

# Online Contents List

## Supplemental Articles

Radio Mathematics

Radio Math Formulas and Notes

Untangling the Decibel Dilemma

Master Glossary

## Tools and Data Files – General Use

Common Schematic Symbols

Copper Wire Tables

Frequency Response Spreadsheet

## Software

### Tonne Software

*ClassE* for designing RF amplifiers using the single-ended Class E topology

*Diplexer* for design and analysis of diplexer filters

*Elsie* for design and analysis of lumped-element LC filters

*Helical* for design and analysis of helical-resonator bandpass filters

*jjSmith* for use of the Smith chart

*MeterBasic* for design and printing of custom analog meter scales

*OPTLowpass* design and analysis program for optimizing amateur-band transmitter output lowpass filters

*PI-EL* for design and analysis of pi and pi-L networks for transmitter output

*PIZZA* for printing great circle and rectangular projection world maps

*QuadNet* for design and analysis of active all-pass networks for SSB operation

*SVC Filter Designer* for design and analysis of lumped element highpass and low-pass filters

## Chapter 2 – Electrical Fundamentals

### Articles

Hands On Radio: Kirchoff's Laws by Ward Silver, NØAX

Hands On Radio: Laying Down the Laws by Ward Silver, NØAX Hands On Radio:

Putting the Laws to Work by Ward Silver, NØAX Hands On Radio: Thevenin

Equivalents by Ward Silver, NØAX

## **Chapter 3 – Radio Fundamentals**

### **Articles**

Digital Electronic Basics by Dale Botkin, NØXAS

Hands On Radio: Maxwell's Equations — Grad, Div, and Curl by Ward Silver, NØAX

Hands On Radio: Maxwell's Equations — The Wave Emerges by Ward Silver, NØAX

Hands On Radio: The Effects of Gain-Bandwidth Product by Ward Silver, NØAX

Maxwell Without Tears by Paul Shuch, N6TX

## **Chapter 4 – Circuits and Components**

### **Articles**

Hands On Radio: Basic Operational Amplifiers by Ward Silver, NØAX

Hands On Radio: Field Effect Transistors by Ward Silver, NØAX

Hands On Radio: Load Lines by Ward Silver, NØAX

Hands On Radio: The Common Base Amplifier by Ward Silver, NØAX

Hands On Radio: The Common Emitter Amplifier by Ward Silver, NØAX

Hands On Radio: The Emitter-Follower Amplifier by Ward Silver, NØAX

Large Signal Transistor Operation

Cathode Ray Tubes

Thermistors in Homebrew Projects by Bill Sabin, W0IYH

Thermistor Based Temperature Controller by Bill Sabin, W0IYH

### **Tools and Data**

LTSpice circuit simulation files (separate folder)

Machine-wound coil data

## **Chapter 5 – RF Techniques**

### **Articles**

Designing Wide-band Transformers for HF and VHF Power Amplifiers by Chris Trask, N7ZWY

Reflections on the Smith Chart by Wes Hayward, W7ZOI

Simplified Design of Impedance-Matching Networks, Parts I through III by George Grammer, W1DF

The Galactic Background in the Upper HF Band by Dave Typinski, AJ4CO

The Smith Chart

Noise Instrumentation and Measurement by Paul Wade, W1GHZ

### **Tools and Data**

*LTSpice* simulation files for Effects of Parasitic Characteristics

*MATCH.EXE* software by WØIYH

Reflection Coefficient, Attenuation, SWR, and Return Loss

## **Chapter 6 – Electronic Design Automation (EDA)**

### **Articles**

Mathematical Stability Problems in Modern Non-Linear Simulation Programs by Dr. Ulrich Rohde, N1UL and Rucha Lakhe

The Dangers of Simple Usage of Microwave Software by Dr. Ulrich Rohde, N1UL and Hans Hartnagel

