

Introduction to the WSR-88D System

Introduction

Introduction



Notes:

Welcome to this lesson, Introduction to the Weather Surveillance Radar - 88 Doppler (WSR-88D). This lesson will take approximately an hour to complete. Let's get started.

Learning Objectives

Learning Objectives

1. Given a WSR-88D equipment group, or its primary subcomponents, identify the function the component (or subcomponent) performs in the WSR-88D system.
2. Given a descriptive statement of a system function, identify the name (or acronym) of the WSR-88D system component or primary subcomponent that performs the task.
3. Identify the systems or data streams with which Principal and Other Users can access and visualize WSR-88D data.
4. Identify where each WSR-88D equipment group, and its primary subcomponents, fit into the system as a whole relative to other equipment groups.
5. Given one or more WSR-88D functions, identify whether the function(s) can be performed at the Radar Product Generator (RPG) Human Control Interface (HCI), the Radar Data Acquisition Unit (RDA) HCI, or the Advanced Weather Interactive Processing System (AWIPS) Workstation.

Notes:

This lesson has five learning objectives. Please take a moment to review them, and advance to the next slide when you are ready to proceed.

The WSR-88D System Basics

The WSR-88D System Basics

- Radar Data Acquisition Unit (RDA)
 - Wideband Communications between the RDA and The Radar Product Generator
- Radar Product Generator (RPG)
 - Master System Control Function (MSCF)
- Product Distribution Communications
 - User Systems (e.g., Advanced Weather Interactive Processing System)



Notes:

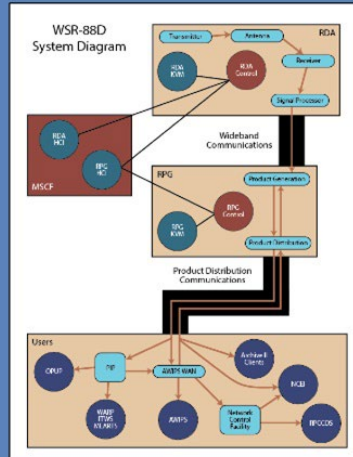
The WSR-88D system contains several data processing, control, and display components. Some of these units also employ multiple subcomponents. NWS forecasters should have a basic understanding of the WSR-88D system in order to effectively produce the best quality radar data. This understanding includes knowledge of the components (and subcomponents), their relationship to each other, and the flow of data through the system. These six different components are:

- Radar Data Acquisition Unit (RDA),
- Wideband Communications between the RDA and The Radar Product Generator,
- Radar Product Generator (RPG),
- Master System Control Function (MSCF),
- Product Distribution Communications, and
- User Systems (e.g., Advanced Weather Interactive Processing System).

Navigating This Lesson

Navigating This Lesson

- ➔ Next/Prev buttons
- ➔ Menu
- ➔ In slide buttons
- ➔ System diagram links



Click to view system diagram

Notes:

As you go through this lesson, I have provided you with different ways to progress through the content. You can navigate through the lessons in a traditional way by using the next and previous buttons in the player or choosing specific slides from the menu. Many of the slides will have buttons that let you choose which slide to view next, too. We did this because this lesson can be used as a reference after the fact, if needed. Once you have visited a slide, the buttons corresponding to that slide will have a check mark visible. Also, most of the slides will have a link in the lower left saying "Click to view system diagram". These images will appear in a lightbox on top of the slide, and highlight where the current content fits into the WSR-88D system as a whole. It's not necessary to visit each of these images, but may help orient you if you get confused as to where a certain component fits in the system at large.

Radar Data Acquisition Unit (RDA)

Radar Data Acquisition Unit (RDA)


Radar Data Acquisition Unit (RDA)

- RDA Intro
- Transmitter ←
- Antenna ←
- Receiver ←
- Signal Processor ←
- KVM Interface → **Origination point of radar data you will use**

→ Use buttons on the left to learn more about each subcomponent

[Next Section](#)

Click to view system diagram



Notes:

The Radar Data Acquisition Unit (or RDA) is the origination point of the radar data that you, the operator, will ultimately use. The RDA component group includes five primary subcomponents:


- Transmitter,
- Antenna,
- Receiver,
- Signal processor, and
- Keyboard-Video-Mouse (KVM) and Monitor Interface.

These subcomponents work together to generate and radiate radio frequency (RF) pulses, receive reflected energy from those pulses, and process this received energy into digital base data.

Transmitter

Transmitter

- RDA Intro
- Transmitter**
- Antenna
- Receiver
- Signal Processor
- KVM Interface



- First step in process
- 10 cm wavelength pulse, 750 kW peak power
- Allows for collection of base moments & dual-pol variables

Next Section

[Click to view system diagram](#)

Notes:

The first step in acquiring radar data is the transmission of a radio frequency (RF) signal. The WSR-88D uses a RF signal transmitted from a klystron amplifier. The klystron amplifier produces a coherent signal with a precisely controlled amplitude, frequency, and phase. The WSR-88D transmits this high frequency signal using an approximately 10 cm wavelength RF pulse at a peak power of 750 kW. These specifications allow for collection of base moments (Reflectivity, Velocity, and Spectrum Width), as well as dual-polarization variables (Differential Reflectivity, Correlation Coefficient, and Differential Phase) of sufficient quality for current NWS purposes.

Antenna: Overview

Antenna: Overview

RDA Intro Overview VCPs Pulses Ops Modes AVSET SAILS MRLE

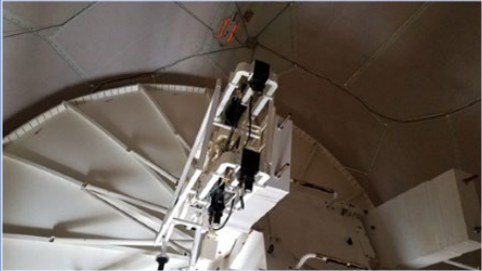
Transmitter

Antenna

Receiver

Signal Processor

KVM Interface



Next Section

Click to view system diagram

- ➔ Broadcasts pulse & intercepts returned energy
- ➔ VCPs can position at various elevation angles
- ➔ Learn more about antenna using buttons above

Notes:

The antenna broadcasts the RF signal out into the atmosphere and intercepts returning energy. The antenna transmits a RF signal polarized at a 45 degree angle (i.e., polarized in the horizontal and vertical direction).

The antenna elevation position has a wide possible range (i.e., anywhere from - 1.0 to 60.0 degrees) for scanning purposes. The Volume Coverage Pattern (VCP), the operational mode in use, and the use of three different dynamic scanning strategy applications determine the antenna angles used to collect data. You can learn more about these by clicking on the buttons above the image.

Here's an important note...The radar operator cannot manually position the radar antenna at a given elevation or azimuth. So, you should choose wisely when selecting a VCP and any dynamic scanning strategies.

Antenna: VCPs

Antenna: VCPs

RDA Intro Overview VCPs Pulses Ops Modes AVSET SAILS MRLE

Transmitter

Antenna

Receiver

Signal Processor

KVM Interface

- VCP = Volume Coverage Pattern
- ➔ Specify elevation angles antenna will scan
- ➔ 7 VCPs currently available

Next Section

Click to view system diagram

Notes:

The Volume Coverage Pattern specifies the actual elevation angles the antenna will scan (e.g., 0.5°, 1.5°) in a specified period of time. The WSR-88D currently has seven operational VCPs. They are:

- VCP 12 - Which samples up to 15 elevations (0.5° elevation potentially scanned up to four times when SAILS is enabled) during the 4.5 minute volume scan.
- VCP 112 - Samples up to 15 elevations (0.5° elevation scanned two times when SAILS is enabled) during the 5.5 minute volume scan that uses the Multi-PRF Dealiasing Algorithm (MPDA) on the lowest 3 elevations.
- VCP 31 - Samples 5 elevations during the 10 minute volume scan.
- VCP 32 - Samples 5 elevations during the 10 minute volume scan.
- VCP 35 - Samples 9 elevations (0.5° elevation scanned two times when SAILS is enabled) during the 8 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 3 elevations.
- VCP 212 - Samples up to 15 elevations (0.5° elevation scanned up to four times when SAILS is enabled) during the 4.5 to 5 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 3 elevations.
- VCP 215 - Samples up to 15 elevations (0.5° elevation scanned two times when SAILS is enabled) during the 7 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 3 elevations.

