WX/ASR Basic Operation and Baseline Configuration

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1. Document Scope

Baron Services, Inc. of Huntsville, AL provided two dual-use ASR tracking and weather radar system as a subcontractor to Boeing for the SBX project. This system shall be referred to here as the WX/ASR. SIGMET, Inc. of Westford, MA, as a subcontractor to Baron Services, provided the following in support of the WX/ASR system under Baron Services PO 7281 dated 6 January 2004:

- Qty 2 RF-to-IF Radar Receiver Systems.
- Qty 2 RVP8 Digital Receiver and Signal Processor Systems
- Qty 2 RCP8 Radar/Antenna Control Processors with Shipboard Stabilization
- Qty 2 IRIS/Radar software licenses installed on the RCP8's.
- Qty 1 IRIS/Analysis/Composite License installed on a PC provided by Baron Services.
- Qty 1 IRIS/Display License installed on a PC provided by Baron Services.

A modular spares part for the RVP8 and RCP8 were delivered under a separate purchase order from Baron Services (PO 7536 dated 6 May 2004).

This document describes the hardware and software provided by SIGMET, including the hardware interconnections to the Baron Services radar system and the hardware and software configurations that were made for the SBX project. Specifically:

Section 2: WX/ASR System Overview

Section 3: Routine System Operation

Section 4: Basic System Maintenance

Annex A: IRIS Menu Configurations

Annex B: RVP8 Configurations

Annex C: RCP8 and BITE Configurations

Annex D: RCP8 Connector Panel Wiring

Annex E: RF-to-IF Receiver Schematic/Wiring

This brief manual is installed in the Extra's section of the IRIS Manuals interface. To access this on-line, simply double–click the Manuals icon in IRISNet, or type "manuals" in a terminal window.

2. WX/ASR Overview

Two Radar Systems for Full 360° Coverage

The WX/ASR system consists of two C–band radar systems along with their associated control, monitoring, processing and display computers. The radars are mounted diagonally on the platform so that by combining the data from the two radars, full 360 degree coverage is achieved.

- Radar A: Mounted port/forward. This operates at slightly lower transmit frequency. Radar A supplies the master trigger to the radar B as well functioning as the NTP time server.
- Radar B: Mounted starboard/aft. This operates at slightly higher transmit frequency and receives the master trigger from system A.

WX and ASR Antennae on Each Radar Pedestal

Each of the radars has two antennae mounted one above the other on the pedestal, each antenna separated by 90 degrees in elevation:

- The WX antenna- a pencil beam weather radar antenna used for calibrated mapping of weather echoes including calculating path loss by attenuation.
- An ASR antenna- a cosecant-squared air surveillance antenna used for detection and tracking of airborne targets.

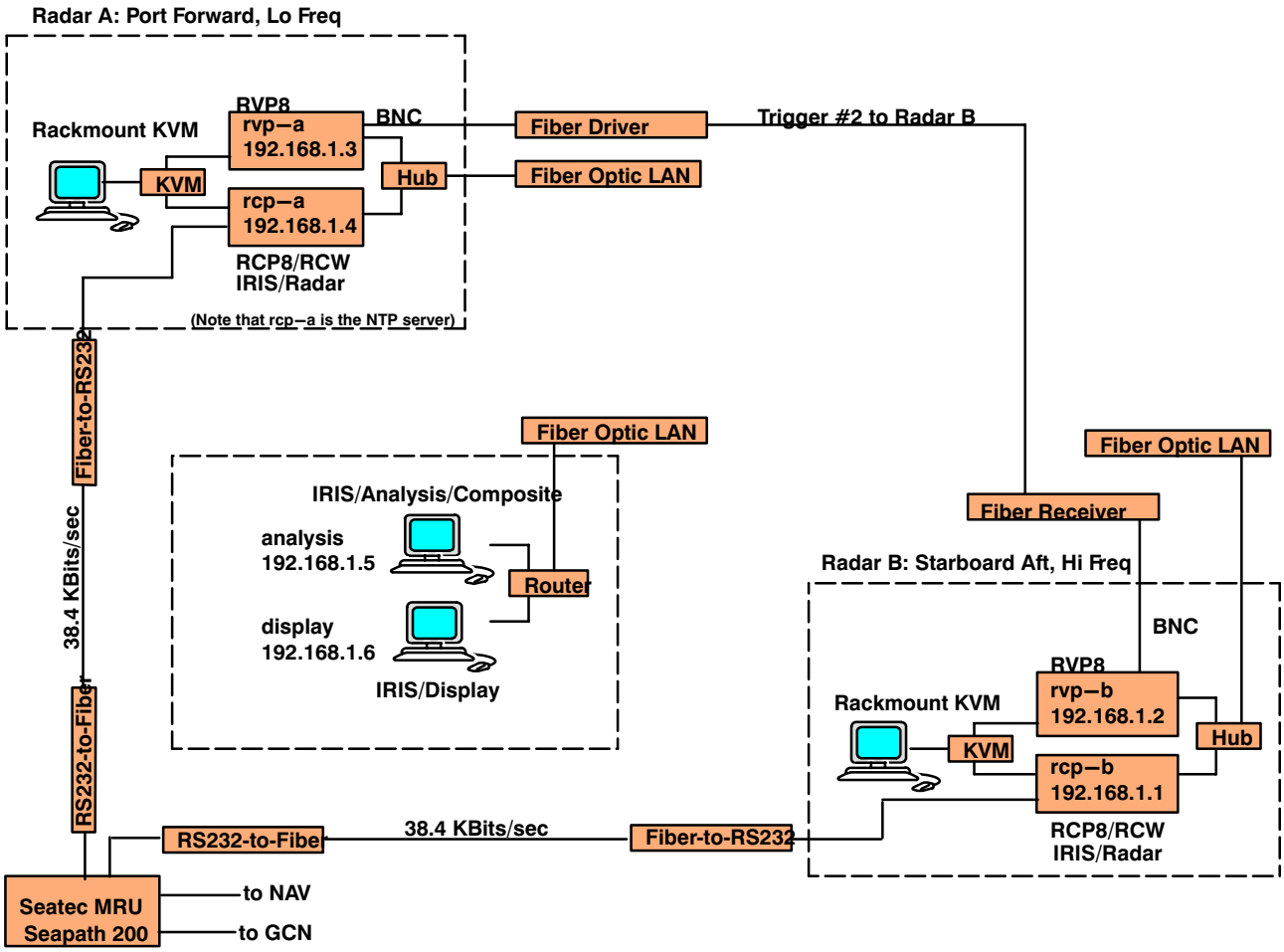
Antenna Stabilization for Platform Motion

Because the platform is subject to motion at sea (pitch, roll and heading changes), each antenna system is “stabilized” to scan as if it were a fixed ground based system. This is accomplished by the RCP8 with input from the Seatex Seapath 200 Motion Reference Unit (MRU) which supplies high-speed measurements of pitch, roll and heading to the antenna The RCP8 uses these attitude measurements to compensate the antenna motion for the motion of the ship. The procedures section of this document describes how to use sun tracking to verify the the stabilization is working properly.

Network Block Diagram

Figure 1 below shows the network layout of the various computer systems provided by SIGMET and Baron Services, including the nodenames, IP addresses and installed software modules installed.

