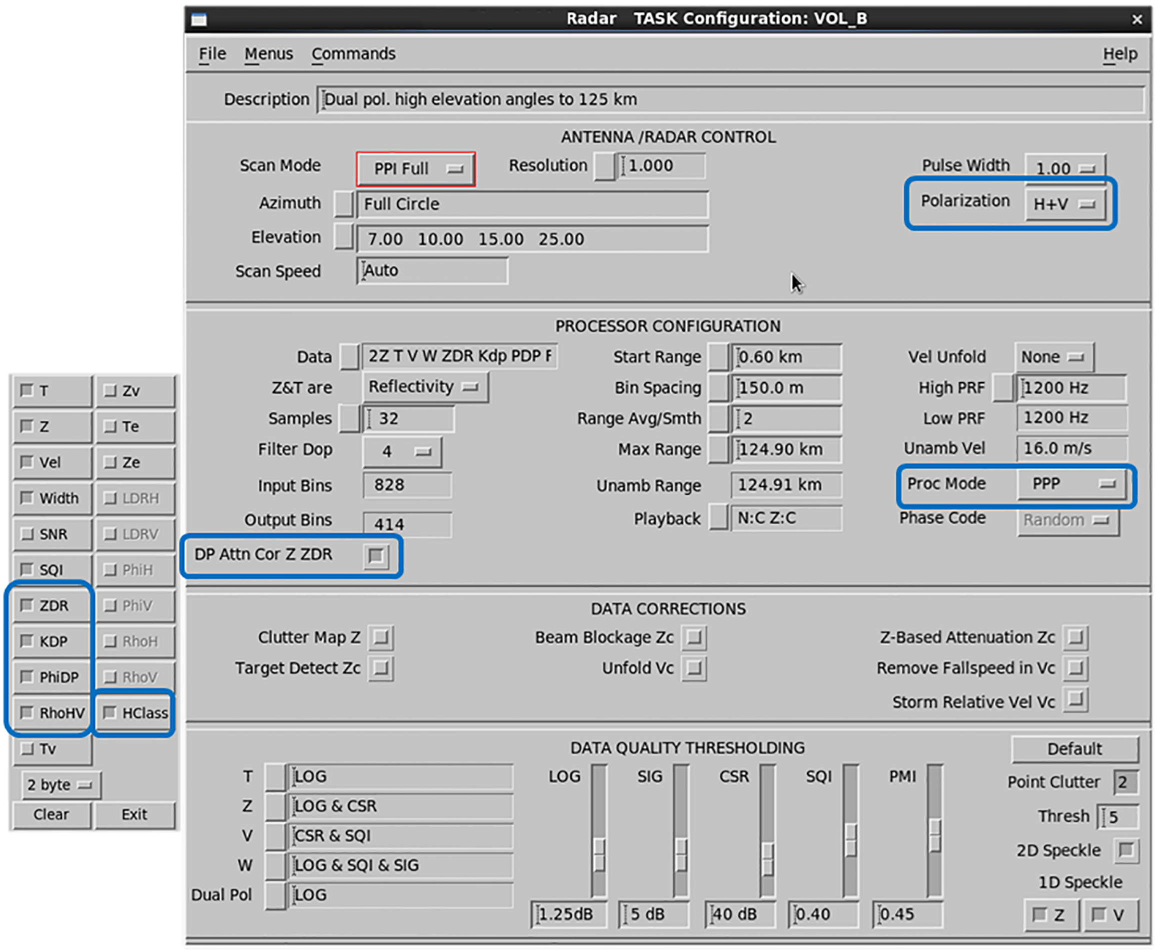


Figure 28 VOL_B task configuration - dual polarization

Polarization	Horiz
DP Attn Cor Z ZDR	disabled
Proc mode	FFT
Measured data moments	T, Z, Vel, Width, SQI

A.1.4 WIND

The WIND task is a short distance volume scan providing wind observations for products such as VVP and WIND.

The task uses the FFT major mode in H-only. A robust dual pulse repetition frequency provides unambiguous winds of up to +/- 50 m/s, up to a range of 78 km. The quality settings are those of a classic Doppler.