Antenna: Operational Modes

Antenna: Operational Modes

Overview VCPs Pulses Ops Modes AVSET SAILS MRLE

RDA Intro

Transmitter

Antenna

Receiver

Signal Processor

KVM Interface

Clear Air Mode

Precipitation Mode

→ Clear Air: VCPs 31, 32, or 35

→ Precipitation: VCPs 12, 112, 212, or 215

Next Section

[Click to view system diagram](#)

Notes:

In addition to VCPs, the WSR-88D has two operational modes which play a part in antenna positioning: Clear Air mode and Precipitation mode. The operational mode of the radar determines which VCPs are available to be used. For example:

- Clear Air mode offers VCPs 31, 32, or 35
- Precipitation mode offers VCPs 12, 112, 212, or 215.

Antenna: SAILS

Antenna: SAILS

Overview VCPs Pulses Ops Modes AVSET SAILS MRLE

RDA Intro

Transmitter

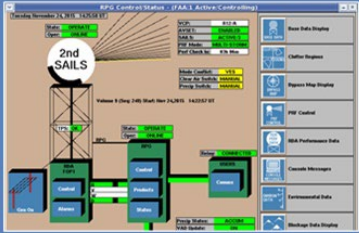
Antenna

Receiver

Signal Processor

KVM Interface

Next Section



→ SAILS: Supplemental Adaptive Intra-Volume Low-Level Scan

→ Allows for additional lowest level tilt scans in a VCP

Click to view system diagram

Notes:

Another dynamic scanning feature available in certain VCPs is called the Supplemental Adaptive Intra-Volume Low-Level Scan (or SAILS). During severe weather operations (for which VCPs 12 and 212 were designed), SAILS allows the WSR-88D to behave like a Terminal Doppler Weather Radar (or TDWR) by adding up to three additional low level (0.5 degrees for most sites) scans at regular intervals during the volume scan. In VCPs 35, 112, and 215, a single SAILS tilt can be enabled. When SAILS is enabled for these scanning strategies, one additional lowest level tilt will be added to the middle of the volume scan.

The radar operator controls the use of SAILS at the MSCF or at the AWIPS Workstation.

Antenna: Long Pulse Vs. Short Pulse

Antenna: Long Pulse Vs. Short Pulse

RDA Intro | Overview | VCPs | Pulses | Ops Modes | AVSET | SAILS | MRLE

Transmitter

Antenna

Receiver

Signal Processor

KVM Interface

Next Section

Click to view system diagram

The diagram shows two pulses, Pulse 1 and Pulse 2, on a timeline. Pulse 1 is a long pulse with a duration of 1.57 μsec and a length of 500 m. Pulse 2 is a short pulse. A yellow bar represents the Signal Processing Timeline, which starts at the beginning of Pulse 1 and ends at the end of Pulse 2. A horizontal line below the pulses indicates the Listening Period, which is 998.53 μsec long. The Pulse Repetition Time is 1000 μsec, starting from the beginning of Pulse 1. A red line indicates the start of the listening period, which is 1.47 μsec after the start of Pulse 1. A red line also indicates the end of the listening period, which is 1.47 μsec before the end of Pulse 2. The text 'CLICK TO ENLARGE' is present above the diagram.

Figure 5

Pulse Duration = 1.57 μsec
Length = 500 m = H

CLICK TO ENLARGE

Pulse 1

Pulse 2

Signal Processing Timeline

"Listening Period" = 998.53 μsec

Pulse Repetition Time = 1000 μsec
(beginning of one pulse to beginning of next)

→ VCP 31: Long pulse (4.7 μs)
→ VCP 32: Short pulse (1.57 μs)

→ Long pulse:
– Increases radar sensitivity
– Poorer quality Doppler velocity

→ Only VCP 31 uses long pulse (all others use short pulse)

Notes:

VCPs 31 and 32 have similar elevations and scanning time periods. However, VCP 31 uses a long pulse (4.7 microseconds), while VCP 32 uses a short pulse (1.57 microseconds). Longer pulses increase the sensitivity of the radar, but result in poorer Doppler velocity data. As a result, VCP 31 is the only VCP that uses a long pulse. All the other VCPs use a short pulse.

Antenna: AVSET

Antenna: AVSET

RDA Intro Overview VCPs Pulses Ops Modes AVSET SAILS MRLE


Transmitter

Antenna

Receiver

Signal Processor

KVM Interface



Next Section

Click to view system diagram

- AVSET = Automated Volume Scan Evaluation & Termination
- Allow for early termination of a VCP if no radar echoes
- VCPs ~30 sec shorter w/AVSET enabled , on average

Notes:

VCPs determine the elevation angles that the radar scans, but WSR-88D operators have the ability to implement "dynamic" scanning techniques, too. The first dynamic scanning technique we will discuss is the Automated Volume Scan Evaluation and Termination (or AVSET). This application can stop a VCP if there is no relevant weather data at higher tilts. Use of AVSET on WSR-88D sites throughout the U.S. has allowed for an approximately 30 second decrease, on average, in scanning time of precipitation mode VCPs.

AVSET only removes elevation angles above 6.4°. As a result, AVSET doesn't run during any Clear Air mode VCPs. The radar operator controls AVSET at the Master System Control Function (MSCF) or at the AWIPS Workstation.

Antenna: MRLE

Antenna: MRLE

Overview VCPs Pulses Ops Modes AVSET SAILS MRLE

Thursday May 26, 2016 12:12:48 UT

State: OPERATE
Oper: ONLINE

VCP: 212
AVSET: STABLE 23
SAILS: DISABLED
MRLE: ACTIVE 1
PPI Mode: MAG 11-210DM
Perf Check No: 117207h_4km

Mode Conflict: NO
Clear Air Switch: AUTO
Precip Switch: AUTO

MRLE Control

MRLE Status: ACTIVE

MRLE Control

Volume 7 (Step 7) Start: May 26 12:12:48 UT

0.5 MRLE

Click to view system diagram

- MRLE = Mid-Volume Rescan of Low-Level Elevations
- Can add an extra scan of up to 4 lowest tilts in VCP
- Can't run MRLE & SAILS at same time

Notes:


The latest dynamic scanning feature added to the WSR-88D is the Mid-Volume Rescan of Low-Level Elevations (MRLE). During severe weather operations, MRLE can be used to collect an extra scan of up to the lowest four tilts in the volume scan. Like SAILS, these extra tilts are collected during the middle portion of the volume scan. MRLE and SAILS cannot be enabled concurrently, so you have to choose one option or the other.

The radar operator controls the use of MRLE at the MSCF. AWIPS does not currently have the ability to turn MRLE on. However, if MRLE is enabled, the radar operator can turn MRLE off by enabling SAILS at AWIPS.

Receiver

Receiver

- RDA Intro
- Transmitter
- Antenna
- Receiver**
- Signal Processor
- KVM Interface



- Listens for returned signal
- Amplifies, adjusts, and digitizes signal
- Captures the necessary amplitude and phase data

Next Section

[Click to view system diagram](#)

Notes:

As the antenna intercepts returning (backscattered) energy, it routes the energy, or returned signal, to the receiver. The WSR-88D receiver "listens" for data in both the horizontal and vertical channels simultaneously. The returned signal contains far less energy than the originally transmitted signal. To aid in processing, the receiver amplifies the returned signal, adjusts its frequency, and then digitizes the signal using an Intermediate Frequency Digital Receiver (IFDR). In this process, the receiver captures the amplitude and phase information needed to compute all of the base data moments and dual-polarization base data.

Signal Processor: Overview

Signal Processor: Overview

RDA Intro Overview Clutter Base Data RF Level I

Transmitter


Antenna

Receiver

Signal Processor

KVM Interface

Next Section



- Signal processor performs:
 - • Ground clutter suppression
 - • Calculation of base data
 - • Range unfolding of Doppler velocity data

[Click to view system diagram](#)

Notes:

Upon reception of the digitized output from the receiver, the radar signal processor (also called the RSP) accomplishes three important functions:

- ground clutter suppression,
- calculation of base data, and
- range unfolding of Doppler velocity data.

Additionally, Archive Level I recording - if performed - occurs at the signal processor. Click on the buttons above the image to learn more about these functions.

