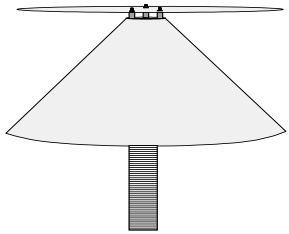
AMPLIFIED BROADBAND DISCONE ANTENNA



Ramsey Electronics Model No. DAP25

Looking for a broadband antenna with full 360 degree coverage? Discover what communication professionals have known for years using a "discone" antenna. Use this antenna to bring a multitude of signals out of the noise making it ideal for scanners and Ultra High through Microwave Frequency receivers! Search the airwaves for signals with this unique kit!

- **Omni directional performance; no need to point in any direction!**
- **Learn about antenna theory, and what makes the discone an ideal broadband antenna!**
- **Covers all frequencies between 450 MHz and 2500 MHz, and you'll learn why!**
- **E-Z cable connection, industry standard "F" type connector.**
- **Out-performs models costing tens to hundreds of dollars more.**
- **Super small in size for easy mounting almost anywhere! An ideal "apartment" size antenna!**
- **All hardware and pre-drilled metal work included.**
- **"Forgiving" design gives you a high performance antenna each and every time.**

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DAP25 KIT INSTRUCTION MANUAL

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KIT ASSEMBLY
AND INSTRUCTION MANUAL FOR

BROADBAND DISCONE ANTENNA KIT DAP25

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INTRODUCTION

In today's ever growing "wireless" society, it almost seems a bit ironic that antennas have become less and less the topic of interest in hobbyist circles. The recent advances in wireless technology have shrunk antennas to ever smaller an unobtrusive sizes. An example of this is the cable television industry. They have removed the larger "traditional" antenna arrays that were once commonplace for TV reception and replaced them with a single wire or two entering the household. Advances in the semiconductor industry have provided engineers with the tools to pull the smallest signals from the airwaves with better noise performance than could have been dreamed of when the technology of radio reception was envisioned. Advances in satellite technology have reduced the size of a reception "dish" from over 12 feet in diameter to a 1 foot round platform!

Antenna design certainly has not made the "quantum leap" that was brought on with the advances in the semiconductor industry, but it is just as important as it was in those early days of radio. The original aerials, or reception antennas, had to provide enough signal to overcome the ever present noise and allow the early receivers to detect and demodulate signals. These early antennas were quite large (we'll talk a little more about this later) due to the lower frequencies being transmitted. Again, more recent improvements have allowed us to use higher frequencies with significantly smaller antennas.

With less and less demand for consumer antennas, the market price of these commodities has increased. As many of us have discovered, even the lowest cost antennas run in excess of one hundred dollars! While they are necessary if we intend to use the antenna commercially or for television reception, it simply is too much for a hobbyist to invest for use with a monitoring receiver. Enter the Ramsey line of discone antennas, allowing us to "tinker" with the airwaves at an affordable price.

Ramsey Antennas 101:

Before we break open our discone kit, lets talk about what makes an antenna tick, and some of the terms used to define antenna performance.

How Fast are Radio Waves?

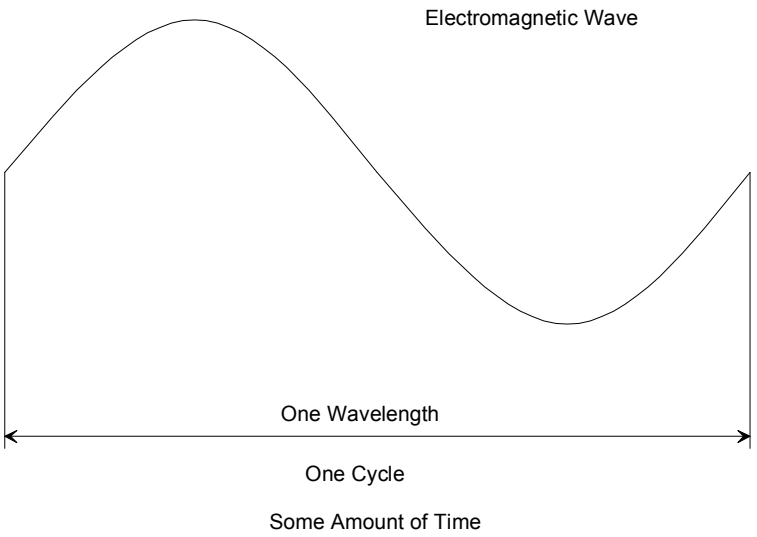
If one were to "whip" the end of a taught length of rope, you could observe the wave created traveling down the rope to it's end. Going back to our physics class, recall that the speed of any object is the distance it travels divided by the time it takes to get there, or Velocity = Distance / Time. The time a wave takes to travel is dependant on the type of wave and the transmission medium. The wave in our rope example can take seconds to traverse down the length of the medium. Sound waves travel about 1100 feet every second; if we called out

before we snapped the rope, the sound waves would arrive much quicker than the “rope wave” would. In the case of radio waves, the rate at which the waves travel is much faster, reaching the speed of light (186,000 miles / second, or about $3x10^8$ meters / second) in a vacuum. Radio waves do travel slightly slower in air however. In a wire transmission line, they travel even slowly!