A higher dual pulse repetition frequency ratio (4:3, 5:4) can increase the unambiguous velocity regime and/or the maximum range. However, using higher dual PRF ratios as well as longer ranges decreases the quality of velocity data.

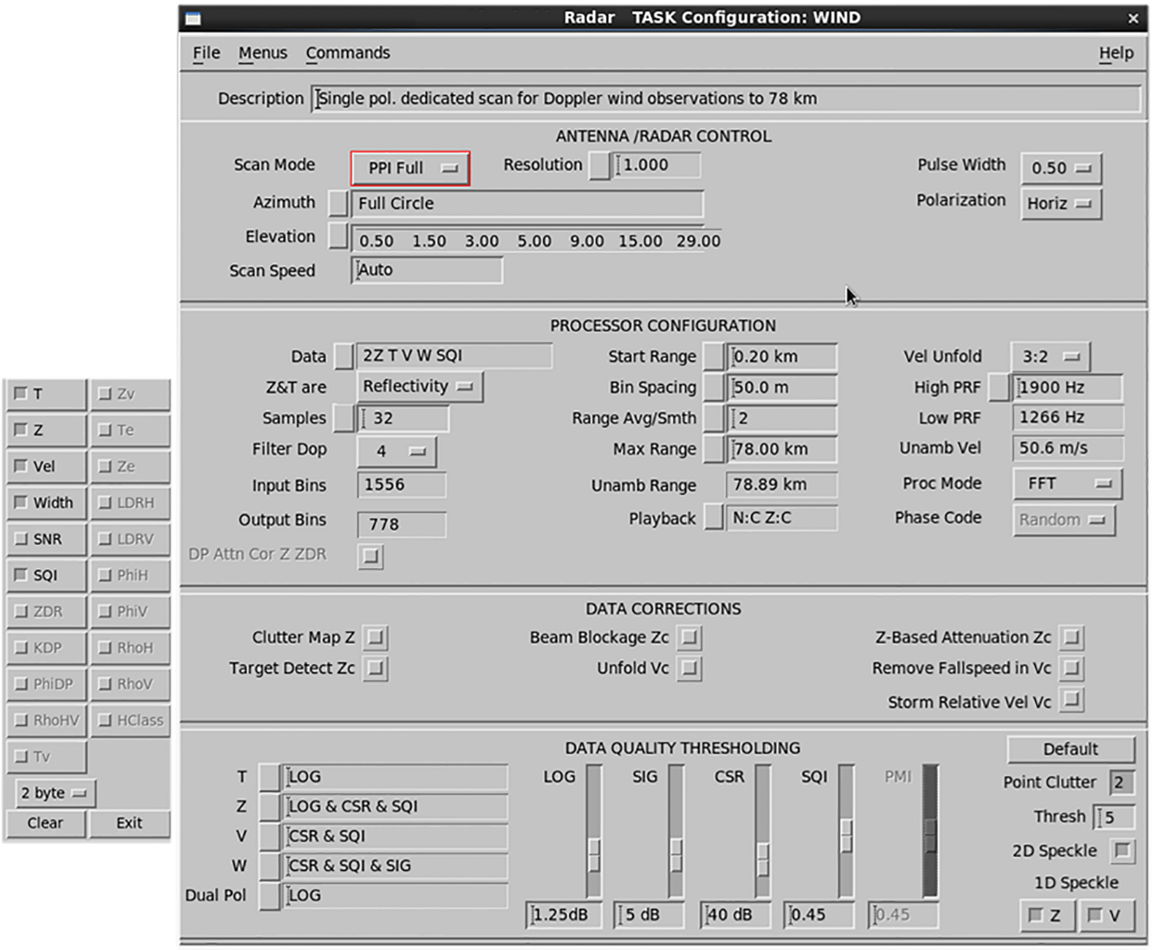


Figure 29 WIND task configuration

A.1.5 SUNCAL and ZDRCAL tasks

Detailed configurations of the SUNCAL and ZDRCAL tasks are in the `/usr/sigmet/config/suncal.conf` and `zdrcal.conf` files.

