Distance Learning Operations Course

Topic 2: Introduction to the Weather Surveillance Radar 1988 Doppler (WSR-88D)

Presented by the
Warning Decision Training Branch

Version: 1210

Introduction to the WSR-88D

The WSR-88D system is made up of several data processing, control, and display components. Some of these units also employ multiple subcomponents. In order to effectively operate the WSR-88D and produce the best quality data, you should have a basic understanding of these units and their subcomponents, their relationship to each other, and the flow of data through the system. This lesson describes the five equipment (or component) groups and their primary subcomponents, as well as some of the user systems that visualize WSR-88D output. These six different groups are the:

- 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, Open Principal User Processor).

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) is performed at the Radar Product Generator (RPG) Human Control Interface (HCI), the Radar Data Acquisition Unit (RDA) HCI, or the AWIPS Workstation.

Figure 1: Image of the Radar Data Acquisition (RDA) Unit.

Radar Data Acquisition Unit (RDA)

The RDA is the origination point of the radar data that you, the operator, will ultimately use. The RDA component group is made up of five primary subcomponents:

- Transmitter,
- Antenna,
- Receiver,
- Signal processor, and
- Keyboard-video-mouse 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

The first step in acquiring radar data is the transmission of a RF signal. The RF signal from the WSR-88D is transmitted using 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 a 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) and dual-polarization variables (Differential Reflectivity, Correlation Coefficient, and Differential Phase) of sufficient quality for current NWS purposes.

Antenna

The antenna is the RDA subcomponent that broadcasts the RF signal out into the atmosphere and intercepts returning energy. How the antenna transmits that energy depends on which RDA build your local radars use:

- Radars using RDA Build 11 will send and receive a horizontally polarized RF signal, while
- Radars using RDA Build 13 will send a RF signal polarized at a 45° 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^o to 60.0^o) for scanning purposes. The antenna angles used to collect data are determined by the Volume Coverage Pattern (VCP), the operational mode in use, and the use of the Advanced Volume Scan Evaluation and Termination (AVSET) application.

NOTE: The radar operator cannot manually position the radar antenna at a given elevation or azimuth.

Volume Coverage Pattern (VCP)

The Volume Coverage Pattern (VCP) specifies the actual elevation angles the antenna will scan (e.g., 0.5^{o}, 1.5^{o}) in a specified period of time. The WSR-88D currently has nine operational VCPs:

- VCP 11 - The antenna samples 14 elevations during the 5 minute volume scan.
- VCP 12 - The antenna samples 14 elevations during the 4.5 minute volume scan.
- VCP 21 - The antenna samples 9 elevations during the 6 minute volume scan.
- VCP 121 - The antenna samples 9 elevations during the 5.75 minute volume scan.
- VCP 31 - The antenna samples 5 elevations during the 10 minute volume scan.
- VCP 32 - The antenna samples 5 elevations during the 10 minute volume scan.
- VCP 211 - The antenna samples 14 elevations during the 5 minute volume scan using the Sachidananda-Zrnic (SZ)-2 range unfolding algorithm on the lowest 2 elevations.
- VCP 212 - The antenna samples 14 elevations during the 4.5 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 3 elevations.
- VCP 221 - The antenna samples 9 elevations during the 6 minute volume scan using the SZ-2 range unfolding algorithm on the lowest 2 elevations.

Long Pulse vs. Short Pulse

Though VCPs 31 and 32 have similar elevations and scanning time periods, VCP 31 uses a long pulse (4.7 ms) while VCP 32 uses a short pulse (1.57 ms). 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. More information on the WSR-88D operational VCPs will be presented in DLOC Topic 3, Lesson 1.

Operational Modes

In addition to VCPs, the WSR-88D has two operational modes which play a part in antenna positioning: Precipitation mode (mode A) and Clear Air mode (mode B). The mode in which the radar operates will determine which VCPs can be used. These modes are:

- Mode A (Precipitation) - Uses VCP 11, 12, 21, 121, 211, 212, or 221 and
- Mode B (Clear Air) - Uses either VCP 31 or 32.

