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INTERFACE CONTROL DOCUMENT
FOR THE
ARCHIVE II/USER

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INTERFACE CONTROL DOCUMENT
FOR THE ARCHIVE II/USER
2620010
DOCUMENT REVISION RECORD FORM

REVISION	-	A	B		
RELEASED BY	ROC	ROC	ROC		
RELEASE DATE	06/28/98	01/30/04	04/13/05		
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Section 3.0	-	A	B		
Section 4.0		A	B		
Section 5.0		A	B		
Section 6.0		A			
Section 7.0		A	B		
Appendix A	-	A	B		

INTERFACE CONTROL DOCUMENT FOR THE ARCHIVE II/USER
2620010
REVISION RECORD

Revision	Description	Date
-	Update for metadata (B-10) (Pages 3-3, 3-4)	26 May 1998
	Incorporate all previous changes and Build 10.0 changes. Document number changed from 1208302C to 2620010.	26 June 1998
A	Remove tape media references. Add network interface and LDM information.	April 2003
B	Incorporate changes to metadata for Open RDA and correct errata.	13 April 2005

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1 SCOPE

1.1 Identification

This document defines the Next Generation Weather Radar (NEXRAD) Archive II Interface. Archive II functionality runs on the BDDS hardware. For hardware information refer to the BDDS/User ICD 2620013. The Archive II Interface design is based on the Collaborative Radar Acquisition Field Test (CRAFT) done in coordination with the University of Oklahoma (OU), The National Severe Storms Laboratory (NSSL), the Center for Analysis and Prediction of Storms (CAPS), the University of Washington, and the NEXRAD Radar Operations Center (ROC). For this new Archive II communications interface, this document identifies applicable standards and defines the protocol, syntax, and meaning of the binary data transmission frames. This ICD is not intended to serve as a tutorial document concerning the applicable standards. That is, the reader is assumed to be generally knowledgeable of the contents, terminology, etc., of the standards. This document maps the unique aspects of new Archive II communications into the appropriate standard. Distribution of this document is unrestricted.

1.2 System Overview

The WSR-88D acquires, generates, and distributes Doppler radar products for meteorological and hydrological applications. Specifically, the Radar Data Acquisition (RDA) functional area acquires radar data; controls antenna, transmitter, and receiver electronics; prepares radar data in a digital format; transmits radar data and status to the Radar Product Generator (RPG); and processes control information from the RPG. The RPG functional area receives radar data and status information from the RDA, formats and sends control commands to the RDA, generates radar products, and distributes radar products for graphical and alphanumeric display systems.

Base Data Distribution System (BDDS) was implemented as a function of the RPG, in a cooperative effort between the WSR-88D Radar Operations Center (ROC, W/OPS42) and National Severe Storms Laboratory (NSSL). The RPG takes the digital radar data and other messages from the RDA and transmits them to the BDDS. The BDDS then provides WSR-88D Data (Archive II) to non-RPG components via a Local Area Network (LAN) using Unidata Local Data Manager (LDM) Software. The Weather Forecast Office will retrieve the information from the BDDS and disseminate the data on to the next step in the network chain. The endpoint of the data will be NCDC and others. Due to cost and communication constraints, some DOD and FAA WSR-88D radar sites may not have the Base Data Distribution function.

2 REFERENCE DOCUMENTS

The following documents are referenced herein. In the event of a conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

2.1 Specifications:

2810000	WSR-88D System Specification
2620013	Interface Control Document for BDDS/User
2620002	Interface Control Document for RDA/RPG
Source:	WSR-88D Radar Operations Center 3200 Marshall Avenue, Suite 100 Norman, OK 73072 URL: http://www.roc.noaa.gov

2.2 Other Publications:

Unidata LDM Documentation	Local Data Manager (LDM) Documentation and Software
Source:	**UCAR Office of Programs** **Unidata Program Center** **P.O. Box 3000** **Boulder, CO 80307-3000** **URLs: http://www.unidata.ucar.edu** http://my.unidata.ucar.edu/content/software/ldm
Michael Burrows and D. J. Wheeler: 5/10/94. Digital SRC Research Report 124.	A block-sorting lossless data compression algorithm. (This is the basis for bzip2). ftp://ftp.digital.com/pub/DEC/SRC/research-reports/SRC-124.ps.gz
libbzip2 version 1.0.2.	bzip2 library by Julian Seward
bzip2 and libbzip2	The bzip2 and libbzip2 official home page.
Source:	The bzip2 utility used in this ICD is a component of the Solaris 8 Operating System. The source can be found at: URL: http://sources.redhat.com/bzip2/
MIL-STD-1777	Internet Protocol
MIL-STD-1778	Transmission Control Protocol
Source:	Documentation Automation and Production Service Building 4/D 700 Robins Avenue Philadelphia, PA 19111-5094