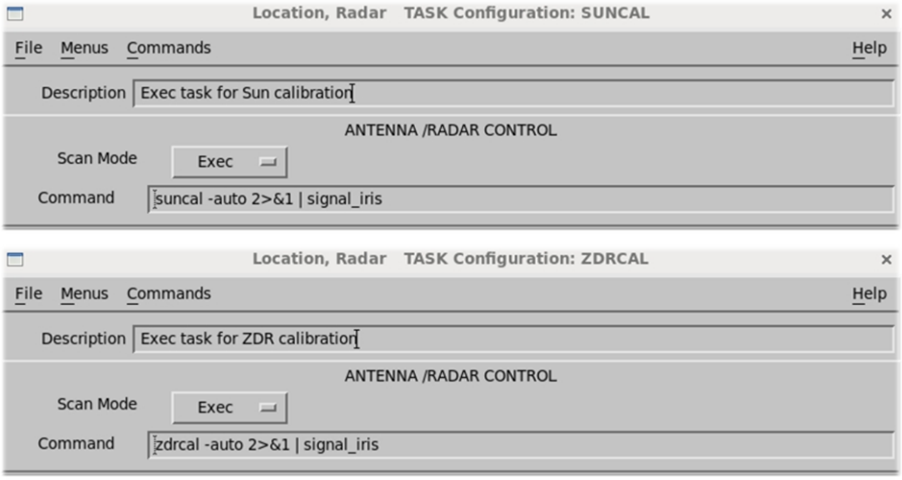


Figure 30 SUNCAL and ZDRCAL task configurations

SUNCAL

For the SUNCAL task, adjust the start, stop, and repeat time for each site so that the task is executed three times a day: shortly after sunrise, at noon, and just before sunset.

ZDRCAL

ZDRCAL task is only for dual polarization systems.

A.2 Product configurations and scheduler

A.2.1 RAW products

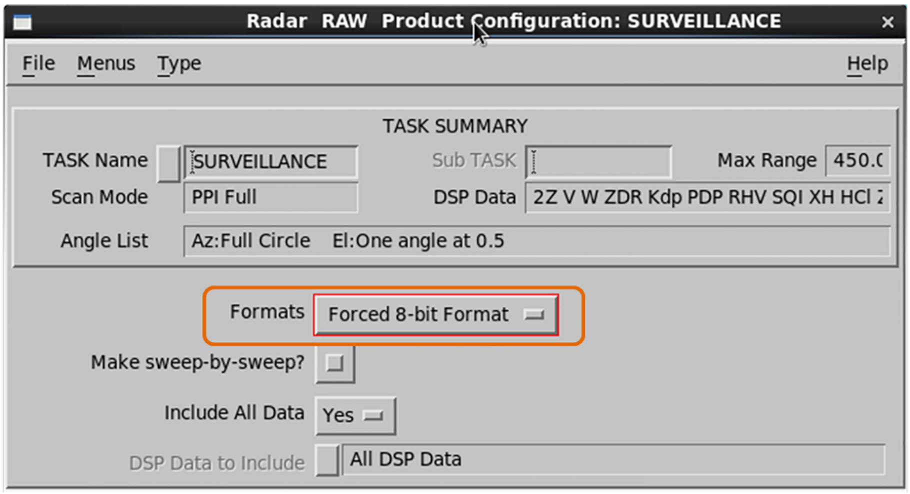
The radar system produces **RAW** products on the radar server computer and sends them to the central site for product generation.

To reduce communication bandwidth, by default data is truncated to1- byte, 8-bit resolution from the original 2-byte, 16-bit resolution.

If the communication bandwidth allows, use 16 bit resolution to improve data quality for post-processing:

1. On the product configuration menu, select **Type > RAW**.
   By default, the option is **Forced 8-bit Format**, which truncates the content.

2. Select **Preserve Format** to preserve 16-bit resolution.



3. Select **File > Save As > OK**.

A.2.2 Melting height products

In dual polarization systems, a melting height product, VOL, is configured and scheduled by default.

This product uses tasks VOL_A and VOL_B to compute the height of the melting layer.