Frequency and Wavelength

Since all antennas collect electromagnetic waves, lets take a moment to think about the wave motion of the radio wave itself. Try to picture a repeating sinusoidal waveform moving down a line (oscillating). A wave that repeats itself has a certain period (amount of time) that it takes to complete a full cycle. Since this cycle is regular, we say that the wave has a *frequency* of repetition. This frequency in fact is the reciprocal of the time it takes for the wave to complete one full cycle, mathematically speaking $f = 1 / T$. By the same token the time and frequency are related by the expression $T = 1 / f$.

The distance in free space that the wave takes to repeat itself is said to be the *wavelength* and can be calculated using the same velocity equation. By rearranging the velocity equation algebraically, we can say that the Distance = Velocity x Time. Since we will approximate the velocity to be the speed of light (“c”), once the Time is determined we can solve for the distance traveled which is the wavelength; usually denoted as the Greek letter lambda (“λ”) reducing our equation to $\lambda = v \times T$. In English, the wavelength is equal to the velocity multiplied by the period of the waveform. Pretty neat, huh!



What Are We Driving At?

Time to pull some of that theory together and get some answers:

Since: $\lambda = v \times T$

And $T = 1 / f$

We can substitute and get:

$$\lambda = v / f$$

Since the velocity equals “c” we wind up with:

$$\lambda = c / f$$

The wavelength of the radio wave equals the speed of light divided by the frequency.

Lets plug some numbers into our equation and work out a few wavelengths. We should notice some other properties of electromagnetic waves.

If f = 450 MHz (the wave cycles 450 million times in a second) then $\lambda = 3x\ 10^8 / 450 \times 10^6$ or .666 meters for a full wavelength.

If f = 2500 MHz (the wave cycles 2500 million times in a second) then $\lambda = 3x\ 10^8 / 2500 \times 10^6$ or .120 meters for a full wavelength.

It’s important to note that as the frequency of a wave *increases*, its wavelength *decreases.* Keeping in mind the introduction section where we talked about antenna size, lets consider the “old” days of radio. The common use of low frequencies meant much longer wavelengths and significantly larger antennas for reception. Today's modern electronic devices tend to operate at much higher frequencies and thereby require smaller antennas to operate properly.

Determining the Resonant Frequency of the Antenna

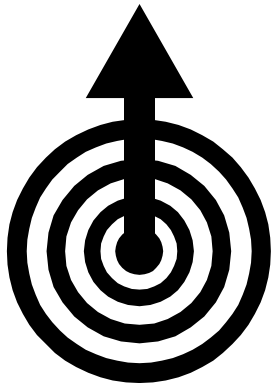
Let’s explore another factor in antenna as well as radio design, the resonant frequency of the circuit. Recalling that we would like our discone antenna to work over a large range of frequencies, we need the antenna system to be optimized for the full desired range. Resonance in an antenna circuit occurs when the antenna length exactly matches the wavelength of the desired frequency. To make an antenna resonant over a range of frequencies, it needs to look like a multitude of lengths.

Looking at the desired waveform, the shortest length of wire that will resonate at a given frequency is one which is just long enough to permit an electric charge to travel from one end to the other and then back again in the time of

one radio frequency (or RF) cycle. Since the charge traverses the wire twice, the length of wire needed to permit the charge to travel the total distance in one cycle is $\lambda / 2$, or one half the wavelength. Therefore, the shortest resonant wire length will be one half wavelength long.

Let's consider a "half wavelength" example to help it make sense. Picture a trough with barriers at each end. If a rubber ball is rolled along the trough from one end to the other it will hit the end and bounce back. When it bounces back, it will hit the near barrier and bounce again. This will continue until the ball runs out of energy and stops. If however, whenever the ball returns to the near barrier it is given a push just as it starts away, its back and forth motion can be kept up indefinitely as long as the impulses are timed properly. In other words, the rate or frequency of the impulses must be adjusted to the length of travel and the rate of travel. If the timing of the impulses (the push) and the speed of the ball are fixed, the length of the trough must be adjusted to "fit". In the case of the antenna, the speed is constant. This leaves the alternatives of adjusting the frequency or the length of wire to match a given frequency.

