

Propagation-Prediction Files

The ARRL Antenna Book supplemental material contains N6BV propagation-prediction tables for more than 240 different transmitting QTHs throughout the world, including 42 locations in the USA. Each file is in PDF format for viewing and printing using Adobe *Acrobat Reader*. On the following pages you will find instructions on how to use and interpret the tables.

Instructions

Summary Tables Index

Detailed Tables Index

Summary Propagation Tables

USA

W1B Boston, MA
W2A Albany, NY
W2N Buffalo, NY
W3D Washington, DC
W3P Pittsburg, PA
W4A Montgomery, AL
W4F Miami, FL
W4G Atlanta, GA
W4K Louisville, KY
W4N Raleigh, NC
W4S Columbia, SC
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
C6A Nassau, Bahamas
FG Guadeloupe
HP Panama City, Panama
HR Tegucigalpa, Honduras
J3 Grenada
J7 Dominica
KL7 Anchorage, Alaska
KP2 Virgin Islands
OX Godthaab, Greenland
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 Calgary, Alberta
VE7 Vancouver, BC
VE8 Yellowknife, NWT
VO1 St. John's, NFL
VP2 Anguilla
VP5 Turks & Caicos
VP9 Bermuda
XE1 Mexico City, Mexico
YV0 Aves Island
ZF Cayman Islands

Europe

9A Zagreb, Croatia
9H Malta
CT Lisbon, Portugal
CT2 Azore Islands
DL Bonn, Germany
EA Madrid, Spain
EI Dublin, Ireland
ER Kishinev, Moldavia
ES Tallinn, Estonia
F Paris, France
G London, England
HA Budapest, Hungary

HB Berne, Switzerland
I Rome, Italy
JW Svalbard
LA Oslo, Norway
LY Vilnius, Lithuania
LZ Sofia, Bulgaria
OH Helsinki, Finland
OK Prague, Czech Republic
OM Bratislava, Slovakia
ON Brussels, Belgium
OZ Copenhagen, Denmark
S5 Ljubljana, Slovenia
SM Stockholm, Sweden
SP Warsaw, Poland
SV Athens, Greece
TF Reykjavik, Iceland
UA3 Moscow, Russia
UA6 Rostov, Russia
UR Kiev, Ukraine
YO Bucharest, Romania
YU Belgrade, Yugoslavia

South America

8R Georgetown, Guyana
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
PY5 Porto Alegre, Brazil
PY0 Fernando de Noronha
VP8 Falkland Islands
YV Caracas, Venezuela
ZP Asuncion, Paraguay

Asia

1S Spratly Islands
3W Ho Chi Minh City, Vietnam
4J Baku, Azerbaijan
4L Tbilisi, Georgia
4S Columbo, Sri Lanka
4X Jerusalem, Israel
5B Nicosia, Cyprus
7O Aden, So. Yemen
9K Kuwait City, Kuwait
9N Katmandu, Nepal
A5 Thimbu, Bhutan
A7 Ad-Dawahh, Qatar
AP Karachi, Pakistan
BV Taipei, Taiwan
BY1 Beijing, China
BY4 Shanghai, China
BY0 Lhasa, China
EP Tehran, Iran
EX Frunze, Kirghiz
EY Samarkand, Tadzhiik
EZ Ashkhabad, Turkoman
HL Seoul, Korea
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
UA0 Khabarovsk, Russia
UN Alma-Ata, Kazakh
VR2 Hong Kong
VU New Delhi, India
VU4 Andaman Islands
VU7 Laccadive & Nicobar Islands
XZ Rangoon, Myanmar
YA Kabul, Afghanistan
YI Baghdad, Iraq
YK Damascus, Syria

