

Supplemental Files – ARRL Antenna Book, 24th Edition

Supplemental files are included with the downloadable content. They include additional discussion, related articles, additional projects, construction details and other useful information. All of these packages are available in the **Supplemental Files** directory and then organized by chapter. (Note: Chapters 2 and 28 have no supplemental files.)

Chapter 1

Supplemental Articles

- “Radio Mathematics” — supplemental information about math used in radio and a list of online resources and tutorials about common mathematics
- “Why an Antenna Radiates” by Kenneth MacLeish, W7TX

Chapter 3

Supplemental Articles

- “Determination of Soil Electrical Characteristics Using a Low Dipole” by Rudy Severns, N6LF
- “Maximum-Gain Radial Ground Systems for Vertical Antennas” by Al Christman, K3LC
- “Radiation and Ground Loss Resistances In LF, MF and HF Verticals: Parts 1 and 2” by Rudy Severns, N6LF
- “Some Thoughts on Vertical Ground Systems over Seawater” by Rudy Severns, N6LF
- “The Case of Declining Beverage-on-Ground Performance” by Rudy Severns, N6LF
- FCC Ground Conductivity Map Set

Chapter 4

Supplemental Articles

- Antenna Book Table 4.3 expanded for other locations
- “Using Propagation Predictions for HF DXing” by Dean Straw N6BV

Chapter 5

Supplemental Articles

- “An Update on Compact Transmitting Loops” by John Belrose, VE2CV
- “A Closer Look at Horizontal Loop Antennas” by Doug DeMaw, W1FB
- “The Horizontal Loop — An Effective Multipurpose Antenna” by Scott Harwood, K4VWK
- “Small Gap-resonated HF Loop Antenna Fed by a Secondary Loop” by Kai Siwiak, KE4PT and R. Quick, W4RQ
- “Active Loop Aerials for HF Reception Part 1: Practical Loop Aerial Design, and Part 2: High Dynamic Range Aerial Amplifier Design,” by Chris Trask, N7ZWY

Chapter 6

Supplemental Articles

- Appendix B — Manual Calculations for Arrays
- “A Wire Eight-Circle Array (for 7 MHz)” by Tony Preedy, G3LNP
- “A Study of Tall Verticals” by Al Christman, K3LC
- “Tall Vertical Arrays” by Al Christman, K3LC
- “The Simplest Phased Array Feed System — That Works” by Roy Lewellan, W7EL

Note: EZNEC modeling files are in the separate **ARRL Antenna Modeling Files** folder with the download

Chapter 7

Supplemental Articles

- 5-Band LPDA Construction Project and Telerana Construction Project
- “An Updated 2 Meter LPDA” by Andrzej Przedpelsi, KØABP
- Log Periodic-Yagi Arrays
- “Practical High-Performance HF Log Periodic Antennas” by Bill Jones, K8CU
- “Six Band, 20 through 6 Meter LPDA” by Ralph Crumrine, NØKC
- “The Log Periodic Dipole Array” by Peter Rhodes, K4EWG
- “Using LPDA TV Antennas for the VHF Ham Bands” by John Stanley, K4ERO
- “Vee Shaped Elements vs Straight Elements” by John Stanley, K4ERO