Figure 1: WX/ASR Network Layout



WX and ASR Operating Modes

In operation, the two radar systems (A and B) are switched simultaneously into one of three operating modes which are defined by the names assigned to the local IRIS Radar Status Menu on each radar. In normal operation, the simultaneous switching is forced to occur whenever the operator switches the mode on the "analysis" node (three–letter site code SBX). The three modes are:

- **DEFAULT**: The default power–up mode which is configured to have radiate off, and the Ingest Process off. This provides safety for personnel when the system is first powered–up or if the IRIS software is restarted. This mode is also used as a standby mode for system maintenance. Note the pencil–beam antenna
- **ASR:** This activates the ASR antenna for aircraft target detection and tracking using the ASR antenna.
- **WX**: This activates the pencil–beam antenna for weather surveillance.

In normal operation, a mode switch is done at the analysis workstation, which then forces the mode switch on the two IRIS/Radar systems.

Data Transmission, Processing and Compositing

The data from the two radars are transmitted from each RCP8 via the LAN to a node called "analysis" where it is processed separately for each radar and then merged to form composite products that cover the full 360 degrees. In ASR mode, the composite products are then further processed to produce target tracking. Final products can be displayed on the analysis workstation or sent to the display workstation.

3. Routine System Operation

This section describes the routine operation of the system including the following topics:

- 3.1 Power-up procedure.
- 3.2 System mode switching.
- 3.3 Shutdown procedure.
- 3.4 Weather mode products and interpretation
- 3.5 ASR mode products and interpretation

These are described in the sections below.

3.1 System Power-Up Procedure

3.1.1 Reasons for system power-up

This section describes the power-up of the WX/ASR system. The system is designed to run continuously so there is no requirement for system to be periodically shutdown and restarted. However, there are times when a system power-up may be necessary, for example,

- Loss of power to one or more components. In this case, it is usually sufficient to power–up only that component.
- After software upgrade.
- In the event that a full system reset is required to attempt to restore operation after an unexplained failure.

With regard to the last reason, if there is little expertise on board to trouble shoot a problem, a power-up reboot is sometimes the easiest way to restore system operation.

3.1.2 Power-up Order

See also the ***IRIS Installation Manual*** **Section: 1.10**

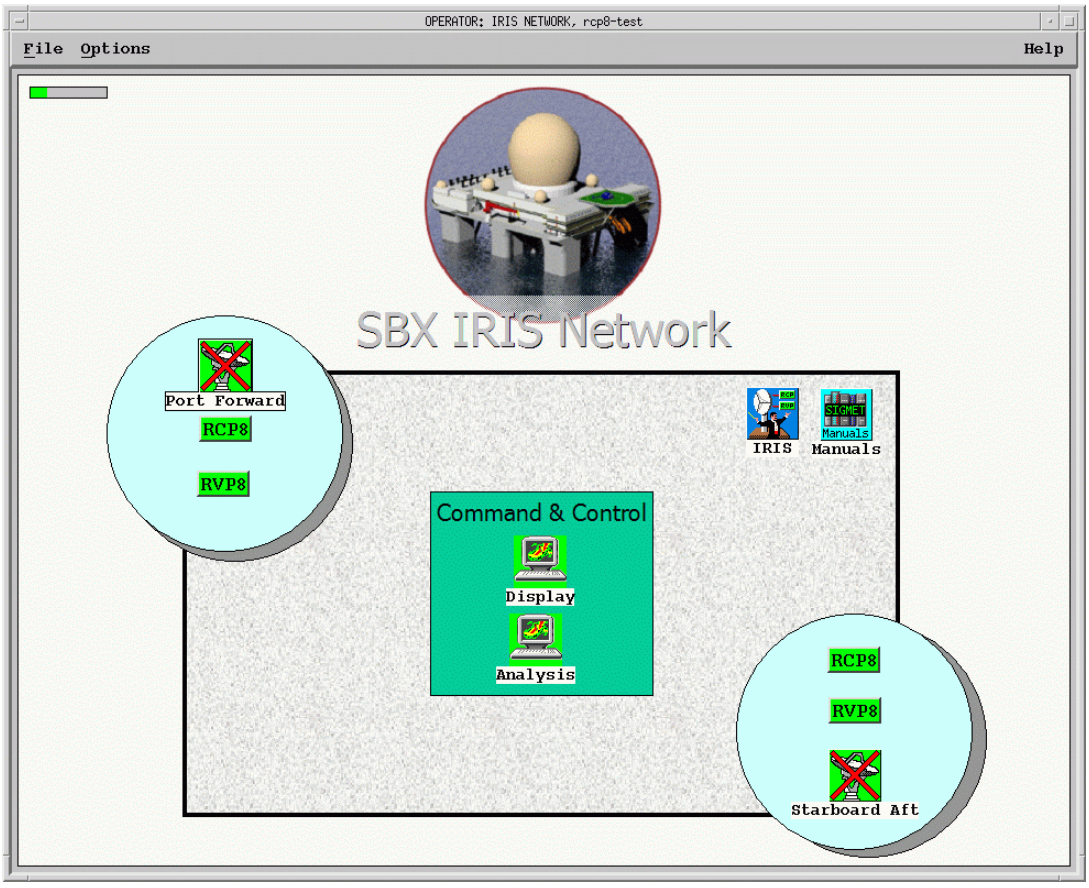
The recommended power-up sequence for a complete cold restart is as follows:

- 1. **Networking:** All networking hardware such as any switches and hubs in the two radar rooms and the Command and Control Room.
- 2. **IRIS/Analysis and IRIS/Display** workstations.
- 3. **Seapath 200 MRU:** Detailed power-up instructions are provided in separate documentation from Baron Services. Power-up the Seapath MRU and its associated GPS system. Approximately 15 to 30 minutes of time may be required for the the MRU to achieve stabilization. However, it is OK to continue with the power–up sequence while the MRU is stabilizing. Detailed power-up instructions are provided in separate documentation from Baron Services and Seatex.
- 4. **Radar A and B:** Detailed power-up instructions are provided in separate documentation from Baron Services. The transmitter/receiver and antenna servo systems for the two radars starting with Radar A (port forward). The radar control mode switch should be set to "LOCAL" mode. Note that approximately 5 minutes of warm-up time is required for the transmitter to radiate.
- 5. **RVP8** digital receiver at each radar. During power up, the front panel display shows "Boot", "Running Diagnostics", "Diagnostics Passed" and then an operational display (e.g. FFT ...). Refer to section 2.3.6 of *RVP8 User's Manual*.
- 6. **RCP8** radar control processor and IRIS/Radar host at each radar. The front panel will indicate "OK" when all diagnostics have passed.

Note that at each radar site, there is a KVM switch to select between the RVP8 and RCP8 for keyboard, mouse and monitor usage. In general, this should ALWAYS be set to function on the RCP8 since all RVP8 features can be accessed through the RCP8.

3.1.2 Verification of Successful Power-Up

The IRISNet display is available at each RCP8 and the Display computer. This is the primary tool for verification of the system status. IRISNet can be started by right–clicking the mouse and selecting “Irisnet” from the pop–up list, or by typing “irisnet” at a command line prompt in a terminal (as either operator or observer). Please refer to the ***IRIS Product and Display Manual*** Chapter 3 on the configuration and use of IRISNet. An example, showing normal IRIS power-up state is shown below.



Normal power-up is as follows: **All nodes will show green except that the two IRIS/Radar nodes will show a red “X”.** This is a normal indication when the system is in standby mode which is the default power–up state. When the operator switches to ASR or WX operational modes, then all the nodes in IRISNet will show green without any fault indicators (X’s). If not, then use the procedures in Section 4 to diagnose and repair the problem.