Oceania

3D2 Fiji Islands
3YP Peter 1 Island
9M6 Sabah, E. Malaysia
9V1 Singapore
A3 Nukualoafa, Tonga
DU Manila, Philippines
FK Noumea, New Caledonia
FO Tahiti
H4 Honiara, Solomon Islands
KH0 Saipan, Mariana Islands
KH1 Baker & Howland Islands
KH3 Johnston Island
KH4 Midway Island
KH5 Palmyra Island
KH6 Honolulu, Hawaii
KH7K Kure Island
KH8 American Samoa
KH9 Wake Island
P2 Papua New Guinea
T30 Bonriki, W. Kiribati
T31 Kanton, Central Kiribati
T32 Christmas, E. Kiribati
V7 Kwajalein, Marshall Islands
VK2 Sydney, Australia
VK3 Melbourne, Australia
VK4 Brisbane, Australia
VK5 Adelaide, Australia
VK6 Perth, Australia
VK8 Darwin, Australia
VK9C Cocos Island
VK9N Norfolk Island
VK9X Christmas Island
VR6 Pitcairn Island
YB Jakarta, Indonesia
YJ Port Vila, Vanuatu
ZK1 Manihiki, N. Cook Islands
ZK2 Niue
ZL1 Auckland, New Zealand

ZL3 Christchurch, New Zealand
ZL7 Chatham Islands
ZL8 Kermadec Islands

Africa

3B7 St. Brandon
3B9 Rodrigues
3C Bata, Equatorial Guinea
3V Tunis, Tunisia
3Y0B Bouvet Island
5A Tripoli, Libya
5H Dar es Salaam, Tanzania
5N Lagos, Nigeria
5R Antananarivo, Madagascar
5T Nouakchott, Mauritania
5U Niamey, Niger Republic
5V Lome, Togo
5Z Nairobi, Kenya
6W Dakar, Senegal
7P Maseru, Lesotho
7Q Longwe, Malawi
7X Algiers, Algeria
9G Accra, Ghana
9J Lusaka, Zambia
9L Freetown, Sierra Leone
9Q Kinshasa, Zaire
9X Kigali, Rwanda
A2 Gaborone, Botswana
C5 Banjul, The Gambia
C9 Maputo, Mozambique
CN Casablanca, Morocco
CT3 Madeira Islands
D2 Luanda, Angola
D4 Cape Verde Islands
EA8 Canary Islands
EL Monrovia, Liberia
ET Addis Ababa, Ethiopia
FR Reunion
FR5G Glorioso

FT8X Kerguelen
J2 Djibouti
ST Khartoum, Sudan
SU Cairo, Egypt
T5 Mogadisho, Somalia
VQ9 Chagos, Diego Garcia
XT Burkina Faso
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3W Ho Chi Minh City, Vietnam
4J Baku, Azerbaijan
4L Tbilisi, Georgia
4S Columbo, Sri Lanka
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T30 Bonriki, W. Kiribati
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ZL1 Auckland, New Zealand

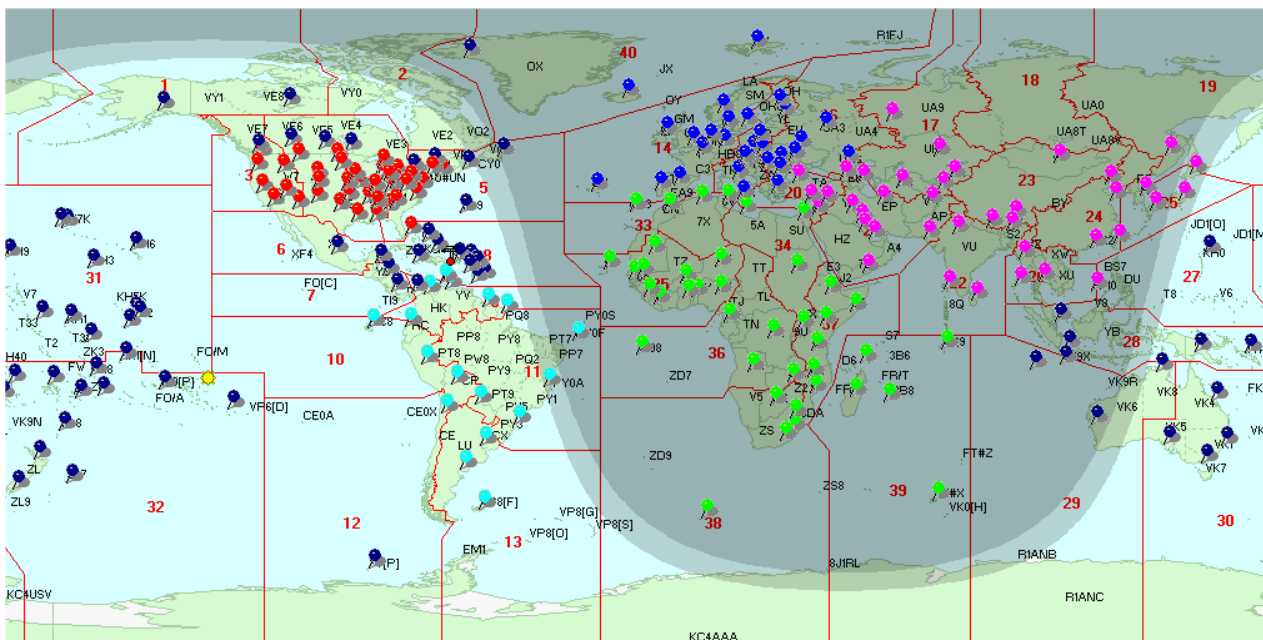
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ZL7 Chatham Islands
ZL8 Kermadec Islands