Harmonic Balance by Dr. Ulrich Rohde, N1UL, Ajay Poddar, and Matthias Rudolph

Using Simulation at RF by Dr. Ulrich Rohde, N1UL

Color versions of EM simulation figures

### **Tools and Data**

SON and data files for the Electromagnetic Analysis of RF Circuits section

## **Chapter 7 – Power Sources**

### **Articles**

Testing and Monitoring Batteries — Excerpts from *Batteries in a Portable World* by Isidor Buchmann

Vacuum Tube and Obsolete Rectifiers

### **Projects**

12 V 15 A Power Supply — Article and PCB Template

13.8 V 5 A Power Supply — PCB Template

A Deluxe High Voltage Supply by James Garland, W8ZR

A Small, Lightweight High-Voltage Switch-Mode Power Supply by Ralph Crumrine, NØKC

Build an Inverting DC-DC Converter by Jim Stewart

Diode Voltage Drops Raise Battery Power Drain by Ward Silver, NØAX

Four Output Bench Supply by Larry Cicchinelli, K3PTO

Overvoltage Crowbar Circuit

Power Gadgets from USB Sources with the Simple Switching Boost Supply by Tom Wheeler, NØGSG

Revisiting the 12 V Power Supply

Simple Adjustable Tracking Power Supply by Bryant Julstrom, KCØZNG

## **Chapter 8 – DSP and SDR Fundamentals**

### **Articles**

SDR Simplified — Fourier Transforms by Ray Mack, W5IFS

SDR Simplified — Fundamentals of Sampling by Ray Mack, W5IFS

SDR Simplified — More on Sampling by Ray Mack, W5IFS

## Chapter 9 – Oscillators and Synthesizers

### Articles

An Optimized Grounded Base Oscillator Design for VHF/UHF by Dr. Ulrich Rohde, N1UL, and Ajay Poddar, AC2KG

Automatic Tracking Filter for DDS Generator by Riccardo Gionetti, IØFDH

Calculation of FM and AM Noise Signals of Colpitts Oscillators in the Time Domain by Dr. Ulrich Rohde, N1UL

Crystal Test Oscillators by Fred Brown, W6HPH

Frequency Synthesis: Current and Future Projections by Alexander Chenakin

Measuring Receiver Phase Noise

Novel Grounded Base Oscillator Design for VHF-UHF by Dr. Ulrich Rohde, N1UL

Optimized Oscillator Design by Dr. Ulrich Rohde, N1UL

Oscillator Design Using LTSpice by David Stockton, GM4ZNX (also see *LTSpice* files in SwissRoll folder)

Oscillator Phase Noise by Dr. Ulrich Rohde, N1UL

Programming the DDS AD9850 Signal Generator Module by James Kretzschmar, AE7AX

Simulation of the Low Noise Oscillator from Solid State Design for the Radio Amateur by Linley Gumm, K7HFD

Some Thoughts on Crystal Oscillator Design by Dr. Ulrich Rohde, N1UL

Some Thoughts on Designing Very High Performance VHF Oscillators by Dr. Ulrich Rohde, N1UL

What You Always Wanted to Know About Colpitts Oscillators by Dr. Ulrich Rohde, N1UL, and Anisha M. Apte

### Tools and Data

LTSpice simulation files for Oscillator Design Using LTSpice (SwissRoll folder)

## **Chapter 10 – Analog and Digital Filtering**

### **Articles**

Crystal Filter Design and Crystal Characterization

Hands On Radio: ELSIE Filter Design — Parts 1 and 2 by Ward Silver, NØAX

SDR Simplified — Cascaded Integrator Comb Filters by Ray Mack, W5IFS

SDR Simplified — Filter Design Program by Ray Mack, W5IFS

SDR Simplified — Fourier Transforms by Ray Mack, W5IFS

SDR Simplified — More Filter Activities by Ray Mack, W5IFS

Using Active Filter Design Tools by Dan Tayloe, N7VE

### **Projects**

6-Meter Filter with Harmonic Suppression by Paul Wade, W1GHZ

A High Performance, Low Cost 1.8 to 54 MHz Low Pass Filter by Bill Jones, K8CU

Altoids Tin Filters by Paul Wade, W1GHZ

Clean Up Your Signals with Band-Pass Filters — Parts 1 and 2 by Ed Wetherhold, W3NQN