ISO 8802-2: 1989 ANSI/IEEE 802.2-1989	Part 2: Logical link Control
ISO/IEC 8802-3: 1993 ANSI/IEEE 802.3-1993	Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications
Source:	American National Standards Institute 11 West 42nd Street 13th Floor New York, NY 10036 URL: http://www.ansi.org
IEEE P802.3u/D5, March 1995	IEEE Draft Standard for Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications: Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation (version 5.0). Draft Supplement to 1993 version of ANSI/IEEE Std 802.3, 100BASE-T
Source:	IEEE Standards Office 445 Hoes Lane Piscataway, NJ 08855-1331

2.3 Request For Comments (RFCs)

Reference Number	Title
RFC 894	IP over Ethernet
RFC 826	Address Resolution Protocol
RFC 793	Transmission Control Protocol
RFC 791	Internet Protocol
Source:	Internet Architecture Board (IAB) Internet Engineering Task Force (IETF) URL: http://www.ietf.org/home.html

3 ARCHIVE II PHYSICAL LAYER

3.1 Applicable Standard

The physical layer will contain a LAN interface as specified in either the ANSI/IEEE 802.3 (10 Mbps) or 802.3u (100 Mbps) Standard with the following caveat: The 2 octet length field that is specified in paragraph 3.2.6 of the ANSI/IEEE 802.3 Standard will be used as a type field for the interface as specified in the DIX Ethernet standard, version 2.0. This variance is allowed by Note 7 to paragraph 3.2.6 of the ANSI/IEEE 802.3 Standard as long as the value of this field exceeds 0x05EE (hex), which is the maximum IEEE 802.3 frame size. All values that will be used in this interface for this field, as specified in the DIX Ethernet Version 2.0 standard are 0x0800 and larger.

3.2 Communications Medium, Transfer Rates, Mechanical Connection

A physical layer LAN port connection will be provided on an RPG LAN switch. Refer to BDDS/User ICD and hardware drawings for specific cable or hardware information.

3.2.1 <u>10 MBps</u>

The baseband medium for a 10 Mbps network will be twisted pair cable, as specified in the ANSI/IEEE 802.3 Standard, paragraphs 10.5 and 14.1.1.3 respectively. This baseband medium and its associated Medium Attachment Units (MAU) is referred to as type 10BASET in the ANSI/IEEE 802.3 Standard. The maximum segment length of 10BASET segments will be no longer than 100 meters.

3.2.2 <u>100 MBps</u>

The baseband medium for a 100 Mbps network will be Category 5 twisted pair cable, as specified in the draft ANSI/IEEE 802.3u Standard. This baseband medium and its associated Medium Attachment Units (MAU) is referred to as type 100BASET in the draft ANSI/IEEE 802.3u Standard. The maximum segment length of 100BASET segments will be no longer than 100 meters.

4 ARCHIVE II DATA LINK LAYER

4.1 Applicable Standard

The data link layer, which is composed of the Media Access Control (MAC) and Logical Link Control (LLC) sublayers for this interface, will be implemented as specified in the ANSI/IEEE 802.3 standard for the MAC sublayer and as specified in ANSI/IEEE 802.2 for the LLC sublayer.

4.2 Media Access Control Procedure

The media access control (MAC) sublayer mechanism for this interface will be Carrier Sense Multiple Access with Collision Detection (CSMA/CD) as specified in sections 3.0 and 4.0 of the ANSI/IEEE 802.3 Standard. The "improved" IEEE 802.3 MAC mechanism that listens for the carrier to return during the first part of inter-packet gap, as described in the ANSI/IEEE 802.8 Standard, will be implemented in the MAC sublayer for this interface. (The ANSI/IEEE 802.3 Standard specifies the physical layer as well as the MAC sublayer for this interface.)

4.3 Logical Link Control

The Logical Link Control (LLC) sublayer protocol for this interface will be implemented as specified in the ANSI/IEEE 802.2 standard.