3.2 System Mode Switching

3.2.1 Available Operating Modes

Operating modes are configured, saved and loaded using the IRIS Radar Status Menu. Please refer to Chapter 4 of the ***IRIS Radar Manual*** for details of this menu which is the main menu for control and monitoring of the IRIS software.

In the case of the WX/ASR system, each radar and the analysis system are configured with three operating modes:

- DEFAULT- this is essentially a non–operating standby mode configured with the IRIS “Radar Process” and radiate forced to off. When the IRIS/Radar software starts on an RCP8, it comes up in the DEFAULT mode. DEFAULT
- ASR- this is used for point target detection and tracking. To optimize the tracking update rate, the high-speed scanning is done at a single fixed elevation angle.
- WX- this is a volume scan mode used for weather surveillance. During volume scanning, the antenna scans a full 360 degrees at multiple elevation angles to collect 3D data in range, azimuth and elevation space.

The data collection at the radars and the product generation at the radars and at the analysis system are changed to meet the requirements of each operating mode.

3.2.2 System Mode Switching

IMPORTANT: Before changing the operating mode from DEFAULT to either ASR or WX, verify that automatic radar operation will not pose a hazard to personnel either inside or outside the radome.

To change mode, follow the procedure below. Note that for normal operation it is best to work from the Analysis or the Display workstations. However, the sequence can also be done from either radar workstation (rcp8–a or rcp8–b).

- You must be logged into an IRIS workstation as operator.
- Start an IRISNet and click the IRIS menu button 

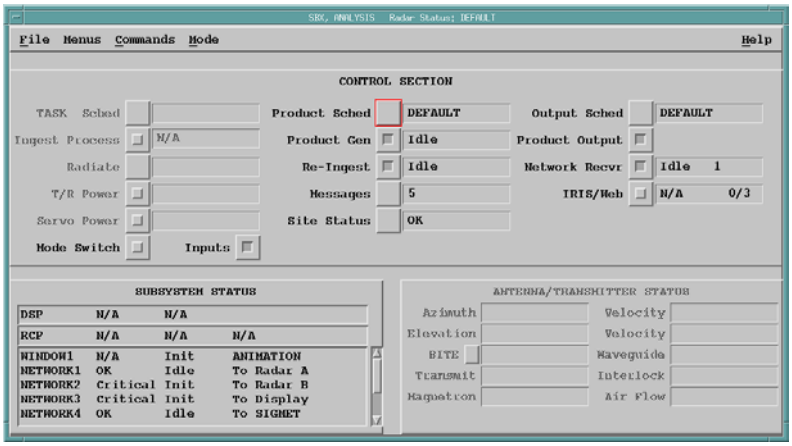
. Alternatively you can right-click to open a “New Window” (terminal) and type:

  ```
  $ iris &
  ```

  In either case the following menu shall appear (the IRIS Main Menu):

- Select **Connect –> analysis**. The top of the menu will change to show that you are conceded as “OPERATOR: SBX, ANALYSIS”.
- Select **Menus–> Radar Status,** will appear as shown below. Note that the current operating mode is shown at the very top of the menu. In the example it is the power-up mode “Radar Status: DEFAULT”
- Select at the top left **File–>Open ...** then select the desired mode (ASR, DEFAULT or WX).



3.2.3 Verifying the Mode Switch

You can easily verify that the mode change on the Analysis system successfully forced the corresponding mode change at the two radars by simply using the "Connect" feature of the IRIS Main Menu as follows (note this can be done from any IRIS workstation on the network):

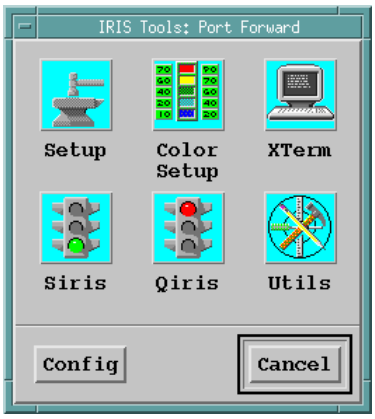
- "Connect" to a radar.
- Select **Menus–>Radar Status**
- The current mode is shown at the top of the menu, e.g., "Radar Status: ASR".

When connected to a radar, the Radar Status Menu will also show you that the antenna is azimuth is turning (see the lower left).

3.2.4 Disabling Forced Mode Switching During Maintenance

Sometimes during maintenance or test, it is useful to switch modes locally at the radar rather than using the Analysis system to force the mode switch. In this case it is important to disable the mode switching that is forced by the Analysis system. Otherwise, soon after you switch the radar to a new mode, it will switch back to the mode forced by the Analysis system.

There are several ways to prevent the Analysis system from interfering with local mode selection at a radar. The safest way is to simply stop the IRIS software. To do this, in the IRISNet utility double-click on on the Analysis node to get the IRIS Desktop as shown below:



Double-click the red traffic light to stop IRIS

Later double-click the green traffic light to start IRIS

Not that you must have operator privilege to do this.

3.3 System Shutdown

See also the ***IRIS Installation Manual*** **Section: 1.10**

3.3.1 When is a Shutdown Necessary

The WX/ASR IRIS workstations including the Analysis, Display, RVP8 and RCP8 systems, are designed to run continuously without need of routine shutdown. Possible reasons for shutting down the workstations are almost always related to maintenance as follows:

- After a software upgrade.
- As an emergency repair attempt for an un-diagnosed problem.
- In advance of an extended system stand-down.

Since the RVP8, RCP8, analysis and display systems are configured to reboot in a preset baseline configuration, with all required software started automatically, the reboot (shutdown/power-up) strategy can often restore normal operation after a fatal software failure or operator mis-configuration.

3.3.2 Mode Switch to DEFAULT (standby mode)

Use the procedure described in section 3.2.2 to switch into DEFAULT mode. This will stop the antenna motion and turn-off the radiate.

3.3.3 IRIS Workstation Local Shutdown Procedure

For RVP8 systems, no formal shutdown procedure is required. Simply push the red power switch on the front of the unit to turn-off the system.

For the other WX/ASR IRIS workstations including the Analysis, Display and RCP8 systems, the “power failure” method will work as well, but in general we recommend that whenever possible it is best to do an orderly shutdown of the systems. The shutdown procedure for the RCP8’s, Analysis and Display computers are as follows:

- On the system that you want to shutdown, open a “New Window” by right clicking in the background workspace.
- Become “super user” (aka root) by typing:

```
$ su
Password:  <password>
#
```

  The # symbol prompt indicates that you are root.

- Issue the shutdown command as root:

```
# shutdown -h now
```

When prompted in the terminal , you can turn the power switch off. Alternatively, if you want to shutdown and restart in one step, you can type the command "**`reboot".`**

3.3.4 IRIS Workstation Remote Shutdown Procedure

Any of the WX/ASR workstations can be shutdown remotely from another workstation. In most cases it is preferable to do a remote "**`reboot"`** rather than a shutdown so that it is not required to physically go to the system to re-start the computer.

The procedure for a shutdown or reboot is identical to the one described in the previous section, except that you will need to open a remote terminal to type-in the commands. You can use IRIS-Net to open a remote terminal (as operator) by double clicking on the node that you want to shutdown, and then double-clicking the "Xterm" icon in the IRIS desktop. The top of the window will identify the user as"operator" and the name workstation. At this point you can type the commands to become superuser and reboot as described in the previous section.

