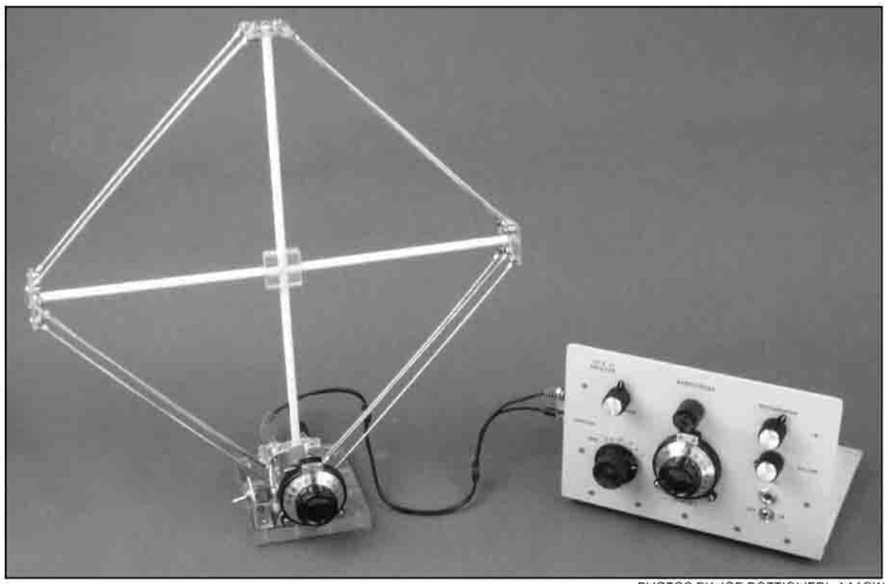
By Dan Wissell, N1BYT

The OCR II Receiver

Here's the radio a number of readers have been asking for: A simple, all-mode shortwave receiver based on the combination of the popular SLR and OCR receiver designs.

Since the introduction of the SLR (shielded loop receiver)[1] and OCR (optically coupled regenerative)[2] receiver designs in *QST*, I have been gratified by the overwhelmingly positive response from builders of these receivers. Many builders have asked the same question: "How can I convert the receiver to cover a wider frequency range?" Independently converting the SLR or the OCR to cover a broader frequency range poses design challenges. Being a simple D-C design, it's easy to make the SLR cover a broader frequency range, but this receiver is not suitable for good AM shortwave reception. On the other hand, the OCR is by design an all-mode receiver, but it's quite difficult to make it cover a broader frequency range. To answer the question, I combined the SLR and OCR designs to produce an all-mode multiband (ie, 3.5 to 8.5 MHz) shortwave receiver that I'll describe here.



PHOTOS BY JOE BOTTIGLIERI, AA1GW

The challenge I faced was designing a receiver that retains the qualities of both earlier unique designs. For the SLR, these qualities include its sensitivity and ability to use a small loop antenna to reduce local noise pickup. The OCR offers the extraordinary performance of the optically isolated regenerative detector, providing all-mode operation. The receiver presented here answers the design challenge, yet contains about the same number of components as used in either *one* of the other receivers. Because I've provided a means of using simple random-wire antennas *and* a tuned-loop antenna, I've dubbed this receiver the OCR II. A PC board and kit of parts are available to speed construction.[3] I encourage you to review the previous two *QST* articles to gain a greater insight into the evolution of this design (see Notes 1 and 2).

The Receiver Circuit

Overview

Refer to Figure 1. The OCR II is basically a single-conversion receiver with a 455-kHz IF. An incoming 3.5- to 8.5-MHz signal is converted to the IF, amplified and presented to the detector, which is an OCR operating at a fixed frequency of 455 kHz. An audio preamplifier and a headphone amplifier follow the OCR. This approach is similar to that employed by simple receiver designs of the 1950s and 1960s that use oscillating (regenerative) detectors at a fixed IF. There is, however, no comparison between the performance of those earlier detectors and the better OCR!

[1]Notes appear on page 37.

