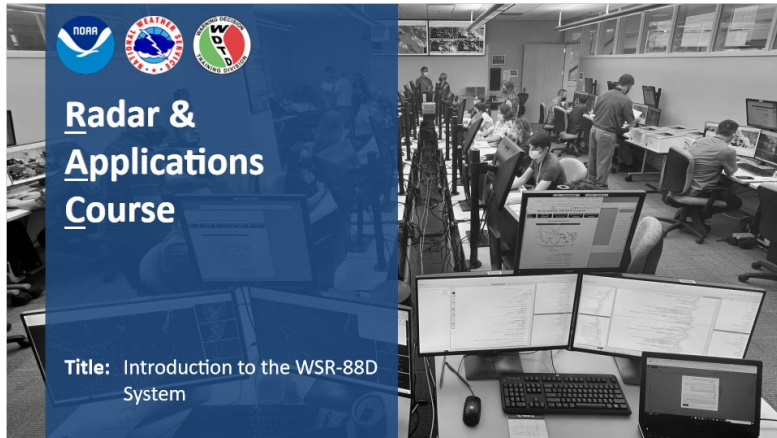


Introduction to the WSR-88D

1. Introduction to the WSR-88D

1.1 Introduction

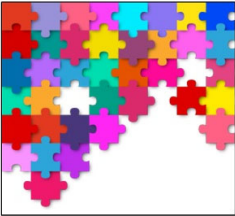
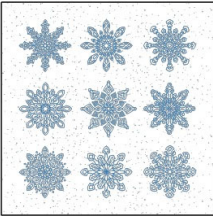


Notes:

Welcome to this lesson, Introduction to the Weather Surveillance Radar - 88 Doppler (WSR-88D). Let's get started.

1.3 Key Points to Know about This Lesson

Key Points to Know about This Lesson

	<p>WSR-88D NWS DoD FAA AWIPS WFO</p>	
How components fit together	Introduce common acronyms	Show system variability

Notes:

You have just started the Radar & Applications Course, and we begin with this introductory lesson on the WSR-88D. While it makes sense to start a large course with an introduction, what we are introducing may not be clear at first. So, let me explain:

1. First, we are introducing you to the different components that make up the WSR-88D and how they fit together. It's like a big jigsaw puzzle. As we tell you about these different pieces of the system, we try to do so with limited details. It's kind of like a 10,000 foot view of each component and how they fit together. The details we do provide are primarily examples that may be included on the test at the lesson.
2. We also will be introducing you to a LOT of acronyms. We will not ask you to regurgitate what these acronyms are. However, you are going to get exposed to a lot of acronyms during your time of government service, and the WSR-88D (which is itself an acronym) has many components, applications, and related practices that use these terms. What we include is our institution jargon, so we are just ripping the band-aid off now to help you get used to it.
3. The last thing we are introducing is the variability in the system. This radar network is owned and maintained by three federal agencies (NWS, Dept. of Defense, and the FAA). Your office may have access to and control of radars with different configurations due to which agency owns that particular radar or certain restrictions and requirements that had to be met when siting the system. Even if some of these details don't apply to your local radar, these details bring awareness to the variability of the different radars in the vast WSR-88D network.

1.4 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:

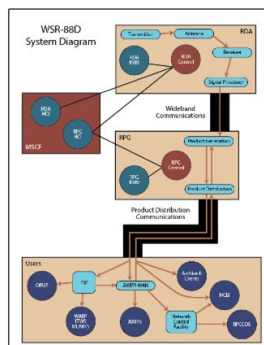
- Radar Data Acquisition Unit (RDA),
- Wideband Communications between the RDA and The Radar Product Generator,
- Radar Product Generator (RPG),
- Master System Control Function (MSCF),
- Product Distribution Communications, and
- User Systems (e.g., Advanced Weather Interactive Processing System).

(Crum et al., 1993; Crum et al., 1998)

1.5 Note on System Diagram Links

Note on System Diagram Links

- Located on bottom of each slide
- Open up images as a lightbox
- Not necessary to visit (only provided to assist)



Notes:

As you go through this lesson, 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.

1.6 Radar Data Acquisition Unit (RDA)

Radar Data Acquisition Unit (RDA)

- Origination point of radar data you will use
- Consists of 5 subcomponents:
 - Transmitter
 - Antenna
 - Receiver
 - Signal Processor
 - KVM Interface



[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.

1.7 Transmitter

Transmitter

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



[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.