3.4 Weather (WX) Mode Products

3.4.1 Overview WX Mode Observation

WX mode is used for observing rain and snow in the atmosphere. In WX mode, the "pencil beam" antenna is scanned in azimuth and the elevation is raised after each 360 degree sweep. The baseline configuration uses 14 angles from 0.5 to 20 degrees elevation. This is called a "volume scan". The name of the scan TASK is WX_PPI_VOL.

In addition, a long range scan TASK called WX_SURV sweeps at 1.5 degrees elevation. Data collection is made to a range of 600 km, but in practice the maximum range effective range of weather detection will be approximately 300 km because of the effects of earth curvature and refraction.

The detailed configurations of these scan TASK's are given in Annex 1. The two scans are scheduled to run every 6 minutes.

3.4.2 Products in WX Mode

The product images produced in WX Mode are as follows:

- PPI (plan position indicator): The radar reflectivity (dBZ) for a 360 degree sweep at a selected elevation angle.
- CAPPI (constant altitude PPI): The radar reflectivity (dBZ) for a 360 degree sweep at a selected height.
- TOPS: The height of a selected dBZ intensity threshold.
- VIL: The integrated water content in mm of depth for a selected layer.
- WARN: Generates an alert if the VIL exceeds 2 mm within 50 km of the radar.

Details of the configurations are provided in Annex 1.

IRIS supports "LIVE" product generation in the Quick Look Window. This allows the observers to load any of the products above and then remake them interactively in the display, essentially expanding the number of products that can be made and viewed. This is described in detail in Section 5.5 of the ***IRIS Product and Display Manual***. For example, the user can view a CAPPI at 1 km height and then interactively change the CAPPI height to an arbitrary value.

3.4.3 Viewing Products

Products can be viewed on the Analysis or the Display workstations. Three display windows, called Quick Look Windows, are configured on the Analysis station. Any one of these can be used. Note that automatic output assignments are typically made for these windows, but they are subject to change. At installation these were:

- WINDOW1 (ANIMATION) CAPPI Z_010_150
  Intensity CAPPI at 1 km height to 150 km range based on volume scan TASK.
- WINDOW2 PPI Z_005_300
  Long Range PPI based on the surveillance TASK.
- WINDOW2 PPI Z_005_600
  Long Range PPI based on the surveillance TASK.

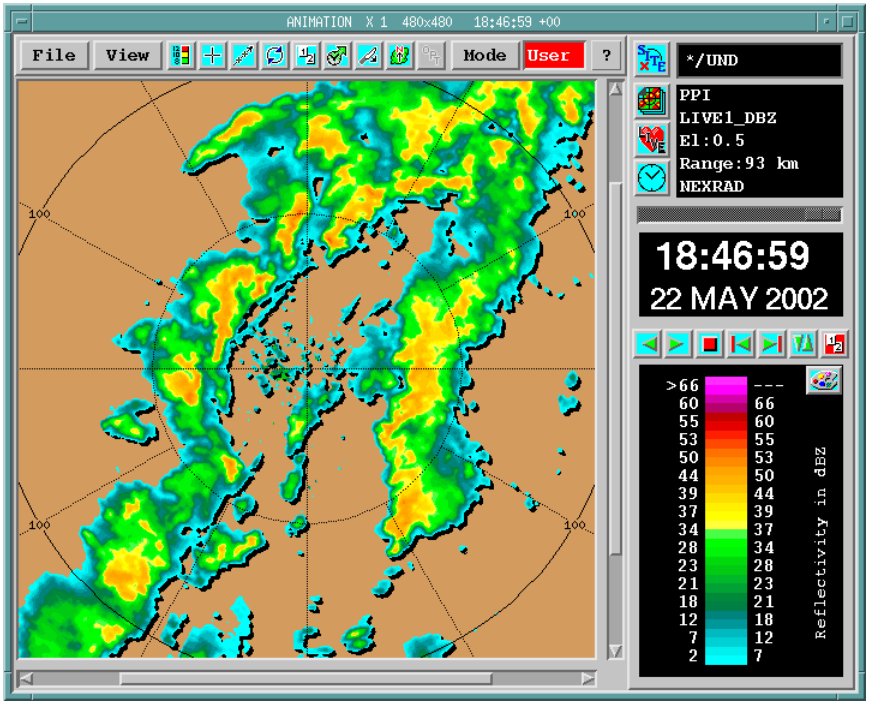
For information on the use of the Quick Look Window, click the "?" icon on the upper right of the display window. This will take you to Chapter 5 of the ***IRIS Product and Display Manual***: The Quick Look Window. Observers should read this section of the manual since the Quick Look Window (QLW) is the primary observation tool in IRIS. Some important topics are:

- How to select products for display and step through time sequences.
- Live IRIS features which allow custom product generation right in the window.
- How to use the tools such as the cursor.
- Pan, scroll zoom and animation.
- Selection of display units (km or nautical miles).

An example of a PPI product display in the QLW is shown below.

3.4.4 Product Interpretation

CAPPI and PPI Intensity Products (PPI example below)



The products in WX mode are designed to show areas of precipitation, e.g., millimeter–size particles such as rain or snow. C–band radars do not see clouds since the droplets are too small. The units of intensity are dBZ which is called the radar reflectivity. The dB scale is used because of the wide range of reflectivity that can be observed by the radar. The relationship between the rainfall rate and the reflectivity is given approximately by the so–called Marshall Palmer relationship:

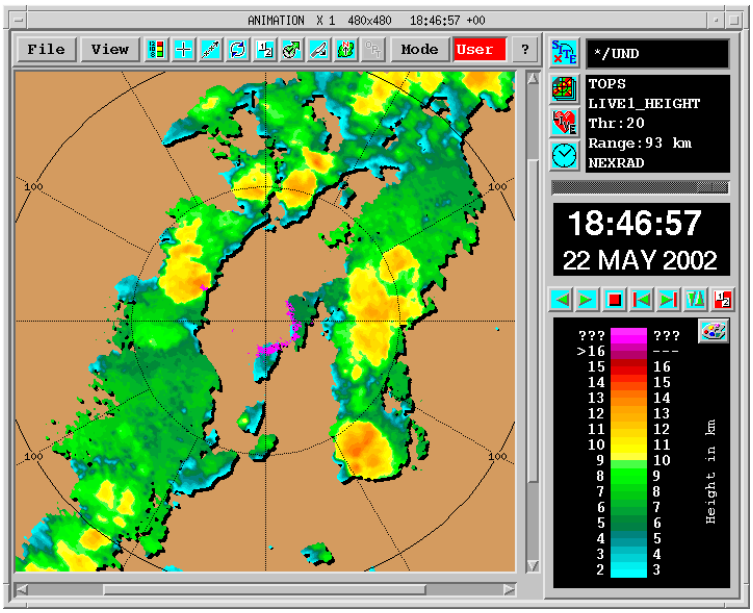
$$Z = 200\ R^{1.6} \qquad \text{for R in mm/hour and Z in } mm^6/m^3$$

Some examples are:

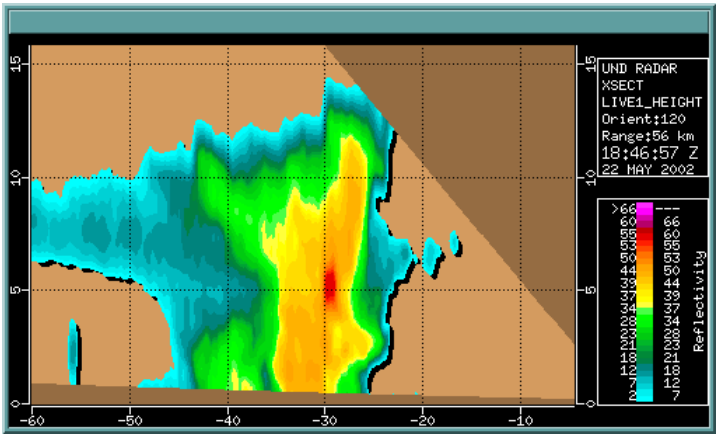
Rain Intensity	DVIP	Z mm^6/m^3	dBZ	R (in/hr)	R(mm/hr)
Very Light	1	889	29.5	0.10	2.5
Light	2	3850	35.9	0.25	6.4
Moderate	3	11671	40.7	0.50	12.7
Heavy	4	50562	47.0	1.25	31.8
Very Heavy	5	153274	51.9	2.50	63.5
Hail Likely	6	325132	55.1	4.00	101.6

DVIP level was used as a standard on old National Weather Service radars. However, dBZ has become the standard on NWS radars. The example PPI product above shows cores of moderate to very heavy rainfall.

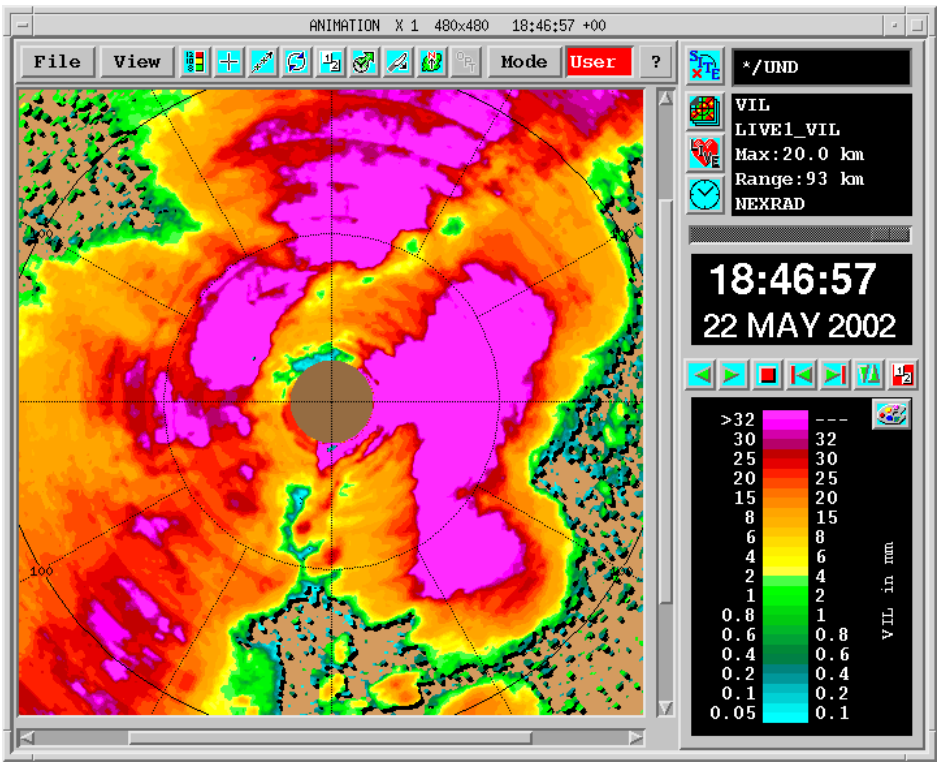
Echo TOPS Product



The TOPS product shows the height of a selected dBZ threshold. The baseline configuration uses 20 dBZ. This is indicated in the legend “Thr:20”. In some cases, this will correspond to the cloud top. However, because C–band radar does not detect cloud, there will often be cloud above the 20 dBZ contour. In general, the higher the 20 dBZ contour, the more intense and deep the precipitation. However, the correlation between echo tops and severe weather depends on the season and local climatology. In this example, the maximum TOPS extend to approximately 15 km indicating very severe weather. The XSECT tool in the QLW (the “knife”) can be used to make a vertical cut through the weather to look at TOPS in more detail. An example is shown below.



Vertically Integrated Liquid (VIL) Product



The vertically integrated liquid product shows the equivalent depth of water (in mm) contained in the precipitation over each point. This has an advantage over CAPPI since results from a deep layer can be displayed rather than just a single height so there is less chance of missing significant weather. The correspondence between VIL and severe weather depends on season and local climatology. In this example, of very deep powerful thunderstorms, the VIL values exceed 30 mm. (over one inch of rainfall equivalent).

3.5 Air Surveillance Radar (ASR) Products

3.5.1 ASR Data Collection and Product Generation

ASR mode is used for detection and tracking of aircraft. In ASR mode, the cosecant–squared antenna is used. This antenna has high resolution in azimuth, but a fan beam in elevation so that all heights are covered during a single 360 degree rotation. Because of this, the data are collected at a single elevation angle of 4 degrees. The scan speed is 30 degrees per second (5 RPM) to provide rapid updates for high-speed targets.

The details of the scan TASK's and the product generation are provided in Annex 1 per the baseline configuration. The product generation steps are fairly complex so a detailed description of this is provided there as well.

3.5.2 ASR Display

The primary tracking product is called:

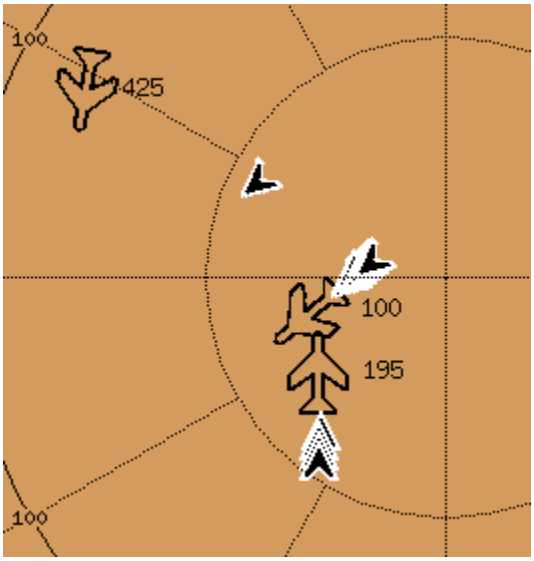
ASR_DWELL_WA

This product shows the current and past target detections in the QLW. To display this product:


Click the product selection button in the upper right portion of the QLW.

Select **WARN**, then select **ASR_DWELL_WA**

An example of some aircraft detections is shown below.



The detection icons are oriented to the measured heading of the target. The large icon signifies that the location of a target that has been detected in the current sweep (i.e., at the time indicated in the QLW legend). The small icons indicated previous detections in past sweeps. The number signifies the speed in knots. (Note that the "Opt" tool at the top is used to select the speed display.) In the example, there are three current detections (large icons). Two of them have a past detection history as indicated by the well–aligned small icons. There is also a small icon that has no current detection and no past history. This is a possible false alarm. The display of the small icons serves to indicate the confidence of the detection.

HINT: It is sometimes useful to animate this display.

4. Basic System Maintenance Procedures

This section describes the various tools and their usage for system alignment and test, especially with regard to special features or procedures for the WX/ASR system. The goal is to provide the operator with tools necessary to perform basic maintenance tasks and to gather information to provide to Baron Service or SIGMET in the event that support is required to solve a problem.