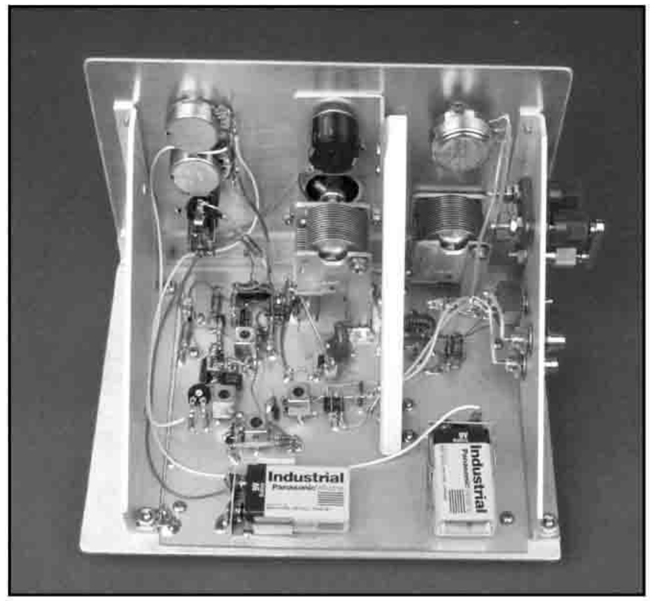
Description

As in the SLR design, the receiver's converter employs an SA602 mixer, U1. L1 and **BANDSET** capacitor C9 control U1's internal oscillator frequency. Tuning diode D1 provides bandspread. The oscillator tunes between about 3 and 8 MHz. This provides coverage of about 3.5 to 8.5 MHz without the need for a band switch. This tuning range includes 80 and 40 meters and a number of popular shortwave bands. It's possible to operate the mixer at higher frequencies, but more-complicated oscillator circuits are needed to achieve the required frequency stability. A preselector consisting of Q1 and related components precedes the converter. The preselector allows the use of simple wire antennas. T1 and C1 form a tuned circuit providing receiver front-end selectivity that helps minimize images. R2 at the gate of Q1 reduces the T1/C1 tuned-circuit Q and sufficiently broadens the tuning so that a vernier drive is not required with C1.

The incoming-signal level can be attenuated by R1, a 1-kΩ potentiometer. Providing attenuation control is important with the SA602 mixer. Overloading the mixer creates many unwanted mixing products that produce considerable audio hash. The loop antenna used in the original SLR makes it very difficult to overload the mixer. That's one of the reasons the apparent sensitivity and selectivity of the SLR receiver design are so good.

Broadband transformer T2 converts the single-ended low-impedance output of Q1 into a fairly well balanced 3-kΩ input impedance required by the mixer. As I found with the SLR receiver, the SA602 works

A front-panel view of the OCR II.



To a builder's eye, the inside of the OCR II is as attractive as the outside.

considerably better when used with balanced inputs and outputs. I found this to be true even though I expended considerable effort trying to provide proper single-ended terminations. Note that the preselector is essentially an impedance-matching buffer and provides no gain, thus it has little chance of oscillating.

As with the original SLR, the preselector circuit can be removed from the signal path and a tuned loop antenna used in its place. When a loop antenna is used, connections to the mixer are made via C4 and C5. In general, I find that there is little difference in receiver performance with the loop antenna or the combination of the preselector and a modest wire antenna. However, by properly positioning the loop antenna, you can null local noise sources and strong broadcast stations—the wire antenna alone cannot accomplish this feat.

U1's output is terminated in the primary of T3, a 455-kHz IF transformer. (I use these IF transformers wherever possible because they're inexpensive and allow a good range of impedance-matching flexibility.) T3's secondary is terminated by R7. This presents an approximate 3-kΩ termination impedance to U1. Q2 and T4 form a tuned 455-kHz amplifier. Q3 is used as an impedance-matching stage between T4 and T5. This is necessary because the secondary of T5 is terminated in a relatively low (and variable) impedance of regeneration controls R13 and R14. If not for the buffering action of Q3, this would impact the IF amplifier and could result in unwanted oscillations.

The 455-kHz energy is coupled to linear optocoupler U2 via the secondary of T5. An Agilent (formerly Hewlett-Packard) HCPL4562 linear optocoupler is the heart of the OCR. Although its operation is fully described in the original OCR article, a brief explanation of how it works is worth mentioning here. The 455-kHz RF energy is coupled to the cathode of U2's LED via T5. This energy modulates the current flowing through the LED. Photons from the LED provide the base current for the optocoupler transistor. The transistor in U2 is configured as a 455-kHz Colpitts oscillator using L2 and associated components. The current flowing through the LED controls the circuit oscillation creating an ideal regenerative oscillator. The magic in this design is that by virtue of the LED, both the RF energy and the regeneration control are *totally isolated* from the sensitive areas of the oscillator, such as the tank circuit. This technique delivers a very well behaved regenerative detector with none of the infamous regenerative detector problems. An infinite impedance detector (Q4) recovers the audio, as opposed to a transformer and RF-choke scheme often employed with regenerative circuits.