Africa

3B7 St. Brandon
3B9 Rodrigues
3C Bata, Equatorial Guinea
3V Tunis, Tunisia
3Y0B Bouvet Island
5A Tripoli, Libya
5H Dar es Salaam, Tanzania
5N Lagos, Nigeria
5R Antananarivo, Madagascar
5T Nouakchott, Mauritania
5U Niamey, Niger Republic
5V Lome, Togo
5Z Nairobi, Kenya
6W Dakar, Senegal
7P Maseru, Lesotho
7Q Longwe, Malawi
7X Algiers, Algeria
9G Accra, Ghana
9J Lusaka, Zambia
9L Freetown, Sierra Leone
9Q Kinshasha, Zaire
9X Kigali, Rwanda
A2 Gaborone, Botswana
C5 Banjul, The Gambia
C9 Maputo, Mozambique
CN Casablanca, Morocco
CT3 Madeira Islands
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XT Burkina Faso
ZD8 Ascension Island
ZS1 Capetown, So. Africa
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Instructions for N6BV Propagation Predictions



Coverage map for both Summary and Detailed propagation predictions.

There are two types of propagation data sets. The first is a single-page *Summary Table* of propagation for 80, 40, 20, 15 and 10 meters — all the bands used for HF contesting.

Oct., MA (Boston), for SSN = High, Sigs in S-Units. (c) 2010 Dean Straw, N6BV

UTC	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									
0	7	-	9+	9	5	-	9+	9	-	9+	9	6	-	9+	6	7	9+	9	9	7	9+	1*	7	9+	2*	7	8	9	-	4*	9	4*	3*	5	9	0	
1	8	-	9+	9	5	-	9+	9	-	9+	9	7	1	9+	6	8	9	9	9	8	9+	-	5*	9+	2*	4*	8	9+	-	4	-	-	-	2	1		
2	8	-	9+	9	4	-	9+	9	-	9+	9	7	3	9+	7	7	9	9	9	9	9+	1*	1*	8	2	1*	6	8	-	-	-	-	-	1	2		
3	9	-	9+	9	2	1	9+	9	-	9+	9	5	5	9+	6	7	9	9	9	8	9+	-	1	7	4	1	2*	2	-	-	-	-	-	1	3		
4	9	-	9+	9	-	2	9+	9	-	9+	9	4	7	9+	1*	7	9	9	8	9	9+	-	-	8	8	-	5*	2	-	-	-	-	-	1	4		
5	9+	-	9+	9	-	6	9+	9+	-	9+	9	2	7	9+	-	7	9	9	6	9	9+	-	-	8	4	-	4*	2	-	-	-	-	-	1	5		
6	9+	-	9+	9	-	8	9+	9+	1	9+	9	1	9	9+	-	7	9	9	5	9	9+	-	1*	8	-	-	4*	2	-	-	-	-	-	1	6		
7	8	-	9+	8	-	8	9+	9	2	9+	9	1	9	9+	-	4	9	6	1	9	9+	-	-	3	-	-	-	2	-	-	-	-	-	1	7		
8	6	-	9+	6	-	8	9+	9	4	9	9	2	9	9+	-	2*	9	6	-	9	9+	-	-	-	-	-	-	2	-	-	-	-	-	1	8		
9	3	2	9+	2	-	8	9+	8	7	9	8	2	9	9+	6	1*	9	9	2	8	9+	-	-	-	-	-	-	2	-	-	-	-	-	1	9		
10	-	2	9+	-	-	8	9+	6	5	9	5	4	8	9+	9	5*	9	9	5	5*	9	-	1*	7	9	-	5*	2	-	-	-	-	-	1	10		
11	-	1	8	-	-	6	9+	3	7	9	1	2	8	9+	9	8	9	9	8	5*	9+	9	6*	9	9	7	7*	1	-	2*	1	8	-	5*	1	11	
12	-	-	5	-	-	4	9+	1	4	9	-	2	7	9+	9	8	9	8	8	9	9+	9+	7*	9	9	8	5*	9	8	6*	9	9	7	5*	1	12	