(Heiss et al., 1990; Bringi and Chandrasekar, 2001; Curtis, et al., 2003)

1.8 Antenna

Antenna

- Volume Coverage Patterns
- Pulses
- Operational Modes
- AVSET
- SAILS
- MRLE



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

[Click to view system diagram](#)

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).

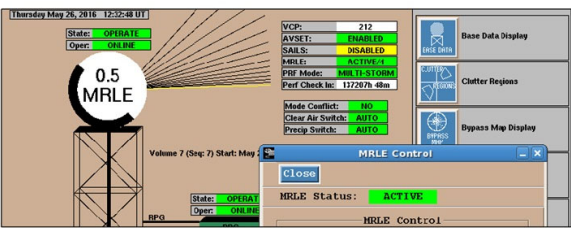
The antenna elevation position has a wide possible range (i.e., anywhere from -1.0 to 60.0 degrees) for scanning purposes. The Volume Coverage Pattern (VCP), the operational mode in use, and the use of three different dynamic scanning strategy applications determine the antenna angles used to collect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

MRLE (Slide Layer)

Antenna

- Volume Coverage Patterns
- Pulses
- Operational Modes
- AVSET
- SAILS
- MRLE



- 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

[Click to view system diagram](#)

Notes:

The latest dynamic scanning feature added to the WSR-88D is the Mid-Volume Rescan of Low-Level Elevations (MRLE; Chrisman, 2016). 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.

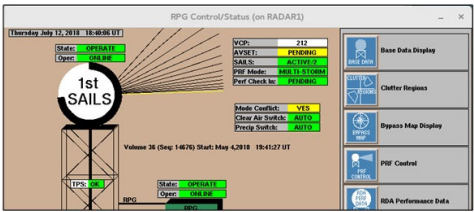
The radar operator controls the use of MRLE at the MSCF or AWIPS workstation.

SAILS (Slide Layer)

Antenna

- Volume Coverage Patterns
- Pulses
- Operational Modes
- AVSET
- SAILS
- MRLE

[Click to view system diagram](#)



VCP:	212
AVSET:	YES
SAILS:	YES
PRF Mode:	800 11 110000
PRF Check:	OK
Mode Control:	YES
Clear Air Switch:	NO
Presc. Switch:	NO

Volume 36 (Seq: 14076) Start: May 4, 2018 18:41:27 UT

State: OPERATIONAL
Open: 2018-05-04

- SAILS: Supplemental Adaptive Intra-Volume Low-Level Scan
- Allows for additional lowest level tilt scans in a VCP
 - 3 additional tilts in VCPs 12 & 212
 - 1 additional tilt in VCPs 34, 35, 112, & 215

Notes:

Another dynamic scanning feature available in certain VCPs is called the Supplemental Adaptive Intra-Volume Low-Level Scan (or SAILS; Chrisman, 2013). 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 34, 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.

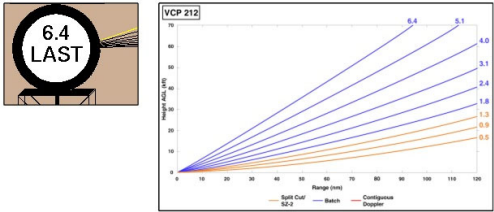
The radar operator controls the use of SAILS at the MSCF or at the AWIPS Workstation.

AVSET (Slide Layer)

Antenna

- Volume Coverage Patterns
- Pulses
- Operational Modes
- AVSET
- SAILS
- MRLE

[Click to view system diagram](#)



- AVSET = Automated Volume Scan Evaluation & Termination
- Allows for early termination of a VCP if no radar echoes
- VCPs ~30 sec shorter w/AVSET enabled, on average
- Doesn't run in clear air mode VCPs

Notes:

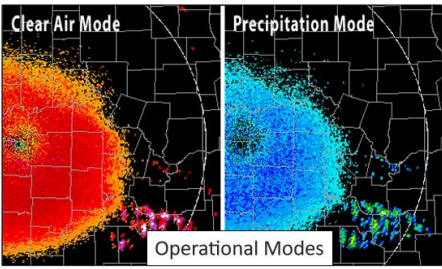
VCPs determine the elevation angles that the radar scans, but WSR-88D operators have the ability to implement "dynamic" scanning techniques, too. The first dynamic scanning technique we will discuss is the Automated Volume Scan Evaluation and Termination (or AVSET; Chrisman, 2009). This application can 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.

