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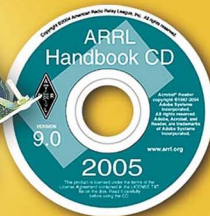
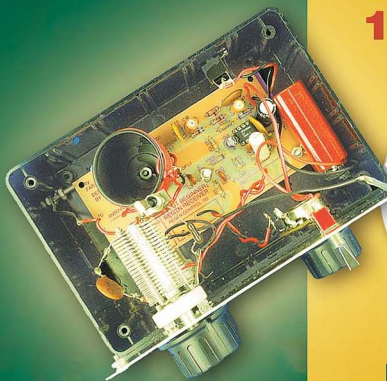
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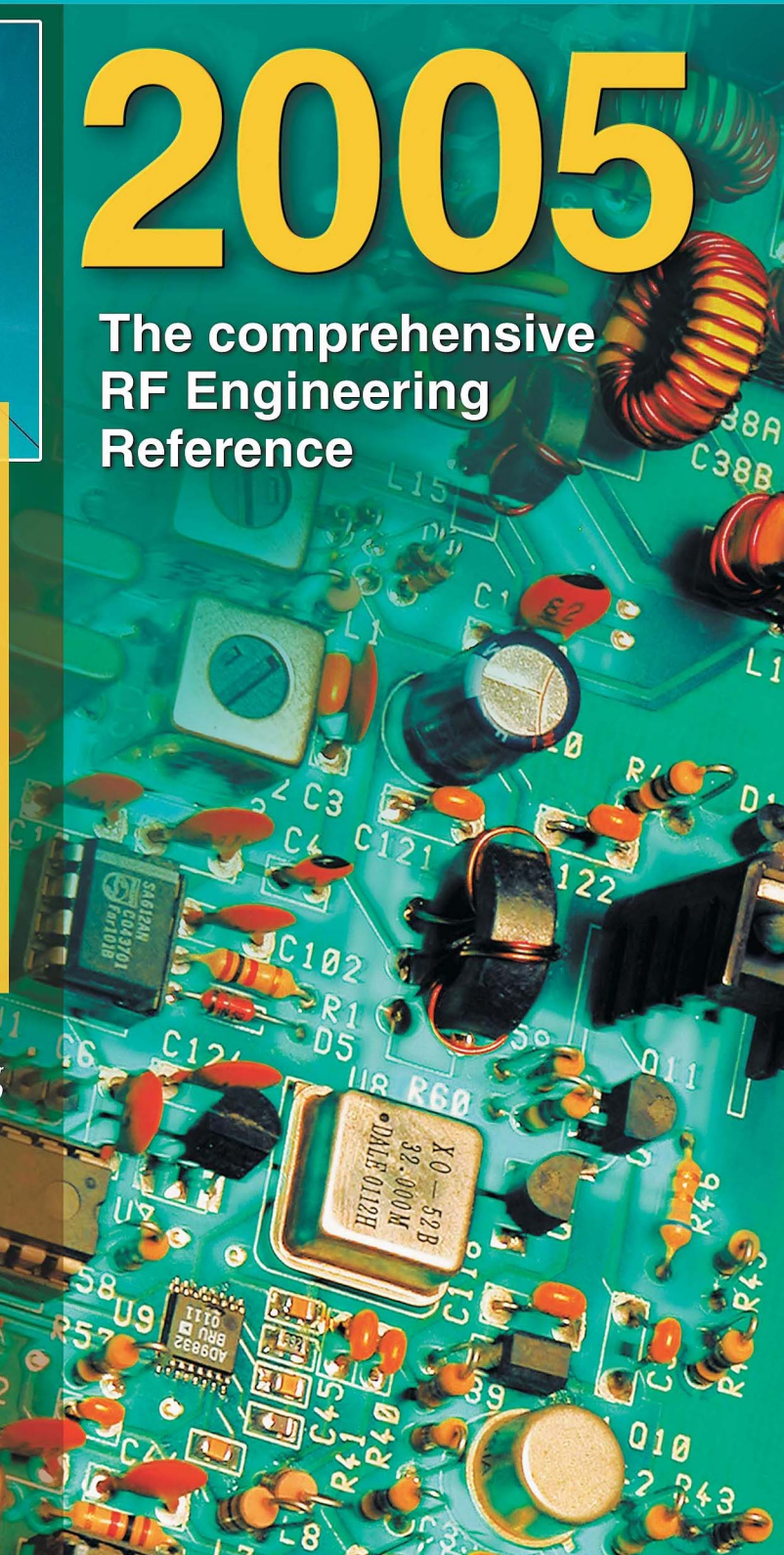