13	-	-	-	-	-	-	9+	-	2	5	-	1	5	9+	9	8	9	8	8	9	9+	9	8	9	9	9	9	9	9	6*	9	9	8	5*	9	13	
14	-	-	-	-	-	-	9	-	-	1	-	1	2	9+	9	6	9	6	7	8	9+	9	8	9	9	8	8	8	9+	9	5*	9	9	8	5*	3	14
15	-	-	-	-	-	-	8	-	-	-	-	-	-	9+	8	5	9	7	6	7	9+	9	7	9	9	7	8	8	9+	9	4	9	9	8	4*	7	15
16	-	-	-	-	-	-	6	-	-	-	-	-	-	9+	9	4	9	8	6	7	9+	9	6	9	9	7	8	8	9+	9	6	9	9	6	4*	9	16
17	-	-	-	-	-	-	5	1	-	-	-	-	-	9+	9	5	9	9	6	5	9+	9	7	9	9	8	9	9+	8	6	9	9	3*	7	9	17	
18	-	-	-	-	-	-	7	2	-	-	1	-	-	9+	9	6	9	9	8	5	9+	9	7	9	9	8	8	8	9+	4	7	9	9	4*	8	9	18
19	-	-	-	-	-	-	9	5	-	4	4	1	-	9+	9	7	9	9	8	6	9+	9	7	9	9	5	9	9+	-	7	9	9	4*	8	9	19	
20	1	-	-	1	-	-	9+	6	-	8	7	3	-	9+	9	8	9	9	8	7	9+	5	8	9	9	2	8	9+	-	1*	9	9	3*	8	9	20	
21	2	-	4	3	-	-	9+	8	-	9	8	5	-	9+	9	7	9	9	6	6	9+	1*	8	9	9	3	8	9+	-	2	9	8	2*	8	9	21	
22	5	-	8	7	2	-	9+	8	1	9	9	6	-	9+	9	8	9	9	9	7*	9+	1*	8	9	9	4	8	9+	-	5*	9	5*	3*	8	6	22	
23	6	-	9	9	4	-	9+	9	1	9	9	6	-	9+	7	8	9	9	9	8*	9+	1*	8	9	7	5	8	9+	-	5*	9	5*	-	7	1*	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		

Sample: Summary table for Boston.

Each Summary table applies to a specific month and level of solar activity and shows the predicted signal levels to seven generalized receiving areas throughout the world, abbreviated as:

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, Canada and Mexico).

There are six levels of solar activity, related to the SSN (Smoothed Sunspot Number) level:

Very Low: SSN between 0 to 20, equivalent to solar flux from 64 to 79
Low: SSN between 21 to 40, equivalent to solar flux from 80 to 94
Medium: SSN between 41 to 60, equivalent to solar flux from 95 to 111
High: SSN between 61 to 100, equivalent to solar flux from 112 to 145
Very High: SSN between 101 to 150, equivalent to solar flux from 146 to 193
Ultra High: SSN above 151, equivalent to solar flux above 194

Selecting a Summary Prediction Table to View

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[Detailed Tables Index](#)

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EP Tehran, Iran
EX Frunze, Kirghiz
EY Samarkand, Tadzhik
EZ Ashkhabad, Turkoman
HL Seoul, Korea
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
UA0 Khabarovsk, Russia
UN Alma-Ata, Kazakh
VR2 Hong Kong
VU New Delhi, India
VU4 Andaman Islands
VU7 Laccadive & Nicobar Islands
XZ Rangoon, Myanmar
YA Kabul, Afghanistan
YI Baghdad, Iraq
YK Damascus, Syria