The detected audio is band-pass filtered by C22, C25, C28 and R20 and R22. These components along with Q5 form the audio preamplifier. A ubiquitous LM386 (U4) is used as the headphone or loudspeaker amplifier.

Regulated voltage is supplied by U3, an LM78L05 three-terminal regulator. The regulated voltage is used at U1, U2 and tuning diode D1.

Construction Details

One of the more difficult tasks in designing a project such as the OCR II is component selection. When building a single unit, one-off parts, such as those found at flea markets or in junk boxes, are okay to use. But when developing a design to be copied, every effort must be made to use readily available parts. This, in turn, often forces design decisions that may appear arbitrary. An example of this process is the trade-off required when deciding how to implement the tuning in the OCR II. Some of the various options included a band switch, pluggable coils or an external VFO. Each choice has its own set of complications including part availability and cost. For this project, I decided to use common 365-pF air-dielectric variable capacitors to eliminate more complex band-switching circuits that require good-quality switches. Because such switches cost about the same as the capacitor, I used the latter. A vernier dial is used with the **BANDSET** capacitor. Besides making the tuning easier, it provides a calibration scale.

For the **TUNING** control, however, I decided in favor of a low-cost tuning diode and 10-turn potentiometer. Both of these decisions are based upon the availability of reasonably priced components from at least one reliable source.[4] In general, I have taken a minimum-component design approach, consistent with the desired receiver performance. No components can be eliminated and still retain good circuit performance. The bulk of the parts are available from standard suppliers. The HCPL-4562 (U1) is stocked by Newark Electronics.

The frequency-dependent portion of the U1 oscillator design can be scaled for other frequencies of interest in the lower HF region. However, for operation above about 10 MHz, consider using an external, well-shielded VFO for improved stability.

Instead of the PC board, you may use any of the standard construction techniques such as point-to-point wiring on a copper-