The topics in this section are:

- 4.1 Basic Maintenance Tools
- 4.2 Antenna stabilization/alignment sun check
- 4.3 MRU check
- 4.4 Radar calibration
- 4.5 IRIS Installation Checks
- 4.6 System Backup and Restore
- 4.7 System Upgrade Procedure
- 4.8 Getting Support from SIGMET

Before you do anything, of course you will need to login. The two login choices are:

- **operator**- has full privilege to change the system operation via the IRIS menus and utilities.
- **observer**- may view menus and displays but may not make changes.

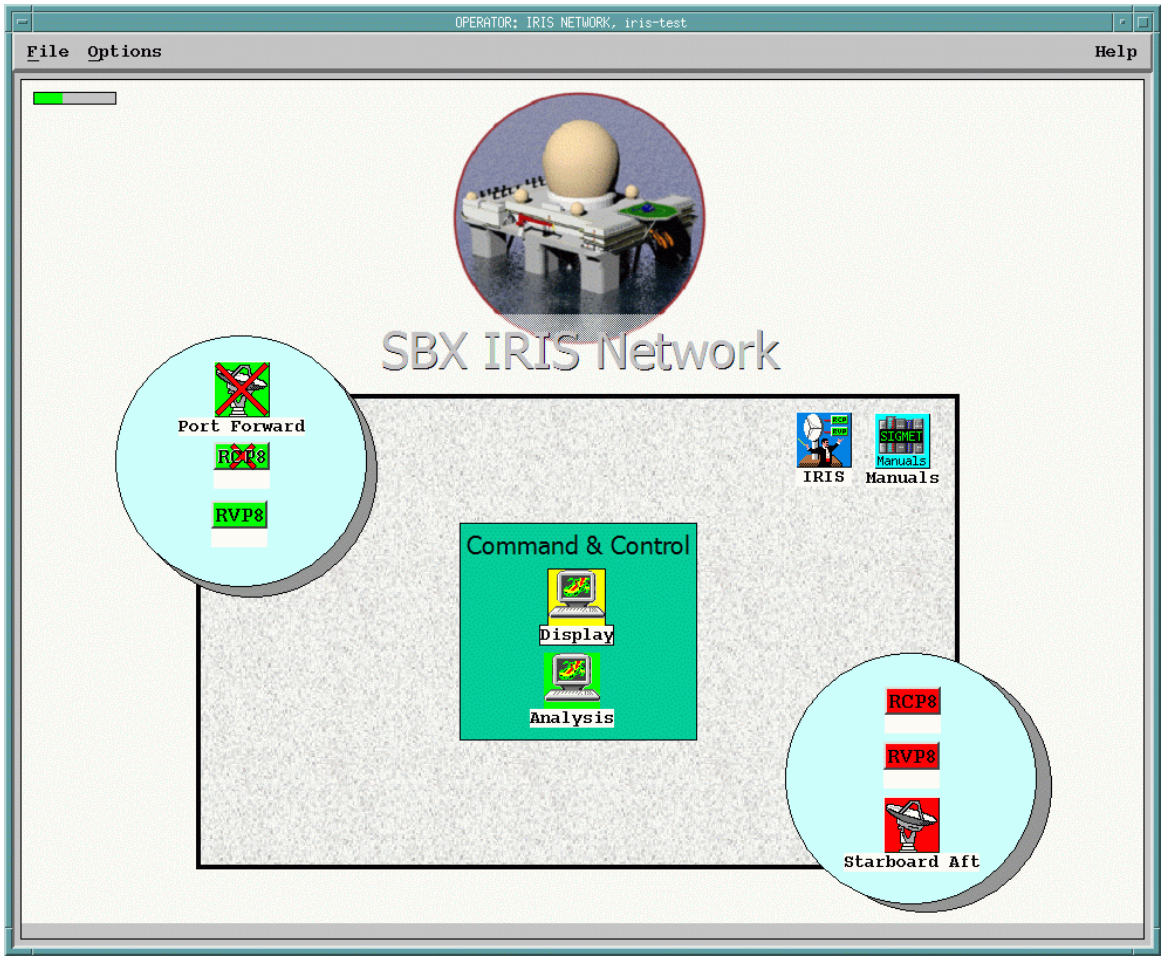
Your system manager will provide you with appropriate passwords. See Section 1.10 of the ***Installation Manual*** for more information related to login procedures.

4.1 IRIS Maintenance Tools

4.1.1 IRISNet

Ref: ***IRIS Product and Display Manual***: Chapter 3

IRISNet is the top level monitoring tool. It is also used to access all IRIS applications on the network, subject to password authorization. See the example below.



There are two ways to start IRISNet:

- Right–click in the blue area of the display and select “Irisnet”. This may not be available on all systems.
- Start a terminal window and type “irisnet”.

The color coding of the icons shows the status of each node.

- Green- SIGMET application software (IRIS or RVP8 or RCP8) software is running and everything is OK.

- Red X- application software is running but there is a critical fault. Check the Radar Status Menu for the node as the first step in fault isolation.
- Yellow X- application software is running but there is a non–critical fault. Check the Radar Status Menu for the node as the first step in problem isolation.
- Yellow Icon- the computer and networking are functioning, but the application code is not running. You can use IRISNet to start IRIS on the RCP8, analysis or display machines. You can also simply reboot these machines and the software will restart automatically.
- Red Icon- either the computer or network has failed, i.e., the node is unresponsive. It is also possible that the node name for the icon is misconfigured. You need to troubleshoot these possibilities.

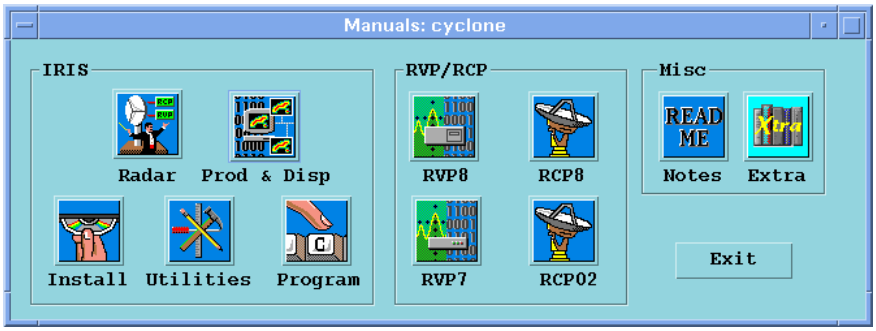
Clicking on a radar or analysis node will open the IRIS desktop tools for that node.

4.1.1 Accessing Manuals

Ref: ***IRIS Product and Display Manual***: Chapter 3.3

Double click the manuals icon in IRISNet, or type “manuals” in a terminal window.

The manuals interface will appear as shown below:



Note that clicking the “Help” or “?” buttons in any menu will take you to the specific chapter of the specific manual that describes the menu. The “Extra” section has this and other custom documentation for WX/ASR.

4.1.1 Starting a local terminal

Ref: ***IRIS Product and Display Manual***: Chapter 3.3

A terminal is frequently required to perform maintenance work or start an application. There are two ways to start a local terminal:

- Right-click in the blue display background and select "Start a new terminal (or window)"
- In IRISNet, double click on your node (indicated by the black background over the node name) and then double click the "Xterm" icon.