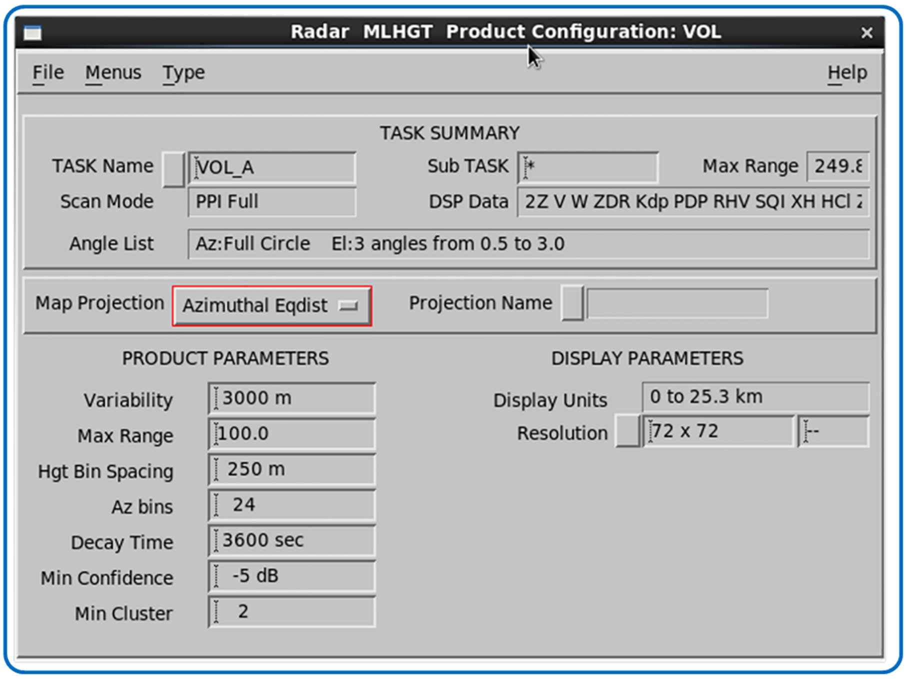


Figure 31 Melting height product configuration

A.2.3 Product Scheduler

If you need other products at the radar site, add them to the **Product Scheduler**. This applies to both radar site and central site data production.

Input task(s)	Products
`Surveillance`	Weather reflectivity surveillance.
`VOL_A` and `VOL_B`	Reflectivity-related end user products, such as rain or storm detection or hydrological measurements.[1)]
`WIND`	Wind-related products. For example, **V**, **VVP**, **WIND**, and **SHEAR**.

1) *In dual-polarization systems, use the R (Z, KDP) algorithm for QPE products, such as rainfall rate or accumulation.*