Operational Modes (Slide Layer)

Antenna

- Volume Coverage Patterns
- Pulses
- Operational Modes
- AVSET
- SAILS
- MRLE



- Clear Air: VCPs 31, 34 or 35
- Precipitation: VCPs 12, 112, 212, or 215

[Click to view system diagram](#)

Notes:

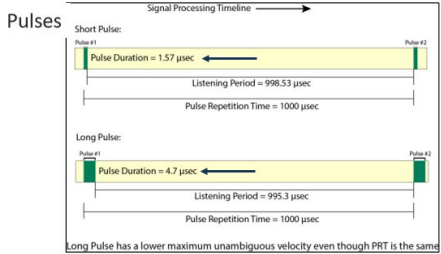
In addition to VCPs, the WSR-88D has two operational modes which play a part in antenna positioning: Clear Air mode and Precipitation mode. The operational mode of the radar determines which VCPs are available to be used. For example:

- Clear Air mode offers VCPs 31, 34 or 35
- Precipitation mode offers VCPs 12, 112, 212, or 215.

Pulses (Slide Layer)

Antenna

- Volume Coverage Patterns
- Pulses
- Operational Modes
- AVSET
- SAILS
- MRLE



- Long pulse:
 - Pro: Increases radar sensitivity
 - Con: Poorer quality Doppler velocity

[Click to view system diagram](#)

Notes:

VCPs 31 and 34 use a long pulse (4.7 microseconds), while all the other VCPs use a short pulse (1.57 microseconds). Longer pulses increase the sensitivity of the radar, but result in poorer Doppler velocity data.

Volume Coverage Patterns (Slide Layer)

Antenna

Volume Coverage Patterns
 Pulses
 Operational Modes
 AVSET
 SAILS
 MRLE

	VCP 12	VCP 112	VCP 31	VCP 34	VCP 35	VCP 212	VCP 215
# of tilts (full)	15	15	5	7	9	15	15
Clear Air/ Precip	Precip	Precip	Clear Air	Clear Air	Clear Air	Precip	Precip
SZ-2/MPDA	No	SZ-2/ MPDA	No	SZ-2	SZ-2	SZ-2/ MPDA	SZ-2/ MPDA
SAILS/MRLE	3/4	1/4	0/0	1/0	1/0	3/4	1/4

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

[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 is enabled) during a volume scan of just over 4 minutes. It also has the options for 3 SAILS or 4 MRLE tilts.
 - VCP 112 - Samples up to 15 elevations during the 5.5 minute volume scan that uses the Multi-PRF Dealiasing Algorithm (MPDA) on the lowest 3 elevations. It has the option for 1 SAILS or 4 MRLE tilts.
 - VCP 31 - Samples 5 elevations during the 10 minute volume scan.
 - VCP 34 – Samples 7 elevations during a 10 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 3 elevations. It has the option for 1 SAILS tilt.
 - VCP 35 - Samples 9 elevations during the 7 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 3 elevations. It also has the option for one SAILS tilt.
 - VCP 212 - Samples up to 15 elevations during the 4.5 to 5 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 3 elevations. It has the option for 3 SAILS or 4 MRLE tilts.
 - VCP 215 - Samples up to 15 elevations during the 7 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 3 elevations. It has the option for 1 SAILS or 4 MRLE tilts.

(Crum et al., 1993; Brown et al., 2005; Boettcher et al., 2022)

1.9 Receiver

Receiver

- Backscattered energy returned to antenna gets routed to the receiver
- Receiver listens for returned signal:
 - Horizontal
 - Vertical
- Amplifies, adjusts, and digitizes signal
- Captures the necessary amplitude & phase data



[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.

1.10 Signal Processor

Signal Processor

- Clutter Filtering
- Base Data
- Range Unfolding
- Level 1 Archive



- 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 left of the image to learn more about these functions.

Level 1 Archive (Slide Layer)

Signal Processor

- Clutter Filtering
- Base Data
- Range Unfolding
- Level 1 Archive



- Archive Level I is returned signal data in digital format
- Available at all sites

[Click to view system diagram](#)

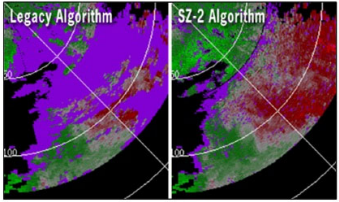
Notes:

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.