Combine Filters for VHF and UHF by Paul Wade, W1GHZ

Combine VHF Bandpass Filters by Reed Fisher, W2CQH

Interdigital Bandpass Filters for Amateur VHF/UHF Applications by Reed Fisher, W2CQH

Crystal Parameter Measurements Simplified by Chuck Adams, K7QO

HF Yagi Triplexer Especially for Field Day by Gary Gordon, K6KV

High-Power Harmonic Filters by George Cutsogeorge, W2VJN

High-Power HF Band-Pass Filter Design by Jeff Crawford, KØZR

Improved Audio-Frequency Bandpass Filter for Morse Code Reception by Jim Tonne, W4ENE

Manual Filter Design Examples by Jim Tonne, W4ENE

Easy Microwave Filters Using Waveguides and Cavities by Paolo Antoniazzi, IW2ACD

Very High Q Microwave Cavities and Filters by Paolo Antoniazzi, IW2ACD

## **Chapter 11 – Modulation**

### **Articles**

About FM by Ward Silver, NØAX

About SSB by Ward Silver, NØAX

Emissions Designator Table

SDR Simplified — Introduction to I and Q by Ray Mack, W5IFS

## **Chapter 12 – Receiving**

### **Articles**

HF Receiver Testing by Adam Farson, VA7OJ/AB7OJ

Noise Power Ratio (NPR) Testing on HF Receivers by Adam Farson, VA7OJ/AB7OJ

Performance Capability of Active Mixers by Dr. Ulrich Rohde, N1UL

SDR Simplified — Filter Design Program by Ray Mack, W5IFS

SDR Simplified — Introduction to CIC Filters by Ray Mack, W5IFS

SDR Simplified — More Filter Activities by Ray Mack, W5IFS

SDR Simplified — Nyquist Meets Real World by Ray Mack, W5IFS

VHF and UHF Receivers and UHF and Microwave Techniques

### **Projects**

10 GHz preamp PCB template by Zack Lau, W1VT

A Dual Band Low Noise Amplifier for 2 Meters and 70 Centimeters by Jim Kocsis, WA9PYH

A High Performance 45 MHz IF Amplifier for an Up-Conversion HF/LF Receiver by  
ColinHorabin, G3SBI

A Long-wave Upconverter by Fred Brown, W6HPH

A Software-Based Remote Receiver Solution by Martin Ewing, AA6E

A Software Controlled Radio Preselector by J. Onate, MØWWA and X. de Fortuny

All Mode 1 kHz to 1.7 GHz SDR Receiver by James Forkin, WA3TFS

Binaural I-Q Receiver project by Rick Campbell, KK7B

General Coverage Preselector by George Hirshfield, W5OZF

Rock Bending Receiver PCB template by Randy Henderson, WI5W

Simple SDR Receiver by Michael Hightower, KF6SJ

Tunable RF Preamplifier Using Varicap Diode by George Steber, WB9LVI

Universal MMIC Preamp by Paul Wade, W1GHZ

## **Chapter 13 – Transmitting**

### **Articles**

Clean, Punchy, Competitive Contest Audio Without Splatter by Jim Brown, K9YC

SDR Simplified — Demystifying PID Control Loops by Ray Mack, W5IFS

SDR Simplified — Noise Reduction and Adaptive Filters by Ray Mack, W5IFS

Speech Processing: Some New Ideas by Jim Tonne, W4ENE

### **HF Projects**

A Fast TR Switch by Jack Kuecken, KE2QJ

Designing and Building Transistor Linear Power Amplifiers, Parts 1 and 2 by Rick Campbell, KK7B

MicroT2 — A Compact Single-Band SSB Transmitter by Rick Campbell, KK7B

MkII — An Updated Universal QRP Transmitter by Wes Hayward, W7ZOI

TAK-40 SSB/CW Transceiver by Jim Veatch, WA2EUI

The Rockmite — A Simple Single-Band CW Transceiver by Dave Benson, K1SWL (article and HEX file)

