QEX 20 October 1983

The ARRL Experimenters' Exchange

STS-9 Schedule

The date for the STS-9 liftoff is now October 28, 11:30 AM EDT. The mission's schedule is based on elapsed time of mission so if there is a delay in the launch, the scheduled operating time will change (UTC, EDT etc.), but the schedule based on elapsed time of the mission will remain the same.

In the overall picture of the STS-9 mission, Amateur Radio plays a minor role. Therefore, the orbits presented below might be adjusted to the operating schedule once STS-9 is in orbit. Remember that the orbits shown here are the only official operating periods scheduled for the mission. W1AW, W5RRR and other NASA related club stations will carry the latest information as it becomes available. ARRL is establishing telephone lines with recorded information (the preliminary number is (203) 666-0688, but it could change before installation of the lines). Westlink will be updating their Hollywood number at least daily -- (213) 465-5550.

Assuming an 11:30 AM launch, the times for Acquisition Of Signal (AOS) listed in the table should be accurate for the first city/area.

Orbit	Date	City/Area	Time
39	10/30	Spokane, Denver, Dallas, Houston New Orleans, S. America	2000 CDT
40	10/30	N. California, down Pacific coast E. of San Francisco & L.A., Mexico	1930 PDT
47	10/31	W. Australia, S. America, Europe	1430 UTC
63	11/1	S. America, USSR, India, Australia	1330 UTC
64	11/1	Iran, Scandinavia, USSR	1555 UTC
77	11/2	NW Africa, E. Europe, Poland, China	0850 UTC
79	11/2	N. tip of S. America, Caribbean, N. Europe, USSR, India	1250 UTC
80	11/2	Caribbean, all E. Coast states, Newfoundland, U.K. central Europe	0815 EST

(Thanks K6DUE, WA6ITF and the Johnson Space Center gang)

Equipment Modifications

Have you developed any modifications to commercial Amateur Radio equipment that you would like to pass along to other experimenters? If so, please keep QEX in mind. We would like to publish brief items on specific problems with commercial gear, how to install the modification and results obtained. Line drawings (black ink on white paper, please) and photographs can be included where necessary to get the idea across.

An example of interesting modifications is when you tried to get on the air with AMTOR. You found that your transceiver wouldn't switch between transmit and receive fast enough so you developed a circuit modification to speed up the turnaround time. Another example is what you did to get that older rig working on the new WARC bands.

Give it some thought and send in your mods to QEX. Try to keep them short, clear and to the point. W4RI

Miscellany

The January 1983 issue of QEX carried an article by Ivo Chladek, ZS6AXT, on the "Microwave Alignment Probe." A number of individuals questioned the list of references given in that article. One letter summing up the situation follows:

The January 1983 issue of QEX contained a very neatly packaged "Microwave Alignment Probe" by ZS6AXT. In that note, the author referenced an article and comments contained in several issues of RSGB Radio Communication. These references ostensibly contain the heart of the recommended procedures for alignment and noise figure measurement of vhf/uhf receivers. In the U.S., and certainly in central Florida, the reference is rather obscure. It would be appreciated if QEX would reproduce the heart of the methods expounded in RAD COM. - Dick Jansson, WD4FAB, 1130 Willowbrook Trail, Maitland, FL 32751.

As you can guess, we are running the reprints from RAD COM in this issue. They can be found starting on page 5.

Antenna Compendium

The League will publish a special Antenna Compendium in May 1984. Potential contributors of unpublished papers on any aspect of Amateur Radio antennas are invited to send a one-page, double-spaced abstract describing the paper to Paul Rinaldo, W4RI, at Hq. Authors will be notified of acceptance and provided preparation guidance. Deadlines are December 2, 1983 for abstracts, March 15, 1984 for manuscripts.

Amateur Radio Satellite Symposium '83

AMSAT will hold an Amateur Radio satellite symposium in conjunction with its annual meeting on Saturday, November 12, 1983. Located at the John Hopkins University Applied Physics Laboratory just off I-95, the planned programs include: How to get on the new OSCAR 10 satellite, tracking OSCAR 10 with and without a computer, a report on the W5LFL Space Shuttle operation, PACSAT and much more!

Admission is free, but advance reservations are required. For further information and reservations, contact AMSAT, P. O. Box 27, Washington, D.C. 20044, or call (301) 589-6062.

Low-Cost Solution

The July 14, 1983 issue of Electronics magazine has an article on "Ceramic-Filled Resonators" as a low-cost solution to building filters for 800-MHz land-mobile applications. It uses six 10-mm varisonators for a receiving filter, four for a transmitting filter. The two filters can be combined to make a duplexer. The author, Tomoki Uwano, of Matsushita, Osaka, Japan, says that the filters could be supplied in the $1 to $2 range, with duplexers under $20, in mass production.

APPLE Computer Program Transmits/Receives Teletype

A recent news release crossed QEX desks from Cotec. The company announced the latest in its line of APPLE II software for communications. The following is direct text from their release.

RTTY MACHINE, like its Morse Code predecessor, is designed to minimize the interface hardware. Audio tones fed into the APPLE cassette input are demodulated and decoded in software, and sent to the screen as text. Keyboard input is encoded to Baudot and sent to the cassette output as MARK (2125 Hz) and SPACE (2295 Hz) tones. A pair of audio cables with the necessary connectors between the speaker output and microphone input of an ssb or fm transceiver and the cassette ports of the APPLE is all that is necessary to run standard TTY.