Click on a transmitting QTH and you will next see:

Summary Propagation Tables for MA (Boston)

SSN Ultra High	SSN Very High	SSN High	SSN Medium	SSN Low	SSN Very Low
January	January	January	January	January	January
February	February	February	February	February	February
March	March	March	March	March	March
April	April	April	April	April	April
May	May	May	May	May	May
June	June	June	June	June	June
July	July	July	July	July	July
August	August	August	August	August	August
September	September	September	September	September	September
October	October	October	October	October	October
November	November	November	November	November	November
December	December	December	December	December	December

Each of the month names in the above table is a hyperlink to the corresponding page of this document. Click on the one you want to jump to.

Click on a month for the appropriate SSN (smoothed sunspot number) and you will finally see the Summary table you want.

Detailed Propagation-Prediction Tables

The second data set is for those who really like details. Each *Detailed Table* is a nine-page, band-by-band listing (160, 80, 40, 30, 20, 17, 15, 12 and 10 meters), for each transmitting QTH for a particular month and a particular level of solar activity, to all 40 CQ Zones.

15 Meters: Oct., MA (Boston), for SSN = High, Sigs in S-Units. (c) 2010 Dean Straw, N6BV

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		6	-	-	-	1*	1*	1*	-	-	-	-	-	-	-	-	-	-	3	8	9	9	9	9	9
VO2 = 02		-	-	-	-	-	-	-	-	-	-	-	-	4*	6	9	9+	9+	9+	9+	9	8	5	-	-
W6 = 03		9	1	-	-	-	-	-	-	-	-	-	-	-	-	-	8	9	9	9+	9+	9	9	9+	9+
W9 = 04		9	3	-	-	-	-	-	-	-	-	-	-	-	9	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+
W3 = 05		1	2	2	2	2	2	2	2	2	2	2	1	1	1*	-	-	-	-	1	1	1	1*	2*	1
XB1 = 06		7	9+	8	1	1	1	1	2	1	-	1*	-	9	5	9+	9+	9	9	9+	9+	9	9+	9+	9+
TI = 07		8	9+	8	5	5	5	5	3	-	-	-	8	3	9+	9+	9+	9	9	9+	9+	9+	9+	9+	9+
VP2 = 08		9	6	2	1	4	5	4	-	-	-	-	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+
P4 = 09		9+	9	6	5	7	8	7	3	-	-	-	9+	9	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+	9+