More information on operational modes will be presented in DLOC Topic 3, Lesson 1.

Automated Volume Scan Evaluation and Termination (AVSET)

VCPs determine the elevation angles that the radar scans, but WSR-88D operators have the ability to implement “dynamic” scans using the Automated Volume Scan Evaluation and Termination (AVSET) software. This application can stop a VCP if there is no relevant weather data at higher volume scans. Use of AVSET on WSR-88D sites throughout the U.S. has shown average decreases in scanning time of approximately 30 seconds when using a precipitation mode VCP.

AVSET is applied only on scans with elevation angles above 5°. As a result, AVSET doesn’t run during Clear Air mode. The WSR-88D operator must manually restart AVSET when the radar switches from Clear Air into Precipitation mode. The radar operator controls the use of AVSET at the Master System Control Function (MSCF), which will be discussed in more detail later on in this lesson.

Receiver

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 amount of returning energy is minute in comparison to 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 Digitizer (IFD). In this process, the receiver captures the amplitude and phase information needed to compute all of the base data moments.

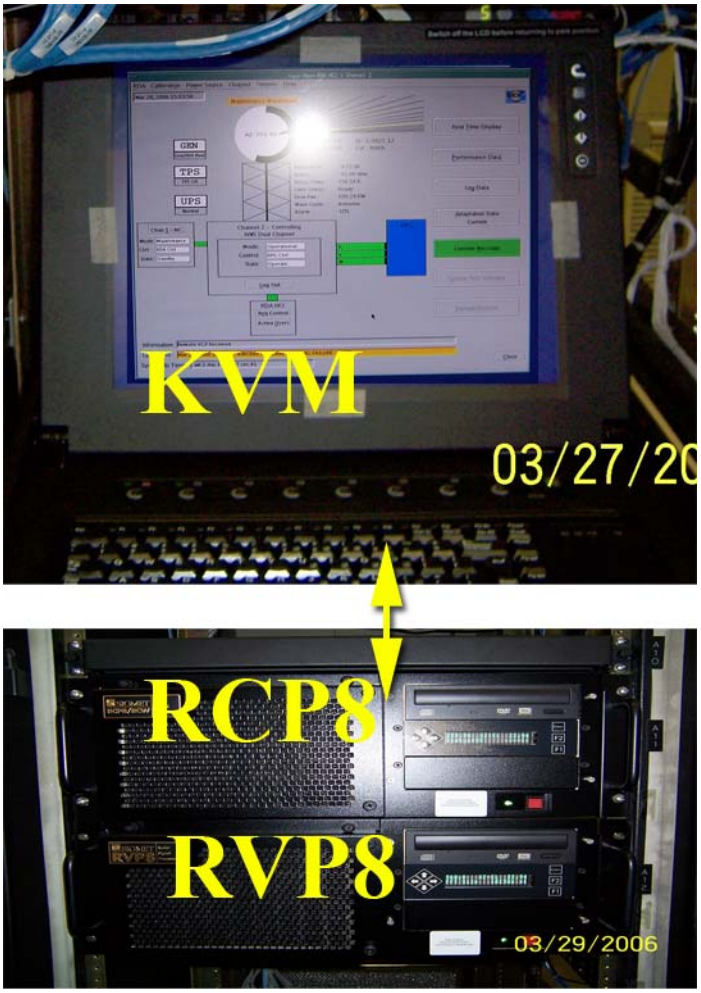


Figure 2: (Top) An image of the Keyboard Video Mouse (KVM) and Monitor Interface. (Bottom) An image of the RVP8 Signal Processor.

Signal Processor

Upon reception of the digitized output from the receiver, the signal processor (also called the RVP 8; Fig. 2) 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.

