

Frequently Asked Questions Concerning
Weather Surveillance Radar-1988 Doppler (WSR-88D) Level II Data
Updated 10/24/11

What Are WSR-88D Level II Data?

Response: Level II data are sometimes referred to as “base data.” Level II data contain the reflectivity, radial velocity, and spectrum width data produced by the WSR-88D. For sites where the Dual Polarization modification has been completed, the following dual polarization moment data are also included: Differential Reflectivity, Correlation Coefficient, and Differential Phase. They contain the data from all scans of the radar, at 256 data levels, and at the highest spatial resolution of the radar ($1^\circ \times 1\text{km}$ for reflectivity, $1^\circ \times 0.25\text{ km}$ for radial velocity, and $1^\circ \times 0.25\text{ km}$ for spectrum width). At lower elevation angles (generally scans at 1.5° or lower), Super Resolution Data are produced. The difference is that Super Resolution has the following spatial resolution ($0.5^\circ \times 0.25\text{ km}$ for reflectivity, $0.5^\circ \times 0.25\text{ km}$ for radial velocity, and $0.5^\circ \times 0.25\text{ km}$ for spectrum width). In addition, Super Resolution data contain Doppler data out to a range of 300 km. For more information, go to: <http://www.roc.noaa.gov/WSR88D/DualPol/DPLLevelII.aspx>.

How Do Level II Data Differ From Level III Data?

Response: Level II data are the input to the Radar Product Generator (RPG) from the Radar Data Acquisition (RDA) system. The Level III data and other products are output of the RPG meteorological algorithms or displays of the data. The Level II data have 256 data levels while the distributed and archived Level III products have 16 or 256 data levels. The Level II data contain data from all scans while the Level III data displays data from the lowest four scans, at most, though the algorithms can consider data collected at all scans. Level II data is collected and redistributed from 140 operational sites while the Level III data is collected and redistributed from 156 operational sites.

How Are The Level II Data Prepared For Distribution?

Response: The Level II data sent to users differs from that used by the RPG in the following ways: (1) The data are compressed using BZIP2 software, (2) A header record containing metadata is added at the start of each volume scan, and (3) Unidata Local Data Manager software is used to route the data.

What Is The Path Of The Level II Data To The User?

Response: In 2010, the Level II collection and distribution architecture was updated: (http://www.roc.noaa.gov/WSR88D/PublicDocs/Level_II/NewArchCor.pdf). What is not depicted is the data flow from the four designated top-tier sites to connecting users. In the new architecture, the regional aggregation points have been replaced by a central aggregation point (NWS Telecommunications Communications Gateway (NWSTG), staffed 24/7) with full redundancy at an off-site location (WSR-88D Radar Operations Center (ROC)). OPSNet communications is used to send the data to the central aggregation point(s). This has resulted in an increased reliability of data flow to users.

Does The Level II Data Follow The Same Path To Users As The Product Data?

Response: No. The RPG is the last common link for the Level II data and the product data. The product data flows to the associated National Weather Service (NWS) Advanced Weather Interactive Processor System (AWIPS) and then to the Radar Product Central Collection Dissemination Service (RPCCDS) (<http://www.nws.noaa.gov/tg/rpccds.html>) central server in Silver Spring, MD via the AWIPS communications system. As shown in the previous question, the Level II data flows from the RPG to the central collection points via different paths.

Is It Possible That I Can Receive Level II In Real-Time But Not Level III And Vice Versa?

Response: Yes. Since the communication paths the Level II and Level III data travel to reach users outside of the NEXRAD Program (described above), one path could be operational and the other one down. In addition, since the product data flows through the associated AWIPS and then to the RPCCDS, if the AWIPS is down (e.g., maintenance, loading software), the product data would not be available, but the Level II flow would not be interrupted.

What Is The Latency Of Real-Time Level II Data?

Response: The latency of Level II data traveling from radar sites to users connected to top-tier sites is usually less than 5s. The radars “bundle” 120 radials of data at a time for transmission. The bundling can take ~3s to ~30s, based on the scanning strategy of the radar. Thus, the data are generally available to users within ~35s of the time the data are collected by a radar.

What Is the Expected Reliability Of Delivery Of Real-Time Level II Data?

Response: The NWS goal is 95% of the time when the radars are operating. The radar availability goal is 96%. These are annual goals. The network has consistently met or exceeded these goals, especially with the new network architecture – 99.99% during the last year.

Can I Ask A Radar Site To Change Their Mode Of Operation?

Response: No. The sites operate the radars to meet the primary mission needs of the NEXRAD agencies and will not change the operating strategy based on external requests.

What Are The Scan Strategies Of The WSR-88D?

