

QEX (ISSN: 0886-8093) is published bimonthly in January, March, May, July, September, and November by the American Radio Relay League, 225 Main Street, Newington, CT 06111-1494. Periodicals postage paid at Hartford, CT and at additional mailing offices.

POSTMASTER: Send address changes to: QEX, 225 Main St, Newington, CT 06111-1494 Issue No 291

Harold Kramer, WJ1B  
*Publisher*

Larry Wolfgang, WR1B  
*Editor*

Lori Weinberg, KB1EIB  
*Assistant Editor*

Zack Lau, W1VT  
 Ray Mack, W5IFS  
*Contributing Editors*

**Production Department**

Steve Ford, WB8IMY  
*Publications Manager*

Michelle Bloom, WB1ENT  
*Production Supervisor*

Sue Fagan, KB1OKW  
*Graphic Design Supervisor*

David Pingree, N1NAS  
*Senior Technical Illustrator*

Brian Washing  
*Technical Illustrator*

**Advertising Information Contact:**

Janet L. Rocco, W1JLR  
*Business Services*  
 860-594-0203 – Direct  
 800-243-7768 – ARRL  
 860-594-4285 – Fax

**Circulation Department**

Cathy Stepina, QEX Circulation

**Offices**

225 Main St, Newington, CT 06111-1494 USA  
 Telephone: 860-594-0200  
 Fax: 860-594-0259 (24 hour direct line)  
 e-mail: [qex@arrl.org](mailto:qex@arrl.org)

**Subscription rate for 6 issues:**

In the US: ARRL Member \$24, nonmember \$36;

US by First Class Mail: ARRL member \$37, nonmember \$49;

International and Canada by Airmail: ARRL member \$31, nonmember \$43;

Members are asked to include their membership control number or a label from their QST when applying.

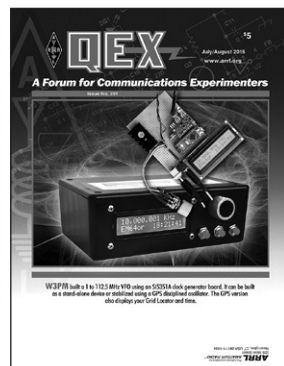
In order to ensure prompt delivery, we ask that you periodically check the address information on your mailing label. If you find any inaccuracies, please contact the Circulation Department immediately. Thank you for your assistance.



Copyright © 2015 by the American Radio Relay League Inc. For permission to quote or reprint material from QEX or any ARRL publication, send a written request including the issue date (or book title), article, page numbers and a description of where you intend to use the reprinted material. Send the request to the office of the Publications Manager ([permission@arrl.org](mailto:permission@arrl.org)).

**About the Cover**

Gene Marcus, W3PM, used an Si5351A clock generator board from Adafruit to build a 1 to 112.5 MHz VFO. You can build this VFO as a stand-alone unit or with a GPS disciplined oscillator to produce a more stable signal frequency. The GPS version also displays your Grid Locator and the time in UTC.



**In This Issue**

## Features

**3 An Arduino Controlled GPS Corrected VFO**  
 Gene Marcus, W3PM/GM4YRE

**8 The DG5MK LCQ-Meter**  
 Michael Knitter, DG5MK

**28 Radiation and Ground Loss Resistances In LF, MF and HF Verticals: Part 1**  
 Rudy Severns, N6LF

**35 A Digital Millihom Meter**  
 Jim Johnson, WA6OZJ

**37 Hands-On SDR**  
 Scotty Cowling, WA2DFI

**43 Upcoming Conferences**

**Index of Advertisers**

Down East Microwave Inc.....	7	Nemal Electronics International, Inc:.....	43
Expert Linears America LLC:.....	Cover III	Quicksilver Radio Products.....	Cover IV
Kenwood Communications:.....	Cover II	RF Parts:.....	31, 33
M²:.....	34	Tucson Amateur Packet Radio: .....	27