The Tuna Tin 2 Today by Ed Hare, W1RFI

### **VHF-UHF Projects**

A 2-Meter Transmitter for Fox Hunting by Mark Spencer, WA8SME

A Microwave Transverter Controller by Hamish Kellock, OH2GAQ

CW Beacon Exciter for 50 MHz by Michael Sapp, WA3TTS (article and parts list)

Simple Frequency Doublers with High Performance by Paul Wade, W1GHZ

VHF and UHF CW Beacons by Michael Sapp, WA3TTS

VHF Open Sources by Rick Campbell, KK7B (article and parts placement)



## **Chapter 14 – Transceiver Topics**

### **Articles**

Hands On SDR — FPGAs by Scotty Cowling, WA2DFI

Hands On SDR — Introduction by Scotty Cowling, WA2DFI

Hands On SDR — More on FPGAs by Scotty Cowling, WA2DFI

Hands On SDR — Sharing Radios on the Network by Scotty Cowling, WA2DFI

Hands On SDR — Using FPGAs in SDR Designs by Scotty Cowling, WA2DFI

Hardware Building Blocks for High Performance SDRs by Scotty Cowling, WA2DFI

SDR Simplified — Demystifying PID Control Loops by Ray Mack, W5IFS

SDR Simplified — Step One Toward a Working SDR by Ray Mark, W5IFS

The Transverter — An Introduction to a Useful Device by Bill Wageman, K5MAT

The Transverter by Tom Williams, WA1MBA

### **Projects**

Build Your Own IF SDR by Alex Schwarz, VE7DXW and Guy Roels, ON6MU

Chapter 14 - Audio Oscillator example.grc (GNU Radio design file)

Digital Signal Processing and GNU Radio Companion by John Petrich, W7FU and Tom McDermott, N5EG

Digital Signal Processing (DSP) Projects: Examples of GNU Radio and GRC Functionality by John Petrich, W7FU, and Tom McDermott, N5EG

A 222 MHz Transverter for the Yaesu FT-817 by Paul Wade, W1GHZ

A 222 MHz Transverter for the Yaesu FT-817 — Revisited by Paul Wade, W1GHZ

Assembling a Microwave Transverter System by Paul Wade, W1GHZ

Cheap & Simple 1296 MHz Transverter Update by Paul Wade, W1GHZ

Corrections and Improvements for Simple and Cheap Multiband Microwave Transverters by Paul Wade, W1GHZ

Sequencers for Transverter Control by Paul Wade, W1GHZ

Smart Fool-resistant Conditional Sequencer by Paul Wade, W1GHZ

Universal MMIC Preamp by Paul Wade, W1GHZ

## **Chapter 15 – Digital Protocols and Modes**

### **Articles and Data Tables**

High-Speed Wireless Networking in the UHF and Microwave Bands by David Bern, W2LNX,  
and Keith Elkin, KB3TCB

Legacy Digital Modes

The FT4 and FT8 Communication Protocols by Steve Franke, K9AN, Bill Somerville, G4WJS,  
and Joe Taylor, K1JT

### **Data**

ITA2 Character Code Table

ASCII Character Code Table

Digital Modes — Lowest Permitted Amateur Frequency

Varicode tables for PSK31, MFSK16 and DominoEX

## **Chapter 16 – Amateur Radio Data Platforms**

### **Articles**

APRS Unveiled by Bob Simmons, WB6EYV

Fox-1 Satellite Telemetry – Part 1: On the Satellite by Burns Fisher, W2BFJ

Fox-1 Satellite Telemetry – Part 2: FoxTelem by Chris Thompson, AC2CZ

High Altitude Platforms – Powerpoint presentations and PDF articles by Paul Verhage, KD4STH