Range Unfolding (Slide Layer)

Signal Processor

- Clutter Filtering
- Base Data
- Range Unfolding
- Level 1 Archive



- Addresses issues from multiple trip echoes
- Three techniques used:
 - Legacy Range Unfolding Algorithm
 - Sachidananda-Zrnica-2 (SZ-2)
 - Multi-PRF Dealiasing Algorithm

[Click to view system diagram](#)

Notes:

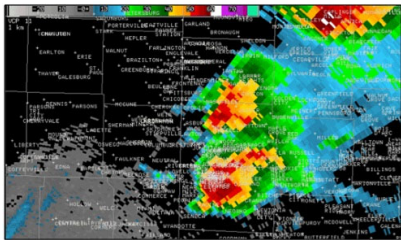
Multiple trip echoes cause a phenomenon known as range folding. Range folding occurs frequently in the velocity and spectrum width data due to the high pulse repetition frequencies (PRFs) that are used. Range unfolding is the process of “unfolding” these returns to their appropriate ranges. The unfolding 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-Zrnica (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.

(Conway et al., 1997; Sachidananda and Zrnica, 1999; Zrnica et al., 2006)

Base Data (Slide Layer)

Signal Processor

- Clutter Filtering
- Base Data
- Range Unfolding
- Level 1 Archive



- 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:

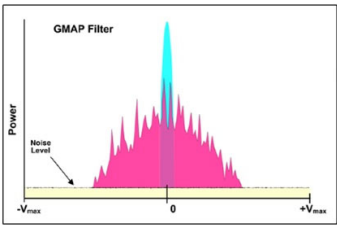
- base reflectivity,
- base radial velocity, and
- base spectrum width.

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.

Clutter Filtering (Slide Layer)

Signal Processor

- Clutter Filtering
- Base Data
- Range Unfolding
- Level 1 Archive



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

[Click to view system diagram](#)


Notes:

Most ground targets have little or no motion. This trait, when applicable, distinguishes ground targets from most atmospheric scatterers (Chrisman et al., 1995). 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; Ice et al., 2007) 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; Passarelli and Siggia, 2004) 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.

1.11 KVM & Monitor Interface

KVM & Monitor Interface



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

[Click to view system diagram](#)


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.

1.12 “Wideband” Communications

“Wideband” Communications

- Direct Wire Link
- Private T1
- Commercial T1
- Backup Comms



- Base data transmission lines between RDA & RPG
- Can be one of three options:
 - Direct Wire link
 - Private T1
 - Commercial T1 (Telco)

[Click to view system diagram](#)

Notes:

Main Slide: 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).

Backup Comms (Slide Layer)

“Wideband” Communications

- Direct Wire Link
- Private T1
- Commercial T1
- Backup Comms



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

[Click to view system diagram](#)

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 (Slide Layer)

“Wideband” Communications

- 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

[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).

Private T1 (Slide Layer)

“Wideband” Communications

- 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

[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.

Direct Wire Link (Slide Layer)

“Wideband” Communications

- 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

[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.

1.14 Product Generation

Product Generation

Product Code	Product Name	Description
BR	Base Reflectivity	Base Reflectivity: 10 10m/2/10 m
BRV	Base Radial Velocity	Base Radial Velocity: 10 10m/2/10 m
BSW	Base Spectrum Width	Base Spectrum Width: 10 10m/2/10 m
CR	Composite Reflectivity	Composite Reflectivity: 10 10m/2/10 m
DVIL	Digital VIL	Digital VIL: 10 10m/2/10 m

- RPG creates products on scan by scan basis
- Use Reflectivity, Radial Velocity, Spectrum Width, and dual-pol data streams
- Base products: Products that depict base data streams in most direct, meteorological manner
- Derived products: All products that aren't base products (e.g., CZ, DVIL)
- KDP treated as a base product since it's best for meteorological interpretation

[Click to view system diagram](#)

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:

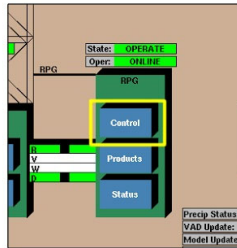
- the Digital Vertically Integrated Liquid (VIL) product,
- the various Precipitation Processing Subsystem (PPS) and Dual-Pol Quantitative Precipitation Estimation (QPE) accumulation products, and
- the Tornadic Vortex Signature (TVS) product.

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.

1.15 RPG Control

RPG Control

- RPG Human Computer Interface (HCI) controls the RPG
- RPG HCI controls how products are generated & distributed
- Examples include:
 - Manual start of 8-hour performance check
 - Wideband & product distribution comms
 - Initiating a RPG reboot



[Click to view system diagram](#)

Notes:

The RPG Human Computer 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.