5 ARCHIVE II NETWORK LAYER

5.1 Applicable Standard

The network layer for this interface will support the Internet Protocol (IP) as specified in RFC 791 and MIL-STD 1777 and as clarified in RFCs 950, 919, 922, and 1122. The Internet Control Message Protocol (ICMP) [RFC 792] and Address Resolution Protocol (ARP) [RFC 826] will also be implemented for this interface. Subnet and host addresses for this interface will be assigned as appropriate.

5.2 Internet Protocol (IP) Description

The Internet Protocol (IP) supports network layer data exchanges between the BDDS and upstream LDM servers. The network layer provides the transparent transfer of data between transport entities. The IP addresses for the network nodes and data hosts are not publicly published.

6 ARCHIVE II TRANSPORT LAYER

6.1 Applicable Standard

The transport layer for this interface will support the Transmission Control Protocol (TCP) as specified in RFC 793 and MIL-STD 1778 and as clarified in RFC 1122.

6.2 Transport Header Description

Connection-oriented transport service is implemented using TCP. TCP is a connection-oriented, end-to-end reliable protocol designed to fit into a layered hierarchy of protocols which support multi-network applications. It provides for guaranteed delivery of data between pairs of processors in host computers attached to networks outside the WSR-88D system. The TCP port number used will be the well-known LDM TCP port 388.

7 ARCHIVE II APPLICATION LAYER

The OSI Model Session, Presentation, and Application layers are defined by an Applications Programming Interface (API), and the format of the messages which are transferred.

7.1 Application Programming Interface (API)

The interface between TCP and an application process consists of a set of calls much like the calls an operating system provides to an application process for manipulating files. There are calls to open, put, get, or close the LDM data store queues. The Base Data Distribution System (BDDS) application uses the LDM API to manage the data and the TCP/IP transmission protocols.

7.1.1 LDM Overview

Unidata's Local Data Manager (LDM) software acquires data and shares them with other networked computers. A data product is treated as an opaque unit, thus nearly any data can be relayed. In particular, the LDM can handle data from different data streams. Data can either be ingested directly from a data source by a client ingestor, or the LDM server can talk to other LDM servers to either receive or send data. Ingestors scan the data stream, determine product boundaries, and extract products, passing those products on to the server product queue. The data, in turn, can be processed locally and/or passed on to other LDM servers. The LDM server software running on the BDDS is configured to store products and allow them to be forwarded to other LDM servers.

7.1.2 LDM Distribution

The Unidata Program Center distributes the LDM software via FTP and WWW at http://www.unidata.ucar.edu/packages/ldm/. Note: LDM data should not be shared outside the receiving organization without the approval of the data provider.

7.1.3 LDM Support

For further information contact:

UCAR Unidata Program Center
P.O. Box 3000
Boulder, Colorado, USA 80307
(303) 497-8643
Internet: *support@unidata.ucar.edu*

7.1.4 LDM Platforms

The LDM is designed to run on a UNIX workstation. The following items comprise the minimum platform requirements: UNIX workstation, adequate disk storage for data (9MB at the time of this publication), TCP/IP Ethernet, standard C compiler (unless the LDM binary version is downloaded), and Perl. The workstation must also maintain a monotonic clock accurate to within one second.

7.2 Connection Procedure

Based upon entries in its ldlm.conf file, the WFO LDM server initiates data exchange with the BDDS by requesting data. The LDM will try to establish a network connection with the BDDS. If the BDDS ldmd.conf file contains entries to accept the connection, the data will be transferred. The BDDS will hold and transfer up to 10 minutes of saved data on a successful connection.

7.3 Data Exchange

This section describes the end-user data structures and values used to store and retrieve Archive II data with the LDM. It also covers the data structures unique to the Archive II data in the LDM context.

7.3.1 LDM Database Keys

Each LDM data record is assigned a key and feedtype when it is placed into the LDM queue. This key is used to assemble and gather like data records. The key is crucial to correctly assembling the records that comprise a complete volume of NEXRAD data. The LDM feedtype for Archive II is **NEXRD2**.

