

- High gain - 20 dB Broadband coverage.
- Excellent review in Feb. 90, 73 Magazine.
- Two stage feedback design ensures stable operation.
- Runs on 12-15 VDC @ 15 mA.
- Complete with applications and hook-up instructions.

BROADBAND RF PREAMP

100 KHz - 1.3 GHz

Perk up that old receiver! Great for scanners, TV sets, frequency counters, shortwave sets, anywhere a stable 20 dB gain is needed!



Kit No. SA7

SA7 INTRODUCTION:

A "preamplifier" gives an initial boost, measured in decibels, to the level of a signal before it is processed by tuned circuits, filters, amplifiers, mixers, detectors or other circuit stages. Preamps may be designed for either RF or audio use and may be either tuned or broadbanded. The SA7 is indeed a "general purpose" RF pre-amplifier. While we realize that most users understand the term "broadband", we understand that some of you would appreciate some clarification. In short, "broadband" means you can use the SA7 to boost the RF level of any signal from the AM broadcast band through VHF and UHF FM and TV bands all the way into the 1300 MHz microwave spectrum. This is possible because the SA7 does not limit or restrict the RF input by means of tuned circuits or filters. Therefore, ALL signals reaching the input are amplified equally. This amplifier differs from the Ramsey PR-10, 20 and 40 models for 144 MHz, 220 and 440 MHz respectively, in that those models include hi-Q tuned circuits to "pre-select" the desired frequency range, restricting the strength of other signals, out of band. A "pre-selector" is a pre-amplifier with a tuned input. We'll show you how to use the SA7 as the heart of such a pre-selector configuration, either fixed or tunable, if that is the practical application which is of most interest to you. So, "broadband" is a mixture of good news and bad news, though it's mostly good news if you understand what such a circuit can and cannot do. Because it boosts all signals equally, its successful operation relies on the input tuned-circuit selectivity of the receiver whose performance you wish to boost. If the receiver does not have much ability to reject unwanted signals, such signals will be boosted just as much as the desired signal.

PARTS SUPPLIED WITH SA7 KIT

Capacitors

- ❑ 1 2.2 pF capacitor [axial style, green body with red bands] (C6)
- ❑ 1 4.7 or 5 pF disc capacitor (C1)
- ❑ 3 .01 uF disc [marked .01 or 103 or 10 nF] (C2,3,5)
- ❑ 1 4.7 to 10 uF electrolytic capacitor (C4)

Resistors

- ❑ 1 47 ohm SMT (surface mount technology)"chip" resistor (R6)
- ❑ 1 51 ohm [green-brown-black] (R2)
- ❑ 2 100 ohm [brown-black-brown] (R1,R5)
- ❑ 1 470 ohm [yellow-violet-brown] (R3)
- ❑ 1 1K ohm [brown-black-red] (R4)

Special Components, Semiconductors:

- ❑ 1 SA7 printed circuit board
- ❑ 1 .04 uH coil [4 turns pre-wound] (L1)
- ❑ 2 2SC2498 or 2SC2570A microwave bipolar transistor (Q1,Q2)

SA7 PRE-AMP ASSEMBLY PROCEDURE

Soldering 15 parts to a PC board is not a big job, but good performance of the SA7 requires attention to keeping all leads as short and neat as possible. The order of the parts installation is not critical for this and other small kits, so the purpose of following the suggested order of assembly is just to make it as easy as possible for you to get the right parts in the right holes. By the time you build your fourth or fifth SA7 for your neighbors old shortwave set or your aunt's FM radio, you'll be an honorary member of the Ramsey factory assembly line! In working with a small PC board such as the SA7, a miniature vise plus a magnifier may prove very helpful.

STEP-BY-STEP PC BOARD ASSEMBLY:

In all steps below, the word install means to insert the component, oriented correctly, into the right holes, solder all wires and cut or nip away excess wire flush with the solder connection.

- 1. Install R1, 100 ohms (brown-black-brown).
- 2. Install R2, 51 ohms (green-brown-black).
- 3. Install C1, 4.7 or 5 pF.
- 4. Install C2, .01 uF (marked .01 or 103 or 10 nF).