HC = 10		9	2	-	-	-	-	-	-	-	-	-	-	9+	9+	9+	9	9	9	9	9	9+	9+	9+	9+
PY1 = 11		9	7	6	7	8	8	8	3	-	-	7	9	9	8	6	5	6	8	8	9	9	9	9	9
CE = 12		9	7	2	5	1	2	2	-	-	-	-	7	9	9	8	7	6	6	8	8	8	9	9	9
LU = 13		9	6	1	1	2	5	5	-	-	-	-	9	9	8	7	5	5	6	8	8	9	9	9+	9
G = 14		-	-	-	-	-	-	-	-	-	-	-	7	9+	9+	9	9	9	9+	9+	9	5	-	-	-
I = 15		1*	-	-	-	-	-	-	-	-	-	-	9	9	9	9	9	9	9	9	9	4	1*	1*	1*
UA3 = 16		-	-	1*	-	-	-	-	-	-	-	-	5	8	8	8	7	8	9	8	4	2	-	-	-
UN = 17		1*	4*	1*	-	-	-	-	-	-	-	-	1	8	9	8	7	5	2	3	2	2	1	-	-
UA9 = 18		5*	2*	-	-	-	-	-	-	-	-	-	3*	4	4	1	1*	-	-	-	-	-	1	1	2*
UA0 = 19		6	2	-	-	-	-	-	-	-	-	-	5*	4*	3*	1*	1*	-	1*	1*	1*	1*	2	8	8
4X = 20		2*	-	-	-	-	-	-	-	-	-	-	8	8	9	9	8	9	9	9	7	1	1*	1*	2
HZ = 21		1*	1*	1*	1	-	-	-	-	-	-	-	7	7	8	8	7	7	8	8	5	1	2*	4	4
VU = 22		3*	3*	1*	1	-	-	-	-	-	-	-	4	8	8	6	7	4	4	2	2	2	3	2	1
JT = 23		7	2*	-	1	-	-	-	-	-	-	-	4*	5*	4	1	1*	1*	1*	1*	1*	-	-	2	5
VR2 = 24		4*	3*	-	-	-	-	-	-	-	-	-	6*	5*	7	5	3	2	1	1	2*	2*	1*	4	7
JAL = 25		7	3	-	1	-	-	1*	-	-	-	1*	4*	2*	1*	1*	-	-	1*	2*	1*	2	8	8	8
HS = 26		5*	4*	1*	-	-	-	-	-	-	-	-	4*	6*	7	7	7	6	5	5	5	4	3*	3*	5*
DU = 27		5*	1*	-	-	-	-	-	-	-	-	-	6*	5*	4	8	7	5	4	3	4*	4*	4*	8	7
YB = 28		7*	5*	1*	-	-	-	-	-	-	-	-	6*	7*	8	8	6	6	7	7	7	8	1	2*	8
VK6 = 29		6	5*	4*	2*	5*	4*	4*	-	-	-	5*	7*	3*	1	8	8	8	8	8	5	1	6	8	7
VK3 = 30		4	4	2	-	-	-	-	-	-	-	3*	2*	1*	8	8	6	-	-	5	4	2	4*	4*	4*
KH6 = 31		8	8	2	-	1*	-	-	-	-	-	1*	2*	2*	2*	1*	-	8	9	8	9	8	8	8	8
KH8 = 32		5	7	6	1	-	-	-	-	-	-	1*	3*	3*	9	4	1*	1*	6	6	5	5	6	5	5
CN = 33		-	2*	1*	-	-	-	-	-	-	-	3	9+	9+	9	9	9+	9+	9+	9+	9+	6	2*	1*	1*
SU = 34		1*	-	-	-	-	-	-	-	-	-	2	8	8	8	9	9	9	9	9	8	5	2*	1*	2
6W = 35		2*	-	-	-	-	-	-	-	-	-	9	9+	9	9	8	8	9	9	9+	9+	9+	9	9	1
D2 = 36		-	-	-	4	8	4	-	-	-	-	8	8	7	7	6	6	8	9	9	9	9	9+	9	7
SZ = 37		-	-	1*	-	2	-	-	-	-	-	6	6	6	5	6	8	8	8	9	9	8	9	9	5
ZS6 = 38		-	-	2	4	2	3	-	-	-	-	5	4	2	5	3	5	6	8	8	9	9	9	9	7
FR = 39		-	-	1*	1	1	-	-	-	-	-	4	5	5	5	5	6	8	8	8	9	9	9	9	5
FJL = 40		1	-	1*	-	-	-	-	-	-	-	-	2*	2*	4	6	6	5	5	6	6	5	2	2	1
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