1.16 Product Distribution

Product Distribution

Archive Level II

Archive Level III

Line	Type	Enabled	Proto	ID	Desc	Name	Class	Status	Delay Rate
1	REDIC	yes	TCP	520			SP00P_90	CONNECT	01 512K
2	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
3	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
4	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
5	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
6	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
7	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
8	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
9	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
10	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
11	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -
12	REDIC	yes	TCP				SP00P_90	COM PERIOD	01 -

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

[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 lesson provides more details on these transmission lines in later sections on the Product Distribution Communications and the Users Systems section. Use the buttons to the left of the image to learn more about the different data distributed to users by the RPG.

Archive Level III (Slide Layer)

Product Distribution

Archive Level II
 Archive Level III

- Standardized set of products made available to NCEI for archiving
- These products also made available in real-time via RPCCDS

[Click to view system diagram](#)

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.

Archive Level II (Slide Layer)

Product Distribution

Archive Level II
 Archive Level III

- Each RPG makes base data available in real-time to outside users
- Base data also sent to NCEI for archiving

[Click to view system diagram](#)

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.

1.17 Master System Control Function

Master System Control Function



- MSCF includes hardware and software allowing radar operators to interface with RDA & RPG
- RPG primarily HCI used by radar operators to perform system tasks, such as:
 - Changing VCP
 - Editing adaptable parameters
- RDA HCI primarily used by electronics technicians for various tasks

[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:

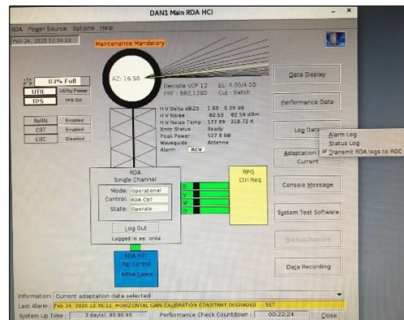
- Changing a VCP or
- Editing adaptable parameters.

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.

1.18 The RDA HCI

The RDA HCI

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



[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:

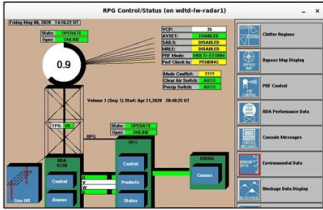
- Power transfers,
- Generating Bypass Maps for clutter suppression, and
- Coordinating with EI Techs for off-line maintenance.

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.

1.19 The RPG HCI

The RPG HCI

- RDA
- Data Quality
- Status Monitoring
- Free Text Message
- Product Distribution



- Control Messages
- Network Map Display
- RPG Control
- Web Performance Data
- Environmental Data
- Message Alert Display

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

[Click to view system diagram](#)

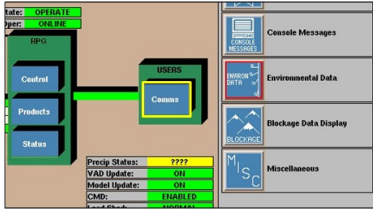
Notes:

- The RPG HCI directly controls the operation and performance of the RPG. Example tasks 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.

Product Distribution (Slide Layer)

The RPG HCI

- RDA
- Data Quality
- Status Monitoring
- Free Text Message
- Product Distribution



- Console Messages
- Environmental Data
- Blockage Data Display
- Miscellaneous

- 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

[Click to view system diagram](#)

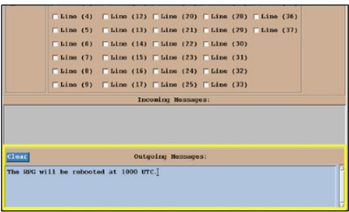
Notes:

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 messages connections; All others have dial-up connections. These communication lines are controlled at the RPG HCI.

Free Text Message (Slide Layer)

The RPG HCI

- RDA
- Data Quality
- Status Monitoring
- Free Text Message
- Product Distribution



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

[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.

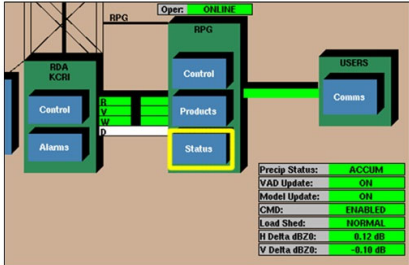
For more information on how Free Text Messages fit into system operations and responsibilities, please read:

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

Status Monitoring (Slide Layer)

The RPG HCI

- RDA
- Data Quality
- Status Monitoring
- Free Text Message
- Product Distribution



Precip Status:	ACCUM
VAD Update:	ON
Model Update:	ON
CMR:	DISABLED
Load Shed:	NORMAL
H Delta dBZ:	0.12 dB
V Delta dBZ:	-0.10 dB

- The RPG HCI provides comprehensive status info on the RDA
- Routine monitoring helps maintain quality products

[Click to view system diagram](#)

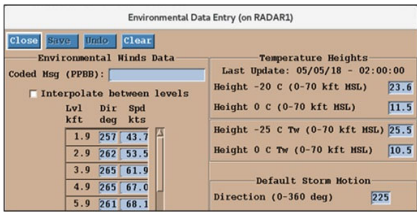
Notes:

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.