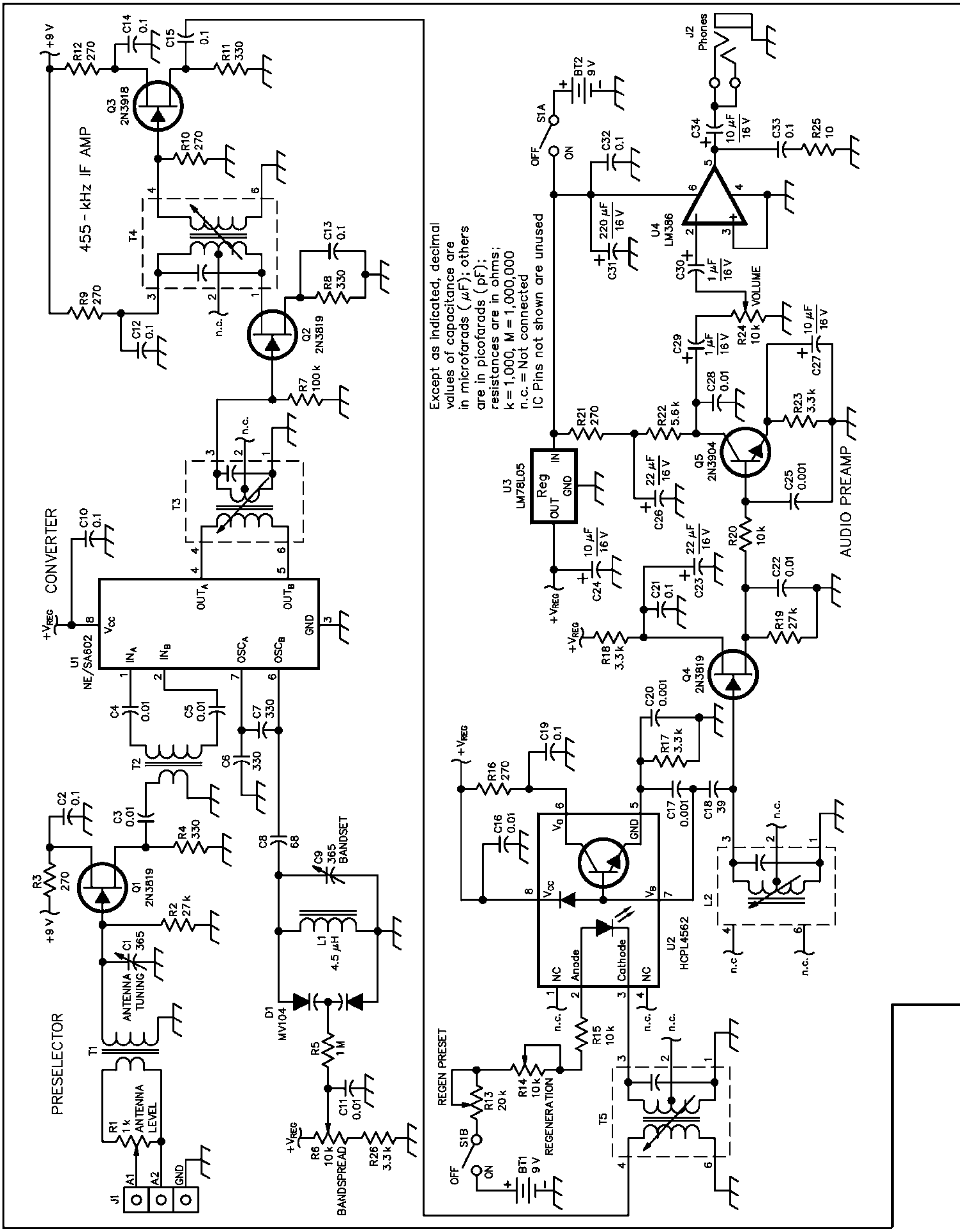
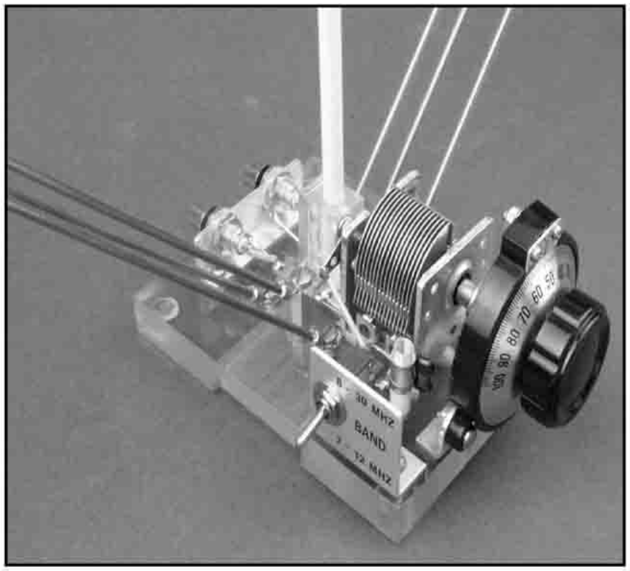

PRESELECTOR
CONVERTER
455-kHz IF AMP
AUDIO PREAMP
Except as indicated, decimal values of capacitance are in microfarads (µF); others are in picofarads (pF); resistances are in ohms; k = 1,000, M = 1,000,000
n.c. = Not connected
IC Pins not shown are unused
U1 NE/SA602
U2 HCPL4562
U3 LM78L05
U4 LM386
Q1 2N3819
Q2 2N3819
Q3 2N3918
Q4 2N3819
Q5 2N3904
D1 MV104
ANTENNA TUNING
ANTENNA LEVEL
BANDSET
BANDSPREAD
REGEN PRESET
REGENERATION
VOLUME
J2 Phones
BT1 9 V
BT2 9 V

Figure 1

Figure 1—Schematic of the OCR II circuit. Unless otherwise specified, resistors are 1/4-W, 5%-tolerance carbon-composition or metal-film units. RS part numbers in parentheses are RadioShack. Other suppliers include Digi-Key Corp, 701 Brooks Ave S, Thief River Falls, MN 56701-0677; tel 800-344-4539, 218-681-6674, fax 218-681-3380; http://www.digikey.com and Newark Electronics, 4801 N Ravenswood Ave, Chicago, IL 60640-4496; tel 800-463-9275, 312-784-5100, fax 312-907-5217; http://www.newark.com. Also, see Notes 3 and 4. Equivalent parts can be substituted; n.c. indicates no connection.