Antenna Gain



Another performance specification common with antennas is their gain, usually given in dBi units. To understand this concept, let's explore the "i" in the dBi unit as an isotropic source. Imagine a point in space as a source of a radiating signal. The signal would then expand spherically from the point source. If we then move a given distance from the point source, the power would be distributed uniformly in all directions. The power density is uniform about an isotropic source and thus is related to the surface area of a sphere (area = $4x \pi x$ radius ^{2}). Although this is not practically possible, it is the basis for an antenna gain specification. The gain of an antenna is usually referenced in comparison to this type of source in a decibel unit with a logarithmic relationship. Without getting hung up too much on logarithmic theory, suffice it to say that an increase of 3 dB is equal to twice the power being present . An increase of 10 dB is equivalent to a gain factor of 10. For example, a 1 Watt signal with a gain of 3 dB equals two Watts, while the same power with 10 dB gain is 10 Watts.

Although we are using our discone as a receiving antenna, the rules of antenna gain are reciprocal so we can count on at least a 14 dBi improvement in the signal power over the entire frequency range.

What About Impedance Matching and VSWR ?

Another consideration with electromagnetic wave antennas is the “match” presented to either the receiver or transmitter. In our discussion of wavelength and resonant frequencies it became apparent that the length of the antenna is critical to match that of the desired frequency. A small error in length can detune an antenna significantly and inhibit the antennas performance.

For many communications systems, 50 or 75 Ohms are the desired “magical” impedance values desired for the antenna systems. The proper impedance allows for maximum power to transfer to or from the antenna system with a minimum of loss. Even with the high frequencies being used we want the antenna to appear as a proper load. In this way the antenna presents a good match to the receiver. Luckily for us, the discone antenna exhibits exceptional performance in the impedance matching department.

The Voltage Standing Wave Ratio (VSWR) of an antenna system is another measure of this impedance match. At RF frequencies, if the load at the end of the transmission line is not the desired impedance, the signal will actually reflect back down the line and precipitate a high VSWR. Typical usable VSWR ratios are in the “3.0 : 1.0” range for commercial available communications equipment, while the robust discone design actually outperforms these at many frequencies with a typical ratio of “1.5 : 1.0” or better. A “1.0 : 1.0” ratio indicates the best match possible resulting in no wasted signal reflection.

DISCONE DESCRIPTION

Getting back to the kit at hand, let us apply some of the theory we just discussed. Notice that the discone antenna is predominately two sections, the upper “disk” and lower “cone” section.

To allow for the large frequency range of the antenna, notice how the lower cone section of the antenna slopes away from the top disk section. This design allows for a smooth transition between the multiple wavelengths that we hope to receive without any discontinuities in between. This is an ideal configuration for an omni-directional antenna response pattern.

The coaxial cable mounts directly to the provided circuit board plate, which in turn will be connected to both the conic section as well as the top disk of the antenna. The cable has been supplied with a crimped BNC type connector at one end for ease of connection to your receiver.

The discone dimensions have been calculated such that the usable performance range is between 450 MHz to 2500 MHz with a typical VSWR of “2.0 : 1.0” or less.

The amplified discone antenna takes advantage of a low noise MMIC amplifier

to provide additional gain for the antenna. The 9 VDC power to run the amplifier is “piggy-backed” up the RF cable and is decoupled at the antenna circuit board. There is also an additional protection diode on the amplifier input to prevent any damage to the sensitive IC.

Ramsey offers two models of this particular antenna, one with no active components and the other with a low noise preamplifier to further boost the antenna gain.

The DAP25 kit which your are about to assemble is the preamplified version. The advantages to this particular model are that in addition to the gain and performance of a standard discone antenna, the DAP25 offers an additional low noise amplifier to provide higher gain for reception of weak signals.

However, if your particular application is for transmission of signals, this is not the kit for you. The low noise amplifier could be damaged by injecting RF power into the antenna. We recommend the non-preamplified version of this kit, the DA25, for transmitting applications. The good news is if you have not begun assembly yet, you may return your kit for full credit towards the non-amplified version within 10 business days from original purchase.

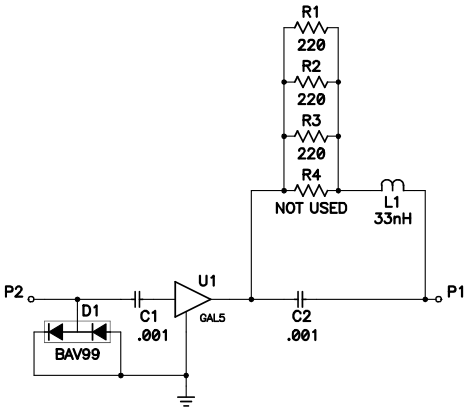
PARTS SUPPLIED WITH YOUR DAP25 KIT

- ❒ 1 3 Qt. funnel “cone”
- ❒ 1 7 inch pie-plate (*CAUTION, EDGES MAY BE SHARP!*)
- ❒ 3 #6 – 32 x 1/4” screws (Nylon)
- ❒ 3 #6 – 32 M-F stand-offs (Nylon)
- ❒ 3 #6 – 32 nuts (Nylon)
- ❒ 1 DCA1 circuit board
- ❒ 1 PVC coupling
- ❒ 1 3” buss wire
- ❒ 1 3’ length type “F” to jumper cable
- ❒ 1 Feed thru power inserter with wall plug transformer