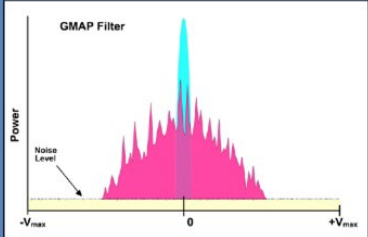
Signal Processor: Clutter Filtering

Signal Processor: Clutter Filtering

- RDA Intro
- Transmitter
- Antenna
- Receiver
- Signal Processor
- KVM Interface

Click to view system diagram

- Overview
- Clutter
- Base Data
- RF
- Level I



- Involves two applications:
 - ➔ • CMD = Clutter Mitigation Decision (identifies clutter)
 - ➔ • GMAP = Gaussian Model Adaptive Processing (removes clutter & rebuilds signal)

Notes:

Most ground targets have little or no motion. This trait, when applicable, distinguishes ground targets from most atmospheric scatterers. However, ground clutter can be identified by other important characteristics. Variables used to identify these characteristics include reflectivity texture, clutter phase alignment, and standard deviations of Differential Reflectivity (ZDR) and Differential Phase (Phi). The Clutter Mitigation Decision (CMD) algorithm uses these variables to detect areas of clutter on an elevation-by-elevation, bin-by-bin basis of every volume scan.

Once areas of clutter are identified, the Gaussian Model Adaptive Processing (GMAP) algorithm uses Spectrum Width data to suppress the ground clutter contaminated portion of the signal. GMAP removes power from the returned signal within a very narrow width centered at zero velocity. Depending on the availability of returns from meteorological targets outside this width, GMAP then rebuilds an estimated weather signal that replaces the initially removed data.

Signal Processor: Base Data

Signal Processor: Base Data

Overview Clutter Base Data RF Level I

RDA Intro

Transmitter

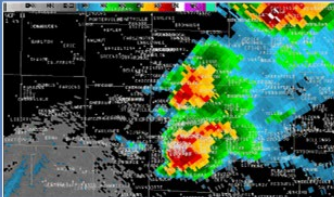
Antenna

Receiver

Signal Processor

KVM Interface

Next Section



→ Base moments (base reflectivity, base radial velocity, & base spectrum width)

→ Dual-polarization base data (correlation coefficient, differential reflectivity, & differential phase)

Click to view system diagram

Notes:

After clutter suppression, three base moments are built. These moments are:

- base reflectivity,
- base radial velocity, and
- base spectrum width.

In addition to these moments, the signal processor calculates the dual-polarization base data. The dual-polarization data differ in character from the legacy base data and, as a result, are not considered to be a base moment. However, these data are one of four base data streams sent to the Radar Product Generator (or RPG) for generating radar products.

Signal Processor: Range Unfolding

Signal Processor: Range Unfolding

RDA Intro

Transmitter

Antenna

Receiver

Signal Processor

KVM Interface

Next Section

Click to view system diagram

Overview Clutter Base Data RF Level I

Legacy Algorithm SZ-2 Algorithm

Addresses issues from multiple trip echoes

Three techniques used:

- Legacy Range Unfolding Algorithm
- Sachidananda-Zrnic-2 (SZ-2)
- Multi-PRF Dealiasing Algorithm

Notes:


Multiple trip echoes cause a phenomenon known as range folding. Range folding occurs frequently in the velocity and spectrum width data due to the high pulse repetition frequencies (PRFs) that are used. Range unfolding is the process of “unfolding” these returns to their appropriate ranges. The unfolding process uses a comparison of base reflectivity (low PRF) and base velocity (high PRF). The Signal Processor can use three range unfolding techniques: the Legacy Range Unfolding Algorithm, the Sachidananda-Zrnic (SZ)-2 Range Unfolding Algorithm, and the Multi-PRF Dealiasing Algorithm. The latter two techniques’ availability and use depends on the particular elevation angle and VCP being processed.

Signal Processor: Archive Level I

Signal Processor: Archive Level I

- RDA Intro
- Transmitter
- Antenna
- Receiver
- Signal Processor
- KVM Interface

Overview Clutter Base Data RF Level I



→ Archive Level I is returned signal data in digital format

→ Available at all sites starting with Build 19

Next Section

[Click to view system diagram](#)

Notes:

The WSR-88D has the ability to record the original returned signal in a digital format (i.e., Archive Level I). Archive Level I recorders have been available at all RDAs since the fielding of RDA/RPG Build 19. The data recorder is a two terabyte removable drive.

KVM & Monitor Interface

KVM & Monitor Interface

RDA Intro

Transmitter

Antenna


Receiver

Signal Processor

KVM Interface

Next Section

Click to view system diagram



- KVM = Keyboard Video Mouse
- ➔ Allows for local access to RDA
- ➔ NWS forecasters will likely never interact with this subcomponent

Notes:

The Keyboard Video Mouse (KVM) and Monitor Interface is used to control the RDA locally (i.e., at the RDA shelter) and to monitor RDA maintenance functions. Each RDA shelter contains a KVM and Monitor Interface. Many of the KVM and Monitor Interface control functions can also be performed remotely via the RDA Human Computer Interface (HCI) at the Master System Control Function (MSCF). In general, NWS forecasters will never have to interact with this subcomponent of the RDA Unit.

Wideband Communications

“Wideband” Communications

“Wideband” Communications

Wideband Intro

Direct Wire Link

Private T1

Commercial T1

Backup Comms

Next Section

Click to view system diagram

The diagram, titled "WSR-88D System Diagram", illustrates the data flow between the Remote Data Acquisition (RDA) and the Remote Product Generation (RPG) units. On the left, the Mission Support Control Facility (MSCF) contains an RDA HCI and an RPG HCI. The RDA unit includes a Transceiver, Antenna, Receiver, and Signal Processor. The RPG unit includes Product Generation and Product Distribution. A central vertical bar labeled "Wideband Communications" connects the RDA and RPG. A yellow arrow points from the MSCF to the Wideband Communications link, and another yellow arrow points from the Wideband Communications link to the RPG. A black arrow points to the Wideband Communications link from the right.

→ Base data transmission lines between RDA & RPG

→ Can be one of three options:

- Direct Wire link
- Private T1
- Commercial T1

Notes:

The RDA and the RPG link together through a “wideband” communications line that provides high speed, full duplex (simultaneous, two-way) data transmission. These communication lines transmit the four channels of base data (reflectivity, velocity, spectrum width, and dual-polarization) from the RDA to the RPG. Depending on the distance between the RDA and RPG (and the locally available services), the primary wideband link for a particular WSR-88D site may be any one of the following:

- Direct Wire Link,
- Private T1, or
- Telco (Commercial) T1.


Approximately half of WSR-88D sites also have a backup wideband communications link in case the primary link fails for some reason. The backup wideband comms available include:

- Wireless cellular data (currently 4G), or
- Very Small Aperture Terminal (VSAT).

Direct Wire Link

Direct Wire Link

- Wideband Intro
- Direct Wire Link**
- Private T1
- Commercial T1
- Backup Comms



- Used when RDA & RPG less than 400 ft apart
- DoD & FAA sites use this connectivity for primary link

[Next Section](#)

[Click to view system diagram](#)


Notes:

Direct wire links connect the RDA and RPG when the distance between them is less than 400 feet. This WSR-88D configuration occurs most often when the RPG is located in the RDA shelter. All Department of Defense (DoD) and Federal Aviation Administration (FAA) sites use this type of connectivity for their primary link.

Private T1

Private T1

- Wideband Intro
- Direct Wire Link
- Private T1**
- Commercial T1
- Backup Comms



- Used when RDA & RPG 400-3000 ft apart
- Primarily used when RDA adjacent to a NWS WFO
- About half of NWS sites use this link

Next Section

[Click to view system diagram](#)

Notes:

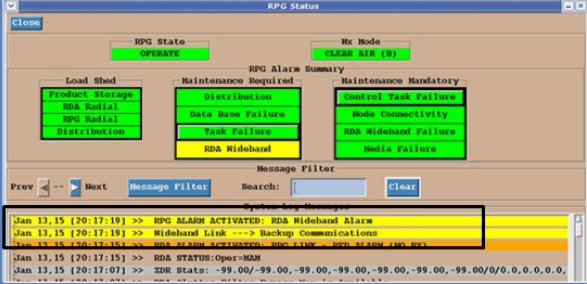
This type of wideband link is used when the distance between the RDA and RPG is between 400 and 3000 feet. This configuration link occurs most commonly when the RDA is adjacent to the NWS Weather Forecast Office (WFO). Approximately half of the NWS WSR-88D site connections use this type of primary communications link.