The receive portion of the program has two modes of operation. For afsk, which is typical of vhf/uhf operation, the program is operated in the absolute mode: 2125/2295 MARK/SPACE. For use with an hf transceiver, a second mode can be used to match the software discriminator frequency to the center of the receiver audio passband so that increased selectivity may be used. A novel real time tuning indicator at the top of the screen assists the operator in making tuning adjustments.

The transmitting portion also has two modes of operation. In the first mode, each character is sent as a key is pressed. This is similar to the way the standard mechanical TTY machines operate. The second mode allows the sender to prepare and edit a message before sending it. A number of automatic formatting features are built in for operator convenience.

In addition to the cassette port interface, dc output through the Game I/O connector is available to drive frequency shift keying circuitry and transmit/receive switching. Two printer drivers are also included in the software which converts the received signal to ASCII for generating hard copy.

Written in machine language for the APPLE II, APPLE II+, or APPLE //e using DOS 3.3, RTTY MACHINE comes double sided on a 5.25 inch diskette with full instructions for installation and use. RTTY MACHINE is available for $29.95 including postage and handling. No C.O.D. orders, foreign orders add $4.00 and California residents add sales tax. The manufacturer's address is: COTEC, 13462 Hammons Ave., Saratoga, CA 95070.

A 12/70-Watt Class C Amplifier for 146 MHz

By Randy Bynum, *WB2SZK

Having been an avid vhfer for years on the east coast, my move to California prompted a shift toward more fm activity on 2 meters than what I was accustomed to. I soon became a proud owner of an ICOM IC-2AT to help meet that need.

I always had a "base" fm transceiver, but found it inconvenient to transfer the rig from the house to the car. A better approach was to use the 2AT and an amplifier in the car and not disturb the main transceiver. To reach that goal, I designed, built and tested the amplifier described herein.

My arbitrary value was a target output of 70 watts because I wanted a little more than the normal 10-20 watts. Seventy watts is an easily achievable power level on 2 meters with today's solid-state devices and this would ensure extra reliability in emergency situations, should one occur. To double the power (3 dB), the circuit could become more complex as well as expensive.

I decided to build a 3-stage amplifier, starting from the low power (120 mW nominal) position of the 2AT with a two level approach. This gave me a choice between 12- and 70-W output. I first designed the 12-W two-stage amplifier; the 70-W stage came later. The overall design is slightly more complex than need be by my combining the two separate amplifiers. However, this approach will allow anyone needing only 12 W to build just the first two stages. To obtain 12 W, C5 (Arco 461) need be changed to an Arco 422 and the output taken at point XX. The balance of the circuit can then be omitted. As I pointed out earlier, by changing the circuit from 12 to 70 W, it is more complex. A much simpler matching network could have been used between Q2 and Q3. If you already have 10-12 W but would like 70 W, C5 may be changed to an Arco 462 and the input fed to point X.

Tune-up is simple. Double check all connections and make sure no shorts exist in the wiring. Leave the power supply feed separated from each of the transistors to allow ease of tune-up. Make the following adjustments for short periods of time: 10 seconds on and 30 seconds off.

Apply 13-V dc to Q1 and 0.12 W of drive to J1. Adjust C1 and C2 for maximum collector current to Q1. This will be about 300 mA at 0.12-W input. A good heat sink must be used on Q1 to maintain a sufficiently low temperature.

Next, apply power to Q1 and Q2, adjust C3 and C4 for maximum collector current drawn by Q2 and repeak C1 and C2. The current drawn by Q2 should be just under 2 A. Finally, connect 50-ohm load and apply 13-V dc to Q3 and peak C5, C6 and C13 for maximum Q3 collector current. Again, this should be done for only short periods of time to reduce dissipation until all adjustments are properly set.

With the 50-ohm dummy load still connected to J2, adjust C7 and C8 for maximum output. Go back and repeak all adjustments in each of the three stages. Q3 current will be about 9 A.

At least 60 W of power should be observed on an inline wattmeter placed between J2 and the 50-ohm dummy load. Do not tune the amplifier into the antenna as someone may be using the frequency at the time. Should you have the good fortune of a spectrum analyzer, tune-up is much easier. This should not be needed, however, to attain a clean signal when starting with the 2AT hand-held or other similar transceivers. Caution should be used to prevent the hand-held from being operated in the high power position. This could destroy Q1. Utilizing a low power BP3 and 13.2-V dc for the amplifier, I was able to obtain 65-W output into the 50-ohm dummy load at 11 A total current drain.

I have developed a COR circuit for use with the amplifier, but am not pleased with its performance. The problem with the COR is developing sufficient voltage to drive a transistor far enough into conduction to close the T/R relay. I have had to place an NPN and PNP together to prevent the small amount of leakage current through the drive transistor from tripping the relay because of the high gain involved. A better approach may be to use the HT on high power (with the DC-1 or equivalent) and attenuate the signal into Q1. You may wish to directly dirve Q2 from the 1-W position. This, or course, would require recalculating the Q2 input network. Although I consider it a poor circuit, it has been included for further improvement.

My need for the amplifier has dwindled with the purchase of a new higher powered all mode radio. Because of this, I have not made any attempt to improve the COR circuit. I do recommend further work in this area for anyone who wants to use the amplifier. I would be interested in any feedback or comments describing improvements (easily done) to this circuit.

An easily performed modification that can be used with the all mode radios currently available in the 10-W range is to forward bias the final transistor. In this case, only Q3 would be required.

