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Introduction to the CD-ROM Edition
The ARRL Antenna Book, 21st Edition

"In recent years it has been borne home on us most forcibly that there is greater room for increased performance through superior antenna systems than in any other part of the equipment."

—from the Foreword to the First Edition,

Much has changed since 1939, including the possible ways of delivering information—this CD-ROM is evidence of that! One thing that hasn't changed is that antennas and antenna systems are still the make-or-break component of any amateur station. We are pleased to bring you this 21st edition of *The ARRL Antenna Book* on CD-ROM. The CD-ROM book contains all of the text, drawings and photos contained in the printed 21st edition. And exclusive to the CD-ROM are over 70,000 pages of propagation tables that can help you determine what HF propagation to expect throughout the world, throughout the year and throughout the sunspot cycle.

Make sure you try out the software included for the PC. Follow the instructions for installation of the software and data files.

Using this CD-ROM

This CD-ROM is viewed using Adobe's *Reader* software. Version 7.0 of the software is included on the CD-ROM. The book and the companion files include hyperlinks. These links will appear in blue or green text. Clicking on the text of a hyperlink will cause *Reader* to display another, related part of the book. (See the *Reade*r Help documentation for information on configuring this feature.)

The version of *Acrobat Reader* used with this CD-ROM includes Acrobat Search capability, which allows rapid full-text search of the entire book. This functions as an instant index for every chapter and word in the book. We strongly recommend that you take a few minutes to view the on-line documentation available from *Acrobat Reader*'s Help menu.

Note: Adobe *Reader* version 6.0 or higher is required to use the search index included on this CD-ROM. Older versions of *Acrobat Reader* will not work with the search index, but are otherwise functional. Again, Adobe *Reader* 7.0 is included on the CD-ROM, if you need to install this version.

Installing Adobe *Acrobat Reader*

You may not have *Acrobat Reader* installed on your computer or you may have an older version installed. Installing Adobe *Acrobat Reader Ver.7* is optional during the main Setup installation, and you can do it later, after installing the *Antenna Book* software too.

To install *Acrobat Reader* for *Windows*:

Select **Run** from the *Windows* **Start** menu.

1. Type or Browse to **d:\AdbeRdr709_en_US.exe** (where d: is the drive letter of your CD-ROM drive; if the CD-ROM is a different drive on your system, use the appropriate letter) and press **Enter**.
2. Follow the instructions that appear on your screen.

To install *Acrobat Reader* for the Macintosh:

1. From the top-level folder of the CD, double click on the file "Adobe_Reader_MAC_708.dmg" to open up the disk image. Then double click the Adobe Reader Installer icon to launch the installer.

AB21 Intro to CD.DOC HE:RDS 3/7/2007 8:14 AM Page 3

USA

W1B	Boston, MA
W2A	Albany, NY
W2N	NYC, NY
W3D	Washington, DC
W4A	Montgomery, AL
W4F	Miami, FL
W4G	Atlanta, GA
W4K	Louisville, KY
W4N	Raleigh, NC
W4T	Memphis, TN
W5A	Little Rock, AR
W5H	Houston, TX
W5L	New Orleans, LA
W5M	Jackson, MS
W5N	Albuquerque, NM
W5O	Oklahoma City, OK
W5T	Dallas, TX
W6L	Los Angeles, CA
W6S	San Francisco, CA
W7A	Phoenix, AZ
W7I	Boise, ID
W7M	Helena, MT
W7N	Las Vegas, NV
W7O	Portland, OR
W7U	Salt Lake City, UT
W7W	Seattle, WA
W7Y	Cheyenne, WY
W8M	Detroit, MI
W8O	Cincinnati, OH
W8W	Charleston, WV
W9C	Chicago, IL
W9I	Indianapolis, IN
W9W	Milwaukee, WI
WØC	Denver, CO
WØD	Bismarck, ND
WØI	Kansas City, MO
WØK	Middle of US, KS
WØM	St. Louis, MO
WØN	Omaha, NE
WØS	Pierre, SD

Other, North America

6Y	Kingston, Jamaica
8P	Bridgetown, Barbados
HP	Panama City, Panama
KL7	Anchorage, Alaska
KP2	Virgin Islands
TI	San Jose, Costa Rica
V3	Belmopan, Belize
VE1	Halifax, Nova Scotia
VE2	Montreal, Quebec
VE3	Toronto, Ontario
VE4	Winnipeg, Manitoba
VE5	Regina, Saskatchewan
VE6	Edmonton, Alberta
VE7	Vancouver, BC
VE8	Yellowknife, NWT
VO1	St. John's, NFL
VP2	Anguilla
VP5	Turks & Caicos
XE1	Mexico City, Mexico