Backup Communications

Backup Communications

- Wideband Intro
- Direct Wire Link
- Private T1
- Commercial T1
- Backup Comms
- Next Section

Click to view system diagram



The screenshot shows the 'RPG Status' window with the following sections:

- RPG State:** OPERATE
- Rx Mode:** CLEAR AIR (9)
- RPG Alarm Summary:**
 - Load Shed:** Product Storage, RDA Radial, RPG Radial, Distribution
 - Maintenance Required:** Distribution, Data Base Failure, Task Failure, RDA Wideband
 - Maintenance Mandatory:** Control Task Failure, Mode Connectivity, RDA Wideband Failure, Media Failure
- Message Filter:** Search: [] Clear
- Message Log:**
 - Jan 13, 15 (20:17:19) >> RPG ALARM ACTIVATED: RDA Wideband Alarm
 - Jan 13, 15 (20:17:19) >> Wideband Link --> Backup Communications
 - Jan 13, 15 (20:17:15) >> RDA STATUS: Oper-NM
 - Jan 13, 15 (20:17:07) >> ZDR Stat: -99.00/-99.00,-99.00,-99.00,-99.00,-99.00,-99.00/0/0.0.0.0.0.0.

- ➔ Sites with Telco also have backup comms
- ➔ Two options:
 - Cellular connection (4G)
 - VSAT

Notes:

RPGs that rely on commercial T1 service for their wideband link (or linking the RPG to the MSCF) also have a backup communication system. These backup systems use one of the following methods to transfer data between the two sites:


- Cellular data connection (currently 4G) or
- Very Small Aperture Terminal (VSAT).

Backup communications use 4G wireless data in areas where it is available. Other sites rely on VSAT (which is a satellite communications system).

Commercial T1

Commercial T1

- Wideband Intro
- Direct Wire Link
- Private T1
- Commercial T1**
- Backup Comms



→ Used when RDA & RPG too far apart for Private T1
→ About half of NWS sites use this link

Next Section

[Click to view system diagram](#)

Notes:

This type of wideband link is used when the distance between the RDA and RPG is too far for a Private T1. The Radar Operations Center (ROC) leases transmission medium from local telecommunications companies to link the RDA and RPG over an unlimited distance. Approximately half of the NWS WSR-88D site connections use this class of primary wideband comms link. In addition, several DoD and FAA radars also have a separate commercial link to NWS offices if those offices have the MSCF (and the RPG is still in the RDA shelter).

Radars Product Generator

Radars Product Generator (RPG)

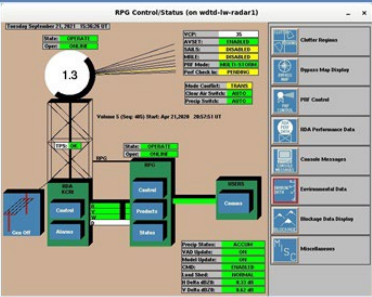
Radars Product Generator (RPG)

RPG Intro

Product Generation

RPG Control

Product Distribution



→ RPG ingests & processes base data from RDA
→ Controlled at the MSCF
→ Creates base & derived products, then distributes to different users

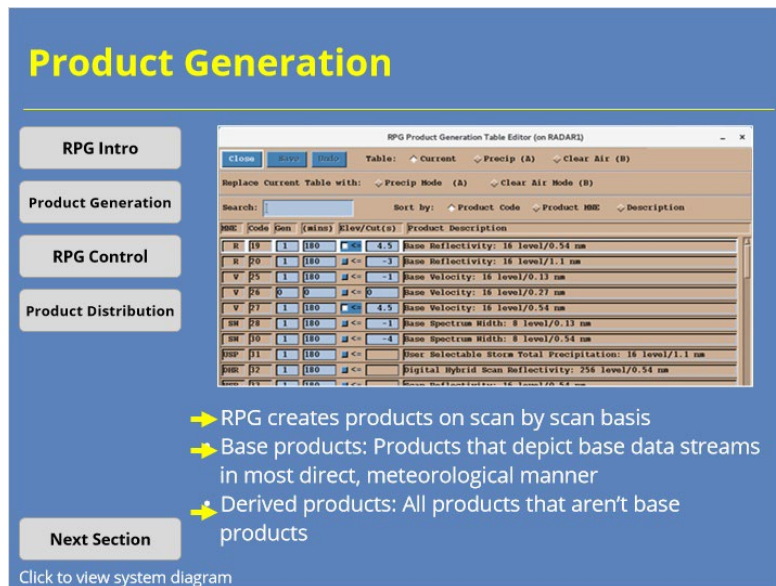
Next Section

[Click to view system diagram](#)

Notes:

The RPG ingests and processes the base data received from the RDA via wideband communications. The NWS radar operator controls the RPG using the MSCF. The RPG generates a suite of base and derived products and then distributes the products to the different users through a variety of product distribution communications.

Product Generation



Product Generation

RPG Intro

Product Generation

RPG Control

Product Distribution

Next Section

Click to view system diagram

RPG Product Generation Table Editor (on RADAR1)

Close Save Help Table: Current Precip (R) Clear Air (B)

Replace Current Table with: Precip Mode (R) Clear Air Mode (B)

Search: Sort by: Product Code Product HRR Description

PRC Code	Scan	Elev (m)	Elev/Cut (m)	Product Description	
R	19	1	100	4.5	Base Reflectivity: 16 level/0.54 nm
R	20	1	100	4.5	Base Reflectivity: 16 level/1.1 nm
V	25	1	100	4.5	Base Velocity: 16 level/0.13 nm
V	26	1	100	4.5	Base Velocity: 16 level/0.27 nm
V	27	1	100	4.5	Base Velocity: 16 level/0.54 nm
SR	28	1	100	4.5	Base Spectrum Width: 8 level/0.13 nm
SR	29	1	100	4.5	Base Spectrum Width: 8 level/0.54 nm
MR	31	1	100	4.5	Base Reflectable Storm Total Precipitation: 16 level/1.1 nm
MR	32	1	100	4.5	Digital Hybrid Scan Reflectivity: 256 level/0.54 nm
MR	33	1	100	4.5	Base Reflectivity: 16 level/0.54 nm

- RPG creates products on scan by scan basis
- Base products: Products that depict base data streams in most direct, meteorological manner
- Derived products: All products that aren't base products

Notes:

Based on operator input, the RPG generates products on a volume scan by volume scan basis. The RPG creates base products (Base Reflectivity, Base Radial Velocity, and Base Spectrum Width) at all elevations of the current VCP directly from the base data received from the RDA (i.e., Level II data). Likewise, three elevation-based products created from the dual-polarization base data stream (i.e., Differential Reflectivity, Correlation Coefficient, and Specific Differential Phase) are also considered to be base products. The RPG then produces derived products using these base data as input.

In general, any product that depicts the base data streams from the RDA are considered base products (i.e., namely, the six products mentioned above). Any product other than those that provide a direct depiction of the Level II data are considered a derived product. Composite Reflectivity is a good example of a derived product. The Composite Reflectivity product algorithm computes the maximum reflectivity at each grid box for all elevation angles and composites them into a single product. Other examples of derived products include:

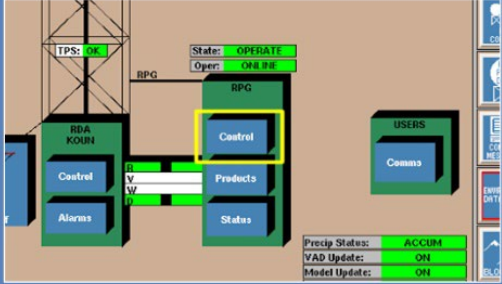
- the Digital Vertically Integrated Liquid (VIL) product,
- the various Precipitation Processing Subsystem (PPS) and Dual-Pol Quantitative Precipitation Estimation (QPE) accumulation products, and
- the Tornadic Vortex Signature (TVS) product.

NOTE: Specific Differential Phase (KDP) is technically not a direct representation of the base data stream, but is the base data with a range derivative applied. However, KDP is considered a base product (even though some radar meteorologists argue that it is technically a derived product) because it is the most direct way to analyze this data stream in a meteorologically relevant manner. In all subsequent training in the Radar & Applications Course, KDP will be treated as a base product.

RPG Control

RPG Control

RPG Intro
Product Generation
RPG Control
Product Distribution



The screenshot displays a control interface for the RPG system. On the left, a navigation menu includes 'RPG Intro', 'Product Generation', 'RPG Control' (highlighted), and 'Product Distribution'. The main area shows a system diagram with components: 'RDA KOUN' (containing 'Control' and 'Alarms'), 'RPG' (containing 'Control', 'Products', and 'Status'), and 'USERS' (containing 'Comms'). A yellow box highlights the 'Control' component within the 'RPG' block. Above the 'RPG' block, status indicators show 'States: OPERATE' and 'Open: ONE 300'. Below the diagram, a status panel shows 'Precip Status: ACCUM', 'VAD Update: ON', and 'Model Update: ON'. A 'Next Section' button is located at the bottom left of the interface.