BT1—9 V
BT2—9 to 12 V; see text.
C1, C9—365 pF air-dielectric variable
C6, C7—330 pF, 5% NP0; see text.
C8—68 pF, 5% NP0; see text.
C24, C27, C34—10 µF, 16 V electrolytic
C23, C26—22 µF, 16 V electrolytic
C29, C30—1 µF, 16 V electrolytic
C31—220 µF, 16 V electrolytic
D1—MV104 varactor
J1—Spring-action terminal strip (RS 274-315)
J2—Three-conductor phone jack (RS 274-249)
L1—Approx. 4.5 µH, 28 turns #24 enameled wire on a T-68-2 core
L2—0.64 mH variable coil Toko RMC-2A6597HM (Digi-Key TK1302)
Q1-Q4—2N3819, MPF102 (RS 276-2035)
Q5—2N3904, 2N2222
R1—1-kΩ, linear-taper pot (RS 271-1715)
R6—10-kΩ, linear-taper, 10-turn panel-mount pot; see text.
R13—20-kΩ, linear-taper, PC-board mount pot; see text.
R14—5-kΩ, linear-taper, panel-mount pot; see text.
R24—10-kΩ audio-taper pot (RS 271-1721)
S1—DPDT (RS 275-614)
T1—Pri: 2 turns #26 enameled wire; sec: 35 turns #26 enameled wire on T-68-2 core
T2—Pri: 10 turns #26 enameled wire; sec: 25 turns #26 enameled wire on T-50-43 core
T3, T4, T5—0.64 mH variable coil, Toko RMC-502182NO (Digi-Key TK1305)
U1—NE/SA602 double-balanced mixer and oscillator
U2—HCPL4562 optoisolator (Newark #HPCL-4562)
U3—LM78L05 5 V, 100 mA positive voltage regulator
U4—LM386-4 audio amplifier
Misc: PC board (see Note 3); two-inch diameter vernier dial, 1/4-inch shaft (Philmore #S50); 9-V battery snap connectors (RS 270-234); 9-V battery holders (RS 270-326); enclosure; hardware



The OCR II can be built to use either wire antennas or tuned loop antennas. You can add the ability to use either antenna by adding a DPDT switch to select the preselector circuit (used with the random-length wire) or the loop antenna.

clad perfboard, or "ugly" ("dead-bug") construction on a bare copper PC board. The only critical area is the SA602 oscillator circuit. NP0 (C0G) capacitors are used here to enhance frequency stability. Use short, direct leads in this area. Make the circuit as mechanically robust as possible to help ensure stability. The hardware used for antenna connector J1 and switch S1 may be whatever you prefer. You can fashion an enclosure from PC board, aluminum or use a manufactured enclosure. A fully closed case is not required for good operation. Several prototype OCR receivers built as open-frame units perform very well over reasonably constant temperature ranges.

One of the more useful and interesting features of the OCR design is the **REGENERATION** control. This not only controls the amount of detector oscillation, but also controls the detector Q, which sets its bandwidth. With careful adjustment, bandwidths of a few tens of Hertz are achievable just before the detector starts to oscillate. To take advantage of this control, the pot used for regeneration control must have a fairly good resolution. Although a multiturn pot could be used here, I took a more cost-effective approach. A board-mounted 20-kΩ pot (R13) is used to preset R14, a 5-kΩ front-panel-mounted pot, for regeneration control. R13 is adjusted so that regeneration starts with R14 at about 75% of its maximum range. Used this way, R14 gives very good control over the regeneration. This scheme works well because the oscillator frequency is fixed, and the regeneration point is quite constant. Because the total current used by the LED in U2 is only about 400 µA, the change in battery voltage related to battery aging is very slow and therefore, only infrequent R13 readjustment is required.

Checkout and Operation

When you finish circuit assembly, carefully check your work for wiring errors and cold or missing solder joints. Verify that the components have been installed correctly before applying power. Note that BT1, used for the regeneration circuit, should be a 9-V battery. This reduces noise in the detector. BT2 may be a 9-V battery for headphone operation or a 12-V battery for loudspeaker operation.

Once all has been checked, plug your headphones into J2 (phones with an impedance of 16 Ω or greater give the best results) and apply power to the receiver. The headphones used should be of good quality. With the **VOLUME** control (R24) set at about midrange, advance the **REGENERATION** control (R14) to about 75% of its range. Adjust the **REGEN PRESET** potentiometer R13 until you hear a gentle but distinct increase in background noise. This indicates that U2 is oscillating and all is well with the OCR detector circuit.