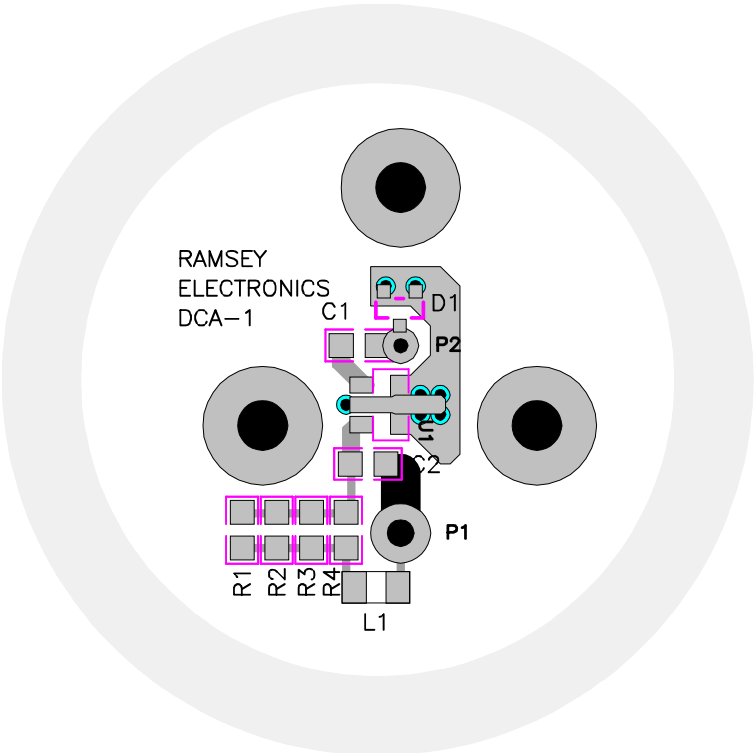
SURFACE MOUNT COMPONENTS: Note there are extra chip capacitors and resistors included (They’re real small aren’t they!).

- ❒ 3 220 ohm surface mount resistors (marked 221) [R1-3]
- ❒ 2 .001 uF surface mount capacitors (Gray smt package or marked A3) [C1,2]
- ❒ 1 33 nH surface mount inductor (White smt package or marked R33) [L1]
- ❒ 1 BAV99 dual diode (three tabs marked 7X) [D1]
- ❒ 1 MMIC amplifier (four solder tabs marked 5) [U1]

DAP25 PREAMPLIFIER SCHEMATIC DIAGRAM



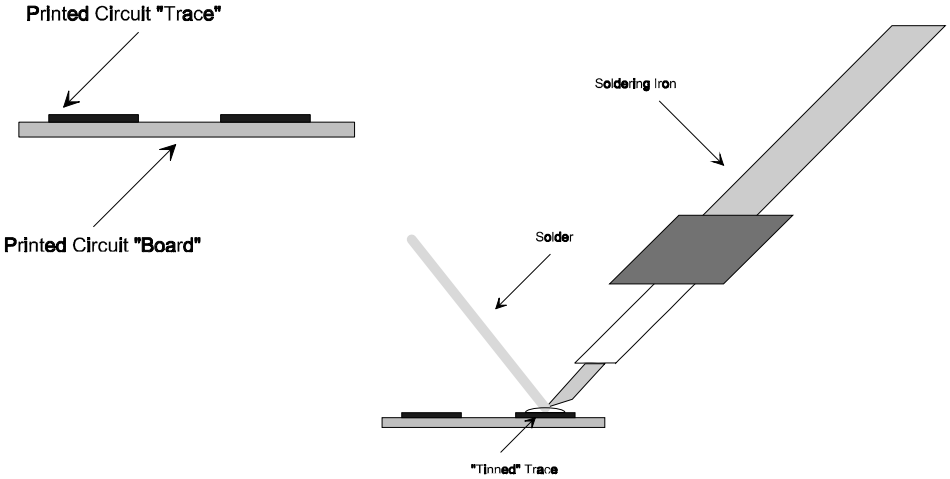
DAP25 PREAMPLIFIER PARTS PLACEMENT DIAGRAM



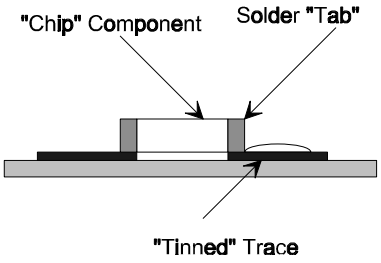
SURFACE MOUNT COMPONENT SOLDERING INSTRUCTIONS:

You'll notice that the circuit board contains only a few holes for component leads to pass through. This is because the SMT components will be affixed to the "solder" side of the PC board, the side that contains the PC traces. Be aware that the component view for assembly is looking at the solder side of the PC board.