Ground Clutter Suppression

Many times, a key distinction between returns from atmospheric scatterers and those from ground targets is that ground returns have little or no motion. However, ground clutter has other important characteristics that can be used to identify it. Variables used to identify these characteristics include Reflectivity texture, Clutter Phase Alignment, and standard deviations of Differential Reflectivity (ZDR) and Differential Phase (Φ, or Phi). These variables are used by the Clutter Mitigation Decision (CMD) algorithm 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 supress the ground clutter contaminated portion of the signal (i.e., return with near-zero velocity). Power is removed from the portion of 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 rebuilds an estimated weather signal that replaces the initially removed data.

Additional information on GMAP, as well as methods for identifying where clutter suppression is

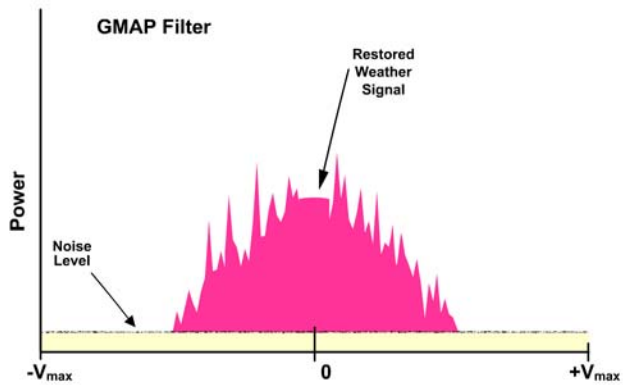


Figure 3: An example of the restored weather signal created by the Gausian Model Adaptive Processing (GMAP) Filter for velocities near zero.

needed, will be presented in DLOC Topic 3, Lesson 4.

Calculation of Base Data

After clutter suppression, the base data (sometimes called base moments) are built. The three types of base data are:

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

In addition to these moments, the dual-polarization base data are calculated. However, these data are different in character from the legacy base data and are not considered to be “base moments.” More information on base data generation can be found in DLOC Topic 3, Lessons 2 and 3.

Range Unfolding of Doppler Data

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. A comparison of base reflectivity (low PRF) and base velocity (high PRF) is used in the unfolding process. There are two range unfolding techniques used by the Signal Processor: the Legacy

Range Unfolding Algorithm and the SZ-2 Range Unfolding Algorithm. The latter technique's usage depends on the particular elevation angle and VCP being processed. Range unfolding by the signal processor is discussed in more detail in Topic 3, Lesson 4.

Data Recording at the RDA: Archive Level I

The WSR-88D has the ability to record the returned signal in digital format (i.e., Archive Level I). The storage device for these data is not operationally fielded. Currently, Archive Level I data recorders are only used for special engineering studies by Radar Operations Center (ROC) technical staff.

The Keyboard Video Mouse (KVM) and Monitor Interface

The Keyboard Video Mouse (KVM) and Monitor Interface (Fig. 2) is used to control the RDA locally (i.e., at the RDA shelter) and to monitor RDA maintenance functions. Two KVM and Monitor Interfaces are present in each RDA shelter for redundancy. 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, National Weather Service (NWS) forecasters will never have to interact with this subcomponent of the RDA Unit.

Wideband Communications between the RDA and the RPG

The RDA and the RPG are linked by a "wideband" communications line that provides high speed, full duplex (simultaneous, two-way) data transmission. These transmission lines are capable of transmitting the four channels of base data (reflectivity, velocity, spectrum width, and dual-polarization) from the RDA to the RPG.

NOTE: While the dual-polarization channel is available prior to the WSR-88D dual-polarization installation, base data will only be transmitted in

this channel after the RDA has been upgraded to dual-polarization.

Depending on the distance between the RDA and RPG (and the locally available services) the wideband link for a particular WSR-88D site may be any one of the following:

- Direct Wire Link,
- Private T1,
- Telco (Commercial) T1, or
- Microwave Line-Of-Sight (MLOS).