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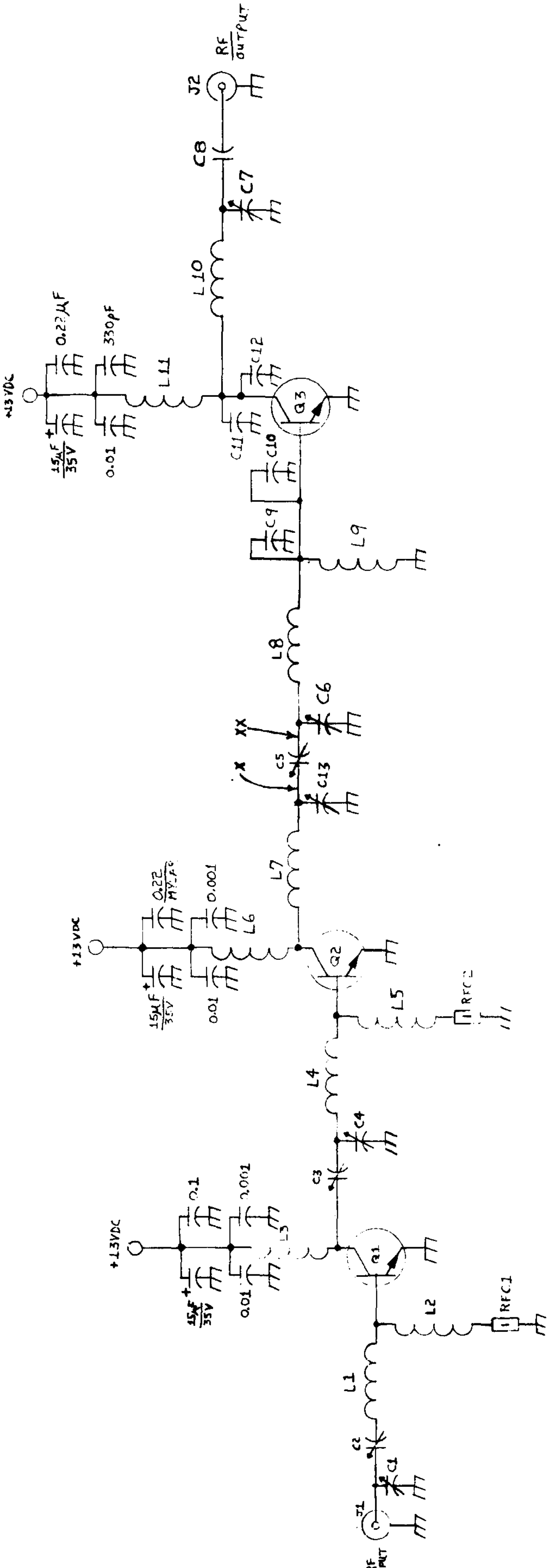

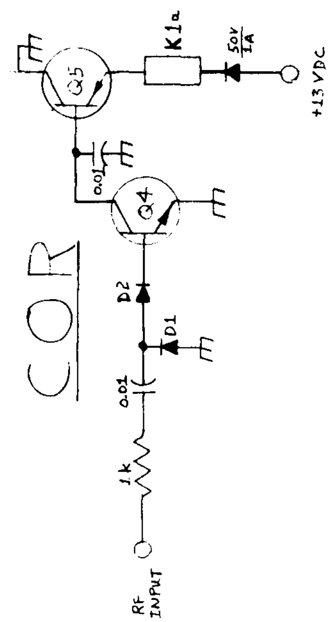

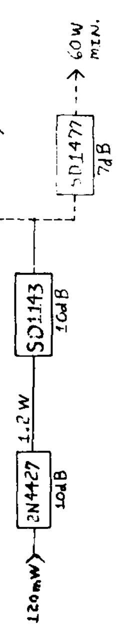

Reprints of ZS6AXT Microwave Alignment Probe References

by J. R. COMPTON, G4COM*

THE normally recommended technique for aligning the front ends of vhf receivers is to adjust for maximum signal-to-noise ratio, which may be, but usually is not, at the same settings as for maximum gain. This can be done by ear using a low-level cw input from a signal generator or beacon, but it is often difficult for the amateur to obtain the use of a vhf generator with a sufficiently attenuated output, while beacon signals tend to suffer from QSB effects if they are weak enough for the purpose required. The author's ears have not proved sufficiently sensitive instruments for any of these methods to be useful other than for approximate alignments.

Another method makes use of a noise generator which need not be precisely calibrated. This is potentially the most accurate method but it does call for repeated comparative readings in the "generator on" and "generator off" conditions, and can be laborious and confusing where adjustments to one part of the circuit interact with others. Although one reference suggests using a "noise increase that you can remember", some form of indicator must be used for accurate work, although this could be very simple and make use of the station multimeter or vvm. [1]

The instrument to be described would seem to overcome most of the problems encountered in the previously-mentioned methods by providing a continuous readout of the difference between the audio output of a receiver with no rf input, and the output when a wideband noise generator is connected to the receiver's aerial terminals. The meter indicates the ratio between the outputs under these two conditions, and the reading is not sensitive to variations in the mean level of the af signal over quite wide limits. The meter has a logarithmic response and could be calibrated linearly in decibels, but this is probably not justified where the absolute level of the noise generator is not known. The cost of building this instrument excluding the case and meter is about £7 (October 1975).

Circuit description (Fig 1)

The circuits used in this design are not novel, all of them being taken with only minor modifications from [2] and [3], which are well worth reading by anyone interested in the use of op amps at dc and af.

IC1 is used in a precision rectifier circuit which gives a dc output from ac inputs down to a very low level, unlike the conventional half-wave rectifier which requires some hundreds of millivolts for satisfactory operation. The gain of the circuit is determined by R2/(R1 + RV1), while D2 and R3 prevent the op amp from saturating on negative half cycles of the input. The output from the circuit is partially smoothed by R4 and C1, and is fed to IC2 which is connected as a logarithmic amplifier by the use of TR1 in its feedback loop (the voltage across a silicon transistor, base shorted to collector, is proportional to the logarithm of the current through the transistor).