➔ RPG Human Control Interface (HCI) controls the RPG
➔ RPG HCI controls how products are generated & distributed

Next Section
Click to view system diagram

Notes:

The RPG Human Control Interface (HCI) at the MSCF controls the RPG. During a regular shift, a NWS forecaster may need to access the RPG HCI and change how products are generated or distributed for many reasons. Examples of RPG control tasks include:

- Manually starting the 8 hour performance check,
- Wideband and product distribution communications control, and
- Initiating a reboot of the RPG.

NOTE: The RPG HCI can also be displayed at the RPG KVM and Monitor Interface, which is similar to the MSCF terminal. However, most NWS staff will not need to access the RPG KVM and Monitor Interface.

Product Distribution

Product Distribution

RPG Intro

Product Generation

RPG Control

Product Distribution

Overview | Level II | Level III

→ Sometimes referred to as “Narrowband” comms
→ RPG distributes base data (Level II) and standard products (Level III) to a variety of users

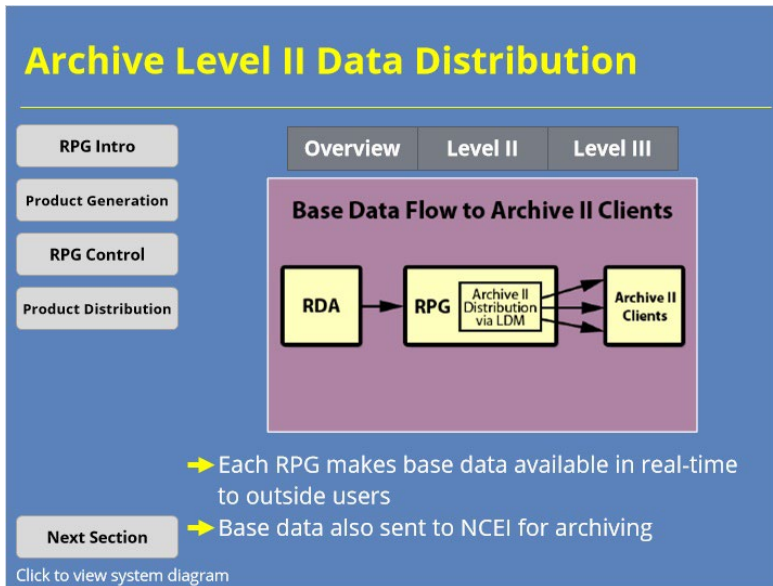
Next Section

Click to view system diagram

Notes:

The RPG distributes the products it generates to a variety of users. The product distribution lines are sometimes referred to as narrowband communications because they once had significantly less bandwidth than the wideband communications between the RDA and RPG. This training provides more details on these transmission lines in later sections on the Product Distribution Communications and the Users Systems section. Use the buttons above the image to learn more about the different data distributed to users by the RPG.

Archive Level II Data Distribution



Notes:

The WSR-88D network includes 122 NWS Radar Product Generators (RPGs) in the Contiguous United States (CONUS), 25 Department of Defense (DoD) RPGs, and 12 Federal Aviation Administration (FAA) RPGs. Each of these RPGs have a separate system - included with its hardware and software - that makes the base data (i.e., Archive Level II data) from the signal processor available in real-time to outside users. This system, the Archive II Data Distribution System, provides a real-time stream of base data from any WSR-88D. These outside users include other government agencies, private companies, universities and research organizations. This system also transmits these data to the National Center for Environmental Information (NCEI) for archiving purposes.

Archive Level III Distribution

Archive Level III Distribution

Overview Level II Level III

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION

Select Station(s):
Select Date Range (YYYYMMDD):
Select Start Date (YYYYMMDD):
Select End Date (YYYYMMDD):
Delivery Distribution (Y/N):
Email Address:

Printed With 0 of 0 Reset Form

Next Section

Click to view system diagram

→ Standardized set of products made available to NCEI for archiving


→ These products also made available in real-time

Notes:

Archive Level III data are a specific set of products which are generated each volume scan. Each RPG distributes the Archive Level III set of products to the NCEI. This process, which is part of the Radar Product Central Collection/Distribution Service (RPCCDS), also makes these products available to other users besides NCEI.

Master System Control Function

Master System Control Function



The screenshot shows a software window titled "Master System Control Functions". It has a "Components" section with buttons for "Close", "Comms Status", "Power Control", "RPG HCI", and "RDA HCI". Below this is a "Network Connectivity" section with buttons for "rpga", "rpgb", "rda", "network", "rpgtr", "rdactr", and "lan".

MSCF Intro

RDA HCI

RPG HCI

- ➔ MSCF includes hardware and software allowing radar operators to interface with RDA & RPG
- ➔ RPG primarily HCI used by radar operators to perform system tasks
- ➔ RDA HCI primarily used by electronics technicians for various tasks

Next Section

Click to view system diagram

Notes:

The MSCF includes the hardware and software for operators to control the WSR-88D system and interface with the RPG and RDA through the RPG and RDA HCIs.

The RPG HCI is commonly used by operators for a variety of system tasks, such as:

- Changing a VCP or
- Editing adaptable parameters.

Some of these tasks, such as changing VCPs, can also be done at the AWIPS workstation. The RDA HCI is primarily used by Electronics Technicians (ETs or EI Techs) to perform a variety of maintenance tasks.

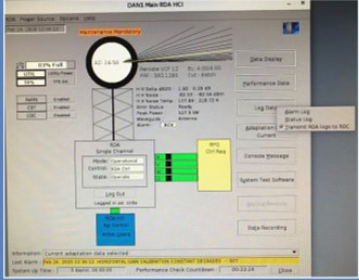
The RDA HCI

The RDA HCI

MSCF Intro

RDA HCI

RPG HCI



- Tasks performed at RDA HCI:
 - ➔ • Power transfers
 - ➔ • Generating static bypass maps
 - ➔ • Coordinating with ETs for off-line maintenance

Next Section

Click to view system diagram

Notes:

Any non-maintenance change in the operational state at the RDA must be initiated at the RDA HCI. Examples of these operational state changes include:

- Power transfers,
- Generating Bypass Maps for clutter suppression, and
- Coordinating with EI Techs for off-line maintenance.

The RDA HCI provides the EI Tech with extensive maintenance analysis tools to determine the overall health of the system. There are a number of diagnostic tools available to determine which maintenance tasks may be needed and if a trip to the RDA itself is necessary.

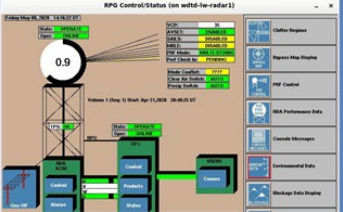
The RPG HCI

The RPG HCI

MSCF Intro Overview RDA Data Quality Status Monitoring FTM Product Distribution

RDA HCI

RPG HCI



- Tasks performed at the RPG HCI include:
 - • Optimizing data quality
 - • RPG status monitoring
 - • Generating Free Text Messages
 - • Controlling product distribution comms

Next Section

Click to view system diagram

Notes:

The RPG HCI directly controls the operation and performance of the RPG.

Examples include:

- Optimizing data quality,
- Status monitoring,
- Generating Free Text Messages, and
- Controlling Product Distribution Communications.

The RPG HCI also allows for some changes at the RDA, usually coordinated with your EI Tech.

RDA Changes at the RPG HCI

RDA Changes at the RPG HCI

MSCF Intro Overview RDA Data Quality Status Monitoring FTM Product Distribution

RDA HCI

RPG HCI

- Examples of RDA changes performed at RPG HCI:
 - ➔ • Changing VCPs
 - ➔ • Toggling AVSET on & off
 - ➔ • Downloading clutter suppression region files

Next Section

Click to view system diagram

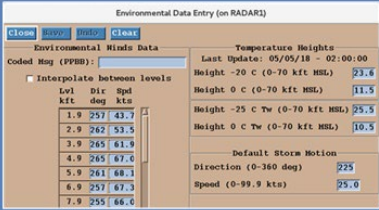
Notes:

Some tasks that affect operations are initiated at the RPG HCI, but are executed at the RDA. Examples are:

- Changing VCPs,
- Manually enabling/disabling AVSET, and
- Downloading clutter suppression region files.

in recent years, common tasks performed at the RPG HCI have been coded where they can also be initiated from a GUI at the AWIPS workstation. Examples of these tasks include changing VCPs and toggling AVSET on and off.