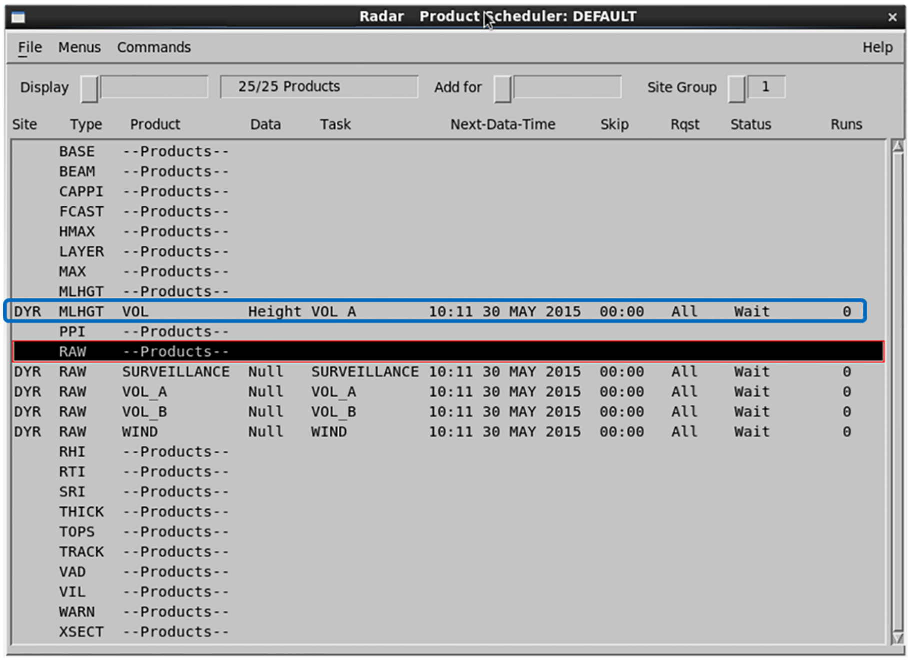


Figure 32 Default Product Scheduler

Appendix B. IRIS Data Parameters

Table 40 IRIS Data Parameters

Abbreviation	Definition
dBT T	Uncorrected reflectivity.
dBZ Z	Clutter-corrected reflectivity.
dBZ c Zc	Reflectivity with corrections for attenuation, occultation, and so on.
Vel V	Mean radial velocity.
Vc	Radial velocity corrected for folding.
Width W	Doppler spectrum width.
Rain R	Rainfall rate.
Liq	Rainfall depth.
Tops	Echo Top height.
VIL	Vertically integrated liquid.
Wind	Wind speed and direction.
Shear	Wind shear.
SQI	Signal quality index for Doppler coherency [0 ... 1].

Table 41 IRIS Data Parameters for Dual Polarization Systems

Abbreviation	Definition
ZDR	Differential reflectivity.
PhiDP	Correlation differential phase between HH and VV channels.
KDP	Specific differential phase (degress/km) between HH and VV channels. Based on derivative of PhiDP.
RhoHV	Correlation magnitude between HH and VV channels.
LDRH LDRV	Linear depolarization ratio for H (or V) transmit cross-/co-polar.

Abbreviation	Definition
`RhoH` `RhoV`	Correlation magnitude between H and V receive for H (or V) transmit
`PhiH` `PhiV`	Correlation phase between H and V receive for H (or V) transmit

Appendix C. Passive IRIS Features

C.1 Passive IRIS Overview

For most installations, IRIS actively controls the radar and antenna through the RVP processor and the RCP.

For some installations, the radar and antenna are controlled by an external RCP and IRIS is connected to the radar by the signal processor. In this case, the external control system performs the scanning and IRIS listens to the signal processor in passive mode.

In passive mode, the radar tasks in IRIS are configured to match the scanning performed by the external control system and IRIS synchronizes to the external scanning. That is, IRIS deduces which TASK should be running, starts the TASK, and acquires the TASK data from the signal processor.

Passive IRIS requires that antenna angle information be supplied to the RVP.

Use Cases For Passive IRIS

- If IRIS is installed in parallel with an existing data acquisition system. The existing system does its own thing and IRIS follows.
- If 2 radars at different frequencies (and correspondingly 2 IRIS's) share the same antenna. In this case, one of the IRIS systems can operate in active mode and the other operate in passive mode to allow simultaneous data collection from both radars. Another application is when using time series playback.

More information

- Using Passive IRIS (page 71)

C.2 Task Configuration, Scheduling, and Synchronization

Passive IRIS must determine what the active system is doing and then follow along acquiring when data. The **TASK Configuration** and **TSC Monitor** menus must be configured for this to work.

Task Configuration

For each task run by the active system, you must configure a corresponding task to run on the passive system. For example, if the active system runs a volume scan, you must configure a corresponding volume scan in the passive system with the same elevation angles.

If the radar trigger is generated externally, you must configure the correct PRF. Note that dual PRF is not supported by passive IRIS when an external trigger is used. If the RVP generates the trigger, you can configure any allowed trigger including dual PRF.

For other signal processing, you can configure any processing option. While passive IRIS must scan the same as the active system, it can use different processing.

Task Scheduler

You must configure the **TASK Scheduler** with the same tasks that are run by the active system:

- The tasks must be in the same order as they are run on the active system unless you are using **Status–Slaving**.
- If your system can run in active or passive mode, set the **Active/Passive** menu selection at the top of the Task Scheduler to **Passive**.

Task Scheduler Synchronization (Passive type)

The following table shows how passive IRIS can synchronizes the task that it is running to the active control system.

Using the **TSC Editor**, you must configure the **TSC Monitor** with the same tasks that are run by the active system.