4.1.1 Starting a remote terminal (sigterm)

Ref: ***IRIS Product and Display Manual***: Chapter 3.3

A terminal on a remote machine is frequently required to perform maintenance work or start an application. There are two ways to start a remote terminal:

- In a local terminal type "sigterm *nodename*" where *nodename* is the name of the computer where you want the terminal, e.g., "sigterm display". sigterm –? will display a list of options.
- In IRISNet, double click on the remote node and then double click the "Xterm" icon.

IMPORTANT: the top of the terminal window will identify the user and the nodename. This is important since it is easy to get confused when you have multiple windows open simultaneously.

4.1.1 IRIS Menus

Ref: ***IRIS Radar Manual***: Chapter 2

The IRIS Menus are the heart of the IRIS system. There are two ways to start the IRIS menus:

- In a local terminal window type “iris &”. The “&” frees–up the terminal window while the menus are running.
- 

In IRISNet click the conductor button

In either case, the following menu will appear:

Use the “Connect” menu to connect to the IRIS node that you want to configure/monitor. Note that you can have multiple IRIS menus on the screen to monitor several nodes simultaneously.

4.1.1 Radar Status Menu

Ref: ***IRIS Radar Manual***: Chapter 4

This is used for mode switching as described in Section 3.2 of this document (especially on the analysis machine). It is also used for fault isolation. Faults will be indicated by red (critical) or yellow (non–critical) highlight. In the case of a BITE fault, the BITEX utility can be accessed directly from the button next to BITE in the lower right. BITEX is described below. In the case of other faults, the solution may be as simple as turning a software process to the on position. In some cases you may need to look at the “Messages” to determine the nature of the fault.

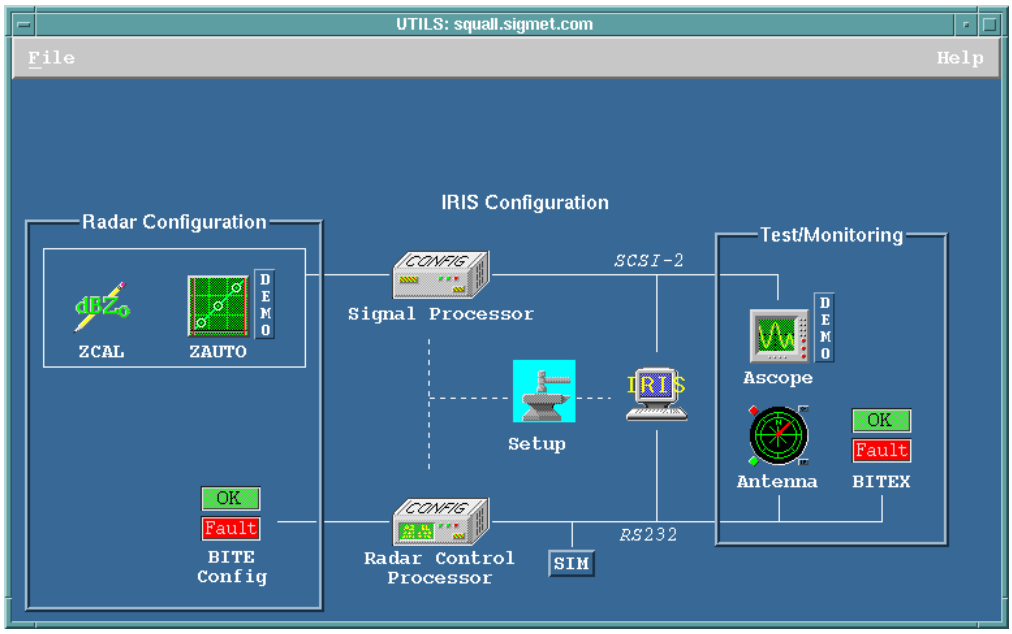
4.1.1 Utilities

Ref: ***IRIS Utilities Manual***: Chapter 1

The Utils menu provides access to other utilities besides BITEX. There are two ways to access the utilities menu.

- Start a terminal on a radar system and type “utils”. You will need to have operator privilege for this.
-  Double click on the the radar node in IRISNet and then double click on the utilities icon.

In either case, the following menu shall appear. Note that it is organized as a block diagram of the system.



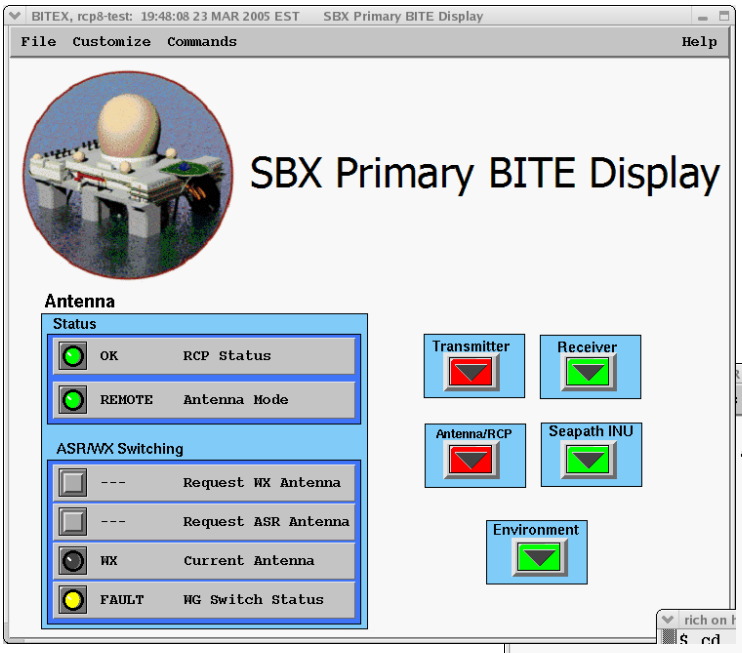
4.1.1 BITEX (BITE Examiner)

Ref: ***IRIS Utilities Manual***: Chapter 3

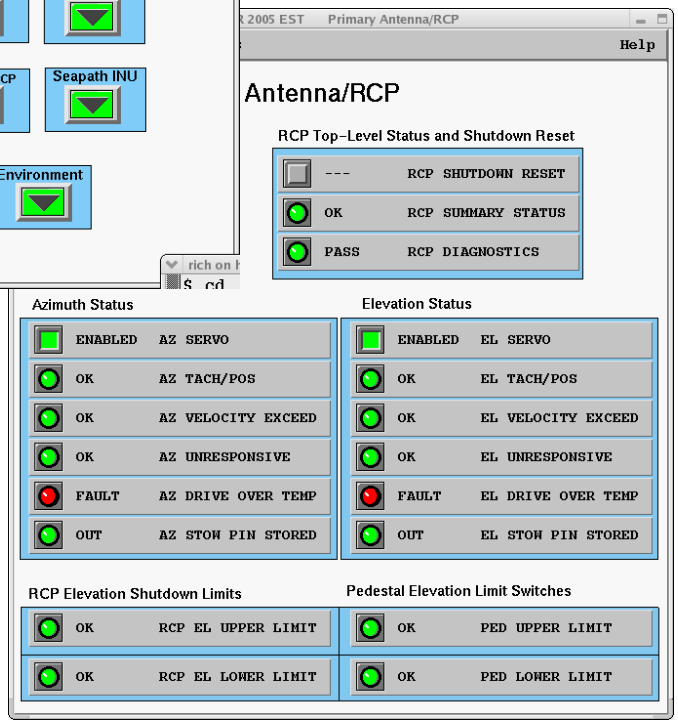
There are three ways to access the BITEX utility:

- Click on the button labeled “BITE” in the lower right of the Radar Status Menu.
- Open a terminal window on the radar and type “bitex”.
- In IRISNet, double click the radar and then select the ”Utils” icon. In the utilities menu, select the BITE button on the right (not the config button on the left).