LDM Key Format:

L2-{CMPR_TYPE}/{ICAO}/{DATE_TIME}/{VOL}/{REC}/{E}

CMPR_TYPE –Data Compression type in ASCII. At the time of publication only "BZIP2" is used.
ICAO – Radar identifier in ASCII. The four uppercase character International Civil Aviation Organization identifier of the radar producing the data.
DATE_TIME – The date and time in yyyymmddHHMMSS format. Where yyyy is year, mm is month, dd is day, HH is hour, MM is minute, and SS is second. This date and time comes from the radar time in Figure 2.
VOL – The Volume ID 1-999. This will be the same number as the extension number found in the Volume Header Record.
REC – The current record number in the volume. A record is a group of Archive II messages grouped and compressed together. The record number starts at 1.
E – This is an optional field. Only the last record in a volume will have an "E" marker attached to the LDM key.
Example 1: L2-BZIP2/KTLX/20021016155526/154/4 This example shows a key for a BZIP2 compressed record number 4 of volume 154 from the KTLX radar on 10/16/2002 at 15:55:26. **Example 2:** L2-BZIP/KTLX/20021016155526/154/43/E This example shows a key for a BZIP2 compressed record number 43 of volume 154 from the KTLX radar on 10/16/2002 at 15:55:26 with an "E"nd of volume marker. The next record should start volume 155.

7.3.2 Archive II Data Stream

Within the LDM storage context, at the beginning of the Archive II data stream is an Archive II Volume Header Record. The Volume Header Record is fixed length and contains information uniquely identifying the format and the data that follows. Following the Volume Header Record are variable-length records containing the Archive II data messages. These records are referred to as LDM Compressed Record(s).

7.3.3 Volume Header Record

At the start of every volume is a 24-byte record describing certain attributes of the radar data. The first 9 bytes is a character constant of "AR2V0001.". This constant identifies the version described in this ICD. The version at the time of publication is 1. The next 3 bytes is a numeric string field starting with the value 001 and increasing by one for each volume of radar data in the queue to a maximum value of 999. Once the maximum value is reached the value will be rolled over. The combined 12 bytes are called the Archive II filename. The next 4 bytes contain the *NEXRAD-modified Julian date the volume was produced in the RDA followed by 4 bytes containing the **BDDS time the volume was recorded. The date and time integer values are big Endian. The last 4 bytes contain a 4-letter radar identifier assigned by ICAO. (See Figure 1)

* NEXRAD-modified Julian date - days since 1/1/1970 where 1/1/1970 equals day 1

**BDDS time - The date and time will be inserted into the record by the BDDS. The BDDS uses Network Time Protocol (NTP) to maintain an accurate clock. The Archive II data timestamp (Figure 2) comes from the RDA. Therefore, these two timestamps may differ.

Figure 1. Start of Volume Header Record Format

9 bytes	3 bytes	4 bytes	4 bytes	4 bytes
Tape Filename: ‘AR2V0001.’	Extension Number: ‘001’	Date: NEXRAD-modified Julian	Time: Milliseconds past midnight	ICAO of Radar producing this data

7.3.4 LDM Compressed Record

The structure of the LDM Compressed Record is a 4-byte, big-endian, signed binary control word followed by a compressed block of Archive II data messages. The control word contains the size, in bytes, of the compressed block exclusive of the control words 4 bytes. As the control word contains a negative size under some circumstances, the absolute value of the control word must be used for determining the size of the block.

With the exception of the first and last LDM Compressed Records, the compressed blocks contain 100 Archive II messages. The number of messages in the last record is dependent upon the number of messages comprising the radar volume and may be less than 100. The first compressed record, the Metadata Record, contains 118 messages and is discussed below. At present, the method of compression used to build the compressed block is the bzip2 implementation of the Burrows-Wheeler block sorting text compression algorithm and Huffman coding.

7.3.5 Metadata Record

The first LDM Compressed Record contains the Archive II messages comprising the Archive II metadata. The size of the uncompressed metadata is fixed at 118 messages, ie. 286976 bytes. The following table contains the message types in the sequence in which they are placed in the LDM Compressed Record. It contains the number of 2432 byte message segments set aside for each message type when they are uncompressed. In those instances where the message requires fewer segments than indicated the message type field of the excess message segments will be set to zero. Subsequent variable-length records contain up to 100 messages.

Message Type	Number of Segments
15	62
13	49
18	4
3	1
5	1
2	1

7.3.6 LDM Data Processing

The end user of Archive II data can use the LDM software to collect and manage the data. Data passed to the LDM server are processed in a variety of ways; how specific data are processed is determined by data identifiers and a configuration file called pqact.conf. Processing actions include placing the data in files and running arbitrary programs on the data. Decoders are also available from Unidata that interface with the LDM and convert data into the forms required by various applications.