Direct Wire Link

This type of wideband link is used when the distance between the RDA and RPG is less than 400 feet. The most common WSR-88D configuration for this link is 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.

Private T1

This type of wideband link is used when the distance between the RDA and RPG is between 400 and 3000 feet. The most common WSR-88D configuration for this link is 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 link.

Telco (Commercial) T1

This type of wideband link is used when the distance between the RDA and RPG is too far for a Private T1 and when commercial service from a telecommunications company (Telco) is available. The link is made by using transmission medium leased from the local telecommunications company and can be used for an unlimited distance. Approximately half of the NWS WSR-88D site connections use this class of wideband link.

Microwave Line-Of-Site (MLOS)

This type of wideband link was originally used when the distance between the RDA and RPG was between 0.6 and 24 miles and when Telco T1 service was not available. Currently, this type of wideband connection is only used as a backup to Telco T1 at three NWS sites.

Radar Product Generator (RPG)

The RPG is a multi-function unit that ingests and processes the base data received from the RDA via wideband communications. A suite of base and derived products is generated by the RPG. The NWS radar operator controls the RPG using the MSCF. The RPG then distributes the products to the different users through a variety of product distribution communications.

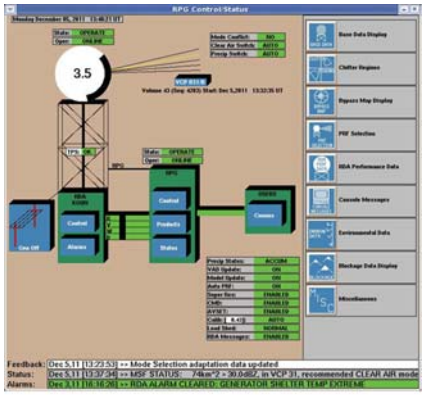


Figure 4: An example of the RPG HCI that is accessible at the MSCF.

Product Generation

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. Derived products are also produced by the RPG using these base data as input.

In general, any legacy product other than the three created directly from the base data are considered

a derived product. Likewise, three 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 data. (NOTE: Some products, such as the Storm Relative Velocity Map, or SRM, product are often used like a base product, even though it is technically a derived product.) A good example of a derived product is Composite Reflectivity. 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 Vertically Integrated Liquid (VIL) product,
- the various precipitation accumulation products, and
- the Tornadic Vortex Signature (TVS) product.

Details on each base product and most derived products available for display on the Advanced Weather Interactive Processing System (AWIPS) workstation are presented in DLOC Topic 5.

RPG Control

The RPG is controlled through the RPG HCI at the MSCF. During the course of a regular shift a NWS forecaster may need to access the RPG HCI and change how products are generated or distributed through the RPG for many reasons. Examples of RPG control tasks include:

- Wideband and product distribution communications control and
- Initiating a reboot of the RPG.

More details on RPG control procedures are provided in DLOC Topic 6.

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

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. More details on these transmission lines and principal user display systems will be presented in the Product Distribution Communications and the Users Systems section of this training. However, two forms of product distribution for non-principal users controlled at the RPG are discussed below: The Base Data Distribution System and Archive Level III.

Archive II Data Distribution System

The WSR-88D network includes 129 NWS RPGs in the Contiguous United States (CONUS), 26 DoD RPGs, and 12 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. These data are also transmitted to the National Climatic Data Center (NCDC) for archiving purposes.

Archive Level III

Archive Level III data are a specific set of products which are generated each volume scan. The Archive Level III set of products are collected and distributed to NCDC from 155 WSR-88D (NWS

Figure 5. The Master System Control Function (MSCF) interface

CONUS and DoD) sites. This process is part of the Radar Product Central Collection/Distribution Service (RPCCDS) which also makes these products available to other users. Automatic generation each volume scan at the RPG of these specific products is governed by the Generation and Distribution Control List.

Master System Control Function (MSCF)

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.

Many of the common tasks that can be performed at the RPG HCI are discussed in more detail in DLOC Topic 6.