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2005

The ARRL Handbook

For Radio Communications

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Cover Info:

Background: The circuit board modified by K1SWL to prototype his 60-Meter transceiver design. This new project is found in Chapter 15.

To the left of the *Handbook CD-ROM* image, the popular HF receiver project by N1TEV (Ch. 14) is shown. To the upper left, these new antenna projects can be found in Ch. 22.

Cover circuit board photography for the 2005 ARRL *Handbook* by Dan Wolfgang.



Eighty-Second Edition

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About the ARRL

About the Included CD-ROM

Foreword

About every decade, our dedicated team of editors, technical advisors, and contributors—most of whom are outside of ARRL Headquarters—rethinks the entire ARRL *Handbook* and its contents. This 2005 (82nd edition) *Handbook* marks such an effort. In fact, many of you who have read previous editions of this world-renowned publication assisted us greatly in this endeavor by responding to a survey request last year. Thank you for your input. We assessed the completed surveys and implemented many of the suggestions offered by readers like you. Among these are more new projects in general, and building levels aimed chiefly at an intermediate level. We also noted the chapters with significant reader interest (like the *Antennas* chapter) and accordingly dedicated author/editor effort.

Truly the largest update in a 10-year span, this edition incorporates many of the features that hams and others with technical prowess are already finding useful in the 21st century. For example, now included is a fully-searchable CD-ROM of all the nearly 1200 *Handbook* pages. Whether you want to tackle projects using surface mount components (Ch. 8), or learn how the computer can actually enhance many aspects and niche areas of your Amateur Radio pursuit (Ch. 24), this *Handbook* has something for everyone.

Among the new projects included is a 10-W USB transceiver for the new 60-meter band; a simple broadcast RFI trap; a brand new 10-meter Inverted-U antenna design (expandable out to 20 meters) and a switched attenuator covering a range of 60 dB in 1-dB increments, and the list goes on. Chapter 9 also gives us some unique insight on the new frontier of communications opened to hams via a new comprehensive section on High-Speed Multimedia (HSMM) authored by John Champa, K8OCL. We would be remiss if we did not mention and extend a sincere thanks to our friends at the Radio Society of Great Britain, especially Dr. George Brown (M5ACN), Mark Allgar, and Steve Telenius-Lowe (G4JVG), who kindly gave us permission to reproduce some of their proven published project articles for this edition.

So, whether you prefer to open this comprehensive reference on your workbench, in your favorite reading chair, or via the CD drive of your computer (the *Handbook CD* includes many of the images in full color), enjoy all that this landmark 82nd-edition *Handbook* has to offer.

David Sumner, K1ZZ
Executive Vice President
Newington, Connecticut
September 2004



The Amateur's Code

The Radio Amateur is:

CONSIDERATE...never knowingly operates in such a way as to lessen the pleasure of others.

LOYAL...offers loyalty, encouragement and support to other amateurs, local clubs, and the American Radio Relay League, through which Amateur Radio in the United States is represented nationally and internationally.