### **Projects**

A Simple Sensor Package for High Altitude Ballooning by John Post, KA5GSQ

ARRL Education and Technology Program Space/Sea Buoy by Mark Spencer, WA8SME

APRS with a Smartphone by Pat Cain, KØPC

Touching Near Space on a Budget by Paul Verhage, KD4STH

## **Chapter 17 – RF Power Amplifiers**

### **Articles**

Design Example — MOSFET Thermal Design by Dick Frey, K4XU

Designing to Avoid Interactive Tuning and Load Adjustments by John Stanley, K4ERO

Determining a Transistor's Power Rating (APT Application Note) by Dick Frey, K4XU

### **Projects**

A Tube Tester for High Power Transmitting Tubes by John Mathis, WA5FAC, and Max Landey, KM4UK

Amplifier Overshoot-Drive Protection by Phil Salas, AD5X

Design Example — HF Amplifier using 8877 Vacuum Tube by John Stanley, K4ERO

Designing Wide-band Transformers for HF and VHF Power Amplifiers by Chris Trask, N7ZWY  
3CX1500D7 RF Linear Amplifier by Jerry Pittenger, K8RA (including PCB layout, Pi-L values spreadsheet, etc.)

### **Data**

Base diagrams and operating values for popular transmitting tubes

The Everyham's Amp by John Stanley, K4ERO (including files with construction notes, layouts, use of different tubes, etc.)

144 MHz Amplifier Using the 3CX1200Z7 by Russ Miller, N7ART

A 6 Meter Kilowatt Amplifier by Dick Stevens, W1QWJ

Build a Linear 2 Meter, 80 W All Mode Amplifier by James Klitzing, W6PQL

High-Performance Grounded-Grid 220-MHz Kilowatt Linear by Robert Sutherland, W6PO

Simple Broadband Solid-State Power Amplifiers by Paul Wade, W1GHZ

2 Watt RF Power Amplifier for 10 GHz by Steven Lampereur, KB9MWR

432 MHz 3CX800A7 Amplifier by Steve Powlishen, K1FO

2304 MHz 70 W Rover Amplifier by Bill Koch, W2RMA, and John Brooks, N9ZL

A High-Power Cavity Amplifier for the New 900-MHz Band by Robert Sutherland, W6PO

A Quarter-Kilowatt 23-cm Amplifier, Parts 1 and 2 by Chip Angle, N6CA

### **Software**

135 Degree Pi Network Calculator Spreadsheet by John Stanley, K4ERO

*MATCH.EXE* software (for use with Tuned (Resonant) Networks)

*TubeCalculator* by Bentley Chan and John Stanley, K4ERO, for analysis of operation of popular high power transmitting tubes

## **Chapter 19 – Propagation of Radio Signals**

### **Articles**

Build a Homebrew Radio Telescope by Mark Spencer, WA8SME

F-Region Propagation and the Equatorial Ionosphere Anomaly by Jim Kennedy, K6MIO/KH6 Gray Line Propagation, or Florida to Cocos (Keeling) on 80m by Ed Callaway, N4II

Hands On Radio: Recording Signals by Ward Silver, NØAX

The New Sunspot Numbers by Carl Luetzelschwab, K9LA

The Penticton Solar Flux Receiver by John White, VA7JW, and Ken Tapping

The Reverse Beacon Network by Pete Smith, N4ZR and Ward Silver, NØAX

The Solar Eclipse QSO Party by Ward Silver, NØAX

Upper Level Lows and 6-Meter Sporadic E by Joe Dzekevich, K1YOW

What to Expect During the Rising Years of Solar Cycle 25 by Frank Donovan, W3LPL Frequency Selection for HF Operation

## **Chapter 20 – Transmission Lines**

### **Articles**

Don't Blow Up Your Balun by Dean Straw N6BV

Measuring Ferrite Chokes by Jim Brown, K9YC

Measuring Isolation Between Radios by George Cutsogorge, W2VJN

Microwave Plumbing by Paul Wade, W1GHZ

Multiband Operation with Open-wire Line by George Cutsogorge, W2VJN

Optimizing the Performance of Harmonic Attenuation Stubs by George Cutsogorge, W2VJN Optimizing the Placement of Stubs for Harmonic Suppression by Jim Brown, K9YC