This circuit is the "heart" of the instrument. It is fed alternately with two voltages corresponding to the receiver noise output and the receiver signal-plus-noise output. The difference (in millivolts) between its output voltages under these two conditions is a function of the ratio between the two input voltages, and this ratio is independent of the average input level. Hence, provided that the various stages of the receiver and the circuit around IC1 are working within their linear range, the ac output from the circuit around IC2 at the pulse frequency employed will be dependent only on the overall s/n ratio. Since the ac output of this circuit is only a small fraction of a volt peak-to-peak, it is amplified by IC3 connected as a voltage amplifier, having a gain R8/(R7 + RV2).

The output of IC3 is fed to IC4, a phase-sensitive detector of unity gain. The reference signal is provided by TR2 from the pulse generator TR3, TR4. A phase-sensitive detector is ideally suited to applications such as this, where an indication is required of the magnitude of an ac signal which has a known frequency and phase but a high accompanying noise level. In the present application, the psd gives a usable output when the signal is accompanied by so much noise that it is undetectable by ear or by examining an oscilloscope trace.

Full-scale deflection in the prototype was about 10dB (s + n)/n, with the scale reading linearly in decibels. IC4 has a low output impedance adequate for driving a 1mA meter. R12, R13 and C3 are chosen to give adequate damping for the meter, which otherwise would have a very erratic response due to the random nature of the noise inputs. The switching device TR2 is a standard general-purpose bipolar transistor. In principle a fet would be more suitable but this would require a larger peak-to-peak switching voltage than is conveniently available, and in practice the simple circuit shown here is quite adequate.

The pulse generator TR3, TR4 is a conventional astable multivibrator operating at about 30Hz. Its output is amplified by TR5 and fed to the noise diode via limiting resistor R20, the diode current being adjusted by RV3. The pulse generator also provides the reference voltage for the psd. The noise generator circuit is conventional and can be built into the body of a uhf plug [1]. The power supply to the pulse generator and noise diode is roughly regulated by ZD1.

Components

Few of the component values are critical and 20 per cent tolerance will suffice. C2, 3, 6, 7 and 8 can be any convenient value not less than the values shown, while C2 only needs to be 2V working. D1 and D2 can be almost any germanium diode such as OA79, OA90 or OA81. The npn transistors can be any low-level audio or switching silicon types of minimum h_{fe} 100. The pnp transistors require a similar specification. Resistors can be rated ¼W.

In the noise generator head the resistor should be of metal film construction for minimum inductance, 51Ω or 75Ω as appropriate, and the capacitors small ceramic. The diode

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used in the prototype was a CV364 microwave mixer from the spares box. Alternatives are 1N21, 1N25, 1N32, 1N23 or, less suitable, 1N82A and 1N34; failing any of these, it may be worthwhile to try an assortment of signal, rectifier and zener diodes as available, in the hope of finding one having sufficient noise output over a wide frequency band.

Construction (Figs 2 and 3)

Layout is not at all critical; at no time even in the breadboard stage of development was there any hint of instability. The prototype was built on an etched circuit board measuring approximately 75mm by 90mm and built into a box 220mm by 130mm by 130mm.

Setting up

The unit requires little alignment, and even this can be done without test equipment. Switch on the receiver, plug in the noise diode and adjust the receiver tuning and audio controls to give an audible noise level. Switch on the alignment unit and adjust the diode current (RV3) to give an audible signal, a rough purring noise.

Connect the audio output of the receiver to the input of the unit. The meter should now give a fairly steady reading which can be varied by adjusting the diode current. Set RV1 so that the meter reading is constant over a wide range of receiver audio gain settings; set RV2 to give fsd on the meter at maximum diode current on the highest frequency band to be required. The unit is now ready for use.

Use

Connect up the unit as above and adjust RV3 for about half-scale deflection on the meter. Any adjustment of the receiver which results in an improved signal gain with no change in the noise figure, or a reduced noise figure with no change in signal gain, or both simultaneously, will result in an increased meter reading. Therefore by noting the meter reading at a given setting of RV3 the effects of various circuit changes in the receiver can be assessed. Although the unit is not especially sensitive to small changes in temperature or battery voltage, it is probably wise to switch on the unit ten minutes before it is required, and to ensure that the ambient temperature is reasonably constant and that the batteries are fresh before using the unit for periodic checks on receiver performance. As mentioned above, the principle of the instrument assumes reasonable linearity of the receiver. It is not suitable for fm alignment. Noise blankers and agc should be disabled before using the unit for testing.

It is recommended that a signal generator or off-air signal be used for initial alignment, as there is a risk that one or more of the front-end circuits may be peaked up to resonate at an image or other spurious frequency when a wide-band signal source is used.

Modifications

The speaker shown in Fig. 1 is included on the assumption that the unit will be connected by inserting a jack plug into the headphone/external speaker jack of the receiver, thereby muting the receiver's internal speaker. If desired, the speaker shown may be replaced by a 15Ω 1W resistor.

A more sensitive meter movement can be used. Should this be contemplated then R12 = R13 = (750,000 ÷ meter sensitivity in microamps) and C3 = 1,000,000/R13, where capacitance is in microfarads and resistance is in ohms. This will give slightly greater meter damping than in the prototype.

As it is unlikely that the instrument will be in constant use it was not considered worthwhile to incorporate a mains unit. If desired, however, this can readily be added using a miniature transformer rated 9V-0-9V at 50mA, a small bridge rectifier and two 470μF 16V capacitors. Voltage stabilization is not necessary, and no change in performance has been noted with changes in supply voltages from less than 8V to more than 14V.