Chapter 8

Supplemental Articles

- *EZNEC* Modeling Tutorial by Greg Ordy, W8WWV

Chapter 9

Supplemental Articles

- “Designing a Shortened Antenna” by Luiz Duarte Lopes, CT1EOJ
- “A 6-Foot-High 7-MHz Vertical” by Jerry Sevick, W2FMI
- “A Horizontal Loop for 80-Meter DX” by John Belrose, VE2CV
- “A Gain Antenna for 28 MHz” by Brian Beezley, K6STI
- “A Low-Budget, Rotatable 17 Meter Loop” by Howard Hawkins, WB8IGU
- “A Simple Broadband Dipole for 80 Meters” by Frank Witt, AI1H
- “A Wideband Dipole for 75 and 80 Meters” by Ted Armstrong, WA6RNC
- “A Wideband 80 Meter Dipole” by Rudy Severns, N6LF
- “Broad-Band 80-Meter Antenna” by Allen Harbach, WA4DRU
- “Broad-banding a 160 m Vertical Antenna” by Grant Saviers, KZ1W
- “Inductively Loaded Dipoles”
- “Off-Center Loaded Antennas” by Jerry Hall, K1PLP
- “The 3/8-Wavelength Vertical — A Hidden Gem” by Joe Reisert, W1JR
- “The 160-Meter Sloper System at K3LR” by Al Christman, KB8I, Tim Duffy, K3LR and Jim Breakall, WA3FET
- “The ‘C-Pole’ — A Ground Independent Vertical Antenna” by Brian Cake, KF2YN
- “The Compact Vertical Dipole”
- “The Half-Delta Loop — A Critical Analysis and Practical Deployment” by John Belrose, VE2CV and Doug DeMaw, W1FB
- “The K1WA 7-MHz Sloper System”
- “The K4VX Linear-Loaded Dipole for 7 MHz” by Lew Gordon, K4VX
- “The Story of the Broadband Dipole” by Dave Leeson, W6NL
- “The W2FMI Ground-Mounted Short Vertical” by Jerry Sevick, W2FMI
- “Use Your Tower as a Dual-Band, Low-Band DX Antenna” by Ted Rappaport, N9NB, and Jim Parnell, W5JAW

Chapter 10

Supplemental Articles

- “A Compact Multiband Dipole” by Zack Lau, W1VT
- “A No Compromise Off-Center Fed Dipole for Four Bands” by Rick Littlefield, K1BQT
- “A Triband Dipole for 30, 17, and 12 Meters” by Zack Lau, W1VT
- “An Effective Multi-Band Aerial of Simple Construction” by Louis Varney, G5RV
(Original G5RV article)
- “An Experimental All-Band Non-directional Transmitting Antenna,” by G.L.
Countryman, W3HH
- “An Improved Multiband Trap Dipole Antenna” by Al Buxton, W8NX
- “Broadband Transmitting Wire Antennas for 160 through 10 Meters” by Floyd
Koontz, WA2WVL
- “Cat Whiskers — The Broadband Multi-Loop Antenna” by Jacek Pawlowski, SP3L
- “End-Fed Antennas” by Ward Silver, NØAX
- “HF Discone Antennas”
- “HF Discone Antenna Projects” by W8NWF
- “Nested Loop Antennas” by Scott Davis, N3FJP
- “Revisiting the Double-L” by Don Toman, K2KQ
- “Six Band Loaded Dipole Antenna” by Al Buxton, W8NX
- “The HF Discone Antenna” by John Belrose, VE2CV
- “The J78 Antenna: An Eight-band Off-Center-Fed HF Dipole” by Brian Machesney,
K1LI/J75Y
- “The Multimatch Antenna System” by Chester Buchanan, W3DZZ
- “The Open Sleeve Antenna” by Roger Cox, WBØDGF
- “The Open-Sleeve Antenna” from previous editions
- “Two New Multiband Trap Dipoles” by Al Buxton, W8NX
- “Wideband 80 Meter Dipole” by Rudy Severns, N6LF

Chapter 11

Supplemental Articles

- “A 10 Meter Moxon Beam” by Allen Baker, KG4JJH
- “A 20 Meter Moxon Antenna” by Larry Banks, W1DYJ
- “Construction of W6NL Moxon on Cushcraft XM240” by Dave Leeson, W6NL
- “Having a Field Day with the Moxon Rectangle” by L.B. Cebik, W4RNL
- “Multimatch Antenna System” by Chester Buchanan, W3DZZ (see the Chapter 10 folder)

Chapter 12

Supplemental Articles

- “A Dipole Curtain for 15 and 10 Meters” by Mike Loukides, W1JQ
- “Bob Zepp: A Low Band, Low Cost, High Performance Antenna - Parts 1 and 2” by Robert Zavrel, W7SX
- “Curtains for You” by Jim Cain, K1TN (including Feedback)
- “Hands-On Radio Experiment #133 – Extended Double Zepp Antenna” by Ward Silver, NØAX
- “The Extended Double Zepp Revisited” by Jerry Haigwood, W5JH
- “The Extended Lazy H Antenna” by Walter Salmon VK2SA
- “The Multiband Extended Double Zepp and Derivative Designs” by Robert Zavrel, W7SX
- “The N4GG Array” by Hal Kennedy, N4GG
- “The W8JK Antenna: Recap and Update” by John Kraus, W8JK