Optimizing Data Quality



The screenshot shows the 'Environmental Data Entry (on RADAR)' window. It features a navigation bar with 'Overview', 'RDA', 'Data Quality', 'Status Monitoring', 'FTM', and 'Product Distribution'. Below the navigation bar are three buttons: 'MSCF Intro', 'RDA HCI', and 'RPG HCI'. The main window displays 'Environmental Winds Data' with a table of wind data and 'Temperature Heights' with a table of temperature data. The wind data table has columns for Level (Lvl), Direction (Dir), and Speed (Spd) in kft, deg, and kts. The temperature data table has columns for Height and Temperature (Tw) in C and Tw in F. The wind data table shows values for levels 1.9 to 7.9. The temperature data table shows values for heights -20 C, 0 C, and -25 C. Below the screenshot, there are two arrows pointing to the right, followed by text: 'The RPG HCI has tools to optimize data quality' and 'Examples include:'. The examples are listed as bullet points: 'Using the appropriate clutter suppression', 'Selecting the optimal VCP', and 'Using the appropriate adaptable parameters'. At the bottom left, there is a 'Next Section' button and a link 'Click to view system diagram'.

MSCF Intro

Overview RDA Data Quality Status Monitoring FTM Product Distribution

RDA HCI

RPG HCI

Environmental Data Entry (on RADAR)

Environmental Winds Data

Lvl	Dir	Spd
kft	deg	kts
1.9	257	43.7
2.9	242	53.3
3.9	245	61.9
4.9	245	67.6
5.9	241	68.1
6.9	257	67.3
7.9	255	66.6

Temperature Heights

Height -20 C (0-70 kft MSL)	23.8
Height 0 C (0-70 kft MSL)	13.5
Height -25 C Tw (0-70 kft MSL)	25.5
Height 0 C Tw (0-70 kft MSL)	10.5

Default Storm Motion

Direction (0-360 deg)	225
Speed (0-99.9 kts)	25.0

→ The RPG HCI has tools to optimize data quality

→ Examples include:

- Using the appropriate clutter suppression
- Selecting the optimal VCP
- Using the appropriate adaptable parameters

Next Section

Click to view system diagram

Notes:

The data that each WSR-88D site generates are available to numerous users for interpretation and decision making. Poor data quality can make product interpretation difficult and could impact critical decisions. The RPG HCI offers NWS forecasters the tools to generate the best quality data possible with current system engineering and design. Examples of data quality problems mitigated using the RPG HCI include:

- Downloading the appropriate clutter suppression region file
- Selecting the optimal VCP for the current weather situation and
- Monitoring and editing adaptable parameters or environmental wind data, when needed.

Free Text Messaging

Free Text Messaging

MSCF Intro Overview RDA Data Quality Status Monitoring FTM Product Distribution

RDA HCI

RPG HCI

- FTM = Free Text Message
- Used to notify users of certain tasks being performed at the RPG HCI, including:
 - RPG reboot
 - Resetting comms hardware

Next Section

Click to view system diagram

Notes:

Certain tasks performed at the RPG HCI require notifying users of that RPG's products that their access will be impacted. The Console Messages button is an efficient tool for composing Free Text Messages and informing users of any upcoming interruptions in their products. Examples include:

- An upcoming RPG reboot and
- Resetting the communications hardware at the RPG.

For more information on how Free Text Messages fit into system operations and responsibilities, please read:

- Federal Meteorological Handbook No. 11 (FMH-11), Part A and
- The tri-agency Memorandum of Agree for the Interagency Operation of the WSR-88D.

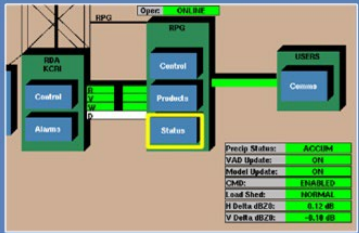
Status Monitoring

Status Monitoring

MSCF Intro Overview RDA Data Quality Status Monitoring FTM Product Distribution

RDA HCI

RPG HCI



Product Status:	ACTIVE
VAD Update:	OK
Model Update:	OK
CMIP:	ENABLED
Last Sync:	1/1/2013
H Delta dBZ:	-0.12 dB
V Delta dBZ:	-0.18 dB

→ The RPG HCI provides comprehensive status info on the RDA

→ Routine monitoring helps maintain quality products

Next Section

Click to view system diagram

Notes:

The RPG HCI offers comprehensive status information on the condition of the RDA, the RPG, and certain users. This information must be monitored frequently to ensure proper system operation so that all users continue to receive quality products.

Product Distribution Comms

Product Distribution Comms

MSCF Intro	Overview	RDA	Data Quality	Status Monitoring	FTM	Product Distribution
------------	----------	-----	--------------	-------------------	-----	----------------------

RDA HCI

RPG HCI

→ Products distributed over various transmission lines

- Principal users have dedicated or dial-up comms

→ All other users use dial-up connections

→ Both are controlled at RPG HCI

Next Section →

Click to view system diagram

Notes:


As products are generated by the RPG, they are sent to the various users over product distribution lines of various transmission rates. These communication lines for principal users (such as the NWS) can be either dedicated or dial-up connections. Offices that control a specific RPG have dedicated connections; All others have dial-up connections. These communication lines are controlled at the RPG HCI.

Product Distribution Comms

Product Distribution Comms

Product Distribution Comms

- Product Distribution Intro
- Primary AWIPS
- Supplemental AWIPS
- Dial-Up Access



- Products transmitted through various lines
- NWS sites: High speed primary connections
- DoD/FAA sites: Dedicated private IP connection
- NWS dial-up access: Transmit through AWIPS WAN

Next Section

[Click to view system diagram](#)

Notes:

As mentioned in the previous section, products generated by the RPG are sent to users over various transmission lines. For most NWS CONUS offices with a dedicated connection to an RPG, the primary connections are high speed lines (AWIPS Local Area Network to NWS RPG LAN connections). For DoD and FAA users (or NWS users of DoD and FAA RPGs), the dedicated connection utilizes a private IP connection. NWS dial-up access initiates at the AWIPS workstation and transmits through the AWIPS Wide Area Network (WAN). Many additional users access the WSR-88D base data (i.e., Archive Level II) and national product list (i.e., Archive Level III) via other distribution methods.

Primary AWIPS Connections

Primary AWIPS Connections

Product Distribution Intro

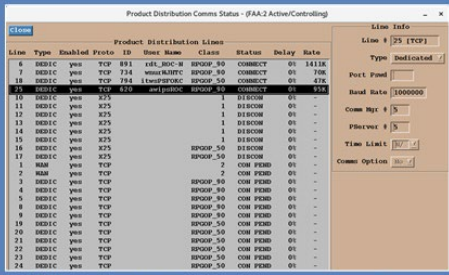
Primary AWIPS

Supplemental AWIPS

Dial-Up Access

Next Section

Click to view system diagram



Line	Type	Enabled	Proto	ID	User Name	Class	Status	Delay	Rate
4	REDUC	yes	TCP	081	rhl_bdc-0	SPQDF_50	CONNECT	00	1411K
7	REDUC	yes	TCP	124	whu@REDUC	SPQDF_50	CONNECT	00	796
10	REDUC	yes	TCP	784	lta@SPDFOR	SPQDF_50	CONNECT	00	47K
10	REDUC	yes	TCP	784	lta@SPDFOR	SPQDF_50	CONNECT	00	47K
11	REDUC	yes	X25			DISCOM	00		
12	REDUC	yes	X25			DISCOM	00		
13	REDUC	yes	X25			DISCOM	00		
14	REDUC	yes	X25			DISCOM	00		
15	REDUC	yes	X25			DISCOM	00		
16	REDUC	yes	X25			DISCOM	00		
17	REDUC	yes	X25			DISCOM	00		
1	RAW	yes	TCP			COM FEND	00		
2	RAW	yes	TCP			COM FEND	00		
4	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
5	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
8	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
9	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
19	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
20	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
21	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
22	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
23	REDUC	yes	TCP			SPQDF_50	COM FEND	00	
24	REDUC	yes	TCP			SPQDF_50	COM FEND	00	

Line Info: Line # 25 (TCP), Type: Dedicated, Port: Pnd, Baud Rate: 3000000, Comm Mtr: 5, Primver: 5, Time Limit: 307, Comm Option: 307

Notes:

Each office should have one or more primary AWIPS connection to a WSR-88D. Your location and type of radar will determine the speed of your primary connection.