Set the detector frequency by listening for the 455-kHz signal from U2 in a general-coverage receiver. Adjust L2 to set the operating frequency of U2. Alternatively, a frequency counter can be used to set the frequency. (Many inexpensive digital multimeters now have frequency counters usable to 10-MHz.) To measure the frequency of U2, connect the frequency counter to pin 5 of U2. Although the signal level is lower at pin 5 than at L2, measuring at this point avoids incorrect readings caused by the probe loading the tank circuit. (Similarly, the converter-oscillator frequency can be measured at pin 7 of U1; this is discussed later.) As the detector frequency is adjusted, the regeneration controls may have to be retouched to keep U2 oscillating. It is not critical that U2's oscillator frequency be set to *exactly* 455 kHz because there are no narrow filters used in the receiver. It is only necessary that all the IF transformers be within adjustment range of each other.

Verify that the mixer oscillator is operating over the correct range by listening for its signal in a general-coverage receiver or using a frequency counter. The converter-oscillator frequency can be adjusted by adding a turn to, or removing a turn from L1. Remember to subtract the IF from the mixer-oscillator frequency. For example, the required mixer-oscillator frequency for receiving a 3.5-MHz signal is 3.045 MHz. Once this is done, connect a 15- or 20-foot-long wire test antenna to terminal **A1** on connector J1. Connect J1 terminal **A2** to the **GND** terminal. If an earth ground is available, connect it to the **GND** terminal also. With the detector oscillating, use the **BANDSET** control to find a signal. Peak the signal with the **ANTENNA TUNING** capacitor, C1. Next adjust the tuning slugs in T3, T4 and T5 for maximum signal strength. There is little interaction between these adjustments. The tuning of T5 is very broad, and an obvious peak is hard to discern. I generally place the tuning slug at the midpoint of its adjustment range. Finally, verify that the **ANTENNA LEVEL** control works and that the **BANDSPREAD** tuning is functional. That's it for tune up!

Using the OCR II

If this is the first regenerative receiver to which you've been exposed, tuning the OCR II will take some practice. The most sensitive operating regions of the detector for AM-signal reception is the area just *before* oscillation and for CW, just *at* oscillation. For SSB reception, the best operating point is found with just a bit more regeneration than that required for CW reception. After using the **REGENERATION** control for a short time, you'll get the feel of the receiver. The interaction between the **REGENERATION** control setting and the gain and selectivity of the detector will become quickly apparent. You may find yourself digging out CW and SSB signals from beneath the AM stations in the 40-meter band—signals you could never hear on other simple receivers! Those who have tried other regenerative receivers will notice that there is virtually no interaction between the received signal strength and the regeneration setting required. And, since the detector is at a fixed frequency, the regeneration level can be maintained over the entire tuning range of the receiver. This is a radio that is great fun to use because you have virtually total control of the receiver performance.

On 80 meters, the **BANDSPREAD** is fairly limited, covering only about 20 kHz or so. I use the **BANDSET** to tune the band and the **BANDSPREAD** as a "fine tuning" control. About 25% of the total tuning range is used to cover 3.5 to 4 MHz, so using it as a "main tuning" control works well with the vernier dial. At 40 meters, the **BANDSPREAD** covers the entire band. When tuning the 40-meter band, insure that the preselector is tuned to 7 MHz. It will also peak up at the image frequency around 6 MHz. This adds even more QRM to the band!

When the conditions are good, use the antenna **LEVEL CONTROL** to reduce the signal level. I have found that if the input signal from the antenna can not be reduced to the level that no signal can be heard on the receiver, the antenna is too big and can overload the converter section when the **LEVEL CONTROL** is set at its minimum.

To receive AM stations, I use the following procedure: Set the regeneration as for CW reception and "zero beat" the AM station. Next, reduce the regeneration just to the point where the oscillation stops. Keeping the regeneration level as high as possible allows the maximum detector sensitivity and provides the tightest audio passband. Depending on the strength of the station and the QRM present, the regeneration level can be reduced. This improves the fidelity of the signal because of the increased detector bandwidth. This technique is possible on the OCR II for two reasons. First, there is virtually no interaction between the received frequency and the regeneration control. Additionally, there is no frequency "pulling" by strong stations. Therefore, a weak station next to a strong station can be easily received.

The measured CW receiver sensitivity is less than 1 µV (by my ear) when driven by a laboratory-grade 50-Ω signal generator. The AM sensitivity is a little more difficult to measure since it depends upon the amount of regeneration being used, but it's about 2 or 3 µV.