The RDA HCI is primarily used by Electronics Technicians (ETs) to perform a variety of maintenance tasks.

The RDA HCI at the MSCF

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 ETs for off-line maintenance.

The RDA HCI provides the ET 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 at the MSCF

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 ET.

RDA Changes Initiated at the RPG HCI

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,
- Downloading clutter suppression region files, and
- Changing the Doppler PRF in the current VCP.

Optimizing Data Quality

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
- Editing adaptable parameters or environmental wind data.

More details on performing these tasks are covered in DLOC Topic 3 and Topic 5, respectively.

Status Monitoring

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. More details on status monitoring are provided in DLOC Topic 6.

Free Text Messages

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 (http://www.ofcm.gov/fmh11/fmh11parta/pdf/FMH11PTA-04-2006.pdf) and

- The tri-agency Memorandum of Agree for the Interagency Operation of the WSR-88D (http://www.roc.noaa.gov/news/MOA.pdf).

Product Distribution Communications

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 Communications

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, or LAN, to NWS RPG LAN connection). For DoD and FAA users (or NWS users of DoD and FAA RPGs), the dedicated connection utilizes a Frame Relay circuit. NWS dial-up access for One-Time Requests (OTRs) and Radar Multiple Requests (RMRs) 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. For instance, the base data are made available from the RPG, via the Archive II Data Distribution System. These data transfers from the RPG, through WFO regional headquarters, and then through commercial communication lines to different sites where they become available for “Other Users.”

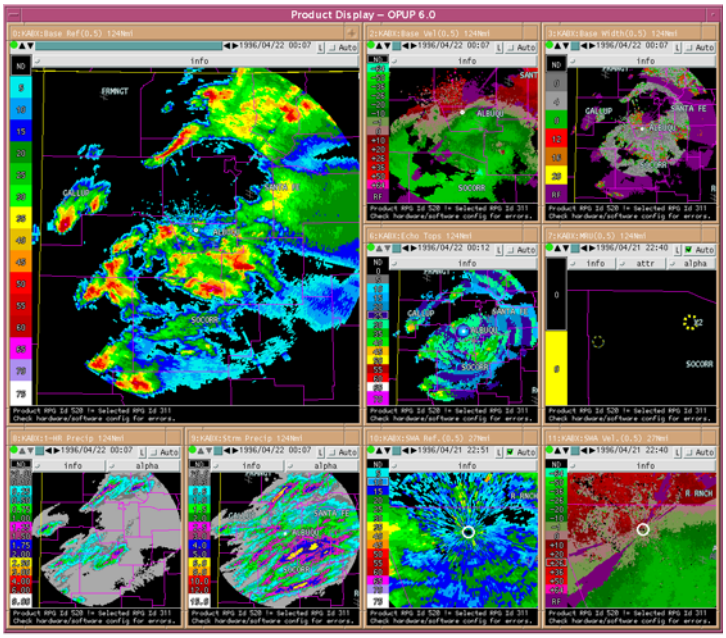


Figure 6: An example of the Open Principal User Processor (OPUP) display.

User Systems

There are numerous users of WSR-88D products. In general, users among the NEXRAD Agencies (NWS, FAA, and DoD) that have dedicated and/or dial up connections to a RPG are called Principal Users. 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 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 AWIPS,
- The DoD uses the Open Principal User Processor (OPUP; Fig. 6), and
- The FAA has a variety of display systems, including the Weather and Radar Processor (WARP) and the Integrated Terminal Weather System (ITWS).

Other Users

Other users have access to WSR-88D base data, as well as a predefined set of products. Access for these users outside the three agencies can be achieved in a variety of ways depending on their needs.

Figure 7: The NWS RIDGE web page.

Archive II Clients

For users that require base data (i.e., Archive Level II), real-time access is available to this data stream via the Archive II Data Distribution System. 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 NCDC. The NCDC makes the archived data available for general use to research organizations and other users interested in past events.