Patience is the key when installing surface mount components. Typically, the first step (after identifying the component) is to "tin" one of the PC traces that will connect to the part.



Once this is accomplished, the part can be installed by holding it with tweezers in contact with the "tinned" trace and re-heating the solder (see the associated diagrams).



This may go a little "against the grain" at first, but it is by far the easiest method. Notice also that when reheating the solder that the iron tip does not come in contact with the "tab" on the body of the chip component. Over heating of this solder tab can cause a fracture of the bond to the component, causing an intermittent connection.

Another commonly used technique is to glue the surface mount components to the printed circuit board before soldering. The procedure is to take a small amount of glue (usually with a pin or toothpick) and "dab" the circuit board in the place where the component will be affixed. Be careful not to apply too

much glue as when the part is placed it may “squash” the glue underneath the soldering tabs of the component. Carefully place the part into position, and when the glue dries, solder the connection.

It is also important to note that the installation of integrated circuits has become more challenging for hobbyists and experimenters. On the bright side, the L band transmitter we are about to construct would be almost an impossible to construct with any repeatability with conventional thru hole components, with ever miniaturizing circuitry we can offer this as a “works every time “ kit. It is, however, considerably more challenging that our simpler kits, and will take some degree of expertise in hand assembly to complete the project. Read thru this manual carefully before proceeding, as once you begin to build you will not be able to receive full credit on return, and we do offer this as a wired and tested product as well.

Pay particular attention to “time and temperature” of your soldering technique. You should be able to perform quality solder connections in a shorter amount of time since there is not as much of a heat “sink” due to large wires on the components.

OOPS, I bridged that connection! This can be a common complaint in surface mount assembly. We recommend that you use a solder braid or wick to remove any excess solder, usually this can be done without removing the component.

RAMSEY "Learn-As-You-Build” KIT ASSEMBLY

There are solder connections on the DAP25 printed circuit board. Therefore, PLEASE take us seriously when we say that good soldering is essential to the proper operation of your discone antenna kit!

- Use a 25-watt soldering pencil with a clean, sharp tip.
- Use only rosin-core solder intended for electronics use.
- Use bright lighting; a magnifying lamp or bench-style magnifier may be helpful.

We have a two-fold strategy for the order of the following kit assembly steps. First, we install parts in physical relationship to each other, so there's minimal chance of inserting wires into wrong holes. Second, whenever possible, we install in an order that fits our "Learn-As-You Build" Kit building philosophy. This entails describing the circuit that you are building, instead of just blindly installing components. We hope that this will not only make assembly of our kits easier, but help you to understand the circuit you’re constructing.

For each part, our word "Install" always means these steps:

1. Pick the correct component with the proper value to start with.

2. Insert it into the correct PC board location.

3. Orient it correctly, following the PC board drawing and the written directions for all parts - especially when there's a right way and a wrong way to solder it in. (Diode bands, electrolytic capacitor polarity, transistor shapes, dotted or notched ends of IC's, and so forth.)

4. Solder all connections unless directed otherwise. Use enough heat and solder flow for clean, shiny, completed connections.

5. Trim or nip the excess component lead wire after soldering.

Enough of that ... let's get started!

DA25 DISCONE ANTENNA KIT ASSEMBLY

Although we know that you are anxious to complete the assembly of your antenna kit, it is necessary to assemble it in a specific order to insure the proper operation of the finished unit. Try to avoid the urge to jump ahead installing components.

Since you may appreciate some warm-up soldering practice we'll start with the SMT resistors; we packed extras should you need them! Remember that the majority of the components will be mounted on the component side of the circuit board and soldered on the "top" side of the circuit board, the side that contains the printed circuit traces. Have a look at the component layout diagram to help with your assembly.

Use the boxes to check off your progress.

Check all received parts against the parts list. The parts list describes the various markings that may be found on the kit parts. Carefully sort the parts into small piles, (an empty egg tray does nicely for this purpose) to aid in finding the correct part at the required time. Some extra SMT parts have been included should you have an accident with one of them!

First we will assemble the preamplifier portion of the circuit. Have a careful look at the parts placement diagram before proceeding to verify the position of the components.

❒ 1. Noting the surface mount installation instructions, install resistors R1-R3 the 220 ohm resistors (marked 221). These resistors are connected in parallel, so it will appear that they are "bridged" together (R4 is not used).