Acknowledgements

The author is indebted to numerous members of Southampton Radio Club for helpful theoretical and practical suggestions.

References

[1] *The Radio Amateurs' VHF Manual*, ARRL, 1972, pp 320-321.
[2] "Operational amplifiers," G. B. Clayton, *Wireless World* February-December 1969.
[3] "Experiments with operational amplifiers," G. B. Clayton, *Wireless World* June 1972 to September 1973. □

Components list

R1, 7, 20, 23	470Ω
R2, 3, 4, 5, 19, 21	10kΩ
R6	2·2kΩ
R8	680kΩ
R9, 10, 11, 18	22kΩ
R12	820Ω
R13	680Ω
R14, 17	4·7kΩ
R15, 16, 22	100kΩ
R24	51Ω or 75Ω to suit receiver
RV1, 2	5kΩ skeleton preset 0·1W horizontal
RV3	5kΩ carbon linear
C1	0·1μ polyester
C2	100μ 3V tantalum
C3	1,000μ 3V
C4, 5	0·22μ polyester
C6	470μ 6V
C7, 8	100μ 10V
C9, 10	2,000pF ceramic
FB	Ferrite bead
ZD1	3·3V 400mW zener diode
ZD2	5·6V 400mW zener diode
D1, 2	OA47, OA79, OA90 or similar
D3	See text
TR1, 5	2N3702, 2N3703, 2N4126 or similar
TR2, 3, 4	BC109, 2N2926 or similar
IC1, 2, 3, 4	741 eight-lead dil
LS	Replacement spkr 4-15Ω
S1	Switch dpst

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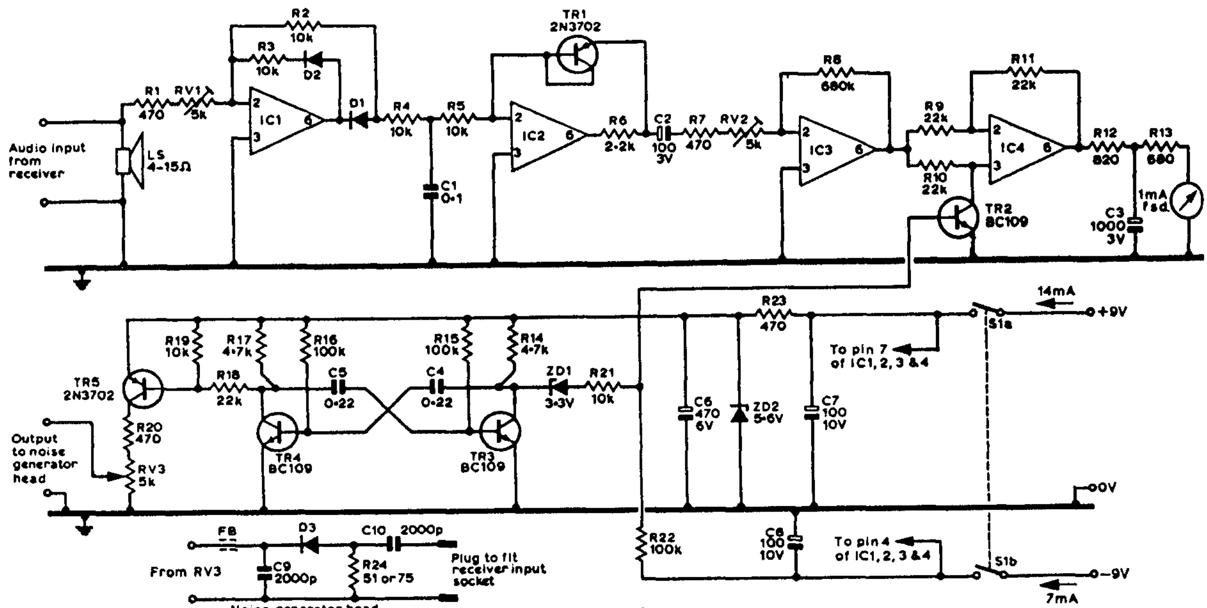