Table 42 Task Schedule Methods

Method	Description	Supported Scans
Multi-Tasking	Passive IRIS tries to run the first task in the schedule. It waits until the PRF and the starting angle match the task configuration and then starts acquiring data for the task. Passive IRIS then waits for the PRF and angle for the 2nd task in the Scheduler and so on. If at any time it notices that the PRF and elevation angle are a better match for the start of a different task, then it interrupts to switch tasks. You may need to adjust the angle tolerances in **Setup/ingest** to tune the task so that it runs properly. For example, if the angles of the task are close together, the angle tolerance should be smaller than the angle spacing. Also, the antenna may not achieve the desired elevation angle, in which case it is better to modify the task in passive IRIS to match the actual rather than the nominal elevation angles.	Only continuous PPI scans
Single-Tasking	IRIS allows only one task to be scheduled in the task scheduler. IRIS waits until the PRF and the starting angles match the task configuration and then starts acquiring data for the task.	All scans including RHIs.
Status–Slaving	This case requires that a Status product be sent to the passive system. If the active system is another IRIS, the Status product on the active system is generated automatically whenever a task is starts and contains the name of the task that is currently running. When the passive system receives this, it starts (or continues running) the same task. The Status product must be configured to be output automatically over the network to the passive system.	All scans including RHIs.

Method	Description	Supported Scans
TS–Playback	Used when trying to synchronize to old time series being played back via the **tsarchive** utility. Support is required by **tsarchive** and by the RVP processor. This is a variation of the **Multi-Tasking** mode. We assume that a single volume scan is being played back. This volume scan may be approximated in IRIS using a single task, multiple tasks, or a hybrid task. IRIS aggressively tries to remain synchronized to the sweeps of the original data. If a sweep ends before the full 360° is complete, IRIS immediately switches to the next to prevent losses at the start. If the sweep is filled before the data is complete, IRIS continues to read rays from the RVP. This is important to make sure that the next sweep does not start with the last few rays of the previous sweep.	Only continuous PPI scans

Glossary

$IRIS_ROOT
: Entry point of the IRIS/RDA install tree

AGC
: Automatic Gain Control. The gain of the linear channel video signals is adjusted based on an estimate of the next signal level. For example using the average power of the last few pulses at that range.

associated task
: The task associated with generating a product. For example, a PPI product requires an associated task that uses the PPI scan mode (Full or Sector).

BEAM product
: Cartesian product similar to the Cross Section perpendicular to the radar which displays data at a fixed range (or averaged over a range interval) on an azimuth vs. elevation grid. This is useful for testing the antenna beam pattern when used with a reference transmitter.

bin
: A single sample of weather data detected at a known direction, altitude, and distance from the radar site. The radial size of a bin increases with distance, so bins further from the radar site cover a larger area than nearby bins.

bright band
: Altitude range over which the falling snow is partially melted, but not completely changed into rain. Wet snow and wet ice has a higher reflectivity than either dry snow or rain, so it forms a band of stronger returns. The top of this band is called the Melting Level or 0°C height.

CAPPI product
: Constant Altitude Plan Position Indicator. A CAPPI is a horizontal slice through the atmosphere at a given height. The positioning and orientation of the cross section is arbitrary.

composite
: Composites combine data (for example, a group of **CAPPI**, **VIL**, **PPI**, or **TOPS** products) from many radars in one image.

differential reflectivity (ZDR)
: Ratio between the horizontal reflectivity and the vertical reflectivity (dBZh - dBZv). ZDR depends on the asymmetry of the shape, orientation, and falling behavior of the particles. Positive values indicate more prominent horizontal echoes (such as from large raindrops), and negative values indicate more prominent vertical echoes (such as from hail and graupel).

Doppler spectrum width
: The standard deviation of the Doppler spectrum in m/s. The spectrum width is a measure of the shear and turbulence in the radar pulse volume at a given range. See also Doppler velocity spectrum.

Doppler velocity spectrum
The spectrum of the power returned as a function of the Doppler velocity (towards or away from the radar). The mean of the Doppler velocity spectrum is the mean velocity computed by the signal processor. The standard deviation of the Doppler spectrum is the spectrum width (in m/s).