Chapter 13

Supplemental Articles

- “A Four Wire Steerable V Beam for 10 through 40 Meters” by Sam Moore, NX5Z

Chapter 14

Supplemental Articles

- “Station Design for DX, Part I” by Paul Rockwell, W3AFM
- “Station Design for DX, Part II” by Paul Rockwell, W3AFM
- “Station Design for DX, Part III” by Paul Rockwell, W3AFM
- “Station Design for DX, Part IV” by Paul Rockwell, W3AFM
- N6BV and K1VR Stack Feeding and Switching Systems
- “Generating Terrain Data Using *MicroDEM*” - from previous editions
- “All About Stacking” by Ken Wolff, K1EA

Chapter 15

Supplemental Articles

- “ $2 \times 3 = 6$ ” by L.B. Cebik, W4RNL
- “A 6 Meter Moxon Antenna” by Allen Baker, KG4JJH
- “A 902-MHz Loop Yagi Antenna” by Don Hilliard, WØPW
- “A Short Boom, Wideband 3 Element Yagi for 6 Meters” by L.B. Cebik, W4RNL
- “A VHF/UHF Discone Antenna” by Bob Patterson, K5DZE
- “An Optimum Design for 432 MHz Yagis — Parts 1 and 2” by Steve Powlishen, K1FO
- “An Ultra-Light Yagi for Transatlantic and Other Extreme DX” by Fred Archibald, VE1FA, including the *EZNEC* model
- “Building a Medium-Gain, Wide-Band, 2 Meter Yagi” by L.B. Cebik, W4RNL
- “C Band TVRO Dishes” from previous editions
- “Development and Real World Replication of Modern Yagi Antennas (III) — Manual Optimisation of Multiple Yagi Arrays” by Justin Johnson, GØKSC
- “High-Performance ‘Self-Matched’ Yagi Antennas” by Justin Johnson, GØKSC
- “High-Performance Yagis for 144, 222 and 432 MHz” by Steve Powlishen, K1FO
- “LPDA for 2 Meters Plus” by L.B. Cebik, W4RNL
- “Making the LFA Loop” by Justin Johnson, GØKSC
- “Microwavelengths — Microwave Transmission Lines” by Paul Wade, W1GHZ
- “RF — A Small 70-cm Yagi” by Zack Lau, W1VT

- “The Helical Antenna — Description and Design” by David Conn, VE3KL
- “Three-Band Log-Periodic Antenna” by Robert Heslin, K7RTY/2
- “Using LPDA TV Antennas for the VHF Ham Bands” by John Stanley, K4ERO
- “V-Shaped Elements versus Straight Elements” by John Stanley, K4ERO

Support Files

- Model files and sample radiation patterns for Yagi designs by Justin Johnson, GØKSC (require *EZNEC PRO/4* to reproduce the gain and other performance specifications listed) These files are located in the **ARRL Antenna Modeling Files** folder included with the download.

Chapter 16

Supplemental Articles

- 5/8-Wavelength Whips for 2 Meters and 222 MHz
- “6-Meter Halo Antenna for DXing” by Jerry Clement, VE6AB
- “A 6m Hex Beam for the Rover” by Darryl Holman, WW7D
- “A 6 Meter Halo” by Paul Danzer, N1II
- “A New Spin on the Big Wheel” by L.B. Cebik, W4RNL and Bob Cerreto, WA1FXT
- “A Simple 2 Meter Bicycle-Motorcycle Mobile Antenna” by John Allen, AA1EP
- “A Two-Band Halo for V.H.F. Mobile” by Ed Tilton, W1HDQ
- “A VHF-UHF 3-Band Mobile Antenna” by J.L. Harris, WD4KGD
- “Bicycle-Mobile Antennas” by Steve Cerwin, WA5FRF and Eric Juhre, KØKJ
- “Introduction to Roving” by Ward Silver, NØAX
- “Omnidirectional 6 Meter Loop” by Bruce Walker, N3JO
- “Six Meters from Your Easy Chair” by Dick Stroud, W9SR
- “The DBJ-2: A Portable VHF-UHF Roll-up J-pole Antenna for Public Service” by Edison Fong, WB6IQN
- “The VHF-UHF Contest Rover Experience — Parts 1 and 2” by Greg Jurrens, K5GJ