Response: During operations, the antenna is controlled by automatic scanning programs. Volume coverage patterns (VCPs) are matched to an operational mode to optimize product generation for given meteorological situations. Please see FMH-11, Part A, Table 4-1, Volume Coverage Pattern Descriptions, available at: <http://www.ofcm.gov/fmh11/fmh11.htm> for details.

Where Can I Learn the Status Of Real-Time Level II Data?

Response: The NWS has a web site which updates each minute and displays the status of Level II data flow for all 140 operational sites. The URL for this site is: <http://weather.noaa.gov/monitor/radar2/>.

Should I Contact Radar Sites If The Level II Data Is Not Flowing?

Response: Please do not contact sites. This can cause a disruption for the staff. The sites monitor their Level II data flow at least twice daily as does the NWSTG. Once the data flow

outage is detected, corrective actions can be taken when the maintenance staff is available.

What Can Cause The Level II Data To Stop?

Response: There are several “single points of failure” in the Level II data stream. Fortunately the hardware/software/communication links are very reliable.

How Can I Determine If a Radar Is Operating If The Level II Data Flow Stops?

Response: There are two approaches. The NWS maintains a web page, updated each minute, which depicts the status of the flow of product/Level III data to the NWS central server of radar products: <http://weather.noaa.gov/monitor/radar/>. This assumes the AWIPS at the site and the communications link to the NWS central server are operating – the reliability of this link is very high. In addition, one can check the many sites on the Internet displaying WSR-88D imagery (e.g., <http://weather.noaa.gov/radar/national.html>) to see if the data from the site is current and updating.

How Can I Obtain Level II Data In Real-Time?

Response: Since there is no restriction on the use or redistribution of the data, there are many locations where you can receive Level II data, including private vendors. The NWS does not track where the data are flowing once they have reached the designated top tiers. The top tier sites and their point of contact are listed below:

- Education and Research Consortium of the Western Carolinas (ERC), Hunter Goosmann, 828-350-2415, hgoosmann@ercbroadband.org
- Purdue University, Professor Matthew Huber, 765-494-3258, huberm@purdue.edu
- University of Oklahoma, Carl Sinclair, 405-325-5938, csinclair@ou.edu or Gary Skaggs, 405-325-6440, gskaggs@ou.edu.

How Can I Obtain Archive Level II Data?

Response: The data are archived at the National Climatic Data Center (NCDC). Check the following web site for the inventory of data and for requesting the data via FTP:
<http://hurricane.ncdc.noaa.gov/pls/plhas/has.dsselect>.

How Do I Learn How To Read Or Display Level II Data?

Response: The following resources are available to Level II users:

1. The ROC provides technical documentation, called an interface control document (ICD), for Level II data. This ICD can be obtained at:
http://www.roc.noaa.gov/ssb/cm/icd_downloads.asp. Request “2620010E ICD for Archive II/User” and “2620002H – ICD for RDA/RPG”.
2. The NWS provides the RPG software and some display software at:
<http://www.nws.noaa.gov/code88d/>. This software, which runs on a Linux platform, is provided without warranty or follow-on support.
3. The National Climatic Data Center (NCDC) provides software that uses Level II data without warranty or follow on support at: <http://www.ncdc.noaa.gov/oa/wct/>.
4. Private sector and other providers offer display software.

Are There Additional References To Better Understand Level II Data And The WSR-88D?

Response: The following references are available which may help:

1. Federal Meteorological Handbook No. 11 (FMH-11), Part A, System Concepts, Responsibilities, and Procedures. Available at:
<http://www.ofcm.noaa.gov/fmh11/fmh11.htm>.
2. Crum, T.D., and R.L. Alberty, 1993: The WSR-88D and the WSR-88D operational support facility. *Bull. Amer. Meteor. Soc.*, **74**, 1669-1687.
3. Crum, T.D., R.L. Alberty, and D.W. Burgess, 1993: Recording, archiving, and using WSR-88D data. *Bull. Amer. Meteor. Soc.*, **74**, 645-653
4. Crum, T.D., R.E. Saffle, and J.W. Wilson, 1998: An update on the NEXRAD program and the future WSR-88D support to operations. *Weather and Forecasting*, 13, 253-262
5. Horvat, D.J., C. Horvat, C. Calvert, and T. Crum, 2011: The Refreshed WSR-88D Level II Data Collection and Distribution Network. Preprints, *26th Int. Conf. on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, Seattle, WA, Amer. Meteor. Soc., Paper 3A.1.

How Can I Request Additional Information About Level II Data?

Response: If you have specific questions or comments in regard to this project, please contact the ROC webmaster at: <http://www.roc.noaa.gov/WSR88D/Comments.aspx>.