

Howard E. Michel, WB2ITX
Publisher

Steve Ford, WB8IMY
Editor

Becky R. Schoenfeld, W1BXY
Managing Editor

Jen Glifort, KC1KNL
Senior Editor

Caroline Kenney
Leanna Zwiebel
Assistant Editors

Bart Jahnke, W9JJ
Radiosport & Field Services
Manager

Rick Lindquist, WW1ME
Happenings

Bob Allison, WB1GCM
Product Review Lab Testing

Mark J. Wilson, K1RO
Al Brogdon, W1AB
Bernie McClenny, W3UR
H. Ward Silver, N0AX
Paul Wade, W1GHZ
Jon Jones, N0JK
Rick Palm, K1CE
Joel R. Hallas, W1ZR
Barry Shackelford, W6YE
Kai Siwiak, KE4PT
Bruce Draper, AA5B
Contributing Editors

Michelle Bloom, WB1ENT
Production Supervisor

Jodi Morin, KA1JPA
Assistant Production Supervisor

Maty Weinberg, KB1EIB
Production Coordinator

David Pingree, N1NAS
Senior Technical Illustrator

Janet Rocco, W1JLR
Advertising Sales Manager

Bob Inderbitzen, NQ1R
Product Development Manager

Yvette Vinci, KC1AIM
Marketing and Sales Manager

Steve Ewald, WV1X
Field Organization Supervisor

Eric Casey, KC2ERC
Convention and Event Coordinator

9 Second Century

Open Technology for Opening Minds

30 Build Your Own D-STAR Hotspot

Bob Wilton, KF5TPQ

33 CW Combo Key

Marc Alan Winzenried, WA9ZCO

39 CAT — Computer Aided Transceiver

Steve Ford, WB8IMY

43 An SWR-Shifting T

Bill Conwell, K2PO

47 Product Review

Mark Wilson, K1RO
FlexRadio Systems FLEX-6600M HF
and 6-Meter SDR Transceiver;
DX Engineering RX Share Audio
Switch; Workbench “Third Hand”
Circuit Board Holders



65 The Evolution of Power

Bob Bruninga, WB4APR

69 Radio-Friendly Real Estate

Allison McLellan

72 Easy Super Stealth Antenna

Dennis Lazar, W4DNN

82 2019 ARRL 10 GHz and Up Contest Results

Jeff Wadsworth, KI5WL

84 2019 ARRL 222 MHz and Up Distance Contest Results

John “JK” Kalenowsky, K9JK

95 A Look Back: April 1970



Columns

Celebrating Our Legacy	101
Classic Radio	102
Close Up	61
Contest Corral	81
Correspondence	24
The Doctor is In	59
Eclectic Technology	64
Happenings	75
Hints & Hacks	62
How's DX?	86
Member Spotlight	13
Public Service	79
Up Front	20
The World Above 50 MHz	88
100, 50, and 25 Years Ago	104

Digital and Mobile Editions

ARRL members can access the digital edition via a link at www.arrrl.org/qst, download our iOS app from the iTunes Store, and download our Android app from the Google Play Store.

Departments

Amateur Radio Band Chart	85
ARRL Section Managers	16
Certificate of Code Proficiency Recipients	91
Convention and Hamfest Calendar	92
Feedback	38
Field Organization Reports	80
Guide to ARRL Member Benefits	14
Ham Ads	140
Index of Advertisers	142, 143
Officers, Division Directors, and Staff	15
QST Cover Plaque Award	93
Silent Keys	105
Special Event Stations	90
Strays	60, 84, 87, 89
W1AW Qualifying Runs	91
W1AW Schedule	94
W1AW's QSL File	28

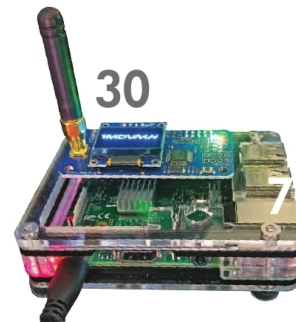
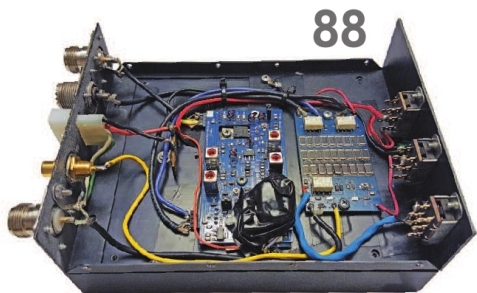
Write for QST

www.arrrl.org/qst-author-guide
email: qst@arrrl.org



Our Cover

The combo key by Marc Alan Winzenried, WA9ZCO, was one of the entries in QST's recent Key Competition. Though it was not one of the winners, we felt its design and construction warranted a closer look. For an overview of how this beautiful piece of gear is made, see "CW Combo Key" on page 33.



QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, Inc., 225 Main St., Newington, CT 06111-1400, USA. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices.

POSTMASTER: Send address changes to: QST, 225 Main St., Newington, CT 06111-1400, USA. Canada Post: Publications Mail Agreement #90-0901437. Canada returns to be sent to IMEX Global Solutions, 1501 Morse Ave., Elk Grove Village, IL 60007.

US & Possessions: Membership in the ARRL, including a 1-year subscription to QST, is available to individuals at \$49. Licensed radio amateurs age 21 and under and the eldest licensee in the household may qualify for the rate of \$25. Life Membership, including a subscription to QST is available at \$1,225.* Membership includes \$21 per year for subscription to QST. Membership and QST cannot be separated. Libraries and institutions, \$49 per year. Single copies \$6.95.

International

To compensate for additional postage for mailing outside the US, the following rates apply:

Canada: Membership in the ARRL, including a 1-year subscription to QST, \$62, payable in US funds. Life Membership, including a subscription to QST is available at \$1,550.* Libraries and institutions, \$62 per year.

All Other Countries: Membership in the ARRL, including a 1-year subscription to QST, \$76, payable in US funds. Life Membership, including a subscription to QST, is available at \$1,900.* Libraries and institutions, \$76 per year.

Membership without QST is available to the immediate family of a member living at the same address, and to anyone who is legally blind, for \$10 per year.

Foreign remittances should be by international postal or express money order or bank draft negotiable in the US and for an equivalent amount in US funds.

Membership in the ARRL, including a 1-year subscription to Digital QST only, is available to Canadian and International members at \$49.

Copyright © 2019 by the American Radio Relay League Inc. Title registered at the US Patent Office. International copyright secured. All rights reserved. Quedan reservados todos los derechos. Printed in the USA.

QST® DXCC®, VUCC®, DX Century Club®, ARES®, Amateur Radio Emergency Service®, Logbook of The World®, LoTW®, and ARRL, the national association for Amateur Radio® are registered trademarks of the American Radio Relay League, Inc.

The ARRL and QST in no way warrant the products described or reviewed herein.

QST is available to blind and physically handicapped individuals from the Library of Congress, National Library Service for the Blind and Physically Handicapped. Call 1-800-424-8567 or go to www.loc.gov/nls/.

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

*Payment arrangements available. Please write for details.

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 at circulation@arrrl.org or 860-594-0200 immediately. Thank you for your assistance.

Reprints and permissions:

permission@arrrl.org

Details of our Online Privacy Policy can be found at www.arrrl.org/online-privacy-policy.

Telephone: 860-594-0200

Fax: 860-594-0259