Radio Frequency (RF) Surge Suppressor Ratings for Transmissions into Reactive Loads by Gene Hinkle, K5PA

RF Connectors and Transmission Lines

Transmission Lines in Digital Circuits

Using TLW to Design Impedance Matching Networks by George Cutsogorge, W2VJN MATCH.EXE software (for use with Tuned (Resonant) Networks discussion

## **Projects**

A Commercial Triplexer Design by George Cutsogeorge, W2VJN  
Chokes and Isolation Transformers for Receiving Antennas by Jim Brown, K9YC  
HF Yagi Triplexer Especially for ARRL Field Day by Gary Gordon, K6KV  
Legacy Wound-Coax Ferrite Chokes  
Simple Splice for 7/8 Inch Heliax by Ott Fiebel, W4WSR  
Splicing Window Line by Joel Hallas, W1ZR  
Reflection Coefficient, Attenuation, SWR, and Return Loss  
Smith Chart Supplement

## **Chapter 21 – Antennas**

### **Articles**

Antenna Material Tables  
The Story of the Broadband Dipole by Dave Leeson W6NL  
Weatherizing Outdoor Inductors and Traps by Dick Sander, K5QY  
Workshop Chronicles: Alloy Designations by Don Daso, K4ZA  
Top-Loaded Low-Band Antenna Construction Details by Dick Stroud, W9SR

### **Projects for HF**

A Simple Direction-Finding Receiver for 80 Meters by Dale Hunt, WB6BYU  
A Simple Broadband Dipole for 80 Meters by Frank Witt AI1H  
A Wideband 80-Meter Dipole by Rudy Severns N6LF  
Broad-Band 80-Meter Antenna by Allen Harbach WA4DRU  
Design of a Two-band Loaded Dipole Antenna by David Birnbaum, K2LYV  
Direction Finding Techniques by Joe Moell, KØOV  
Half-Wave and Multiband Dipole Azimuth and Elevation Patterns  
Small Gap-Resonated Loop Antennas by Kai Siwiak KE4PT and Richard Quick W4RQ  
The 3/8-Wavelength Vertical — A Hidden Gem by Joe Reisert, W1JR  
The Fan Dipole as a Wideband and Multiband Antenna Element by Joel Hallas W1ZR  
A Compact Multiband Dipole by Zack Lau W1VT  
A No Compromise Off-Center Fed Dipole for Four Bands by Rick Littlefield, K1BQT  
An Off-Center End-Fed Dipole for Portable Operation on 40 to 6 Meters by Kai Siwiak, KE4PT  
Extended Double-Zepp for 17 Meters

Five-Band Two-Element Quad by Al Doig, W6NBH, and William Stein, KC6T  
Having a Field Day with the Moxon Rectangle, by L.B. Cebik, W4RNL  
The J78 Antenna: An Eight-band Off-Center-Fed HF Dipole by Brian Machesney, K1LI/J75Y  
The Trimox — A Moxon Tribander for a Holiday DXpedition by Brian Machesney, K1LI  
The W4SSY Spudgun by Byron Black, W4SSY  
Triband Dipole for 30, 17, and 12 Meters by Zack Lau W1VT  
Two-Band Loop for 30 and 40 Meters by James Brenner, NT4B  
Two W8NX Multiband, Coax-Trap Dipoles  
Wire Quad for 40 Meters by Dean Straw, N6BV  
K8SYL's 75 and 10-Meter Dipole by Sylvia Hutchinson K8SYL  
Rotatable Dipole Inverted-U Antenna, LB Cebik W4RNL