FFT
An RVP signal processing mode based on Fast Fourier Transform. See also PPP.

hybrid task
A group of up to 3 tasks with the same scan type which are scheduled together and used together to make products. This allows flexibility of volume scanning schemes.

ingest file
A disk file of raw polar coordinate data that is collected during the execution of a task. Ingest files are used for subsequent product generation. See also RAW product.

IRIS
Interactive Radar Information System. A suite of software tools for configuring, calibrating, and operating a complete weather radar system.

K_{dp}
Specific Differential Phase Shift. The range derivative of the differential phase (PhiDP) expressed in degrees per km. It is nearly linearly proportional to the rainfall rate.

manual scan
IRIS task scan mode in which data is recorded while the antenna is controlled manually or via a separate program. Feedback is provided by the real time display.

MAX product
Shows the horizontal projection and the E-W and N-S vertical projections (in display side panels) of the maximum reflectivity in a user defined layer.

Melting Layer
Melting layer or ML (height). Altitude at which falling snow starts to melt. This forms the top of the Bright Band. Also called the 0°C height.

MLHGT
Melting Level Height Detection

NDOP product
Dual-Doppler velocity product. Combines the velocity measurements from 2 or more radars to get the wind direction and speed.

NSSL
National Severe Storms Laboratory, Oklahoma, USA

PhiDP
Differential Propagational Phase Shift. The phase difference between the HH and VV (co-polarized) channels of a polarization radar. It is calculated by taking the argument of the covariance of these two channels. The differential phase increases with range more rapidly in regions of heavy rain.

PhiH or PHIV
The average phase difference between the co- and cross-polar channels for a dual channel polarization radar operating in fixed or switching mode. The H and V notation indicates the transmit polarization.

PPI Full
IRIS scan geometry during which the antenna scans continuously in PPI mode without stopping between elevation angles.

PPI product
Plan Position Indicator. This is the classic radar scan geometry where the elevation angle is held constant and the antenna is scanned in azimuth. The resulting display is a two-dimensional image (looking down) at a constant elevation angle.

PPI Sector
IRIS scan geometry where the radar scans in PPI mode between two azimuths.

PPP
Poly-Pulse Pair. An RVP signal processing mode based on pulse pair correlations. See also FFT

PRF
See pulse repetition frequency (PRF).

product
Radar products are raw signal data from a radar receiver processed to provide information about current weather conditions. Radar products are calculated from ingest files that are collected during the execution of radar tasks. Products may be data, pictures, or text. For example, **PPI** and **RHI**.

protected areas
Regions around the radar (such as runway locations) for which special alerts are required based on detected radar data.

PRT
Pulse Repetition Time

pulse
A short burst transmission signal sent by the radar, used to measure the weather activity in atmosphere. The reflection measurements from a pulse are sorted into bins.

pulse repetition frequency (PRF)
Number of pulses transmitted per second. When measuring PRF, a *pulse* contains transmit, receive, and dead time phases. PRF affects *range folding* and *velocity folding* detection. In Vaisala IRIS products, PRF limits the area displayed in radar images and the maximum measurable wind speed.

rainfall rate (R)
The rate of the accumulation of precipitation (mm/hour). For snow, this usually refers to the liquid equivalent.

range folding
: Detection of the 2nd trip echoes, which are radar signal echoes from outside the radar maximum range. Range folding causes them to be incorrectly displayed within the radar measurement area. Also called range aliasing.

RAW product
: Spherical coordinate data product obtained directly from the raw ingest data. The data are stored in compressed format so they can be recorded on tape or sent to a workstation for further processing.

real time display
: Image created for each scan of the radar as well as the software process that creates these images.

Reflectivity (Z)
: Z_H - horizontal, Z_V - vertical, Z_{HV}-horizontal and vertical.

Property of the target that describes how much of the energy is reflected from the target. Radars are calibrated to directly give the reflectivity from the received backscattered energy. Unit for the reflectivity is mm^6/m^3. The logarithmic value is in dBZ. Also called reflectivity factor.

RHI product
: Range Height Indicator. A radar scan geometry in which the azimuth is held constant and the antenna is scanned in elevation. The resulting picture is a two-dimensional vertical slice through the atmosphere.

RhoH and RhoV
: The magnitude of the correlation between the co-and cross-polarized channels in a dual channel receiver polarization radar operating in fixed or alternating H and V transmit mode.