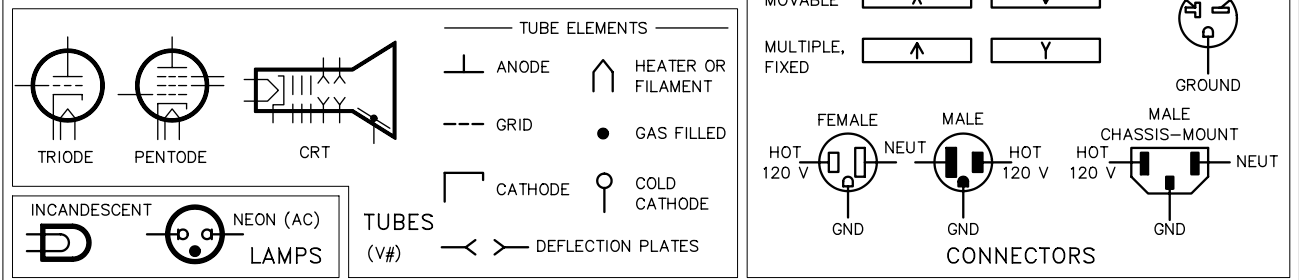
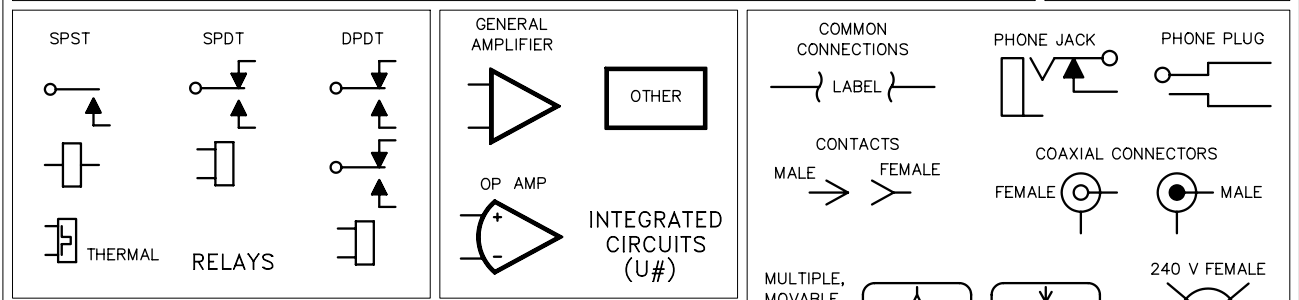
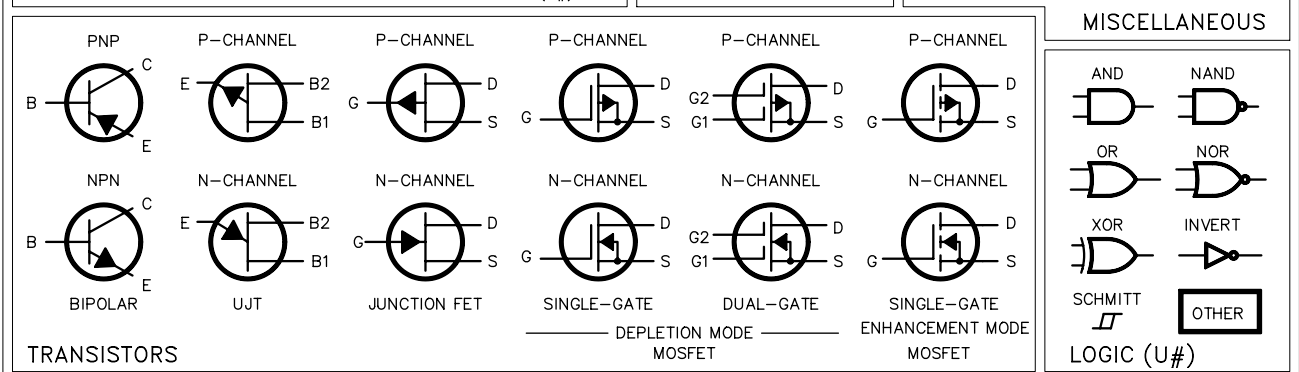
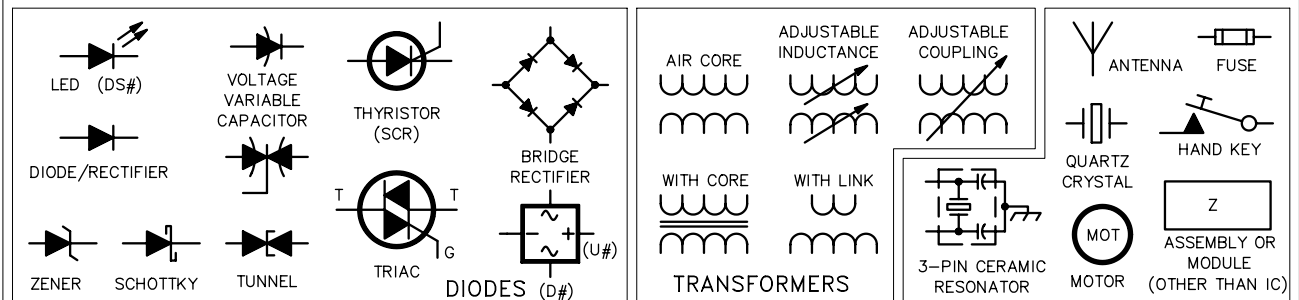