### **Projects for VHF and UHF**

6-Meter Halo Antenna for DXing by Jerry Clement, VE6AB  
A New Spin on the Big Wheel by L.B. Cebik, W4RNL, and Bob Cerreto, WA1FXT  
A Simple Fixed Antenna for VHF/UHF Satellite Work, by L.B. Cebik, W4RNL  
A Small 70-cm Yagi by Zack Lau, W1VT  
A True Plumber's Delight for 2 Meters — An All-Copper J-Pole by Michael Hood, KD8JB  
Cheap Antennas for the AMSAT LEOs by Kent Britain, WA5VJB  
Dual-Band Antenna for 146/446 MHz by Wayde Bartholomew, K3MF  
Medium-Gain 2 Meter Yagi by L.B. Cebik, W4RNL  
Quick and Cheap Omni Antenna for 1296 MHz by Paul Wade, W1GHZ

## **Chapter 22 – Safe Practices**

### **Articles**

Electric Current Abroad — U.S. Dept of Commerce

Field Day Tower Safety by Don Daso, K4ZA and Ward Silver, NØAX

How to Interact with a Concerned Neighbor

Interpreting news about RF Exposure Discoveries

RF Safety at Field Day by Greg Lapin, N9GL

RF Safety Standard Development

RF Surge Suppressor Ratings for Transmissions into Reactive Loads by Gene Hinkle, K5PA

Shop Safety by Don Daso, K4ZA

Types of Scientific Studies

## **Chapter 23 – Construction Techniques**

### **Articles**

Introduction to 3D Printing for Hams by John Portune, W6NBC

Repurposing Obsolete Instrument Enclosures by Scott Roleson, KC7CJ

Reflow Soldering for the Radio Amateur by Jim Koehler, VE5JP

Reflow Soldering for the Radio Amateur — Revisited by Jim Koehler, VE5FP

Soldering Straight-Pin Headers by Joe Eisenberg, KØNEB

Soldering Surface-Mount Devices by Dino Papas, KLØS

Surface Mount Technology — You Can Work With It (Parts 1 – 4) by Sam Ulbing,

N4UAU Soldering Straight-Pin Headers by Joe Eisenberg, K0NEB

### **Projects**

3D Printed Antennas by Paul Wade, W1GHZ

3D Printed Coax-to-Wire Connection Blocks by John Portune, W6NBC

3D Printed Fixture Simplifies Ground-Plane Antenna Construction by John Portune, W6NBC

A No-Special-Tools SMD Desoldering Technique by Wayne Yoshida, KH6WZ

Making Your Own Printed Circuit Boards

## **Chapter 24 – Assembling a Station**

### **Articles**

A Look at Gasoline Powered Inverter Generators by Bob Allison, WB1GCM

Field Day Towers — Doing it Right by Don Daso, K4ZA and Ward Silver, NØAX

## **Chapter 25 – Test Equipment and Measurements**

### **Articles**

Antenna Analyzer Pet Tricks by Paul Wade, W1GHZ

Apparatus for RF Measurements by Bruce Pontius, NØADL, and Kai Siwiak, KE4PT

ARRL Lab Test Procedures Manual

Noise Instrumentation and Measurement by Paul Wade, W1GHZ

Test and Measurement Bibliography

Test and Measurement Further Reading

Testing and Calculating Intermodulation Distortion in Receivers by Dr. Ulrich Rohde, N1UL

Voltage-Power Conversion Table

Receiver Testing and Performance by Rob Sherwood, NCØB (Separate folder)

Receiver Noise Floor and Band Noise Reciprocal Mixing Test Procedure

Sherwood Lab Setup for Dynamic Range Measurements

Terms Explained for the Sherwood Table of Receiver Performance

### **Projects**

Build a Return Loss Bridge by James Ford, N6JF

E- and H-Field Probes by Ward Silver, NØAX

Low Frequency Adapter for your Vector Network Analyzer (VNA) by Jacques Audet, VE2AZX

