HAM 'Xpo 2001

ADOOR AMATEUR RADIO CLUB

9th December, 2001

Silent Key - Saad Ali

OM SAAD ALI, VU2ST, the Goliath of Amateur radio in India became silent key on the morning of 1st November 2001. Only recently, in October 2K, he was awarded the **"LIFE TIME ACHIEVEMENT AWARD"** by the Amateur Radio Society of India during their Millinium meet at Hydrabad For the past forty years he was actively promoting this hobby without expecting any reward or kickback. A description of all his activities in this hobby will require a whole book and we can only present a short account of how he helped each and everyone who wanted to take up this hobby. If ham radio is what it is in India today it is solely and entirely due to the efforts of this great man.

Born and educated in Japan where his father was having a flourishing business, he came into contact with broadcast radio in his boyhood. He made his crystal receiver and was thrilled to hear BC programs coming through the headphone. He also learned about various modes of communication when he was a boy scout.

SAAD ALI-VU2ST

He came to Bombay when World War II started and when ham radio was forbidden. He received his licence in the year 1959 and he has not rested since. He had to depend upon war surplus equipment using big vacuum tubes and heavy transformers. World War II was just over and anyone operating wireless was looked upon with suspicion as spy contacting with enemy countries. The police raided his house and seized his transmitters several times, but he never gave up, but faced all the difficulties with stoic endurance. After the war he settled in Bombay and started his own business. But his office premises was always kept open to hams who could drop in at any time and help themselves in home brewing. He purchased old military transmitters and receivers, each one weighing a few kilos at least and supplied it to new hams at subsidized price or even free. I purchased a sturdy receiver, antenna rotator and wavemeter for just Rs. 300, Om Krishnan, VU2KMK got a receiver absolutely free.

He was liberal to a fault and never cared to make monetary benefit out of this pastime and that was his main weakness. For this he had to face criticism from several quarters mostly hams who berated him sometimes even on the air for which I too was occasionally a silent listener.

He used to visit the Ham Fair in Japan every year and was acquainted with electronic giants like YAESU and KENWOOD. Had he wished, he could have taken up the agency for the same and made a neat packet. But typical of him, he tried to import rigs in bulk quantities at low cost and supply it to hams in India. Even last year he was arranging to import another set of rigs but it is said that his efforts were foiled by some vested interests.

Sincerity and devotion were his guiding principles from which he never deviated even in the face of opposition. He formed ham radio societies and brought out the radio magazines regularly. He found a friend in Om Sahrudeen, VU2SDN and together they tried to bring all the societies under one banner and succeeded partially.

When the Himalayan Car Rally was being organized for the first time, he offered the services of hams which was turned down for the reason that police and military communication had been arranged. Somehow he persuaded the organizers to include amateur wireless and when the event took place ham radio was the only means of communication available. Ever since then amateur radio has become a regular participant in car rallies. He tried to design a simple transceiver for Indian hams but his efforts were not successful. He was also instrumental in conducting the first JOTA and annual ham conventions. In him we have lost a friend, guide and a dedicated worker. Ham radio has become poorer by his loss. We can only cry "When will another come like him?" We offer our heartfelt condolence to members of his family. **"May his soul rest in peace".**

VU2 LV

Editor's Desk

CQ CQ CQ DE VU2LFB

*The **Adur Amateur Radio Club** is ten years old now. What started as a small venture to bring all the Hams in the state to-gether for an eye-ball, has now become a regular and much anticipated annual fete. Inspite of our low financial reserves we have been able to conduct the Hamexpo to the greatest satisfaction of all the delegates. Infact the attendance has been steadily increasing every year. We have also been bringing out a souvenir every year and distrubuting it free to all the delegates.*