The BITEX top display will appear as shown below:



The operator then cascades down through subpanels that show faults to isolate the problem. In this example, the Antenna/RCP has a critical fault as indicated by the red button color. Clicking the button displays the sub-panel which reveals an over temperature condition.



IMPORTANT: There is a reset button for the antenna in the RCP sub-panel. Operators are advised to determine the cause of an antenna shutdown before simply hitting the reset button to restore operation.

4.2 Antenna stabilization/ alignment sun check

Ref: ***IRIS Utilities Manual***: Chapter 2.5

If the antenna can successfully track the sun, then the antenna and MRU alignment and functioning is verified. Two utilities are run simultaneously to do this:

- antenna
- ascope

A detailed procedure is provided in the reference above and is not repeated here.

4.3 MRU check (with antenna utility)

Ref: ***IRIS Utilities Manual***: Chapter 2.6

The Seatex Seapath 200 MRU (Motion Reference Unit) and its associated differential GPS provide the high-speed attitude information for the antenna stabilization and Doppler velocity correction. Note that this is sometime referred to as the INU (Inertial Navigation Unit). The unit has its own manuals and procedures. However, the antenna utility has a special display to show the information coming from the MRU, accessed by **Option–>Stable Platform Params**. In addition, the background color indicates whether the MRU information is invalid (red) or reduced accuracy (yellow).

Note that if the MRU information is invalid, it is ignored by the RCP8. In this case the antenna will operate safely, but is not stabilized for the platform orientation and motion so displays will not be accurate.

4.4 Radar calibration (with zauto utility)

Ref: ***IRIS Utilities Manual***: Chapter 10

The weather mode requires calibration of the radar system. To accomplish this, the system is equipped with a built–in precision noise source. The use of the zauto utility is described in the reference above. Here we describe unique features related to the system calibration for the WX/ASR system.

- Since there are two radars, you will need to calibrate both. The results should be within about 3 dB since the two systems are nearly identical.
- During calibration you will need use BITEX (“Receiver” sub panel) to “Enable” the “Noise Source On/Off” and “Request” “NOISE TO RECEIVER”.
- In Zauto, click the “Sample” button. This will plot a point up on the display.
- Now use BITEX to disable the noise source and select “ANTENNA TO RECEIVER”. This allows the actual receiver noise to be measured in the next step.

- In zauto take a noise sample by clicking “Noise”.
- Click the “Fit” button to make the single–point calibration.
- At this point follow the routine steps of zauto to “Update” the calibration and “View Cal” the results. If the new calibration is significantly different (more than 2 or 3 dB) from the Stored or Reference calibrations, then you should try to determine the reason for the change in sensitivity.
- If you are satisfied with the result, then do a **File–>Save.**
- Repeat the procedure for the other pulse width.

IMPORTANT: Before resuming normal operation make sure that you have BITEX/Receiver set for DISABLED NOISE SOURCE and Request ANTENNA to RECEIVER. Note that the Status below will show if the receiver input was properly switched.

4.5 IRIS Installation Checks and Misc Tools

Ref: ***IRIS Installation Manual***: Chapter 2. See also ***UNIX for Dummies***.

This chapter of the ***Installation Manual*** covers “UNIX Survival Skills”. It describes some of the basic UNIX commands and special SIGMET UNIX script commands that are useful for system maintenance. A few of special note are mentioned here.

`$ sigmet_env (-rda for rvp8)` verifies SIGMET software installation.

`$ ps_iris` show SIGMET processes that are running.

`# kill <PID>` stop processes by process ID number .

`$ qiris` stop the IRIS software processes.

`$ siris` start the IRIS software.

`$ qant` stop the antenna process.

`$ show_iris` various diagnostic info about IRIS.

`$ show_machine_code` Shows IRIS version and license info**.**

4.6 System Backup and Restore

Ref: ***IRIS Installation Manual***: Appendix D

The sigbru utility provides the mechanism for system backup and restore. There are two directories that must be backed–up for each system (2X RVP8, 2X RCP8, analysis, display). Making proper backups is essential in assuring a successful recovery. The directories are:

/usr/sigmet/

/etc

The backup procedure for these directories using sigbru is described in the reference above. The restore procedure is also described, however, what is restored depends on what has been corrupted. some examples are given below:

Total Disk Failure

In this case, a complete install using the IRIS and RedHat Install CDROMs and the install procedure in the ***Installation Manual*** should be done on a new disk. After this is compete, the /usr/sigmet/config and /etc directories should be restored.

IRIS Misconfiguration

In this case simply restore the /usr/sigmet/config directory. If you happen to know the specific directory or file that was corrupted, then you can restore this only.

Operating System Misconfiguration

In this case, restoring the /etc directory is all that is required. Again if you know the specific subdirectory or file that was corrupted you could choose to restore only this.

4.7 System Upgrade Procedure

Ref: ***Installation Manual***: Section 1.7

Software upgrades for IRIS, the RVP8 and RCP8 are offered for download at www.sigmet.com. These come with no support, unless the customer is under warranty or has purchased as support contract from SIGMET, Inc. Note that support customers can request a CDROM upgrade.

The decision to make a software upgrade depends mainly on the need to get a new feature or repair a problem. In some cases, SIGMET may require support customers to make a software upgrade in order to address a problem. The upgrade procedure preserves the configuration state of the system. Usually there are a few new configuration steps, but these are relatively minor.

IMPORTANT: When doing a software upgrade, be sure to download and read the release notes for ALL intervening versions since there may be configuration changes required be these. Follow the release note instructions carefully and you will have a successful upgrade.

4.8 Getting Support from SIGMET

In order to receive support from SIGMET your system must be under warranty (1 year from acceptance) or under support contract. Please contact support@sigmet.com for information on how to purchase a support contract.

A fundamental concept in the RVP8, RCP8 and IRIS systems is that all of the user customization files are stored in the /usr/sigmet/config directory. This is why it is critical to make backups of this directory. During support, SIGMET may request that you send this directory on our ftp site.

The best way to do this is to make a sigbru backup of /usr/sigmet/config to a disk file say in your /tmp directory. You will need internet access. The example below shows how to place a file that is stored on your local machine as **/tmp/file_name** into the incoming directory at SIGMET's ftp site. User typing is indicated in bold font.

```
$ cd /tmp   (location of file to send, /tmp/file_name in example)

$ ftp ftp.sigmet.com
Conected to ftp.sigmet.com
220 Welcome to SIGMET
User (ftp.sigmet.com:<none>>: anonymous
331 Guest login ok, send your complete email adress as password.
Password:<enter your email address>
230 Guest login ok, access restrictions apply.
ftp> cd incoming
250 CWD command successful.
ftp> bin    (sets binary transfer mode)
200 Type set to I.
ftp> put file_name
200 PORT command successful.
150 Opening BINARY mode data connection for file_name.
226 Transfer complete.
ftp: 18 bytes sent in 0.00Seconds 18000.00Kbytes/sec
ftp: bye
221 Goodbye.

c:/tmp>
```

Aside from configuration files we may request that you send us copies of log files (stored in **/usr/iris_data/log/IRIS_ERROR.LOG**) or the results of test programs such as **show_iris** or **sigmet_env**. Familiarity with a text editor such as VI or emacs is very helpful during support. Both of these are supplied on all SIGMET systems.