❒ 2. Install inductor L1, 33 nH [white chip]. Use caution as not to fill the “P1” hole with solder when installing this component.

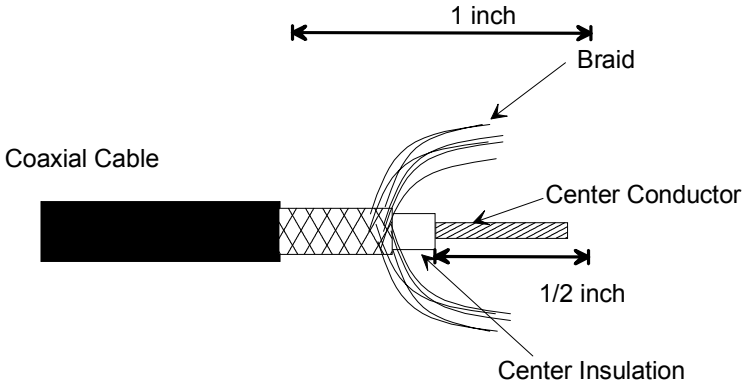
❒ 3. Install capacitor C2, .001 uF [gray chip].

❒ 4. Identify the low noise preamplifier IC (four solder tabs marked with a “5”). After noting carefully the correct orientation, install in the U1 position, soldering all four tabs.

❒ 5. Install C1, the other .001 uF capacitor [gray chip]. Use caution as not to fill the “P2” hole with solder when performing this installation.

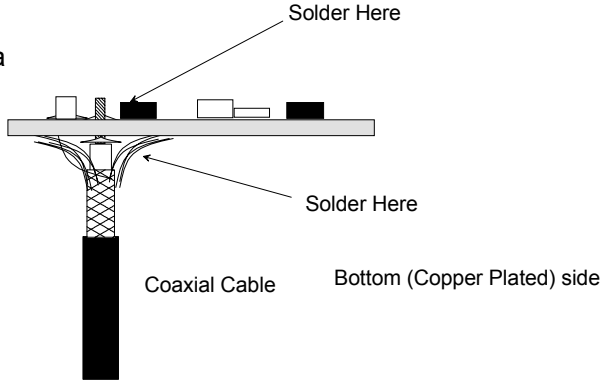
❒ 6. Install diode D1 (marked 7X), noting its orientation and installing in the proper direction.

❒ 7. Now we’ll prepare the coaxial cable for installation to the circuit board. We need to “break out” the two wire components of the cable. Trim about 1” of the outer insulation from the cable, being careful not to cut through the outer braid of wire. Using a fine pointed tool, carefully “un-braid” about 3/4” of the outer conductor and fan out the loose strands of wire. Once this is accomplished, trim back about 1/2” of the center insulation. Be careful not to cut through the center conductor. You will want to trim about 3/4” off of the exposed braid to aid with further installation. Carefully “tin” the center conductor of the cable by adding a small amount of solder to the twisted center conductor of the coaxial cable. Use care not to leave the soldering iron in contact with the wire for too long as it can melt the center insulation and short-out the cable. Tinning allows us easy installation of the coaxial cable to the circuit board assembly and minimizes the chance of overheating the wire when this installation occurs. Be careful that no stray wires tend to short together, if they are too close together carefully trim them away. Have a look at the diagram to see what the complete “pre-assembled” cable should look like.



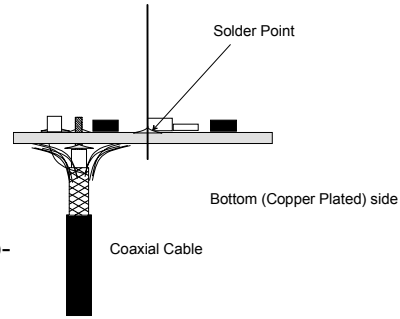
❒ 8. Insert the tinned center conductor wire through the P1 hole in the circuit board. This wire will connect the circuit board assembly to the amplifier section of the antenna; it will also connect to the center conductor of the coaxial cable. Push until the center insulation of the cable is flush to the circuit board. Solder from the top side into place. Trim off any excess lead.

❒ 9. Gently spread the trimmed braid to the area immediately around the P1 hole. Be sure that the braid ***ONLY*** contacts the tinned copper ground plane area. Trim off any stray wires that may short-circuit to the adjacent mounting rings.

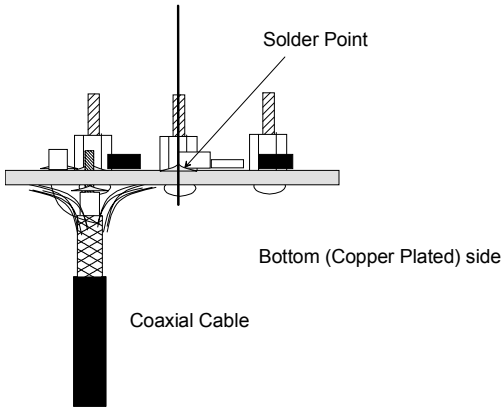


That wasn't so bad, now was it! You've completed the installation of all the components required for the preamplifier.