- ❑ 5. Install C5, .01 uF. Notice that C5 lines up with the DC voltage supply points on the PC board. If you have your red (+) and black (-) supply wires ready, they could be installed now while correct polarity is on your mind.
- ❑ 6. Install R4, 1K ohms (brown-black-red). Note that this resistor is installed vertically, with the resistor body closest to Q1.
- ❑ 7. Install C4, the one electrolytic capacitor. Make sure polarity is correct.
- ❑ 8. Install R5, 100 ohm (brown-black-brown).
- ❑ 9. Install Q1 and Q2, 2SC2498 or 2SC2570A. Both transistors are identical. Press both into their respective PC board holes, now made very obvious by the installation of the previous parts. Orient the flat sides as shown on the PC board illustration. Press both in firmly with finger pressure so that a minimum amount of wire leads are exposed above the PC board. Bend the inserted leads in opposing directions just enough to hold each transistor in place. In soldering, do not be afraid to apply enough heat to make good, solid connections.
- ❑ 10. Install L1, the small pre-wound coil.
- ❑ 11. Install C3, .01 uF.
- ❑ 12. Install R3, 470 ohms (yellow-violet-brown).

Installation of C6 and R6. The style of these components might be new to you, but don't be concerned. We'll get them in right. Having installed all the conventional resistors according to color code, note that the remaining resistor-like part is marked with 6 bands; the first two at one end should both be red. This is the 2.2 pF axial capacitor. Install it between Q1 and R3, taking care that the capacitor body is as close as possible to the PC board.

- ❑ 13. C6, 2.2 pF capacitor installed.

Resistor R6 is, for many of us, Ramsey Electronics' mandatory crash-course in SMT ("Surface Mount Technology") components. It is used in the emitter-to-ground lead of Q2 instead of an ordinary resistor to minimize the possibility of self-oscillation. After you install it correctly, consider yourself a step beyond the 1995 edition of the ARRL Handbook, which simply shows how many SMT parts can gather on a dime and states that the "how to" is beyond the scope of the book!

Tools recommended for installing R6:

- ❑ Tweezers
- ❑ Magnifier
- ❑ Low-wattage, very clean and well-tinned soldering tip.

Procedure for installing SMT R6:

1. Unpack from cardboard protective holder and study how R6 is made, using the magnifier if necessary.
2. Notice that both ends are metallic - these are the soldering points.
3. Lightly pre-tin the PC board trace points where R6 is to be positioned. Do not make too heavy a solder build up.
4. Holding R6 in position with tweezers, touch one end and the PC trace with the soldering tip. The solder should flow nicely. Remove the iron and allow the joint to cool while holding R6 in place.
5. Repeat for the other end of R6.

□ 14. R6 properly installed.

Substitution of a small 47 ohm conventional resistor may work out in some applications but it is not recommended. If you somehow destroy R6 on your first try, a request and SASE to the Ramsey factory will get you another.

Wiring of your SA7 pre-amp PC board is now complete. It's time to work out the DC voltage supply and input-output connections.

USING YOUR SA7 PRE-AMP

The very best way to find out what your SA7 can do, and also cannot do, is to set one up right from the beginning with the input and output connections most practical for your uses. If you are building it with no specific or "dedicated" use in mind, we suggest that you setup its connections to serve as a sort of quick-connect test instrument. Try it out in a variety of situations.

A small metal mini-box with convenient input and output connectors makes a dandy little amp to use around the shop. It is ideal for perking up your frequency counter, shortwave rig or wireless FM transmitter. Having the amplifier in a rugged box with connectors permanently attached allows easy hook-up to all sorts of equipment.

THE RAMSEY PR2: ULTIMATE BROADBAND PRE-AMP

After you find out how practical a well-built SA7 can be, you will be quite impressed with the higher gain plus the convenient AC power supply, BNC I/O connectors and LED "on-off" indicator of the Ramsey PR2. The PR2 uses an advanced microwave MMIC for signal-to-noise figures that are typically 27 db (over 4 "S-units") gain, and only 2-3 db of noise. The PR2 also features a high power output compression point of 18 dBm - almost 100 milliwatts!