Antennas

As mentioned earlier, the OCR II can be built to use a wire antenna or a tuned loop. For versatility, you can add a switch to choose the preselector circuit for the wire antenna or the loop antenna. I did this on a prototype with very good results.

The preselector has two antenna terminals (**A1** and **A2**) and a chassis ground terminal (**GND**). This allows maximum flexibility when using simple wire antennas. For the simplest random-length wire antennas, connect the antenna to terminal **A1**. Connect terminal **A2** to the **GND** terminal. If an earth ground is available, always connect it to the **GND** terminal as well. An antenna length of 20 or 25 feet will give good results. I've found that when an earth ground is available, a simple wire antenna just a few feet long works very well.

If you use a balanced antenna, connect one antenna leg to terminal **A1**, the other to terminal **A2**. Again, if an earth ground is available, connect it to the **GND** terminal. Don't be afraid to experiment with the antenna connections to find the best combination for your antenna. Remember: Overloading the OCR II mixer degrades overall receiver performance. Use the **ANTENNA LEVEL** control to reduce overloading when using large antennas or when very strong shortwave stations are encountered. The **ANTENNA LEVEL** control in conjunction with the **REGENERATION** control make a powerful combination to improve shortwave listening.

Using a tuned loop provides the receiver with front-end selectivity. (Loop-antenna designs are presented in the SLR article; see Note 1.) Generally, the loop should be designed for the lowest operating frequency. For 3.5 MHz, a square loop about 18 inches on a side is a good minimum size. A shielded or unshielded design can be used. My rule of thumb for calculating the inductance of a small wire loop is to estimate the inductance at 26 nH per inch. Thus, the small loop of 18 inches per side will have an inductance of about 1.87 µH. To tune this loop to 3.5 MHz, a capacitance of about 1100 pF is required. At 8.5 MHz, you'll need 187 pF. A combination of fixed-value and variable capacitors can be used to tune a loop over this frequency range. (Here's a good application for that triple-section, 365-pF-per-section variable capacitor you've been saving because it's "too good to throw out!") Of course, the loop can be made a bit larger or a multiturn loop can be used to reduce the capacitance required to tune the loop antenna.

A shielded loop antenna is shown with the OCR II in the title photo. An earlier version of this loop appeared on the cover of *QST* for October 1997. That loop was constructed of 22-gauge wire as described in the SLR article. However, that antenna and the receiver were borrowed so often that replacing the wire loops became a weekly task! I rebuilt the loop using 3/32-inch-diameter tubing sold at model and hardware stores. Copper tubing is used for the active portion of the loop, with lower-cost brass tubing used for the shield loops. This material is sold in 12-inch lengths, solders easily and is quite rigid. The loop made with loops of tubing has proven to be very durable.

This particular loop is small, only nine inches on a side; therefore it is used on frequencies above 6.5 MHz. The loop inductance is approximately 0.95 µH and a capacitance of about 550 pF is required to resonate it at 7 MHz. Tuning the loop is accomplished with a 365-pF air-dielectric variable capacitor in parallel with a fixed-value capacitance of 220 pF. The fixed-value capacitor can be switched in and out, providing two tuning ranges. The lower range covers 7 to 12 MHz, while the upper range covers 8 to 30 MHz. The loop is connected to the receiver using short lengths of low-cost audio cable and standard phono connectors.

Summary

The OCR II receiver is a simple, all-mode multiband receiver. It retains the best features of its predecessors, the SLR and OCR receivers. With sensitivity equal to that of the SLR and the good selectivity provided by the OCR regenerative detector, the OCR II offers performance greater than the sum of its parts. I have enjoyed designing this radio, and have had great fun operating it. I thank those builders of the SLR and OCR receivers who have sent me mail and inspired the design. I hope others are inspired to try their hand at "homebrewing" this and other projects.

Notes

[1]Daniel Wissell, N1BYT, "The 40M SLR—a Shielded-Loop Receiver," *QST*, Oct 1997, pp 33-38.

[2]Daniel Wissell, N1BYT, "The OCR Receiver," *QST*, Jun 1998, pp 35-38.

[3]Jade Products, Inc,, PO Box 368, East Hampstead, NH 03826-0368; tel 800-523-3776, fax 603-329-4499; **jadepro@jadeprod.com**; **http://www.jadeprod.com/**. Jade also offers components used in this project.