RhoHV
: Correlation Coefficient. The magnitude of the correlation between the HH and VV channels of a dual polarization radar operating in STAR mode or switching mode in the range [0,1]. Rain values are typically > 0.98. Wet tumbling hail has smaller values. This value is useful in helping to identify the particle type.

RVP900
: Vaisala Digital Receiver and Signal Processor RVP900. A product suite consisting of Vaisala IF Digital Receiver RVP901 and Vaisala Signal Processor RVP902.

SHEAR product
: Used to identify microburst, gust fronts, cold fronts, and atmospheric waves. SHEAR calculates the radial wind shear in the radial direction and is sensitive to atmospheric convergence and divergence.

signal processor
: A programmable device for digitizing and processing video signals from the radar receiver.

Signal Quality Index (SQI)
The autocorrelation of the received signal at lag 1 divided by lag zero. This is a number in the range [0,1] where 1 is the perfect Doppler point target and 0 is white noise. Typically used for thresholding velocity and width at a level of ~0.3...0.4.

SLINE product
Short for "Shearline". Used to identify a front and fitting a line to it. It looks for elongated regions of high shear and connects them to make a line.

spectrum width (W)
Standard deviation of the Doppler spectrum displayed in m/s. Large width values indicate high turbulence and/or shear in the pulse volume. It is difficult to measure the spectrum width when the spectrum width is more than 1/3 of the total Nyquist interval because of uncertainty in the estimator for broad spectra.

STAR mode
Simultaneous Transmit And Receive. The operational mode of a dual polarization radar where the radar transmits simultaneously horizontally and vertically.

task
A set of instructions to the radar and signal processing systems including, but not limited to, the scan type (PPI or RHI), PRF, pulse width, signal processing data types, time and range averaging criteria. For example, a PPI volume scan at multiple elevation angles or an RHI at a single azimuth. Also called radar task.

TOPS product
PPI format display of the height of a selectable dBZ echo contour.

TRACK product
Interactive tracking product made. After the operator tags echo features, IRIS inserts points in a track and extends the track to show the forecast echo motion for a selectable time.

Vc
Velocity (V) corrected by IRIS for the effects of folding. Note that dual PRF velocity unfolding performed by the processor is stored as V rather than Vc. Vc is used primarily for dual Doppler wind field computation which requires unfolded velocities.

velocity (v)
average radial velocity towards or away from the radar of detected hydrometeors in a measurement volume. Determined by phase measurements from a large number of successive pulses. The value is reflectivity-weighted. In the calculation, it is assumed that raindrops and other particles are advected with the wind and have no own motion except their falling velocity.

velocity folding
Erroneous readings due to particles in the measurement area exceeding the maximum velocity detection threshold of the radar system. The measured velocity "wraps around" to the other end of the scale, resulting in discontinuous readings. Also called velocity aliasing.

VIL product
: Vertically Integrated Liquid. Allows the operator to specify a layer in the atmosphere and integrates the total liquid contained within the layer. The point estimates of the liquid are based on a user-defined Z-W relationship.

VVP product
: The velocity volume product calculates the vertical profile of the mean wind speed, direction, divergence and deformation. The algorithm assumes a linearly varying wind field and performs a least squares fit over a large volume surrounding the radar.

WARN product
: Checks other products to determine if significant weather is present. The operator can define the warning criteria and thresholds. The locations (centroids) of weather features are also calculated.

WIND product
: Uses the velocity volume algorithm to calculate a 2-D horizontal profile of the horizontal wind speed and direction. The algorithm assumes zero vertical velocity and a fixed wind field over a sub-region of the area covered by the radar.

XSECT product
: A vertical slice through a volume scan. The product is similar to RHI except that it is constructed from PPI data collected at multiple elevation angles.

Index

Technical support

Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information as applicable:

- Product name, model, and serial number
- Software/Firmware version
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information on the problem

For more information, see www.vaisala.com/support.

Warranty

For standard warranty terms and conditions, see www.vaisala.com/warranty.

Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

Recycling

Recycle all applicable material.

Follow the statutory regulations for disposing of the product and packaging.

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