Most CONUS NWS offices have a primary AWIPS connection to an NWS radar. These connections are generally fast (approximately 1 Mbps), and load shedding should occur rarely on this connection. CONUS offices with a primary AWIPS connection to a DoD radar will have throughput speeds about half that of a NWS radar. Even with this slower connection, load shedding issues are rare unless there is widespread precipitation and you are using VCP 12 or 212.

Outside of CONUS offices, load shedding is a more likely issue. NWS offices in Alaska and Hawaii both have primary AWIPS connections with typical speeds one-quarter to one-third of that at CONUS sites. Both of these regions can expect load shedding in faster VCPs (e.g., 12 or 212), particularly if there is widespread precipitation. Guam's primary AWIPS connection, unlike those in Alaska or Hawaii, is similar to that of a CONUS site.

Supplemental AWIPS Connections

Supplemental AWIPS Connections

- Product Distribution Intro
- Primary AWIPS
- Supplemental AWIPS
- Dial-Up Access



- Supplemental connections to RPG also available
- Significantly slower than primary connection
- RPS lists for supplemental sites should be shorter, focusing on routinely needed products

Next Section
Click to view system diagram

Notes:

In addition to their primary AWIPS connections, many NWS offices can utilize supplemental AWIPS connections to surrounding radars that may provide a better view of precipitation in their county warning area. These connections are significantly slower than their primary AWIPS connections (i.e., 64-200 Kbps vs 1 Mbps). Products on supplemental AWIPS connections are requested via a Routine Product Set (or RPS) list the same way as with the primary AWIPS connections.


When using RPS lists to request data on supplemental AWIPS connections, offices need to use more care in identifying which products they want to request. RPS lists on these connections should focus on the products forecasters routinely need to perform their duties to prevent load shedding on these slower connections, especially when using faster VCPs during active weather.

NOTE: During office backup support, NWS offices can access a neighboring radar using a different, temporary AWIPS connection that may provide faster throughput speeds depending on your location. However, this connection shares bandwidth with other lines and may not always be your best throughput option. In general, it's best to monitor product availability and adjust your RPS list accordingly during active weather to ensure your AWIPS performs optimally.

Dial-Up Access: OTRs and RMRs

Dial-Up Access: OTRs and RMRs

- Product Distribution Intro
- Primary AWIPS
- Supplemental AWIPS
- Dial-Up Access**



- ➔ OTR = One-Time Request
- ➔ RMR = Radar Multiple Request
- ➔ Load shedding possible due to single line used
- ➔ Only request products you are likely to use

Next Section

[Click to view system diagram](#)

Notes:

Another way NWS offices can request data from a nearby RPG is by submitting a One-Time Request (OTR) or a Radar Multiple Request (RMR) via dial-up access. These requests share a dedicated connection (with a throughput of 128 Kbps), so requests from multiple offices (or even large requests from a single office) can cause load shedding issues. Load shedding from a particular RPG is most likely when service backup operations are ongoing, since OTRs and RMRs share bandwidth with the service backup connection.

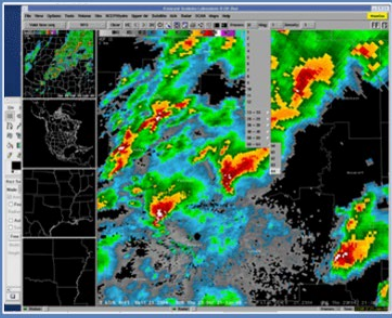
The best way to avoid load shedding on these connections is to avoid requesting products with OTRs or RMRs that your office staff are not likely to use.

User Systems

User Systems

User Systems

- Users Intro
- Principal Users
- Other Users
- AWIPS - II



- Users fall into two general groups:
 - • Principal users
 - • Other users

Next Section

[Click to view system diagram](#)


Notes:

Numerous organizations and individuals use WSR-88D products. We categorize them into two groups based on how they access the data: Principal Users and Other Users. In general, Principal Users (i.e., users among the NWS, FAA, and DoD) have a dedicated and/or dial up connection to a RPG. The remaining users in the NEXRAD Agencies and other users in government, private companies, and academia are referred to as "Other Users."

Principal Users

Principal Users

- Users Intro
- Principal Users**
- Other Users
- AWIPS - II



- Principal users: Governmental agencies that own the WSR-88D
 - • NWS (AWIPS-II)
 - • DoD (Gibson Ridge)
 - • FAA (WARP & ITWS)

Next Section

Click to view system diagram

Notes:

Principal users are members of the governmental agencies which own the WSR-88D. Principal users access RPGs directly through either dedicated or dial-up connections. Each principal user employs different display systems. For instance,

- The NWS uses the Advanced Weather Interactive Processing System (AWIPS) - II,
- The DoD uses the Gibson Ridge (GR) Analyst software (Levels II and III), and
- The FAA has a variety of display systems, including the Weather and Radar Processor (WARP) and the Integrated Terminal Weather System (ITWS).

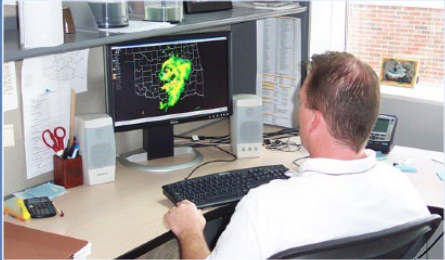
Software and hardware development with these display systems are coordinated with those of the WSR-88D, enabling new WSR-88D products to be displayable on their respective display systems once created by the RPG.

Other Users

Other Users

Users Intro
Principal Users
Other Users
AWIPS - II

Overview Archive II RPCCDS



→ Other user: Any user who isn't a principal user
→ Access WSR-88D base data & products in various ways

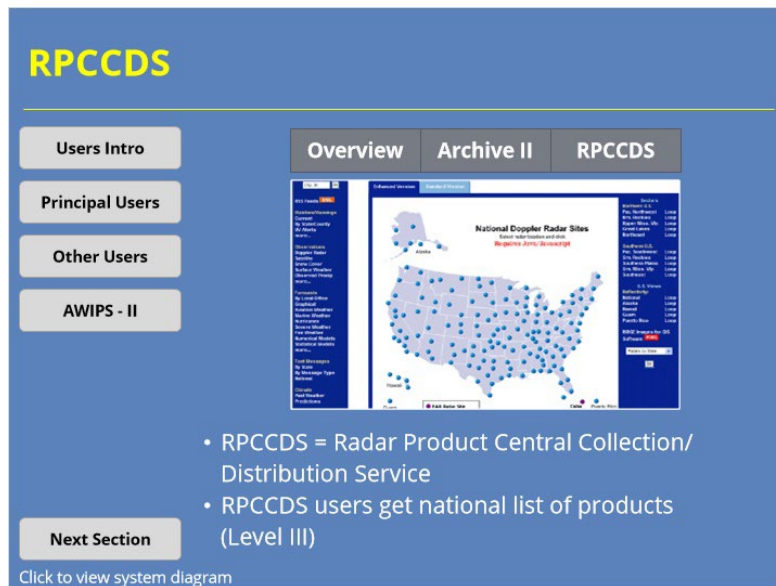
Next Section

Click to view system diagram

Notes:

Other users have access to WSR-88D base data, as well as a predefined set of base and derived products from the RPG. Access for these users outside the three agencies can be achieved in a variety of ways depending on their needs. Use the buttons above the image to learn more about how these users access radar data.

RPCCDS



The screenshot displays the RPCCDS web interface. At the top left, the title "RPCCDS" is shown in yellow. Below it are navigation buttons: "Users Intro", "Principal Users", "Other Users", and "AWIPS - II". A central panel has tabs for "Overview", "Archive II", and "RPCCDS". The "Overview" tab is active, showing a map of the United States with numerous blue dots representing radar sites. To the right of the map is a list of products with columns for "Product", "Status", and "Action". Below the map and list, there are two bullet points: "• RPCCDS = Radar Product Central Collection/ Distribution Service" and "• RPCCDS users get national list of products (Level III)". At the bottom left, there is a "Next Section" button and a link "Click to view system diagram".

- RPCCDS = Radar Product Central Collection/ Distribution Service
- RPCCDS users get national list of products (Level III)

[Click to view system diagram](#)

Notes:

Other users wanting to view WSR-88D products can access a predefined set of real-time products via the Radar Product Central Collection/Distribution Service (RPCCDS). The AWIPS data server sends these products through a dedicated connection to the Network Control Facility's servers at Silver Spring, MD. From there, the data can be accessed by users in real-time via:

- The NWS Ridge web site,
- Paid access to dedicated connections for private companies,
- Third party smartphone applications,
- Free access to a File Transfer Protocol (FTP) server, or
- Other access from many other private sector and university sites.