Radar Product Central Collection/Distribution Service (RPCCDS)

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. These products are sent from the AWIPS data server through a dedicated connection to Network Control Facility (NCF) servers at

Silver Spring, MD. From there, the data can be accessed by users in real-time via:

- The NOAAPort data feed,
- The NWS Ridge web site (http://radar.weather.gov/ridge/),
- Paid access to dedicated connections for private companies,
- 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 NCDC archives for past events.

The Advanced Weather Interactive Processing System (AWIPS)

The NWS hardware and software used to acquire, process, and store the products received from the RPG is called AWIPS. The AWIPS hardware is located primarily in a computer equipment room with AWIPS workstations located in the operations area. Operators request, display, and manipulate WSR-88D products at an AWIPS workstation. The AWIPS workstations also interact with the AWIPS Linux-based processors housed in the computer room.

Figure 8: NWS Forecasters using an AWIPS workstation.

NOTE: The AWIPS hardware and software are in a transition from the initial generation (i.e., AWIPS-1) to the next generation (i.e., AWIPS-2). While most of the information in this training is applicable to both AWIPS-1 and AWIPS-2, specific details mentioned will be for the AWIPS-2 software and hardware.

AWIPS Narrowband Communications to the RPG

All AWIPS sites with co-located RPGs have a dedicated Transmission Control Protocol/Internet Protocol (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 Frame Relay circuit. Details on controlling these connections are provided in DLOC Topic 6. All AWIPS sites can also access non-dedicated RPGs using the OTR and RMR process 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).

RPCCDS and Archive Level III

In addition to making RPG products available to NWS WFO staff, AWIPS also plays an important part in disseminating WSR-88D products out to other organizations. The AWIPS WAN is used to send the Archive Level III products from each RPG to the Network Control Facility (NCF) in Silver Spring, MD. From there, the Archive Level III data are made available to other users through the RPCCDS.

The AWIPS Workstation

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 Common AWIPS Visualization Environment (CAVE). CAVE can display:

- All of the products on the Product Generation Table,
- Products requested through the OTR and RMR processes, and
- Alerts from the dedicated RPG(s).

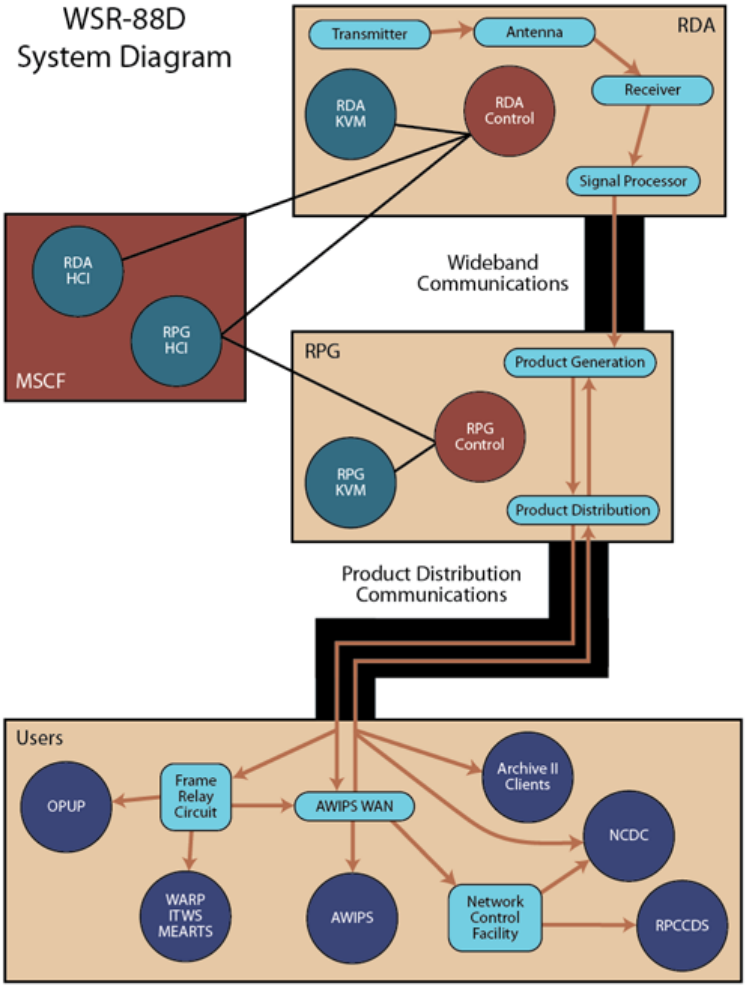
The power of the AWIPS workstation is its ability to display radar and all other meteorological data on a common display environment.