Data Quality (Slide Layer)

The RPG HCI

- RDA
- Data Quality
- Status Monitoring
- Free Text Message
- Product Distribution



Environmental Data Entry (on RADAR1)

Environmental Winds Data

Lvl kft	Dir deg	Spd kts
1.9	257	43.7
2.9	262	53.5
3.9	265	61.9
4.9	265	67.0
5.9	261	68.1

Temperature Heights

Last Update: 05/05/18 - 02:00:00

- Height -20 C (0-70 kft HSL) 23.6
- Height 0 C (0-70 kft HSL) 11.5
- Height -25 C Tw (0-70 kft HSL) 25.5
- Height 0 C Tw (0-70 kft HSL) 10.5

Default Storm Motion

Direction (0-360 deg) 225

- 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

[Click to view system diagram](#)

Notes:

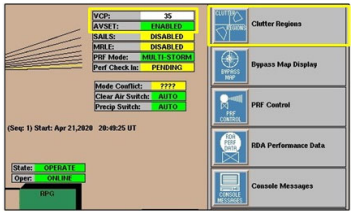
The data that each WSR-88D site generates are available to numerous users for interpretation and decision making. Poor data quality can make product interpretation difficult and could impact critical decisions. The RPG HCI offers NWS forecasters the tools to generate the best quality data possible with 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.

RDA (Slide Layer)

The RPG HCI

- RDA
- Data Quality
- Status Monitoring
- Free Text Message
- Product Distribution



VCP: 35

AVSET: DISABLED

DBLE: DISABLED

MBL: DISABLED

PRF Mode: MBL STORM

PRF Check: OFF

State Control: 7777

Clear Air Switch: AUTO

Pretp Switch: AUTO

(Seq: 1) Start: Apr 21, 2028 20:49:25 UT

State: OPERABLE

Oper: 05/05/18

Buttons: Clutter Region, Depass Map Display, PRF Control, RDA Performance Data, Cascade Messages

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

[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.

1.20 Product Distribution Comms

Product Distribution Comms

- 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

[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.

Dial-Up Access (Slide Layer)

Product Distribution Comms

- 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

[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.

Supplemental AWIPS (Slide Layer)

Product Distribution Comms

- 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

[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.

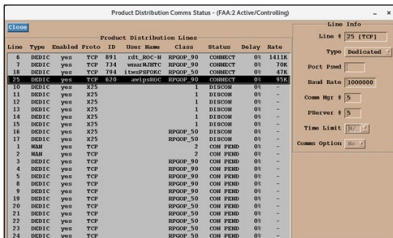
When using RPS lists to request data on supplemental AWIPS connections, offices need to use more care in identifying which products they want to request. RPS lists on these connections should focus on the products forecasters routinely need to perform their duties to prevent load shedding on these slower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

Primary AWIPS (Slide Layer)

Product Distribution Comms

- Primary AWIPS
- Supplemental AWIPS
- Dial-Up Access



Line	Type	Enabled	Proto	ID	User Name	Class	Status	Delay	Rate	
6	DEDIC	yes	TCP	891	isd_bnc-H	IPROF_30	CONNECT	01	1411K	
7	DEDIC	yes	TCP	734	wasw/NBTC	IPROF_30	CONNECT	01	736	
18	DEDIC	yes	TCP	784	lsaw/PRVAC	IPROF_30	CONNECT	01	476	
10	DEDIC	yes	X25				DISCON	01	-	
11	DEDIC	yes	X25				DISCON	01	-	
12	DEDIC	yes	X25				DISCON	01	-	
13	DEDIC	yes	X25				DISCON	01	-	
14	DEDIC	yes	X25				DISCON	01	-	
15	DEDIC	yes	X25				DISCON	01	-	
16	DEDIC	yes	X25				DISCON	01	-	
17	DEDIC	yes	X25				DISCON	01	-	
1	NWS	yes	TCP				CON FEND	01	-	
2	NWS	yes	TCP				CON FEND	01	-	
3	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
4	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
5	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
8	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
9	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
19	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
20	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
21	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
22	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
23	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-
24	DEDIC	yes	TCP				IPROF_30	CON FEND	01	-