Fig 1. Circuit diagram

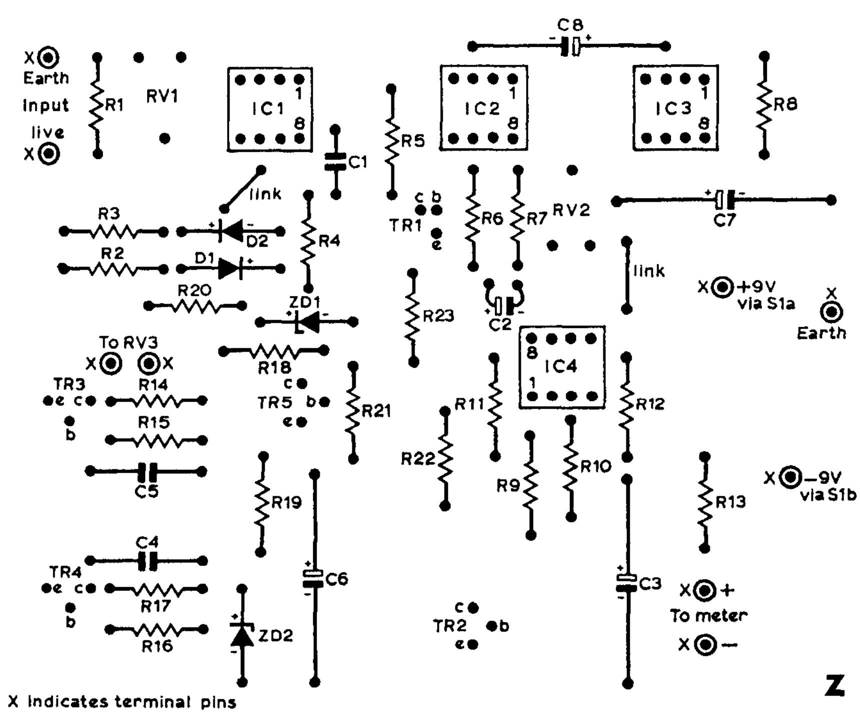

Fig 2. Board layout

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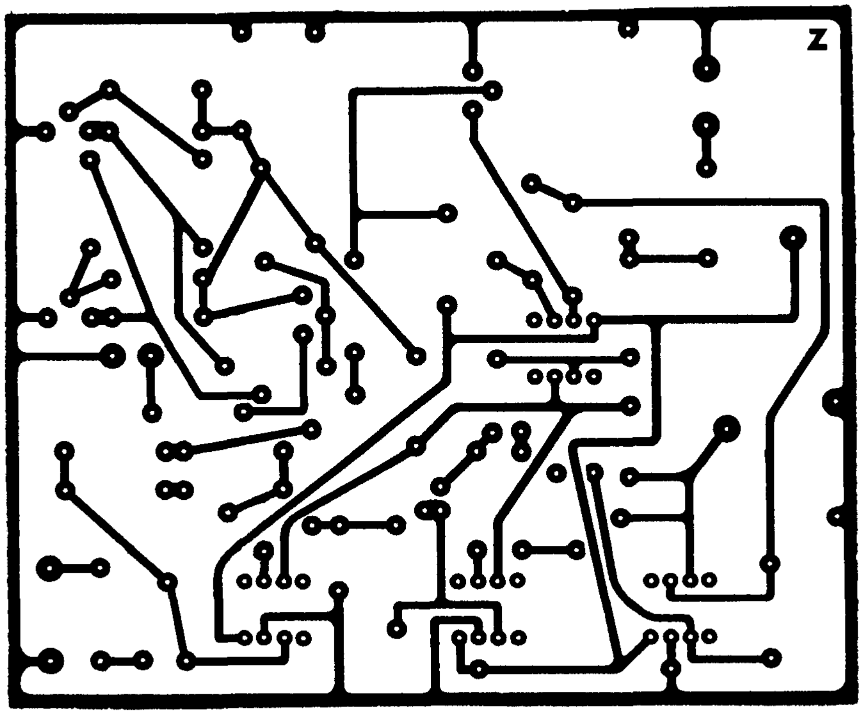

Fig 3. Etching pattern

En passant

Harry Burton, ZL2APC, suggests that the vhf alignment aid described by J. R. Compton, G4COM, in the January 1976 issue of *Radio Communication* (and see also alternative noise source by LA8AK in *TT*, February 1978) is worthy of further publicity. He writes: "It is extremely useful, relatively simple and easy to get going. I modified mine of course (what else!) to use a higher output noise source (BC107 as a zener) with a switched attenuator between the noise source and the output terminal (10dB per step). TR3, 4 and 5 are run at full rail voltage and RV3 is an internal adjustment to make sure the BC107 zeners.

"It may be of interest that, of all the transistors I tried, about the noisiest as a zener was the BC109! The device is very useful on 70cm, and most of the local vhf/uhf gang are enthusiastic. Hewlett Packard seem to make a comparable unit (*HP Journal* February/March 1959 and January 1958) and this still appears in their catalogue as the 340B." □

Voltage-controlled noise generator

This idea comes from Jan Martin Noding, LA8AK/G5BFV, although it is based on a suggestion by DB3RC in *CQ-DL* No 4, 1977. The circuit shown in Fig 7 has been modified to suit the particular requirements of LA8AK for use with the "Alignment aid for vhf receivers" described by J. R. Compton, G4COM, in *Radio Communication*, January 1976. Two units have been built and both worked instantly, delivering a maximum noise output of the order of 10dB (μV). Several transistor types have been tried for TR2 and it seems probable that optimum results will be achieved with a device having as low V_{BE} as possible. Type MPS918 showed the best performance, starting to produce noise with an input voltage of approximately 6V; the BC547 began to produce noise at 9V. However, if a 12V supply is available a BC547 will suffice, although the MPS918 (and possibly 2N3904) will result in more continuous tuning. TR1 does not appear to be at all critical, and types such as BC308, BC178, BC558 or similar devices may be used. The noise maximum is set by RV2 but it could usually be replaced by a 10 to 50kΩ fixed resistor. When an attempt was made to bypass the collector of TR2, LA8AK reports, this reduced the noise output level.

Using the SL664, SL665 nbfm ICs

John Wilson, G8KIS, and Richard Lambley, G8LAM, have been carrying out some practical tests using the new Plessey SL664, SL665 devices designed to provide i.f./af circuits for nbfm receivers and transceivers. Each of these devices provides the basis of a complete i.f. strip and consists of a preamplifier, limiting amplifier, quadrature detector, carrier squelch, dc volume control and audio output stage. The SL664 provides 250mW af output into 8Ω, while the SL665 has low-level af output intended to drive high-impedance loads.

Fig 8 shows the test circuits used (these differ from that shown in the original provisional data sheet which was found by G8KIS to contain an error). Some practical points noted by G8KIS include:

(1) Rf should be chosen to match the receiver's crystal filter.

(2) The SFJ filter acts as a roofing filter after the first i.f. gain block (46dB) and can be any ceramic filter of 330Ω impedance of the type intended for domestic wideband fm receivers. It *must*, however, be one selected for 10·7MHz as these cheap filters are manufactured to rather wide tolerances.