Europe

CT	Lisbon, Portugal
DL	Bonn, Germany
EA	Madrid, Spain
EI	Dublin, Ireland
ER	Kishinev, Moldava
F	Paris, France
G	London, England
I	Rome, Italy
JW	Svalbard
OH	Helsinki, Finland
OK	Prague, Czech Republic
ON	Brussels, Belgium
OZ	Copenhagen, Denmark
SV	Athens, Greece
TF	Reykjavik, Iceland
UA3	Moscow, Russia
UA6	Rostov, Russia
UR	Kiev, Ukraine
YO	Bucharest, Romania
YU	Belgrade, Yugoslavia

South America

CE	Santiago, Chile
CP	La Paz, Bolivia
FY	Cayenne, French Guiana
HC	Quito, Ecuador
HC8	Galapagos Islands
HK	Bogota, Columbia
LU	Buenos Aires, Argentina
OA	Lima, Peru
P4	Aruba
PY1	Rio de Janeiro, Brazil
PYØ	Fernando de Noronha
YV	Caracas, Venezuela
YVØ	Aves Island
ZP	Asuncion, Paraguay

Asia

1S	Spratly Islands
3W	Ho Chi Minh City, Vietnam
4J	Baku, Azerbaijan
4S	Columbo, Sri Lanka
4X	Jerusalem, Israel
9N	Katmandu, Nepal
A6	Dubai, UAE
AP	Karachi, Pakistan
BY1	Beijing, China
BY4	Shanghai, China
BYØ	Lhasa, China
HS	Bangkok, Thailand
HZ	Riyadh, Saudi Arabia
JA1	Tokyo, Japan
JA3	Osaka, Japan
JA8	Sapporo, Japan
JT	Ulan Bator, Mongolia
TA	Ankara, Turkey
UA9	Perm, Russia
UAØ	Khabarovsk, Russia
UN	Alma-Ata, Kazakh
VR2	Hong Kong
VU	New Delhi, India
VU7	Andaman Islands
XZ	Rangoon, Myanmar

Oceania

3D2	Fiji Islands
DU	Manila, Philippines
FO	Tahiti
H4	Honiara, Solomon Islands
JD1	Ogasawara Island
KHØ	Saipan, Mariana Islands
KH5K	Kingman Reef
KH6	Honolulu, Hawaii
KH8	American Samoa
V7	Kwajalein, Marshall Islands
VK2	Sydney, Australia
VK6	Perth, Australia
VK8	Darwin, Australia
YB	Jakarta, Indonesia
ZL1	Aukland, New Zealand
ZL3	Christchurch, New Zealand

Africa

3B9	Rodrigues
3C	Bata, Equatorial Guinea
3V	Tunis, Tunisia
5N	Lagos, Nigeria
5R	Antananarivo, Madagascar
5U	Niamey, Niger Republic
5Z	Nairobi, Kenya
6W	Dakar, Senegal
7Q	Lolongwe, Malawi
7X	Algiers, Algeria
9J	Lusaka, Zambia
9L	Freetown, Sierra Leone
9X	Kigali, Rwanda
C9	Maputo, Mozambique
CN	Casablanca, Morroco
CT3	Madeira Islands
D2	Luanda, Angola
EA8	Canary Islands
IG9	Lampedusa, Italy
J2	Djibouti
ST	Khartoum, Sudan
SU	Cairo, Egypt
VQ9	Chagos, Diego Garcia
XT	Burkina Faso
ZS1	Capetown, So. Africa
ZS6	Johannesburg, So. Africa

These PDF files contain propagation prediction tables valid from the transmitting site indicated in the filename to seven generalized receiving locations throughout the world in the Summary Tables and for the 40 CQ Zones in the Detailed Tables. The user selects a single transmitting site closest to his/her location. You can access this data by opening *Adobe Acrobat Reader* and selecting **Prop Index.pdf**. Or you can operate from the main table of contents in the left pane of the opening window.

Each transmitting location is organized by five levels of solar activity over the whole 11-year solar cycle:

VL (Very Low: SSN between 0 to 20)
LO (Low: SSN between 20 to 40)
ME (Medium: SSN between 40 to 60)
HI (High: SSN between 60 to 100)
VH (Very High: SSN between 100 to 150)
UH (Ultra High: SSN greater than 150)

The seven generalized locations throughout the world for the Summary Tables are:

EU = Europe (all of Europe)
FE = Far East (centered on Tokyo, Japan)
SA = South America (centered on Asuncion, Paraguay)
AF = Africa (centered on Lusaka, Zambia)
AS = southern Asia (centered on New Delhi, India)
OC = Oceania (centered on Sydney, Australia)
NA = North America (all of USA).