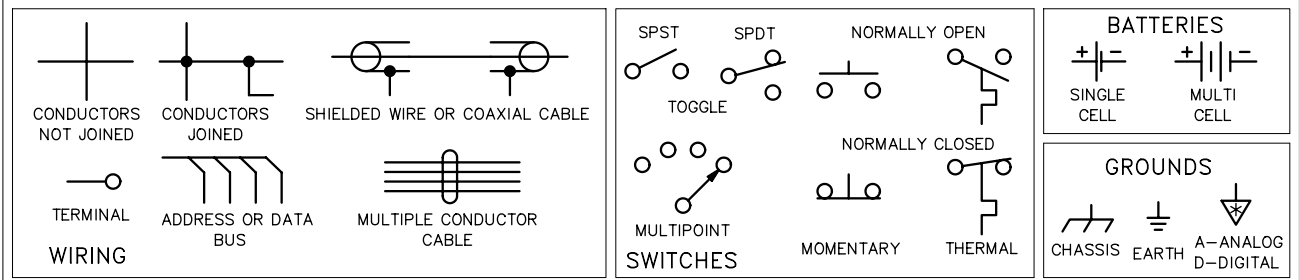
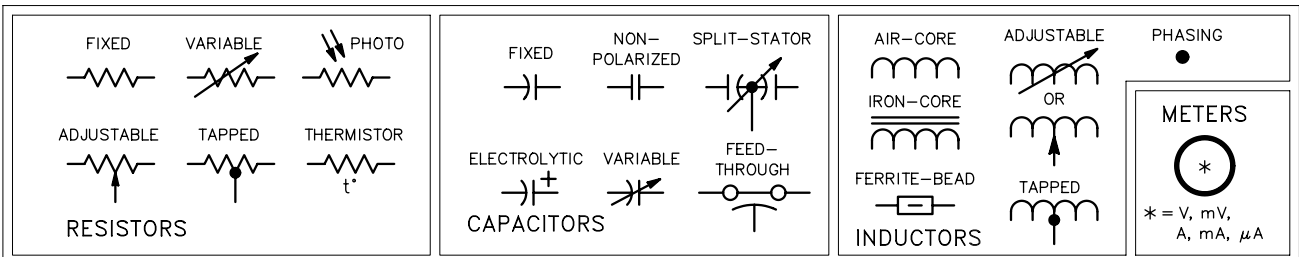
PROGRESSIVE...with knowledge abreast of science, a well-built and efficient station and operation above reproach.