7.3.6.1 LDM Data Processing Example

The end user can take advantage of the LDM pqact process or write a tailored decoder. LDM pqact uses pattern matching to specify what actions are performed on each product after it is received or placed into the LDM queue. Pqact uses a configuration file called pqact.conf to set up the table of patterns and associated actions for products. This file is human-readable and editable. It contains a list of pattern-action entries, where a pattern is a (feed type, regular expression) pair. For example, the following configuration could be placed into the pqact.conf file:

**NEXRD2 ^L2-([^/]*)/(....)/([0-9][0-9][0-9][0-9][0-1][0-9][0-3][0-9][0-2][0-9][0-5][0-9][0-9][0-9])
FILE /export/home/ldm/data/\2/\3.raw**

This regular expression in the pqact.conf file is based upon the database key, and will cause all the volume data to be placed into a directory corresponding to the radar identifier (Key Field 2). Each volume of data will be in a file named after the date and time (Key Field 3) of that volume number (i.e. 20021016094746.raw). For more information refer to the LDM documentation. The format of this raw file is described in the figure below.

7.3.6.1.1 LDM Raw Data File Format

To exploit the Archive II data the end user must develop a program to extract and decompress the data stored in the LDM raw data file. The libbz2 library function BZ2_bzBuffToBuffDecompress can be used to decompress the LDM Compressed Record. Once decompressed each message requires 2432 bytes of storage.

Volume Header Record A 24-byte record that is described in Figure 1. This record will contain the volume number along with a date and time field.
LDM Compressed Record A record that is bzip2 compressed. It consists of Metadata message types 15, 13, 18, 3, 5, and 2. Metadata is only in Compressed Record #1. See paragraphs 7.3.4 and 7.3.5.
LDM Compressed Record A variable size record that is bzip2 compressed. It consists of 100 Archive II messages, or up to 100 Archive II messages with the last message having a radial status signaling "end of elevation" or "end of volume". See paragraph 7.3.4.
Repeat (LDM Compressed Record) Or End of File (for end of volume data)

7.3.6.2 NCDC Data Format

This document does not describe any other stored NEXRAD data formats once the data leaves the LAN. The data provided to the public by NCDC is stored in a slightly different format. For NCDC formats, refer to NCDC documentation.

7.4 Disconnection

The BDDS can stop and start putting Archive II data into the LDM queue. It does not disconnect the LDM transfer stream. The LDM transfer stream is initiated by the upstream LDM server. The upstream LDM server can maintain the connection waiting for any new Archive II data to ingest.

7.5 Archive II Data

7.5.1 Functional Description

Seven (7) RDA message types are archived:

* Message Type 1	Digital Radar Data
* Message Type 2	RDA Status Data
* Message Type 3	RDA Performance/Maintenance Data
* Message Type 5	RDA Volume Coverage Data
* Message Type 13	RDA Clutter Filter Bypass Map
* Message Type 15	RDA Notch Width Map Data
* Message Type 18	RDA Adaptable Parameters

Message types 3, 5, 13, 15 and 18 constitute the Archive II metadata. The metadata describes the operational environment of the RDA at the time the Archive II Digital Radar data was recorded.

7.6 Archive II Message Types

The messages following the Archive II filename are formatted according to the RDA/RPG ICD. Each message is comprised of a message header followed by a data segment. The type of data contained within the message is identified by the message type field within the message header.
Figure 2 illustrates the message header format. The contents of the message header along with the seven (7) message types contained in the Archive II file are briefly described in this ICD. See the RDA/RPG ICD for more details.

Figure 2. Archive II Data Block Format

MSB	8	8	8	8	LSB
FW1	Message Size		RDA Channel	Message Type	4 FW of Message Header
FW2	ID Sequence Number		Modified Julian Date		
FW3	Milliseconds of Day				
FW4	Number of Message Segments		Message Segment Number		
	Message Data Segment				

7.6.1 Message Type-1 Digital Radar Data

Message type 1, Digital Radar Data, is defined in the RDA/RPG ICD. Message type 1 data contains one (1) radial of data.