Both types of propagation files show the highest predicted signal strength (in S-units) throughout the generalized receiving area, for a 1500-W transmitter and rather good antennas on both sides of the circuit. The standard antennas are 100-foot high inverted-V dipoles for 80 and 40 meters, a 3-element Yagi at 100 feet for 20 meters, and a 4-element Yagi at 60 feet for 15 and 10 meters. Discount the S-Meter readings in the tables to represent a smaller station:

Subtract 2 S units for a dipole instead of a Yagi
Subtract 3 S units for a dipole at 50 feet instead of a Yagi at 100 feet
Subtract 1 S unit for a dipole at 50 feet rather than a dipole at 100 feet
Subtract 3 S units for 100 W rather than 1500 W.
Subtract 6 S units for 5 W rather than 1500 W.

Shown below is an image of a Summary Table printout from Boston to the rest of the world, for Very High solar activity in January. This table could be used, for example, to help plan which bands to operate when on a DXpedition to some exotic location.

The Detailed Table printout from Boston to the rest of the world on 20 meters for January from Boston during a Very High level of the solar cycle is shown on the following page. It shows the predicted signal strength in each of the 40 CQ Zones around the world. Note that long-path openings are predicted by an asterisk appended to the end of the predicted signal strength.

Also located on the CD-ROM in the \Propagation subdirectory is the **Fig6Tab.pdf** file described in Chapter 3 of the printed book. This set of tables shows the hours open to each of 10 regions throughout the USA for Very-Low/Medium/Very-High levels of SSN.

Enjoy the software. We would appreciate any feedback or bug reports you might have.

73,

R. Dean Straw, N6BV
Editor, *The ARRL Antenna Book*
email: **n6bv@arrl.org**

Jan., MA (Boston), for SSN = Very High, Sigs in S-Units. By N6BV, ARRL.