FRIENDLY...slow and patient operating when requested; friendly advice and counsel to the beginner; kindly assistance, cooperation and consideration for the interests of others. These are the hallmarks of the amateur spirit.

BALANCED...radio is an avocation, never interfering with duties owed to family, job, school or community.

PATRIOTIC...station and skill always ready for service to country and community.

—*The original Amateur's Code was written by Paul M. Segal, W9EEA, in 1928.*



The ARRL—At Your Service

ARRL Headquarters is open from 8 AM to 5 PM Eastern Time, Monday through Friday, except holidays. Call **toll free** to join the ARRL or order ARRL products: **1-888-277-5289** (US), M-F only, 8 AM to 8 PM Eastern Time.

If you have a question, try one of these Headquarters departments . . .

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You can send e-mail to any ARRL Headquarters employee if you know his or her name or call sign. The second half of every Headquarters e-mail address is **@arrl.org**. To create the first half, simply use the person's call sign. If you don't know their call sign, use the first letter of their first name, followed by their complete last name. For example, to send a message to John Hennessee, N1KB, Regulatory Information Specialist, you could address it to **jhennessie@arrl.org** or **N1KB@arrl.org**.

If all else fails, send e-mail to **hq@arrl.org** and it will be routed to the right people or departments.

Technical Information Service

The ARRL answers questions of a technical nature for ARRL members and nonmembers alike through the Technical Information Service. Questions may be submitted via e-mail (**tis@arrl.org**); Phone (860-594-0214); Fax (860-594-0259); or mail (TIS at ARRL, 225 Main Street, Newington, CT 06111). The TIS also maintains a home page on **www.arrl.org/tis**. See the **Component Data and References** chapter (page 7.11) of this *Handbook* for more details. Also, please note that the "Technical Information Server" or *Info Server* service previously available via e-mail has been discontinued.

ARRL ON THE WORLD WIDE WEB

You'll find ARRL at: **www.arrl.org/**

At the ARRL Web page you'll find the latest W1AW bulletins, a hamfest calendar, exam schedules, an on-line ARRL Publications Catalog and much more. We're always adding new features, so check it often!

Members-Only Web Features

As an ARRL member you enjoy exclusive access to our Mem-

bers-Only Web features. Just point your browser to **www.arrl.org/members/** and you'll open the door to benefits that you won't find anywhere else.

- *QST* Product Review Archive. Get copies of *QST* product reviews from 1980 to the present.
- *QST/QEX* searchable index (find that article you were looking for!)
- Previews of contest results and product reviews. See them here before they appear in *QST*!
- Access to your information in the ARRL membership database. Enter corrections or updates on line!

Stopping by for a visit?

We offer tours of Headquarters and W1AW at 9, 10 and 11 AM, and at 1, 2 and 3 PM, Monday to Friday (except holidays). Special tour times may be arranged in advance. Bring your license and you can operate W1AW anytime between 10 AM and noon, and 1 to 3:45 PM!

Would you like to write for *QST*?

We're always looking for new material of interest to hams. Send a self-addressed, stamped envelope (2 units of postage) and ask for a copy of the *Author's Guide*. (It's also available via the ARRL Web page at **www.arrl.org/qst/aguide/**.)

Press Releases and New Products/Books

Send your press releases and new book announcements to the attention of the *QST* Editor (e-mail **qst@arrl.org**). New product announcements should be sent to the Product Review Editor (e-mail **reviews@arrl.org**).

ARRL Amateur Radio News on the Web

The primary focus of the ARRL Web site, **www.arrl.org**, is Amateur Radio news and general-interest features and columns—available to all. This is the Amateur Radio community's most comprehensive and immediate source for news and information on issues of importance and interest to radio amateurs.

The ARRL Letter

The ARRL Letter has become the League's flagship Amateur Radio news medium. The *Letter* is a weekly news summary for those who want to be on top of what's happening in the world of Amateur Radio. ARRL members can request Friday e-mail delivery via their Member Data Page. It's also available to all on the Web, **www.arrl.org/arrlletter**. *The ARRL Letter* is published 50 times a year.

ARRL Audio News

Another way to keep up with fast-moving events in the ham community is to listen to the *ARRL Audio News*. It's as close as your telephone at 860-594-0384, or on the Web at **www.arrl.org/arrlletter/audio/**.

Interested in Becoming a Ham?

Just pick up the telephone and call toll free 1-800-326-3942, or send e-mail to **newham@arrl.org**. We'll provide helpful advice on obtaining your Amateur Radio license, and we'll be happy to send you our informative Prospective Ham Package.