❒ 10. Identify the small piece of buss wire supplied with your kit. This wire will connect the circuit board assembly to the disk section of the antenna. It is part of the circuit path that connects the disk element to the center conductor of the coaxial cable through the pre-amplifier stage. Insert through the bottom side of the circuit board through the P2 hole. Apply a small amount of solder to the top side of the circuit board, as shown.

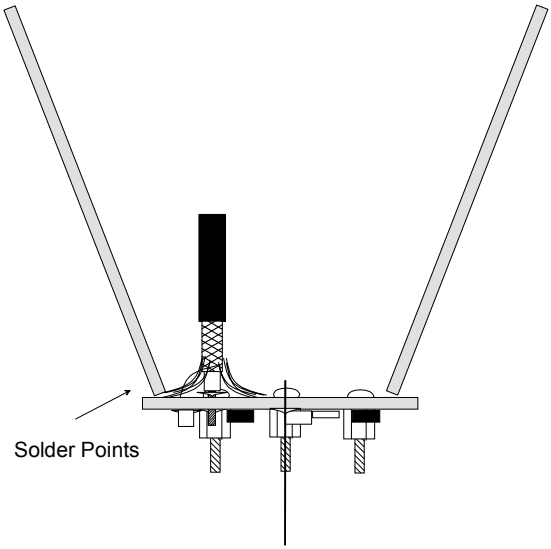


❒ 11. Using the 3 #6-32 nylon screws provided, insert them through the circuit board assembly as shown. Fasten the screws into place using the #6-32 standoffs provided. Be careful no to over-tighten the nylon parts or they may shear off.



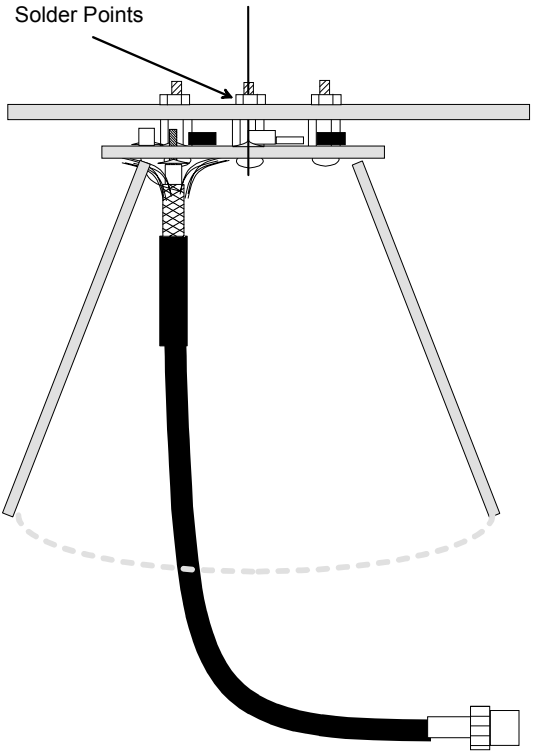
Now we are getting to what is probably the most difficult solder connection of the entire antenna kit! We will solder the circuit board assembly to the funnel cone.

❒ 12. Install the circuit board assembly to the funnel cone as shown. Use care to center the circuit board before you solder the assembly completely. It may be easier if you “tack solder” the board into place before you run a ring of solder completely around the board. Careful now, the entire assembly will be quite hot while you are doing this. You may want to use gloves to protect your fingers from burns (Ouch!). Solder all the connections using enough heat to flow the ground connection completely. This may take a little while depending on the wattage of your soldering pencil.



❒ 13. Install the disk section of the antenna by passing the three #6-32 screw ends of the stand-offs through the disk section of the antenna while passing the center conductor wire through the center hole of the disk. Secure the disk section of your antenna into place with the #6-32 nuts.

❒ 14. Solder the center conductor wire into place on the top side of the disk section of the antenna. Trim off any excess lead that is protruding from the disk section. Have a look at the diagram to help out if necessary.



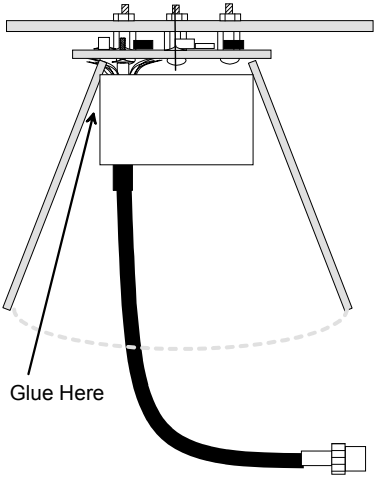
CONGRATULATIONS !