	80 Meters							40 Meters							20 Meters							15 Meters							10 Meters							
UTC	EU	FE	SA	AF	AS	OC	NA	EU	FE	SA	AF	AS	OC	NA	EU	FE	SA	AF	AS	OC	NA	EU	FE	SA	AF	AS	OC	NA	EU	FE	SA	AF	AS	OC	NA	UTC
0	9+	-	9+	9+	8	-	9+	9+	5	9+	9+	9	-	9+	1	9+	9+	9+	9+	9	9+	-	9	9+	2	2	9+	9+	-	1	8	-	-	8	9+	0
1	9+	-	9+	9+	8	-	9+	9+	4	9+	9+	9	2	9+	1	9	9+	8	9+	9+	9+	-	3	9	-	7	9+	9	-	-	-	-	-	4	2	1
2	9+	-	9+	9+	7	-	9+	9+	4	9+	9+	9	7	9+	1	9	9+	8	9	9+	9+	-	-	3	-	-	7	9	-	-	-	-	-	-	2	2
3	9+	-	9+	9+	1	2	9+	9+	4	9+	9+	9	9	9+	-	7	9+	7	8	9+	9	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
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5	9+	-	9+	9+	-	8	9+	9+	6	9+	9+	7	9	9+	-	5	9+	9	9	5	9+	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5
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7	9+	-	9+	9+	-	8	9+	9	8	9+	9+	7	9+	9+	-	9	9+	-	7	9	9+	-	-	1	-	-	-	-	-	-	-	-	-	-	2	7
8	9	7	9+	9	-	8	9+	9	8	9+	9+	8	9+	9+	-	9	9+	-	4	9+	9+	-	-	1	-	-	-	2	-	-	-	-	-	-	2	8
9	8	7	9+	7	-	8	9+	9	9	9+	9	8	9+	9+	-	6	9+	-	1	9+	9+	-	-	-	-	-	-	1	-	-	-	-	-	-	2	9
10	5	8	9+	2	3	8	9+	9	9	9+	8	8	9	9+	4	-	9+	9+	1	5	9	-	-	-	-	-	-	-	-	-	-	-	-	-	2	10
11	1	8	9+	-	4	9	9+	8	9	9+	5	8	9	9+	9+	4*	9+	9+	7	-	8	-	-	9	9	-	-	-	-	-	-	-	-	-	2	11
12	-	7	8	-	1	9	9+	6	9	9+	1	8	9	9+	9+	9	9+	9	9	1*	9+	9	8*	9+	9+	9	5*	-	-	2*	9	9	1	1*	2	12
13	-	-	-	-	-	2	9+	4	8	8	-	7	9	9+	9+	9	9+	9	9	9+	9+	9+	7	9+	9+	9+	3*	9	9	5*	9+	9+	9	6*	2	13
14	-	-	-	-	-	-	9+	2	7	4	-	5	8	9+	9+	9	9+	8	9	9	9+	9+	9	9+	9+	9+	9	9+	9	6*	9+	9+	9	1*	1	14
15	-	-	-	-	-	-	9	1	5	-	-	4	5	9+	9+	9	9+	9	9	9	9+	9+	9+	9+	9+	9+	9	9+	9	5	9+	9+	6	6	8	15
16	-	-	-	-	-	-	8	3	4	-	-	3	1	9+	9+	8	9	9	9	9	9+	9+	9+	9+	9+	9	9+	9+	9	8	9+	9+	-	8	9	16
17	-	-	-	-	-	-	8	5	3	-	2	4	-	9+	9+	8	9+	9+	9	9	9+	9+	9	9+	9+	1*	9+	9+	-	8	9+	9+	-	8	9+	17
18	-	-	-	-	-	-	9	7	4	2	5	5	-	9+	9+	9	9+	9+	9	9	9+	9+	9	9+	9+	1	9+	9+	-	7	9+	9+	-	9+	9+	18
19	1	-	-	1	-	-	9+	8	5	6	8	7	-	9+	9+	9	9+	9+	9	9	9+	-	9+	9+	9+	2	9	9+	-	6	9+	9+	-	9+	9+	19
20	4	-	2	5	-	-	9+	9	6	9	9	8	-	9+	9+	9	9+	9+	9	9	9+	-	8	9+	9+	3	9	9+	-	1	9+	9	-	9	9+	20
21	7	-	8	7	1	-	9+	9+	7	9+	9+	8	1	9+	8	9	9+	9+	9	9	9+	-	6	9+	9+	3	9	9+	-	-	9+	5*	-	9+	9+	21
22	9	2	9+	9	8	-	9+	9+	7	9+	9+	9	4	9+	2	9+	9+	9+	9	9	9+	-	9+	9+	9	1	9+	9+	-	5	9+	4*	-	9	6	22
23	9	-	9+	9	8	-	9+	9+	7	9+	9+	9	-	9+	1	9+	9+	9+	9	9	9+	-	9+	9+	6	-	9	9+	-	7	9+	2*	-	9	2	23
	EU	FE	SA	AF	AS	OC	NA	EU	FE	SA	AF	AS	OC	NA	EU	FE	SA	AF	AS	OC	NA	EU	FE	SA	AF	AS	OC	NA	EU	FE	SA	AF	AS	OC	NA	