Line Info

Type: **Indicated**

Port: **Fixed**

Serial Rate: **3000000**

Comm Mgr: **5**

Flowctrl: **5**

Time Limit: **00:14**

Comm Option: **00:14**

- Each office should have one or more primary connections
- Connections generally fast, load shedding rare
- Load shedding more common at DoD & OCONUS sites

[Click to view system diagram](#)

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.

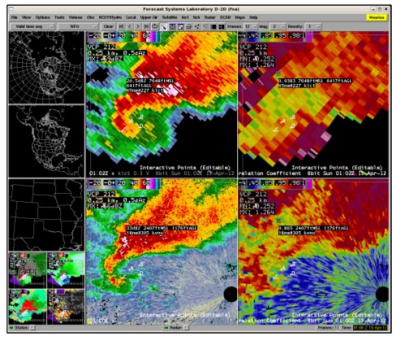
Most CONUS NWS offices have a primary AWIPS connection to an NWS radar. These connections are generally fast (approximately 1 Mbps), and load shedding should occur rarely on this connection. CONUS offices with a primary AWIPS connection to a DoD radar will have throughput speeds about half that of a 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.

1.21 User Systems

User Systems

- Users fall into two general groups
- Principal users:
 - NWS
 - DoD
 - FAA
- Other users:
 - Other government agencies
 - Private companies
 - Academia



[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."

1.22 Principal Users

Principal Users

- Governmental agencies that own the WSR-88D
- Displays systems include:
 - NWS (AWIPS-II)
 - DoD (Gibson Ridge)
 - FAA (WARP & ITWS)
- Software & hardware development coordinated with WSR-88D updates



[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,

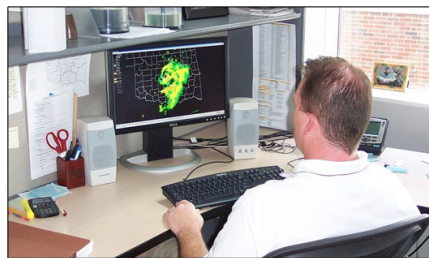
- The NWS uses the Advanced Weather Interactive Processing System (AWIPS) - II,
- The DoD uses the Gibson Ridge (GR) Analyst software (Levels II and III), and
- The FAA has a variety of display systems, including the Weather and Radar Processor (WARP) and the Integrated Terminal Weather System (ITWS).

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.

1.23 Other Users

Other Users

- Archive II Clients
- RPCCDS Users



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

[Click to view system diagram](#)

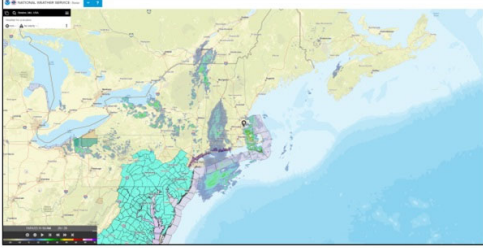
Notes:

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 on the left to learn more about how these users access radar data.

RPCCDS Users (Slide Layer)

Other Users

- Archive II Clients
- RPCCDS Users



- 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:

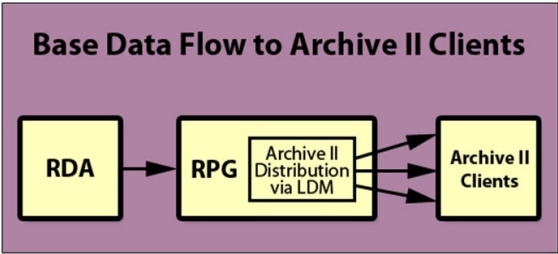
- The NWS Ridge web site,
- Paid access to dedicated connections for private companies,
- Third party smartphone applications,
- Free access to a File Transfer Protocol (FTP) server, or
- Other access from many other private sector and university sites.

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

Archive II Clients (Slide Layer)

Other Users

- Archive II Clients
- RPCCDS Users



- 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

[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.