Your discone antenna is now complete! Have a final look over your work. Pay particular attention to the solder connections. Remember that any problems you find now can save time and effort after the unit has been cased up.

INSTALLATION OF THE ANTENNA MOUNT

When you are satisfied that your solder connections are “just right”, install the PVC antenna mount included with the kit. The antenna mount is the 1” PVC coupler.

We recommend that you glue the coupling firmly into place (all the around) with some RTV or contact cement. Be sure to fit the coupling firmly into place because if the glue sets up with the coupling in a little tilted, you’ll forever see a slightly “off balance” discone.



USING YOUR DA25 DISCONE ANTENNA

Now we are ready for the moment of truth, the running of your discone antenna. We’re pretty sure by now you have a place selected to install it so you can use a couple of nylon wire ties to fasten into place. A fairly good “poor mans” test is to search on your scanner or radio receiver for a weak station, one that is barely breaking the threshold of your receivers sensitivity with your old antenna. Note your signal strength indication of the station, and proceed to disconnect your existing antenna and replace it with your DAP25. Power up your DAP25 by connecting the other end of the “F” type feed cable to the power inserted end labeled “TO AMPLIFIER”. Plug in the wall transformer and then connect a wire for the receivers antenna port to the other end of the power inserter. If you’re like our many satisfied customers you’ll notice a significant improvement in signal quality. Try this test on several frequencies throughout the band and find out just how poorly your original antenna was working!

IMPORTANT NOTE CONCERNING OUTDOOR USAGE

Many of the metal components contained in your discone antenna will oxidize and rust if left exposed to direct weather. It is recommended that if you are planning on permanently mounting the antenna outdoors, you should coat the entire unit with an enamel paint before permanently installing it. A non-conductive covering such as liquid electrical tape should be used to coat the electronic components on the circuit board as well.

TROUBLESHOOTING GUIDE

If your DAP25 is powered up but does not work at all, re-check the following:

- Is that disk on the top soldered to the feed through wire?
- Are there any questionable solder joints that may be shorted?
- Check all the surface mount solder connections for proper placement.
- Use a voltmeter and verify the output of U1 is biased for about 4VDC

Still having trouble?

While we had hoped that it wouldn't come to this, if you are still having trouble with your DAP25 here are a few additional suggestions.

Use a methodical, logical troubleshooting technique. Most problems can be solved using common sense. A volt-ohm meter and a clear head are usually all that are needed to correct any problem. Most problems are due to misplaced parts and/or bad solder connections. Working backwards through the assembly steps will often lead you to the problem. Re-visit the extensive theory of operation include in this manual, and try to apply to your specific problem.

Have another set of eyes look through your work. Here at the shop we have often run into a "stone wall" of a problem only to have a fellow technician see our obvious error. It is sometimes very difficult to see your own mistake, taking a break can often solve this common problem.

Please understand that it is nearly impossible to "troubleshoot" by phone, any specific questions should be documented and sent to us by mail.

CONCLUSION

We sincerely hope that you enjoy the use of this Ramsey product. As always, we have tried to compose our manual in the easiest, most user-friendly format that is possible. As our customers, we value your opinions, comments, and additions that you would like to see in future publications. Please submit comments or ideas to:

Ramsey Electronics Inc.
Attn. Hobby Kit Department
590 Fishers Station Drive
Victor, NY 14564

Please also feel free to visit our Website at www.ramseyelectronics.com and offer your observations to other kit enthusiasts as well.

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:

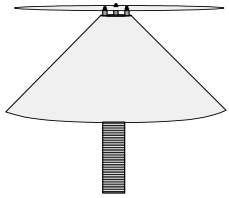
To qualify for Ramsey Electronics factory repair, kits MUST:

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 $25.00, 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 $50.00 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.

DAP25 DISCONE ANTENNA KIT
Quick Reference Page Guide



REQUIRED TOOLS

- Soldering Iron — Ramsey WLC-100
- Thin Rosin Core Solder — Ramsey RTS12
- Needle Nose Pliers — Ramsey RTS05
- Small Diagonal Cutters — Ramsey RTS04
- Technician Tool Set — Ramsey TK405

ADDITIONAL SUGGESTED ITEMS

- Optivisor Magnifier Headband — Ramsey OPMAG
- Holder for PC Board/Parts — Ramsey RTS13
- Desoldering Braid — Ramsey RTS08

Price: $5.00
Ramsey Publication No. MDAP25

Assembly and Instruction manual for:
RAMSEY MODEL NO. DAP25

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TOTAL SOLDER POINTS
25

ESTIMATED ASSEMBLY TIME
Beginner.....3 hrs
Intermediate..... 2 hrs
Advanced..... 1.25 hrs