20 Meters: Jan., MA (Boston), for SSN = Very High, Sigs in S-Units. By N6BV, ARRL.

Zone		UTC --> 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
KL7 = 01		9+	9+	9+	7	-	-	-	-	-	-	-	-	-	-	-	3	9+	9+	9+	9+	9+	9+	9+	9+
VO2 = 02		9+	9	9	9	9	9	8	7	5	3	2	1	5	9+	9+	9+	9+	9+	9+	9+	9+	9+	8	9+
W6 =	03	9+	9+	9+	7	7	1	1	5	8	8	3	-	-	1	9	9+	9+	9+	9+	9	9	9+	9+	9+
W0 =	04	9+	9+	9+	8	5	5	5	5	3	2	1	-	-	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+
W3 =	05	4	2	2	2	2	2	2	3	3	3	3	2	1	1	8	9+	9+	9+	9+	9+	9+	9+	9+	9
XE1 = 06		9+	9+	7	9	9+	9+	9+	9+	9+	9+	9	8	9+	9+	9+	9+	9	9	9	9	9+	9+	9+	9+
TI =	07	9+	9+	8	9	9	9	9	9	9	9+	9	9+	9+	9+	9+	9+	9	8	9	9	9+	9+	9+	9+
VP2 = 08		9+	9+	9+	9+	9+	9+	9+	9+	9+	8	9	9+	9+	9+	9+	9+	9	9+	9+	9+	9+	9+	9+	9+
P4 =	09	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9	9	9	9	9+	9+	9+	9+	9+
HC =	10	9+	8	9+	9	9	9	9	9	7	3	1	7	9+	9+	9	5	5	5	7	8	9+	9+	9+	9+
PY1 = 11		9+	9+	9+	9	9	9+	9+	9	8	6	9	9+	8	2	1	-	-	1	4	8	9	9+	9+	9+
CE =	12	9+	9+	9+	9+	9+	9+	9+	9+	9	8	8	9+	9	8	2	1	1	-	1	3	7	9	9+	9+
LU =	13	9+	9+	9+	9+	9+	9+	9+	9+	8	8	8	9+	8	4	2	1	-	-	1	4	8	9	9+	9+
G =	14	-	-	-	-	-	-	-	-	-	-	-	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	8	2	-
I =	15	-	-	-	-	-	-	-	-	-	-	4	9	9	9	9	9	9	9+	9+	9	8	2	-	-
UA3 = 16		1	1	1	-	-	-	-	-	-	-	-	8	9	9+	9+	9+	9	8	5	-	-	-	-	1
UN =	17	1	-	-	8	7	7	7	1	-	-	-	2	9	9	9	6	-	-	2	4	8	9	5	4
UA9 = 18		6	7	6	6	9	9	9	7	4	1	-	-	8	8	6	6	5	6	7	8	9	9	8	7
UA0 = 19		9+	9	9	6	5	5	8	8	8	4	-	-	2	6	8	8	8	7	4	4	7	9	9+	9+
4X =	20	8	6	3	1	-	3	4	-	-	-	1	8	8	8	8	8	9	9	9+	9	9	8	7	7
HZ =	21	9+	9	4	3	8	8	2	-	-	-	1	7	8	9	8	8	9	9	9	9	9	9	9	9
VU =	22	7	5	8	7	6	7	5	-	-	-	-	6	9	9	9	9	3	2	2	2	8	8	9	8
JT =	23	9	9+	9	5	7	8	8	6	3	-	-	2*	8	8	5	6	8	8	8	8	9	7	5	6
VS6 = 24		9	9	9	5	4	5	7	8	6	1	-	1*	5	7	1	1	1	1	4	2	-	-	-	9
JA1 = 25		9	9	8	7	5	5	8	9	9	6	-	1	1	2	7	7	6	2	-	-	7	9	9+	9
HS =	26	9	9	6	4	2	-	-	2	1	-	-	2*	9	9	9	9	8	7	5	4	5	-	1*	1
DU =	27	9	8	7	-	-	-	5	7	7	1	-	-	1*	9	9	7	6	4	5	3	1*	1*	8	9
YB =	28	9	8	1	-	-	-	-	-	-	-	-	4*	8	9	9	9	8	8	9	9	9	9	9+	9+
VK6 = 29		3*	4*	-	-	-	-	-	-	5	3	-	-	-	5	9	9	9	8	9	9	9	9	9	8
VK3 = 30		1*	-	-	-	-	-	1	3	9	9	4	-	-	9+	9	8	2	1	-	-	1	2*	5*	4*
KH6 = 31		9	9+	9+	9+	8	2	2	6	4	-	-	-	-	-	-	-	9	9	8	7	6	4	6	7
KH8 = 32		-	2	9	9	9	5	5	9	9+	9+	5	-	-	9+	9	9	8	5	3	1	-	-	-	-
CN =	33	-	-	-	-	-	-	-	-	-	-	9	9+	9	9	8	9	9	9+	9+	9+	9+	9+	9+	7
SU =	34	9	8	3	3	-	1	4	-	-	-	2	7	8	8	8	8	9	9	9+	9+	9+	9+	8	8
6W =	35	9+	8	-	-	2	7	5	-	-	-	9+	9+	8	5	4	3	7	9	9+	9+	9+	9+	9+	9+
D2 =	36	9+	9+	5	3	9	9	8	-	-	-	3	-	-	-	-	4	4	7	8	9	9+	9+	9+	9+
5Z =	37	9+	9	2	4	8	8	1	-	-	-	2	-	-	3	5	5	7	8	9	9	9+	9+	9+	9+
ZS6 = 38		9+	9+	8	7	8	9	6	-	-	-	-	-	-	-	1*	1	2	6	8	9	9+	9+	9+	9+
FR =	39	9+	8	2	1	4	1	-	-	-	-	-	-	-	2*	3*	1*	1	3	8	9	9+	9+	9+	9+
FJL = 40		9+	9+	7	4	7	8	7	1	-	-	-	1*	8	9	9	9	9	9	9	9	9+	9+	9+	9+
Zone		UTC --> 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Expected signal levels using 1500 W and 3-element Yagis at 100 feet at each station.