7.6.2 Message Type-2 RDA Status Data

Message type 2, RDA Status Data, is defined in the RDA/RPG ICD. The message 2 data contains the state of operational functions within the RDA and is written out to the Archive II interface each time the status of the RDA changes. There will be at least one RDA Status Data message written to the Archive II interface per Archive II volume. The message 2 data is also written to the Archive II interface whenever the RPG requests the status of the RDA.

7.6.3 Message Type-3 RDA Performance/Maintenance Data

Message type 3, RDA Performance/Maintenance Data, is defined in the RDA/RPG ICD. The message 3 data is written to the Archive II interface once per Archive II volume.

7.6.4 Message Type-5 RDA Volume Coverage Pattern Data

Message type 5, RDA Volume Coverage Pattern, is defined in the RDA/RPG ICD. The message 5 data is written to the Archive II interface once per Archive II volume.

7.6.5 Message Type-13 RDA Clutter Filter Bypass Map Data

Message type 13, RDA Clutter Filter Bypass Map, is defined in the RDA/RPG ICD. The message 13 data is written to the Archive II interface once per Archive II volume.

7.6.6 Message Type-15 RDA Notch Width Map Data

Message type 15, RDA Notch Width Map, is defined in the RDA/RPG ICD. The message 15 data is written to the Archive II interface once per Archive II volume.

7.6.7 Message Type-18 RDA Adaptable Parameters Data

Message type 18, RDA Adaptable Parameters, is defined in the RDA/RPG ICD. The message 18 data is written to the Archive II interface once per Archive II volume.

7.7 Message Sequence

Following the Volume Header Record is the RDA metadata for that volume. RDA metadata (Message Types 2, 3, 5, 13, 15, and 18) consists of all pertinent RDA data that was in effect when the volume of RDA Digital Radar Data was recorded (Message Type1). This pool of metadata is compressed and written to the LDM queue at the start of every volume. After the metadata is written out, message types 1 and 2 will be gathered and written to the LDM queue as described in the earlier sections.

Message types 2, 3, 5, 13, 15 and 18 are written to the Archive II queue in the following sequence (see Figure 3):

Figure 3. Message Type Sequence

Message Type 15 – Notchwidth Map Data
Message Type 13 – Clutter Filter Bypass Map Data
Message Type 18 – Adaptation Data
Message Type 3 – Performance/Maintenance Data
Message Type 5 – Volume Coverage Pattern Data
Message Type 2 – RDA Status Data

RDA Status Data, Message Type 2, is written to the Archive II interface as the status of the RDA changes. There will be at least one Message Type 2 written to the Archive II interface per Archive II volume containing a complete RDA Volume Scan. The structure of the data associated with Message Types 1, 2, 3, 5, 13, 15 and 18 are defined in the RDA/RPG ICD.
*****NOTE: Message types 3, 5, 13, 15, and 18 may not contain meaningful data until Open ORDA Build 1 is fielded. When the metadata is not available from the legacy RDA the corresponding messages will be zero filled.**

APPENDIX A - ACRONYMNS/ABBREVIATIONS

Acronym/ Abbreviation	Description
ANSI	American National Standards Institute
ARP	Address Resolution Protocol
BDDS	Base Data Distribution System
bps	Bits per Second
bzip2	Data Compression algorithm used
CCITT	Consultative Committee for International Telegraph and Telephone
CSMA/CD	Carrier Sense Multiple Access with Collision Detection
FCS	Frame Check Sequence
FW	Full Word, four octets addressed by the location of either the high-order or low-order octet. Usually an address that is 0 modulo 4.
I/O	Input/Output
IAB	Internet Architecture Board
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
ID	Identification
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
ISO	International Standards Organization
LAN	Local Area Network
LDM	Unidata Local Data Manager
LLC	Logical Link Control
LSB	Least Significant Bit
MAC	Media Access Control
Mbps	Million Bits per Second
MSB	Most Significant Bit
NCDC	National Climatic Data Center
NEXRAD	Next Generation Weather Radar
NEXRD2	LDM Feedtype for Archive II data
ORDA	Open Radar Data Acquisition
OS	Operating System
OSI	Open Systems Interconnection
RDA	Radar Data Acquisition
RFC	Request for Change (IAB)
RH	NWS Regional Headquarters; Eastern, Southern, Central, and Pacific.
RPG	Radar Product Generator
SCN	Specification Change Notice
TCP/IP	Transmission Control Protocol/ Internet Protocol
VCP	Volume Coverage Pattern
WFO	Weather Forecast Office