(3) The 470kΩ dc volume control should be *linear*.

(4) The 470kΩ squelch control is very critical of adjustment and can profitably include a fine control wired in series.

(5) The tuned circuit between pins 4 and 5 can be a single-tuned i.f. transformer, but G8KIS/G8LAM found that a small toroid wound with about 15 turns in parallel with an adjust-

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able trimmer was both smaller and of higher *Q*.

(6) Although not obvious from the data sheet, the SL665 does not incorporate internal muting. However, the use of a few extra components and virtually any npn silicon transistor provides *full squelch facilities (Fig 9).*

G8KIS reports that they found the squelch hysteresis very pleasant operationally, and preferable to the usual delay time-constant. In this way, if the squelch opens, it then remains open until the signal sinks a further 10dB into the noise. There is no annoying blast of noise on loss of incoming signal, provided that the control is set correctly.

Because of the enormous gain of these devices, a good layout is essential and decoupling components should be as near the ic as physically possible.

It is clear that these new devices provide a useful addition to the SL600 and SL1600 ranges, being purpose designed for narrow-band fm and suitable for vehicle, hand-held and domestic receivers. □

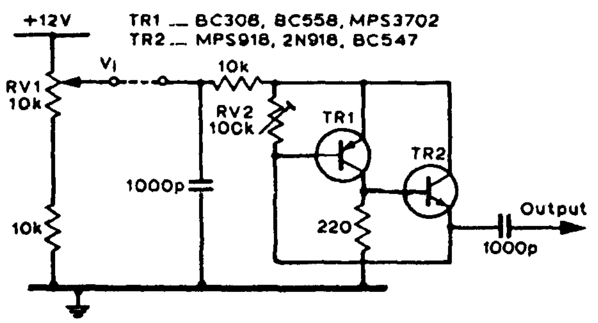

Fig 7. Voltage-controlled noise generator used by LA8AK in conjunction with G4COM's "alignment aid for vhf receivers"

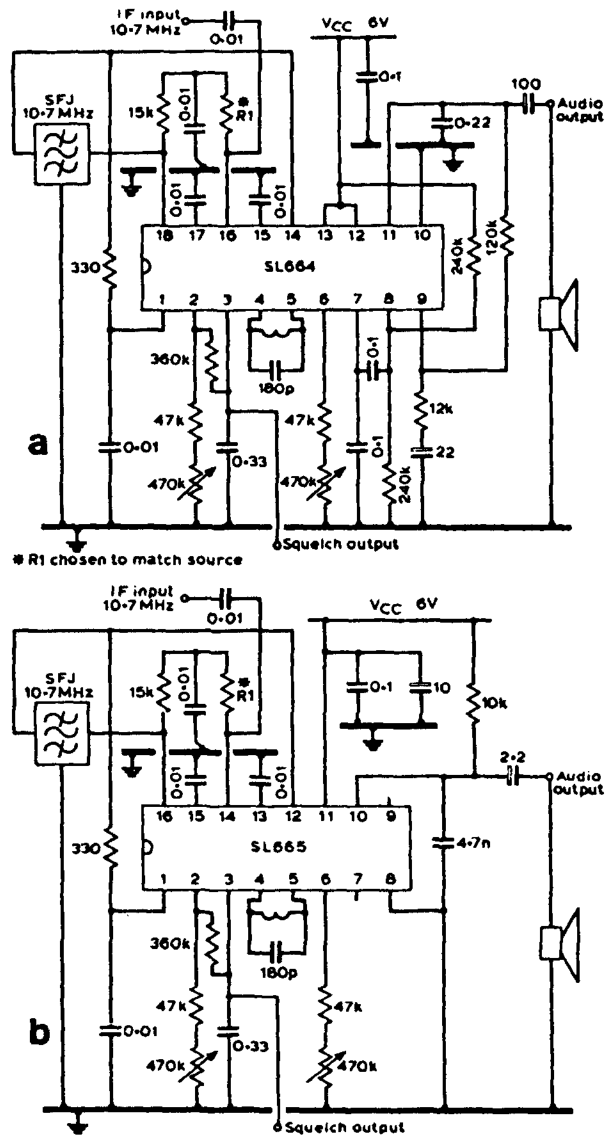

Fig 8. The basic test circuits for the Plessey SL664, SL665. Note that in each circuit a correction has been made to the connections shown in the early data sheet issued by Plessey

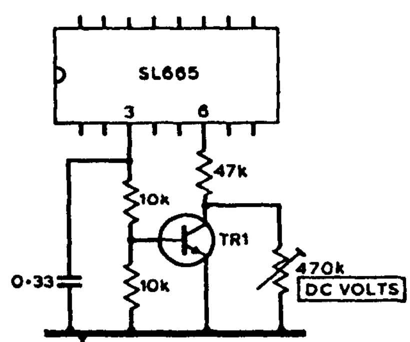

Fig 9. The use of external components to provide a muting facility on the SL665

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Alignment aid improvements

In *Radio Communication* January 1976, J. R. Compton, G4COM, described in detail "An alignment aid for vhf receivers" which enabled vhf receivers to be readily adjusted for maximum signal-to-noise ratio, rather than just for maximum gain. It provides a continuous read-out of the difference between the audio output of a receiver with no rf input, and the output when a wideband noise generator is connected to the antenna socket of the receiver. This unit has gained wide respect as a genuinely useful item of test gear, and follow-up items on alternative noise sources were contributed by LA8AK (*TT* February 1978, pp133-134) and ZL2APC (*TT* June 1978, p511).