* = Longpath
Expected signal levels using 1500 W and 14 dBi isotropic antennas.

Sample: Detailed table for 15 meters for Boston.

Both the Summary and the Detailed Tables show the highest predicted signal strength (in S-units) throughout the receiving area. Here, the calibration is for S9 at 50 μ V, with each S-unit equal to 4 dB of change. This is the nominal response of many modern transceiver S meters.

If the signal strength is followed by an asterisk (*), then the path is by the *long path* rather than the short path. Both long and short paths can, and often do, exist at the same time, but an asterisk indicates that the long path is dominant in predicted signal strength.

All signal levels are computed for a 1500-W transmitter and rather good antennas (but antennas that are quite practical for many amateur stations), on *both* sides of the circuit, transmitting and receiving. The antennas are equivalent to 100-foot high inverted-V dipoles for 80, 40 and 30 meters, a 3-element Yagi at 100 feet for 20 meters and a 4-element Yagi at 60 feet for 17, 15, 12 and 10 meters.

These antennas are larger than what many amateurs can put up in the air, but they show predictions, whereas smaller antennas or a lower transmitter power might show nothing at all. This would mean that you might be fooled into thinking that propagation doesn't exist when the band might actually be open, albeit weakly.

Discounting the Predicted S-Meter Readings

You can discount the predicted S-Meter readings to reflect the predicted signal strengths at a smaller station, on either the receiving or transmitting side, using the following rules of thumb:

- Subtract 2 S units for a dipole at 100 feet instead of a Yagi (for 20 meters and above)
- Subtract 3 S units for a dipole at 50 feet instead of a Yagi at 100 feet (for 20 meters)
- Subtract 1 S unit for a dipole at 50 feet rather than a dipole at 100 feet (160 to 40 meters)
- Subtract 3 S units for 100 W rather than 1500 W (all bands)
- Subtract 6 S units for 5 W rather than 1500 W (all bands).

For example, a 100-W station operating on 20 meters with a dipole at 50 feet would be down 6 S-units from a station using 1500 W and a 3-element Yagi at 100 feet. If the prediction for a particular path is for S8 signals, then the smaller station would have an S2 signal at that time. Note also that all these predictions are for *undisturbed* ionospheric conditions. All bets are off when the Earth's magnetic field is disturbed as a result of solar flares, coronal mass ejections or sudden disappearing filaments on the Sun!

Note that the 160-meter signal strength estimations are created using a simple algorithm derived by K1KI from his extensive experience on that band. The 160-meter levels are simply the 80-meter levels minus 3 S-units. This gives more reasonable predictions in practice than do any of the *IONCAP*-based programs, which are not designed to work at this low frequency since they do not explicitly take into account the Earth's magnetic field.

Using the Propagation-Prediction Tables

To use the Propagation-Prediction Tables their files must be installed to a hard disk. For Windows a single setup file named **ARRL Antenna Book 24th Edition_Setup.exe** is provided for installation.

When installed in Windows the files are found in a folder titled **Propagation Prediction Files** located by default in the installation folder at **C:\Program Files(x86)\ARRL Antenna Book 24th Edition**. A shortcut to the **Propagation-Prediction Files** folder may also be found via the Start menu or on the desktop.

For Macintosh users a single zip file (also known as an archive file) named **ARRL Antenna Book 24th Edition_Mac_Linux.zip** is provided which includes the files. Macintosh users should extract the files from the zip archive to a hard drive.

Navigate to the **Propagation Prediction Files** folder. Within this folder are the following:

1. **PDF** (folder) – contains all Propagation-Prediction Files
2. **Prop Index.pdf** (i.e. this document)

Following is a usage example, step-by-step, assuming the files are installed on a hard drive.

1. Start **Acrobat Reader** by double-clicking the icon for it.
2. Select **File** and then **Open**.
3. Navigate to the **Propagation Prediction Files** folder
4. Double-click the **Prop Index.pdf** file.
5. Click the link for the **Summary Tables Index**, which shows all 240+ transmitting QTHs.
6. Click once on **W1B Boston, MA**, the first line under the **USA** label.
7. Click on the month **November** in the **SSN High** column and examine it on-screen.
8. Print this Summary Table by clicking **File, Print**. A Print dialog provides the option to print ALL pages (73), just the Current page, or other options. For this example only the current page should be printed.
9. Examine this page carefully. Note the 15-meter prediction to the Far East (FE) at 11 and 12 UTC which shows asterisks with levels of 5* and 7*. These are long-path openings.
10. Now examine the **Detailed Tables** for **November** at **SSN High**.
11. Click **File, Open** and select **Prop Index.pdf** again in the **Propagation Prediction Files** folder.
12. Click on the link to the **Detailed Propagation Tables**. Select **W1B Boston, MA** by clicking on it.
13. Click on the month **November** in the **SSN High** column.

14. Look at the signal-level predictions for all 40 CQ Zones for the 160-meter band from Boston in the month of November at a **SSN High** level of solar activity. The format is different from the Summary File in that the time is listed horizontally across the top and bottom of each page, while the 40 CQ Zones are listed vertically.
15. Move to the 80-meter page using the horizontal right-arrow button on the keyboard. Subsequent clicks display other bands through 10 meters for this month/ solar level. Further clicks move into the month of December.
16. A single page of this Detailed Table may be printed by clicking **File, Print** and then selecting **Current Page**. However, it may be best to print the range of all nine pages associated with a particular month and solar-activity level. Specify the range of pages carefully so as not to inadvertently print out 433 pages automatically. In this case specify the first page (page 308, shown at the top center in *Acrobat Reader*, for 160 meters) and add 8 pages, yielding a range from 308 to 316.