Chapter 17

Supplemental Articles

- “A 12-Foot Stressed Parabolic Dish” by Richard Knadle, K2RIW
- “A Parasitic Lindenblad Antenna for 70 cm” by Anthony Monteiro, AA2TX
- “A Portable Helix for 435 MHz” by Jim McKim, WØCY
- “A Simple Fixed Antenna for VHF/UHF Satellite Work” by L.B. Cebik, W4RNL
- “An EZ-Lindenblad Antenna for 2 Meters” by Anthony Monteiro, AA2TX
- “Build a 2-Meter Quadrifilar Helix Antenna” by David Finell, N7LRY
- Converted C-Band TVRO Dishes from previous editions
- “Double-Cross Antenna – A NOAA Satellite Downlink Antenna” by Gerald Martes, KD6JDJ
- “EME with Adaptive Polarization at 432 MHz” by Joe Taylor, K1JT, and Justin Johnson, GØKSC
- “Inexpensive Broadband Preamp for Satellite Work” by Mark Spencer, WA8SME
- “L Band Helix Antenna Array” by Clare Fowler, VE3NPC
- “Quadrifilar Helix As a 2 Meter Base Station Antenna” by John Portune, W6NBC
- “Simple Dual-Band Dish Feed for Es’hail-2 QO-100” by Mike Willis, GØMJW; Remco den Besten, PA3FYM; and Paul Marsh, MØEYT
- Space Communications Antenna Examples from previous editions
- “The W3KH Quadrifilar Helix” by Eugene Ruperto, W3KH (plus two Feedback items)
- “Two-Meter Eggbeater” by Les Kramer, WA2PTS and Dave Thornburg, WA2KZV
- “Work OSCAR 40 With Cardboard-Box Antennas” by Anthony Monteiro, AA2TX
- “WRAPS: A Portable Satellite Antenna Rotator System” by Mark Spencer, WA8SME
- “WRAPS Rotator Enhancements Add a Second Beam and Circular Polarization” by Mark Spencer, WA8SME

Chapter 18

Supplemental Articles

- “A 70-cm Power Divider” by Zack Lau, W1VT
- “Feeding Open-Wire Line at VHF and UHF” by Zack Lau, W1VT
- “Rewinding Relays for 12 V Operation,” by Paul Wade, W1GHZ
- “Increasing Side Suppression by Using Loop-Fed Directional Antennas” by Justin Johnson, GØKSC

Chapter 19

Supplemental Articles

- “6 Meter 4 Element Portable Yagi” by Zack Lau, W1VT (plus separate element design drawing)
- “A 6-Meter Portable Yagi Antenna” by Scott McCann, W3MEO
- “A One Person, Safe, Portable and Easy to Erect Antenna Mast” by Bob Dixon, W8ERD
- “A Portable 2-Element Triband Yagi” by Markus Hansen, VE7CA
- “A Portable End-Fed Half-Wave Antenna for 80 Meters” by Rick Littlefield, K1BQT
- “A Portable Inverted V Antenna” by Joseph Littlepage, WE5Y
- “A Simple and Portable HF Vertical Travel Antenna” by Phil Salas, AD5X
- “A Simple HF-Portable Antenna” by Phil Salas, AD5X
- “A Small, Portable Dipole for Field Use” by Ron Herring, W7HD
- “A Super Duper Five Band Portable Antenna” by Clarke Cooper, K8BP
- “A Two-Element Yagi for 18 MHz” by Martin Hedman, SMØDTK
- “An Off Center End Fed Dipole for Portable Operation on 40 to 6 Meters” by Kai Siwiak, KE4PT
- “Compact 40 Meter HF Loop for Your Recreational Vehicle” by John Portune, W6NBC
- “Fishing for DX with a Five Band Portable Antenna” by Barry Strickland, AB4QL
- “Getting the Antenna Aloft” by Stuart Thomas, KB1HQS
- Ladder Mast and PVRC Mount

- “The Black Widow — A Portable 15 Meter Beam” by Allen Baker, KG4JJH
- “The Ultimate Portable HF Vertical Antenna” by Phil Salas, AD5X
- “The W4SSY Spudgun” by Byron Black, W4SSY
- “Tuning Electrically Short Antennas for Field Operation” by Ulrich Rohde, N1UL, and Kai Siwiak, KE4PT
- “Three-Element Portable 6 Meter Yagi” by Markus Hansen, VE7CA
- “Zip Cord Antennas and Feed Lines for Portable Applications” by William Parmley, KR8L