[4]Additional parts sources include: Dan's Small Parts and Kits, Box 3634, Missoula, MT 59806-3634; tel and fax: 406-258-2782; **http://www.fix.net/dans.html**, for variable capacitors and multiturn potentiometers; The Xtal Set Society, PO Box 3026, St. Louis, MO 63130; tel 800-927-1771; **xtalset@midnightscience.com**; **http://www.midnightscience.com/crystal.html**) is one source of 365-pF air-dielectric variable capacitors.

Dan Wissell, N1BYT, was first licensed as WN2WGE and upgraded to Extra in 1984 as N1BYT. He's been with Compaq Computer Corporation (formerly Digital Equipment Corporation) for 20 years. He is currently a Principal Member of the technical staff, designing RF and analog systems. You can contact Dan at 7 Notre Dame Rd, Acton, MA 01720; **n1byt@arrl.net**.

NEW BOOKS

THIS WAS RADIO

By Ronald Lackmann
First edition. Copyright 2000 by Great American Audio Corporation, 33 Portman Rd, New Rochelle, NY 10801; tel 914-576-7660. Hardcover, 14³/₈ × 11³/₈ inches, 72 pages plus two audio CD-ROMs. $39.95. Available at Barnes & Noble, Borders, and other book retailers.

Reviewed by Steve Ford, WB8IMY
QST *Managing Editor*

◊ *This Was Radio* is saddled with the difficult task of distilling the golden age of broadcast radio into a single multimedia (print and audio) presentation. To a great degree it succeeds, with a few notable shortcomings.

The book itself is a handsome large-format "coffee table" tome packed with crisp black and white photography. Tracing the history of broadcast radio from its roots, for example, we see Frank Nullen in the studio of KDKA in 1922. Along the bottom of the opening pages is a time line that begins with Marconi in 1895. (Curiously, author Ronald Lackmann credits Ambrose Fleming with the invention of the vacuum tube in 1907, yet fails to mention the contributions of Lee DeForest.)

This Was Radio moves forward at a rapid clip with Lackmann's writing style exuding a contagious enthusiasm for his subject. In addition to the well-composed narrative you're treated to more fascinating photography. The collection ranges from rare studio shots to promotional images including photos of Bob Hope, Fanny Brice (as Baby Snooks), Abbott and Costello, Judy Canova, Jimmy Durante, Orson Wells, New York City mayor Fiorello LaGuardia (reading the Sunday comics during a newspaper strike) and much more.

Two audio CDs are embedded in the inside front cover. These contain superbly recorded excerpts from poignant moments in history such as the attack on Pearl Harbor and the crash of the Hindenburg zeppelin ("Oh the humanity!"). Best of all, entire episodes of well-known radio programs are available. Thrillers such as *Lights Out* and *The Inner Sanctum* still retain their ability to scare—more than 50 years after they were broadcast. Groucho Marks and Jack Benny are as amusing as ever. You'll even hear excerpts of speeches by Franklin Roosevelt, Harry Truman, Winston Churchill and flamboyant Louisiana senator Huey Long.

This Was Radio vividly encapsulates broadcast history, but does so from a point of view that is selectively nostalgic. For example, *Amos and Andy* is included in the book (and on the audio CD) because it was the first radio situation comedy. Lackmann, however, fails to discuss how *Amos and Andy* reflected the racism of its time. The fact that *Amos and Andy* stars Freeman Gosden and Charles Correll were actually white actors is only mentioned in passing. A photograph of the duo in black-face makeup appears without comment. (You'd have to be devoid of cultural or political sensitivity not to cringe while listening to their shows today.)

In another well-intentioned desire to sugarcoat the golden age of radio, Lackmann totally ignores Father Charles E. Coughlin, the "Radio Priest". His broadcasts attracted an audience of 30 million at the height of his popularity in the 1930s. Father Coughlin's angry messages often promoted fascist political ideology and offered the American public a strong dose of anti-Semitism. It is a portion of broadcast history that no doubt many would prefer to forget, but if *This Was Radio* intends to honestly portray the era, Father Coughlin should be included.

Finally, a photograph of Tokyo Rose teased me with the possibility that I would hear at least an excerpt of one of her infamous World War II propaganda broadcasts. Alas, she is missing from the CDs (as is Axis Sally). Once again, Tokyo Rose and Axis Sally had important, if dubious, roles in broadcast history. Their absence is puzzling.

Sweetened nostalgia aside, *This Was Radio* is a fine effort and certainly worth the $39.95 price tag. The CDs alone justify the cost. If you want a more thorough, candid look at broadcast history, however, I'm afraid you'll have to search elsewhere.

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