Now Jan Martin Noeding, LA8AK, has come up with some modifications which he considers extends the usefulness of the unit still further. He writes:

(1) Experience indicates that the original value of capacitor C1 is too large; it is preferable either to substitute a 10nF capacitor or to remove the component altogether. This capacitor limits the noise generated and so reduces the accuracy of the instrument. After the value had been reduced it was found that the unit provided a "steadier" reading, with less "drift" of the meter. The logarithmic amplifier can be improved by using a CA3130 device which has greater bandwidth than the 741.

(2) A crystal filter in a receiver acts as a "delay line" to the signal and, when dealing with any receiver having a crystal filter, it is preferable for the chopping signal to be delayed by a corresponding time. This delay time will vary from receiver to receiver, but an average time delay for an ssb filter is about 1ms; cw filters have greater delay times. Fig 6 shows the circuit diagram of a simple means of adding a delay circuit to the multivibrator; the discrete transistors correspond to those used in the original unit. LA8AK considers that the easiest way to adjust such an oscillator without using either trimmer-capacitors or potentiometers is to use parallel connections of resistors and capacitors, as indicated. When C1 and R1 are chosen to provide the correct time constant, the frequency may be tuned up or down by *adding* resistors (R2) or capacitors (C2). The actual frequency for this application is not critical, so no final adjustments should be necessary.

LA8AK mentions that he uses only a single power supply line from a standard 12V psu, the negative voltage being supplied from a cmos inverter using an MC14049BCP device and a two-diode rectifier/voltage doubler arrangement. He also reports that LA6MQ is developing a new version of this useful alignment aid, following rather different principles and requiring only a single supply voltage.

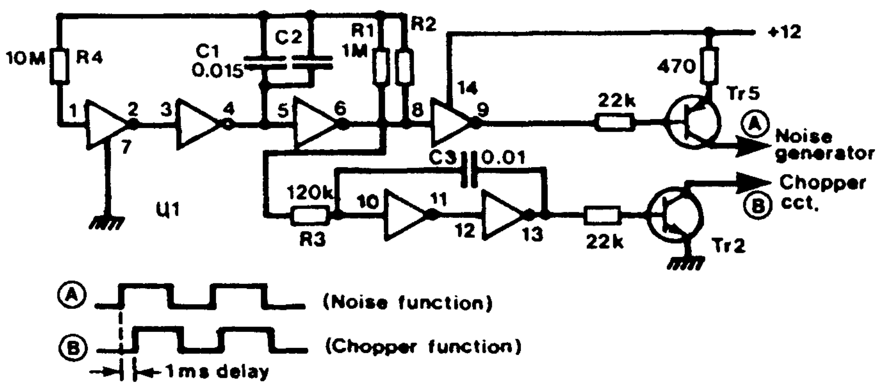

Fig 6. LA8AK's modification to the G4COM alignment aid provides a delay circuit to the chopping multivibrator

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FCC Science and Technology Tutorials

FCC Tutorial Video Tape Update

The Federal Communications Commission and Office of Science and Technology (FCC/OST), conducts a series of tutorials for interested personnel and the general public. These tutorials are usually held in the Commission Meeting Room, Room 856, 1919 M St., NW, Washington, DC.

For those individuals unable to attend, videotape duplications are offered. The individual, however, must supply a blank U-Matic or VHS-120 cassette to be sent to the Audio-Visual Duplicator, Consumer Assistance & Information Division, Room 258, FCC, Washington, DC 20554. The telephone number is (202) 632-7000. One U-Matic hour cassette should be included for each hour or fraction thereof.

A list of tutorials was first printed in the February 1982 issue of QEX. Here is an update on the tutorials not appearing in that issue.

Title	Speaker/Affiliation	Time
Amateur Radio Technology	Paul L. Rinaldo ARRL/AMRAD	1:15
An Experiment Involving Computers to Allow Professionals to Work at Home	Ted E. Climis IBM	1:30
Advanced Modulation Techniques for High Density Digital Microwave Radio Transmission Systems	J. T. Carter B. T. Bynum P. R. Hartmann Collins Transmission Systems	2:30
Applications of ACSB to UHF Radio Channels	J. P. McGeehan, PhD Univ. Bath	1:30

Turn Your TRS-80 Color Computer into a Complete CW Morse Code Terminal

If you have a desire to turn your TRS-80 color computer into a complete cw Morse code terminal, read this! MITRONIX of Wisconsin has recenty introduced a state-of-the-art quality modem. It is called the KA9FSQ CW Modem. It's interface converts the RX tone into a digital pulse and this feature makes it possible to transmit or receive morse code on the TRS-80 color computer.

An LED mounted on the unit indicates that you are locked in on a signal, and it is being received. The modem uses an optoisolator to prevent keying voltages on the computer and gives a clean signal pulse to the transmitter. The unit can also be used with other cw programs with proper software modifications.

The KA9FSQ CW Modem is easy to use. The cartridge plugs into the ROM-PAC slot on the side of the computer, one of the two cables is connected to the transmitter, the other to the receiver. The price is in the $50 range and comes with a 90 day warranty. MITRONIX is located at 5953 N. Teutonia Ave., Milwaukee, WI 53209.

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2) document advanced technical work in the Amateur Radio field, and

3) support efforts to advance the state of the Amateur Radio art.

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Both theoretical and practical technical articles are welcomed. Manuscripts should be typed and double spaced. Please use the standard ARRL abbreviations found in the latest December issue of QST. Authors should supply their own artwork using black ink on white paper. When essential to the article, photographs may be included. Photos should be glossy, black-and-white positive prints of good definition and contrast, and should be the same size or larger than the size it will be when printed in QEX.

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