FINAL NOTES ABOUT BROADBAND PRE-AMPS

Yes, the Ramsey SA7 or PR2 RF pre-amp will give that promised boost to the signal strength of that distant FM broadcast station that your wife, sister or dad wants to tune in without so much static. However, if there is a strong local station 20 KHz up or down the band, remember that station is entitled to the same amount of boost! The result may be that the radio will try harder to "lock" on to the frequency of the stronger station, wiping out the very station you want to boost. In such cases, a highly directional gain antenna, with a good line-of-sight view of the broadcasting station, needs to be the first improvement, using the pre-amp for a further boost.

When using a broadband preamp with a frequency counter to check the performance of an RF oscillator, remember that neither the preamp or counter have any control over the quality of the oscillator's frequency output. If the next harmonic of the RF source looks better to the counter-preamp combo, that is exactly what you will see and count!

Finally, be aware that adding a preamp to a poorly designed VHF or UHF receiver used in busy RF environments will result in very noticeable boosting of out-of-band images and heterodynes.

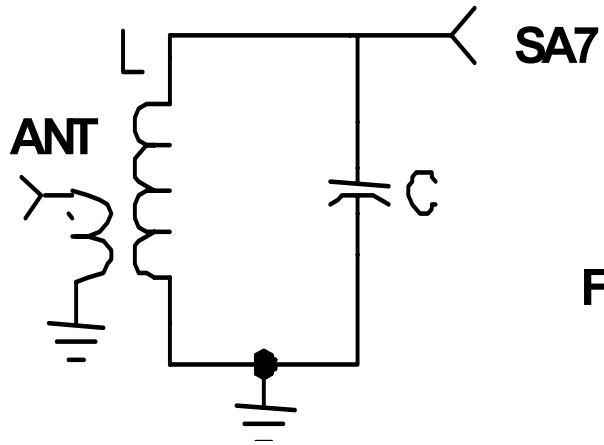
BROADBAND "ACTIVE ANTENNA"

For situations where a short or indoor receiving antenna is needed, the SA7 preamp will give considerably improved performance even if the antenna is little more than a collapsible whip or short length of wire. For a well-engineered active antenna kit for both HF and VHF, at a breakthrough low price, take a look at our new Model AA7 Active Antenna, which features on-board battery supply, adjustable gain control, heavy-duty whip, HF-VHF mode switching, and jack for using external antenna.

ADDING A TUNED RF INPUT:

The SA7 is designed to give a high RF boost to all that it "hears" - from a few hundred Hz into the GHz region. If you want a preamp that can be "choosy" about what comes from the output, you need to add a tuneable L/C network or filter to the input or output or both. Even though the ARRL Handbook was not much help on soldering SMT components, it's loaded with circuit examples which will show you clearly how to use the SA7's tried and true amplification stages with coils and variable capacitors to accomplish the goals of many different projects. Have fun with your SA7 pre-amp!

Adding a tuned RF input



$$\text{Freq.} = \frac{1}{6.28\sqrt{L \times C}}$$

SA7—12

WARNING: Under no circumstances should transmitter power be applied to the SA7. Although this seems common-sense, most receivers are in transceiver configuration and one slip of the mike key will blast your little SA7 to La-La Land.

The Ramsey Kit Warranty

Please read carefully BEFORE calling or writing in about your kit. Most problems can be solved without contacting the factory.

Notice that this is not a "fine print" warranty. We want you to understand your rights and ours too! All Ramsey kits will work if assembled properly. The very fact that your kit includes this new manual is your assurance that a team of knowledgeable people have field-tested several "copies" of this kit straight from the Ramsey inventory. If you need help, please read through your manual carefully. All information required to properly build and test your kit is contained within the pages!

1. DEFECTIVE PARTS: It's always easy to blame a part for a problem in your kit, Before you conclude that a part may be bad, thoroughly check your work. Today's semiconductors and passive components have reached incredibly high reliability levels, and it's sad to say that our human construction skills have not! But on rare occasions a sour component can slip through. All our kit parts carry the Ramsey Electronics Warranty that they are free from defects for a full ninety (90) days from the date of purchase. Defective parts will be replaced promptly at our expense. If you suspect any part to be defective, please mail it to our factory for testing and replacement. Please send only the defective part(s), not the entire kit. The part(s) MUST be returned to us in suitable condition for testing. Please be aware that testing can usually determine if the part was truly defective or damaged by assembly or usage. Don't be afraid of telling us that you 'blew it', we're all human and in most cases, replacement parts are very reasonably priced.