More details on displaying WSR-88D base data and products on the AWIPS workstation were discussed in DLOC Topic 1. Please feel free to review that information, including any Weather Event Simulator (WES) exercises, as you proceed through DLOC to enhance your understanding and expertise with CAVE.

WSR-88D System Diagram

The schematic of the WSR-88D System shown below illustrates:

- The primary components of the system (as either rectangles or black pipes);
- Key hardware/software subcomponents that collect, process, or distribute data through the system (cyan rounded rectangles);
- Access points for human interaction to control the system (slate blue circles);
- Data display platforms for users (deep blue circles);
- Path data follows through the system (brown arrows); and
- Control pathways for the system (blank lines).



List of Acronyms Used in Topic 2

The following list provides definitions of the various acronyms used during the course of this lesson.

- **AVSET** - Automated Volume Scan Evaluation and Termination
- **AWIPS** - Advanced Weather Interactive Processing System
- **CAVE** - Common AWIPS Visualization Environment
- **CIWS** - Corridor Integrated Weather System
- **CMD** - Clutter Mitigation Decision algorithm
- **CONUS** - Contiguous United States
- **DoD** - Department of Defense
- **Dual-Pol** - Dual-Polarization Radar Technology
- **ET** - Electronics Technician
- **FAA** - Federal Aviation Administration
- **FMH** - Federal Meteorological Handbook
- **FTP** - File Transfer Protocol
- **GMAP** - Gaussian Model Adaptive Processing
- **HCI** - Human Control Interface
- **IFD** - Intermediate Frequency Digitizer
- **ITWS** - Integrated Terminal Weather System
- **KVM** - Keyboard Video Mouse
- **LAN** - Local Area Network
- **LAN-LAN** - Local Area Network to Local Area Network
- **LDM** - Local Data Manager
- **MLOS** - Microwave Line-of-Sight
- **MSCF** - Master System Control Function
- **NCDC** - National Climatic Data Center

- **NCF** - AWIPS Network Control Facility
- **OPUP** - Open Principal User Processor
- **OTR** - One-Time Request
- **Phi** - Differential Phase
- **PRF** - Pulse Repetition Frequency
- **RDA** - Radar Data Acquisition Unit
- **RF** - Radio Frequency
- **RMR** - Radar Multiple Request
- **RPCCDS** - Radar Product Central Collection/Distribution Service
- **RPG** - Radar Product Generator
- **RUC** - Rapid Update Cycle
- **RVP 8** - Signal processor used by the WSR-88D
- **SRM** - Storm-Relative Velocity Map
- **SZ** - Sachidanada-Zrnic
- **TCP/IP** - Transmission Control Protocol/Internet Protocol
- **Telco** - Private Telecommuncations Company
- **TVS** - Tornado Vortex Signature
- **VCP** - Volume Coverage Pattern
- **VIL** - Vertically Integrated Liquid
- **WAN** - Wide Area Network
- **WARP** - Weather and Radar Processor
- **WFO** - Weather Forecast Office
- **WSR-88D** - Weather Surveillance Radar 1988 Doppler
- **ZDR** - Differential Reflectivity