1.24 AWIPS - II

AWIPS - II

- AWIPS Narrowband Comms
- AWIPS & RPCCDS
- AWIPS Workstation



- AWIPS = Advanced Weather Interactive Processing System
- Hardware & software used by NWS

[Click to view system diagram](#)


Notes:

Main Slide: 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 Workstation (Slide Layer)

AWIPS - II

- AWIPS Narrowband Comms
- AWIPS & RPCCDS
- AWIPS Workstation



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

[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:

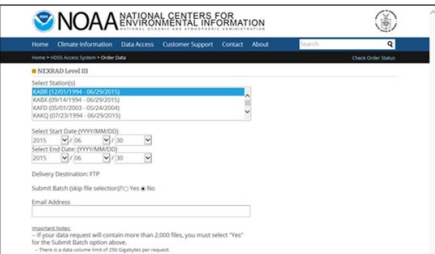
- All of the products on the Product Generation Table,
- Products requested through the One-Time Request and Radar Multiple Request processes, and
- Alerts from the dedicated RPGs.

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

AWIPS & RPCCDS (Slide Layer)

AWIPS - II

- AWIPS Narrowband Comms
- AWIPS & RPCCDS**
- AWIPS Workstation



- AWIPS plays an important role in disseminating Level III products to other users
- AWIPS WAN transfers data to NCF, other users

[Click to view system diagram](#)

Notes:

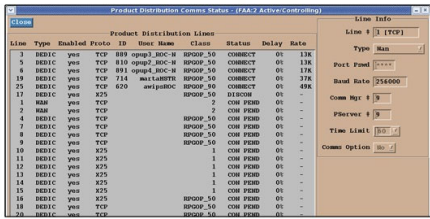
In addition to making RPG products available to NWS WFO staff, the AWIPS also plays an important part in disseminating WSR-88D products out to other organizations. Each RPG sends Archive Level III products via the AWIPS WAN to the NCF in Silver Spring, MD. From there, the Archive Level III data are made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

AWIPS Narrowband Comms (Slide Layer)

AWIPS - II

- AWIPS Narrowband Comms
- AWIPS & RPCCDS
- AWIPS Workstation

[Click to view system diagram](#)



Line	Type	Enabled	Photo	ID	Host	Name	Class	Status	Delay	Rate
3	REDC	yes	TOP	889	opwpl_RDC-H	RP00-56	CONNECT	01	11k	
5	REDC	yes	TOP	810	opwpl_RDC-H	RP00-56	CONNECT	01	11k	
8	REDC	yes	TOP	891	opwpl_RDC-H	RP00-56	CONNECT	01	11k	
19	REDC	yes	TOP	714	mscLARRY	RP00-56	CONNECT	01	37k	
25	REDC	yes	TOP	620	awipstnc	RP00-56	CONNECT	01	49k	
31	REP	yes	REP	825		RP00-56	DISCON	01		
1	REP	yes	TOP			2	COM P200	01		
2	REP	yes	TOP			RP00-56	COM P200	01		
4	REDC	yes	TOP			RP00-56	COM P200	01		
7	REDC	yes	TOP			RP00-56	COM P200	01		
8	REDC	yes	TOP			RP00-56	COM P200	01		
9	REDC	yes	TOP			RP00-56	COM P200	01		
10	REDC	yes	REP			1	COM P200	01		
11	REDC	yes	REP			1	COM P200	01		
12	REDC	yes	REP			1	COM P200	01		
13	REDC	yes	REP			1	COM P200	01		
14	REDC	yes	REP			1	COM P200	01		
15	REDC	yes	REP			1	COM P200	01		
16	REDC	yes	REP			1	COM P200	01		
18	REDC	yes	TOP			RP00-56	COM P200	01		
26	REDC	yes	TOP			RP00-56	COM P200	01		

Line 4 [TCP]

Type: Min

Port: Pwd

Band Rate: 256000

Comm Mtr: 5

Priority: 4

Time Limit: 300

Comm option: 00

- 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).

1.25 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 the 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. 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.

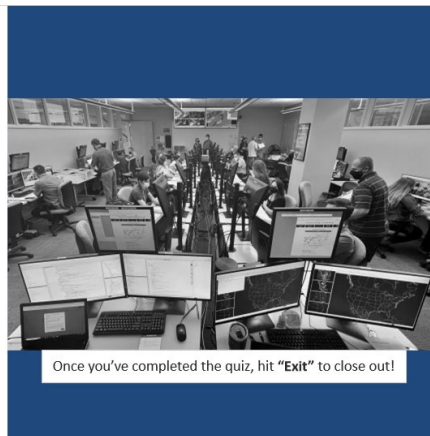
With this information in mind, please proceed to the next slide to start the quiz.

1.37 Contact Information

Contact Information

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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.