2. MISSING PARTS: Before assuming a part value is incorrect, check the parts listing carefully to see if it is a critical value such as a specific coil or IC, or whether a RANGE of values is suitable (such as "100 to 500 uF"). Often times, common sense will solve a mysterious missing part problem. If you're missing five 10K ohm resistors and received five extra 1K resistors, you can pretty much be assured that the '1K ohm' resistors are actually the 'missing' 10 K parts ("Hum-m-m, I guess the 'red' band really does look orange!")

Ramsey Electronics project kits are packed with pride in the USA. If you believe we packed an incorrect part or omitted a part clearly indicated in your assembly manual as supplied with the basic kit by Ramsey, please write or call us with information on the part you need and proof of kit purchase

3. FACTORY REPAIR OF ASSEMBLED KITS:

To qualify for Ramsey Electronics factory repair, kits MUST:

1. NOT be assembled with acid core solder or flux.
2. NOT be modified in any manner.
3. BE returned in fully-assembled form, not partially assembled.
4. BE accompanied by the proper repair fee. No repair will be undertaken until we have received the MINIMUM repair fee (1/2 hour labor) of \$18.00, or authorization to charge it to your credit card account.
5. INCLUDE a description of the problem and legible return address. DO NOT send a separate letter; include all correspondence with the unit. Please do not include your own hardware such as non-Ramsey cabinets, knobs, cables, external battery packs and the like. Ramsey Electronics, Inc., reserves the right to refuse repair on ANY item in which we find excessive problems or damage due to construction methods. To assist customers in such situations, Ramsey Electronics, Inc., reserves the right to solve their needs on a case-by-case basis.

The repair is \$36.00 per hour, regardless of the cost of the kit. Please understand that our technicians are not volunteers and that set-up, testing, diagnosis, repair and repacking and paperwork can take nearly an hour of paid employee time on even a simple kit. Of course, if we find that a part was defective in manufacture, there will be no charge to repair your kit (But please realize that our technicians know the difference between a defective part and parts burned out or damaged through improper use or assembly).

4. REFUNDS: You are given ten (10) days to examine our products. If you are not satisfied, you may return your unassembled kit with all the parts and instructions and proof of purchase to the factory for a full refund. The return package should be packed securely. Insurance is recommended. Please do not cause needless delays, read all information carefully.



RAMSEY TRANSMITTER KITS

- FM10A FM Stereo Transmitter
- TV6 Television Transmitter

RAMSEY RECEIVER KITS

- FR1 FM Broadcast Receiver
- AR1 Aircraft Band Receiver
- SR2 Shortwave Receiver
- AA7 Active Antenna
- SC1 Shortwave Converter

RAMSEY HOBBY KITS

- SG7 Personal Speed Radar
- SS70A Speech Scrambler
- SP1 Speakerphone
- MD3 Microwave Motion Detector
- PH14 Peak Hold Meter
- TG1 DTMF Tone Grabber

RAMSEY AMATEUR RADIO KITS

- DDF1 Doppler Direction Finder
- HR Series HF All Mode Receivers
- QRP Series HF CW Transmitters
- CW7 CW Keyer
- CPO3 Code Practice Oscillator
- QRP Power Amplifiers

RAMSEY MINI-KITS

Many other kits are available for hobby, school, Scouts and just plain FUN. New kits are always under development. Write or call for our free Ramsey catalog.

TOTAL SOLDER POINTS

37

ESTIMATED ASSEMBLY TIME

Beginner..... 1.1 hrs
Intermediate..... 0.6 hrs
Advanced 0.5 hrs

REQUIRED TOOLS

- Soldering Iron Ramsey WLC100
- Thin Rosin Core Solder Ramsey RTS12
- Needle Nose Pliers Ramsey MPP4 or RTS05
- Small Diagonal Cutters Ramsey RTS04
<OR> Technician's Tool Kit TK405

ADDITIONAL SUGGESTED ITEMS

- Holder for PC Board/Parts Ramsey HH3
- Desoldering Braid Ramsey RTS08
- Digital Multimeter Ramsey M133

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