Two-Tone Oscillator — PCB artwork and layout graphics by ARRL Lab

RF Field Strength Meter by John Noakes, VE7NI

RF Sampler Construction details by Thomas Thompson, WØIVJ

RF Step Attenuator by Denton Bramwell, K7OWJ

Compensated RF Voltmeter by Sidney Cooper, K2QHE

Gate Dip Oscillator articles and PCB artwork by Alan Bloom, N1AL

Logic Probe — supporting photos and graphics by Alan Bloom, N1AL

Transistor Tester PCB artwork and layout graphics by Alan Bloom, N1AL



## **Chapter 26 – Troubleshooting**

### **Articles**

Amplifier Care and Maintenance by Ward Silver, NØAX

Diode and Transistor Test Circuits by Ed Hare, W1RFI

Hands On Radio: Power Supply Analysis by Ward Silver, NØAX

Troubleshooting Radios by Mel Eisman, NC4L

### **Project**

Building a Modern Signal Tracer by Curt Terwilliger, W6XJ

### **Project Files**

PC Board Templates

AF/RF signal injector template

Crystal controlled signal source template

## **Chapter 27 – RFI and EMC**

### **Articles**

Building Contest Scores by Killing Receive Noise — Parts 1 and 2 by Jim Brown, K9YC

Can Home Solar Power and Ham Radio Coexist? by Tony Brock-Fisher, K1KP

Tracking RFI with an SDR Once Source at a Time by Alan Higbie, KØAV

TV Channel, Amateur Band, and Harmonic Chart

What to Do if You Have an Electronic Interference Problem — CEA Handbook

Common Mistake - What Is It?

Solar Power Retrofit by Paul Cianciolo W1VLF

### **Projects**

A Home-made Ultrasonic Power Line Arc Detector and Project Update by Jim Hanson, W1TRC

A Simple TRF Receiver for Tracking RFI by Rick Littlefield, K1BQT

Active Attenuator for VHF-FM by Fao Eenhoorn, PAØZR (article and template)

Handheld Loop Antenna for RFI Location by Gary Johnson, NA6O

RF Sniffer Construction Notes by Mark Kupferschmid, AC9PR

Simple Seeker by Dave Geiser, W5IXM

Tape Measure Beam for Power Line Hunting by Jim Hanson, W1TRC

## **Station Accessory Projects**

A Digital Interface in Time for Field Day by Julian Moss, G4ILO

A Low-Cost Remote Antenna Switch by Bill Smith, KO4NR

A Raspberry Pi Network Server/Client for Antenna Rotor, by Tom Doyle, W9KE

A Remote Power Controller by Mike Bryce, WB8VGE

A Simple DC Power Polarity Checker by John Burnley, NUØV

A Switched Attenuator courtesy of RSGB

An Improved DSP Audio Filter by Grant Zehr AA9LC and Scott Zehr K9GKC

An Overvoltage Protection Circuit by Ralph Gable, WA2PUX

Arduino CW Serial IDer by Bob Anding, AA5OY (plus software/support files)

Audio Splitter by Glenn Loake, GØGBI

Bistable Transfer Relay by Oliver Nicic, DG7XO

Build a 50-75 W Broadband Transformer for 1.8-54 MHz by Stan Johnson, WØSJ

Build a Legal Limit Bias T that Covers 1.8 to 230 MHz by Phil Salas, AD5X

Digital 10 W Stereo Audio Amplifier by Helmut Berka, DL2MAJ and Wolfgang Fortsch, DK4MZ

Eight Channel Remote Control Antenna Selector by Michael Dzado, ACØHB

High-Efficiency 2 kW Water-Cooled Dummy Load by Guenther Knebel, DK6ET

ID-O-Matic Station Identification Timer by Dale Botkin, NØXAS (plus source code and support files, separate folder)

Improve Workbench Safety with GFCI and a Kill Switch by Allen Wolf, KC7O

Multiband Tuning Circuits by R. W. Johnson, W6MUR

Receiver Step Attenuator by Scott Roleson KC7CJ

Two QSK Controllers for Amplifiers by Jim Colville, W7RY and Paul Christensen, W9AC (plus source code and support files, separate folder)

Versatile T/R Switch for SDRs and Vintage Radios by Bob Nickels, W9RAN

Web Switch for Selecting Antennas and Radios by John Burnley, NUØV

## **Data**

Trio of Computer Interfaces PCB template