Chapter 20

Supplemental Articles

- “A Compact Loop Antenna for 30 through 12 Meters” by Robert Capon, WA3ULH
- “A Disguised Flagpole Antenna” by Albert Parker, N4AQ
- “A 6-Meter Moxon Antenna” by Allen Baker, KG4JJH
- “An All-Band Attic Antenna” by Kai Siwiak, KE4PT
- “An Antenna Idea for Restricted Communities” by Cristian Paun, WV6N
- “Apartment Dweller Slinky Jr Antenna” by Arthur Peterson, W7CZB
- “Better Results with Indoor Antennas” by Fred Brown, W6HPH
- “Honey, I Shrunk the Antenna!” by Rod Newkirk, W9BRD
- “Small High-Efficiency Loop Antennas” by Ted Hart, W5QJR
- “Short Antennas for the Lower Frequencies – Parts 1 and 2” by Yardley Beers, WØJF
- “Stealth 6-Meter Wire Beam” by Bruce Walker, N3JO
- Tuning Capacitors for Transmitting Loops
- “Using LPDA TV Antennas for the VHF Ham Bands” by John Stanley, K4ERO

Chapter 21

Supplemental Articles

- “How To Build A Capacity Hat” by Ken Muggli, KØHL
- “Screwdriver Mobile Antenna” by Max Bloodworth, KO4TV
- “Table of Mobile Antenna Manufacturers” by Alan Applegate, KØBG

Chapter 22

Supplemental Articles

- “A Four-Way DFER” by Malcolm Mallette, WA9BVS
- “A Fox-Hunting DF Twin Tenna” by R.F Gillette, W9PE
- “A Receiving Antenna that Rejects Local Noise” by Brian Beezley, K6STI
- “A Reversible LF and MF EWE Receive Antenna for Small Lots” by Michael Sapp, WA3TTS
- “Active Antennas” by Ulrich Rohde, N1UL
- “Beverages in Echelon”
- “Design, Construction and Evaluation of the Eight Circle Vertical Array for Low Band Receiving” by Joel Harrison, W5ZN and Bob McGwier, N4HY
- “Flag, Pennants and Other Ground-Independent Low-Band Receiving Antennas” by Earl Cunningham, K6SE
- “Ferrite-Core Loop Antennas”
- “Introducing the Shared Apex Loop Array” by Mark Bauman, KB7GF
- “Is This EWE for You?” by Floyd Koontz, WA2WVL
- “K6STI Low-Noise Receiving Antenna for 80 and 160 Meters” by Brian Beezley, K6STI
- “Modeling the K9AY Loop” by Gary Breed, K9AY
- “More EWEs for You” by Floyd Koontz, WA2WVL
- “Rebuilding a Receiving Flag Antenna for 160 Meters” by Steve Lawrence, WB6RSE
- “Simple Direction-Finding Receiver for 80 Meters” by Dale Hunt, WB6BYU
- “The AMRAD Active LF Antenna” by Frank Gentges, KØBRA
- “The Snoop-Loop” by Claude Maer, WØIC
- “Transmitter Hunting with the DF Loop” by Loren Norberg, W9PYG

Chapter 23

Supplemental Articles

- “Coaxial RF Connectors for Microwaves” by Tom Williams, WA1MBA
- “Hands-On Radio: Open Wire Transmission Lines” by Ward Silver, NØAX
- “Hands-On Radio: SWR and Transmission Line Loss” by Ward Silver, NØAX
- “Hands-On Radio: Choosing a Feed Line” by Ward Silver, NØAX
- “Hands-On Radio: Feed Line Comparison” by Ward Silver, NØAX
- “Installing Coax Crimp Connectors” by Dino Papas, KLØS
- “Microwave Plumbing” by Paul Wade, W1GHZ
- “Multiband Operation with Open-wire Line” by George Cutsogeorge, W2VJN
- “My Feedline Tunes My Antenna” by Byron Goodman W1DX
- RF Connectors and Transmission Line Information - ARRL Handbook
- Smith Chart supplement
- “The Doctor Is In: Yes, Window Line Can be Spliced — If You Must” by Joel Hallas, W1ZR
- “Using RG58 coaxial crimp connectors with RG6 cable” by Garth Jenkinson, VK3BBK