Outside users can also access these products (i.e., Archive Level III data) via the NCEI archives for past events.

Archive II Clients

Archive II Clients

Users Intro | Overview | Archive II | RPCCDS

Principal Users

Other Users

AWIPS - II

Base Data Flow to Archive II Clients

```
graph LR; RDA[RDA] --> RPG[RPG Archive II Distribution via LDM]; RPG --> Clients[Archive II Clients];
```

- Archive II data for users that require base data
- Users can use or redistribute data as they wish
- Archive II data available in real-time and from NCEI database

Next Section

[Click to view system diagram](#)

Notes:


For users that require base data (i.e., Archive Level II), the Archive II Data Distribution System provides real-time access to this data stream. These users, or Archive II Clients, have no restrictions on the use or redistribution of the base data. In addition to real-time usage, the Archive Level II data are also transferred to archives at the NCEI. The NCEI makes the archived data available for general use to research organizations and other users interested in past events.

AWIPS - II

AWIPS - II

- Users Intro
- Principal Users
- Other Users
- AWIPS - II

Overview Comms RPCCDS Workstation



- AWIPS = Advanced Weather Interactive Processing System

Next Section → Hardware & software used by NWS

[Click to view system diagram](#)

Notes:

The NWS hardware and software used to acquire, process, and store the products received from the RPG is called AWIPS, which is primarily located in a computer equipment room in the NWS office. AWIPS operators request, display, and manipulate WSR-88D products at an AWIPS workstation in their local operations area. The NWS currently uses the second generation of AWIPS, commonly called AWIPS - II.

AWIPS Narrowband Comms to RPG

AWIPS Narrowband Comms to RPG

Users Intro

Principal Users

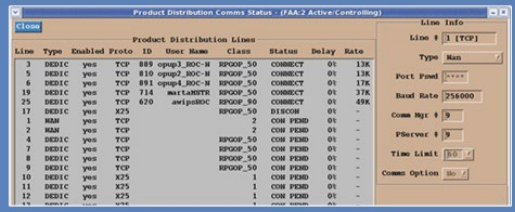
Other Users

AWIPS - II

Next Section

Click to view system diagram

Overview Comms RPCCDS Workstation



Line	Type	Enabled	Proto	ID	Desc Name	Class	Status	Delay	Rate
3	DEDIC	yes	TCP	888	opsp1_RDC-N	RPQOP_50	CONNECT	01	13K
5	DEDIC	yes	TCP	810	opsp2_RDC-N	RPQOP_50	CONNECT	01	13K
6	DEDIC	yes	TCP	891	opsp4_RDC-N	RPQOP_50	CONNECT	01	17K
19	DEDIC	yes	TCP	714	AWIPSTR	RPQOP_50	CONNECT	01	37K
25	DEDIC	yes	TCP	670	AWIPSDIC	RPQOP_50	CONNECT	01	45K
17	DEDIC	yes	X25			RPQOP_50	DIBCON	01	-
1	RMM	yes	TCP				COM FREQD	01	-
2	RMM	yes	TCP				COM FREQD	01	-
4	DEDIC	yes	TCP			RPQOP_50	COM FREQD	01	-
7	DEDIC	yes	TCP			RPQOP_50	COM FREQD	01	-
8	DEDIC	yes	TCP			RPQOP_50	COM FREQD	01	-
9	DEDIC	yes	TCP			RPQOP_50	COM FREQD	01	-
10	DEDIC	yes	X25				COM FREQD	01	-
11	DEDIC	yes	X25				COM FREQD	01	-
12	DEDIC	yes	X25				COM FREQD	01	-
14	DEDIC	yes	X25				COM FREQD	01	-

Line Info

Line # 1 (TCP)

Type: Man

Post Found: []

Band Rate: 254000

Comm Hgt: [9]

Priority: [9]

Time Limit: [30]

Comm Option: [0]

➔ AWIPS w/co-located RPGs have dedicated LAN connections

➔ All AWIPS can use RPS List, OTRs, & RMRs for non-dedicated sites

➔ AWIPS can send data & commands to RPG, too

Notes:

All AWIPS sites with co-located RPGs have a dedicated TCP/IP connection from the AWIPS LAN to the RPG LAN. For NWS sites with MSCF control of DoD or FAA radars, AWIPS connects to those RPGs by a Private IP connection. All AWIPS sites can also access data from non-dedicated RPGs using RPS Lists, as well as either the One-Time Request or Radar Multiple Request processes through the AWIPS WAN.

AWIPS both receives and sends data to dedicated RPGs through the Product Distribution (sometimes called Narrowband) Communications lines. AWIPS data servers transfer Rapid Refresh (RAP) model data to the RPG. In doing so, users can automate the computation of RPG algorithm inputs that require environmental data (e.g., the Hail Detection Algorithm and the Environmental Wind Table). AWIPS users can also send commands to the RPG that mimic tasks typically performed at the RPG HCI, such as:

- Enabling AVSET,
- Changing VCPs, and
- Choosing to enable SAILS (and how many SAILS tilts to include).


This capability makes it easier for the radar operator to maintain data quality during operations of a time sensitive nature (such as warning operations).

AWIPS Workstation

AWIPS Workstation

- Users Intro
- Principal Users
- Other Users
- AWIPS

Overview Comms RPCCDS Workstation



- AWIPS uses Linux workstations
- CAVE = Common AWIPS Visualization Environment
- CAVE displays radar and other data types on common background

Next Section

[Click to view system diagram](#)

Notes:

AWIPS uses Linux-based workstations to display the radar image products and alphanumeric data. The primary application used for radar data display and analysis is the Common AWIPS Visualization Environment (CAVE). CAVE can display:

- All of the products on the Product Generation Table,
- Products requested through the One-Time Request and Radar Multiple Request processes, and
- Alerts from the dedicated RPGs.

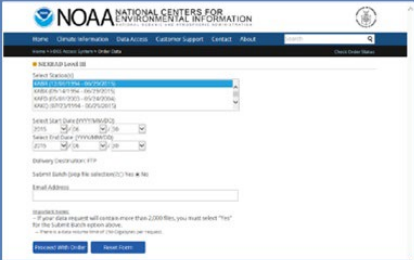
The power of the AWIPS workstation is its ability to display radar and all other meteorological data on a common map background.

AWIPS & RPCCDS

AWIPS & RPCCDS

- Users Intro
- Principal Users
- Other Users
- AWIPS

Overview Comms RPCCDS Workstation



→ AWIPS plays an important role in disseminating Level III products to other users

→ AWIPS WAN transfers data to NCF, other users

Next Section

Click to view system diagram

Notes:

In addition to making RPG products available to NWS WFO staff, the AWIPS also plays an important part in disseminating WSR-88D products out to other organizations. Each RPG sends Archive Level III products via the AWIPS WAN to the NCF in Silver Spring, MD. From there, the Archive Level III data are made available to other users through the RPCCDS.

Conclusion & Quiz

Conclusion

Conclusion

We identified:

- 6 components of the WSR-88D & their functions
- Several key functions of the WSR-88D & which components (or sub-components) perform them
- Where components & sub-components fit into the system as a whole
- Systems or data streams where users may visualize data from the WSR-88D
- Interfaces (RPG HCI, RDA HCI, or AWIPS) where certain tasks can be performed

Notes:

During this lesson, we identified the following items. We discussed the six components (and their various sub-components that make up the WSR-88D. We, also, mentioned their functions. Likewise, we highlighted certain key functions of the WSR-88D system and which parts of the system perform them. So, hopefully you feel comfortable relating the components of the system to the system's functions, and vice versa. We discussed how each of the components and sub-components fit into the system as a whole, too. So, you should have an idea where the different components fit in the system as a whole. We identified the systems and data streams that users may use to visualize radar data. We also discussed the different interfaces where radar operators might interact with the WSR-88D system in order to control the data it outputs.

With this information in mind, please proceed to the next slide to start the quiz.

Lesson Completion

Lesson Completion

You have successfully completed the lesson!

Use the Exit button to close the lesson & record completion

Notes:

Congratulations on completing the lesson! You are now ready to move on to the rest of the Radar & Applications Course. If you are taking this lesson in the Commerce Learning Center, please make sure to use the Exit button in the player to close this window and record your completion.