Chapter 24

- “Baluns in Matching Units” by Robert Neece, KØKR
- “Broadband Antenna Matching”
- “Coiled-Coax Balun Measurements” by Ed Gilbert, K2SQ
- “Compact 100-W Z-Match Antenna Tuner” by Phil Salas, AD5X
- “Demystifying the Smith Chart” by Michael J. Toia, K3MT
- “Don’t Blow Up Your Balun” by Dean Straw, N6BV
- “Factors to be Considered in Matching Unit Design” by Robert Neece, KØKR
- “Hairpin Tuners for Matching Balanced Antenna Systems” by John Stanley, K4ERO
- “High-Power ARRL Antenna Tuner” by Dean Straw, N6BV
- “Matching with Inductive Coupling”
- “Matching-Unit Circuit Comparison Table” by Robert Neece, KØKR

- “Optimizing the Performance of Harmonic Attenuation Stubs” by George Cutsogeorge, W2VJN
- “Tapered Lines” from previous editions
- “The AAT — Analyze Antenna Tuner — Program” by Dean Straw, N6BV
- “The EZ Tuner — Parts 1, 2, and 3,” by Jim Garland, W8ZR
- “The Quest for the Ideal Antenna Tuner” by Jack Belrose, VE2CV
- “Why Do Baluns Burn Up?” by Zack Lau, W1VT

Chapter 25

Supplemental Articles

- “K5GO Half-Element Designs” by Stan Stockton, K5GO
- “Conductors for HF Antennas” by Rudy Severns, N6LF
- “Insulated Wire and Antennas” by Rudy Severns, N6LF
- “3D-Printed Coax-to-Wire Connection Blocks” by John Portune, W6NBC

Chapter 26

Supplemental Articles

- “A One Person, Safe, Portable and Easy to Erect Antenna Mast” by Bob Dixon, W8ERD
- “Antenna Feed Line Control Box” by Phil Salas, AD5X
- “Homeowners Insurance and Your Antenna System” by Ray Fallen, ND8L
- “Installing Yagis in Trees” by Steve Morris, K7LXC
- “Is Your Tower Still Safe?” by Tony Brock-Fisher, K1KP
- Ladder Mast and PVRC Mount
- “Lightning Protection for the Amateur Station, Parts 1, 2 and 3” by Ron Block, KB2UYT
- “Removing and Refurbishing Towers” by Steve Morris, K7LXC
- Rotator Specifications

- “The Care and Feeding of an Amateur’s Favorite Antenna Support — The Tree” by Doug Brede, W3AS
- “The Tower Shield” by Baker Springfield, W4HYY and Richard Ely, WA4VHM

Chapter 27

Supplemental Articles

- “A Reflectometer for Twin-Lead” by Fred Brown, W6HPH
- “An Inexpensive VHF Directional Coupler” and “A Calorimeter for VHF and UHF Power Measurements”
- “Antenna Analyzer Pet Tricks” by Paul Wade, W1GHZ
- “Build a Super-Simple SWR Indicator” by Tony Brock-Fisher, K1KP
- “Improving and Using R-X Noise Bridges” by John Grebenkemper, KI6WX
- “Microwavelengths — Directional Couplers” by Paul Wade, W1GHZ
- “On Tuning, Matching and Measuring Antenna Systems Using a Hand Held SWR Analyzer” by John Belrose, VE2CV
- RF Power Meter (Kaune) support files
- “QRP Person’s VSWR Indicator” by Doug DeMaw, W1FB
- “Smith Chart Calculations”
- “SWR Analyzer Tips, Tricks, and Techniques” by George Badger, W6TC, et al
- “Technical Correspondence — A High-Power RF Sampler” by Tom Thompson WØIVJ (plus “More on a High-Power RF Sampler” by Thompson, two files)
- * “The Noise Bridge” by Jack Althouse, K6NY
- “Time Domain Reflectometry” from previous editions
- “The Gadget — An SWR Analyzer Add-On” by Fred Hauff, W3NZ
- “The No Fibbin RF Field Strength Meter” by John Noakes, VE7NI
- “The SWR Analyzer and Transmission Lines” by Peter Schuch, WB2UAQ
- “The Tandem Match — An Accurate Directional Wattmeter” by John Grebenkemper, KA3BLO (plus corrections and updates, four files)
- “Using Single-Frequency Antenna Analyzers” from previous editions

Repeater Antenna Systems

Supplemental Articles

- 144 MHz Duplexer Cavities