*This is the sixth consecutive year of **HAM EXPO**. No small achievement in a country where infant mortality of clubs is very high, especially for a noncommercial Hobby like Amateur Radio, whose popularity is being challenged with the advent of Internet and other high-tech communication systems. We had our vicissitudes, problems and difficulties in plenty, but we faced them and overcame the hurdles and came out with flying colours. We have a good team of youngsters who are active, earnest and innovative and their contribution to our success is really praiseworthy. Our achievements in the last year deserves special mention. Many of our members started coming on 2 meters and most of them are regularly on the air. They keep their rigs on throughout and any call on the calling channel is sure to be answered. We have also been able to get VHF rigs for many hams outside Adoor. Two of our members Om A.P. Prabhakaran, VU2PBT and Om P. Surendran, VU2SYT handled the communication traffic during the Gujarath tragedy so efficiently and thoroughly that they have become household names in the homes of all who have relatives in Gujarat. Our kudos to these veteran hams who set an example to others. Now we have about 75 members half of them licensed operators and the rest SWLs. The response to HAM AWARENESS DAY conducted last year was encouraging. Many of them are attending our classes and hope to appear for the examination very soon. AARC and the club at Kadayanalloor conducted a seminar at Kadayanalloor last April with the help of Dr. Subramaniam, VU2RZA which was well attended.*

We thank our members for their sincere devotion to this hobby and unstinting support in all our efforts. We specially thank our contributors for the high technical standard of the articles. We are also thankful to our advertisers without whose help this venture would not have been possible.

73.

L.V.Sharma

CONTENTS

Private Circulation Only

ADOOR AMATEUR RADIO CLUB
Mukalethumatom
Adur-691 523
Phone: 428358
Club Station-VU2 LFB

Noise Cancelling With Electret Condenser Microphones

(Based on QST article in Dec. 2000)

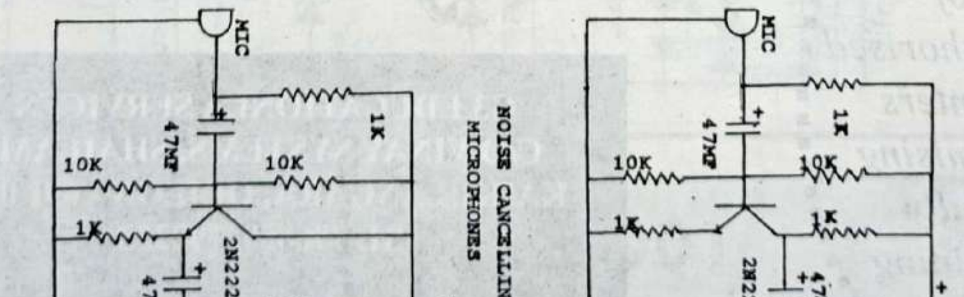
When I purchased my Kenwood TS130 the microphone supplied with the rig contained a switch for noise cancellation. Curious to know what the circuit used in it was, I opened the microphone. The microphone case had some holes at the back. When the noise cancelling switch was put in "ON" position the holes at the back were covered by a moving circular disc. In use I found that the noise cancelling switch had no significant effect in the performance. Very often when I am having QSO with fellow hams on phone. I can often hear extraneous voices like QRP clamoring for attention and trying to snatch the mike from your hand and XYL calling from the kitchen. If you are residing in crowded cities noises from car and scooter engines, TV programmes & dogs barking add to the discomfort. The noise cancelling microphone is designed to do a good job of cancelling all external noises.

> *If you are residing in crowded city, noises from car and scooter engines, TV programmes & dogs barking add to the discomfort. The noise cancelling microphone is designed to do a good job of cancelling all external noises.*

With older dynamic microphone noise cancelling is easy. You simply mount the microphones back to back and wire each microphone's positive terminal to the other's negative terminal, then feed the combined output to the amplifier. Because external noise enters both microphones simultaneously, the noise is cancelled while the speech received by the microphone in front of you is alone amplified.

One way of achieving this using electret condenser microphones is described here. Only standard type condenser microphones are used here. Separate amplifiers are used for each microphone. In one amplifier signal is taken from the collector while in the other signal is taken from the emitter. This provides the phase difference and sound of equal intensity falling on the two microphones will get cancelled in the next stage. The second transistor acts as a buffer. The output of the buffer is combined and fed directly to microphone amplifier. Resister 10K to the base of the first two transistors can be replaced with a 20K preset, which should be adjusted to get equal amplitude from both amplifiers. External noises falling with equal strength on the two microphones will be cancelled, but your own voice will get through. The circuit will be useful for use in mobile or outdoor events.

Fig 1.1



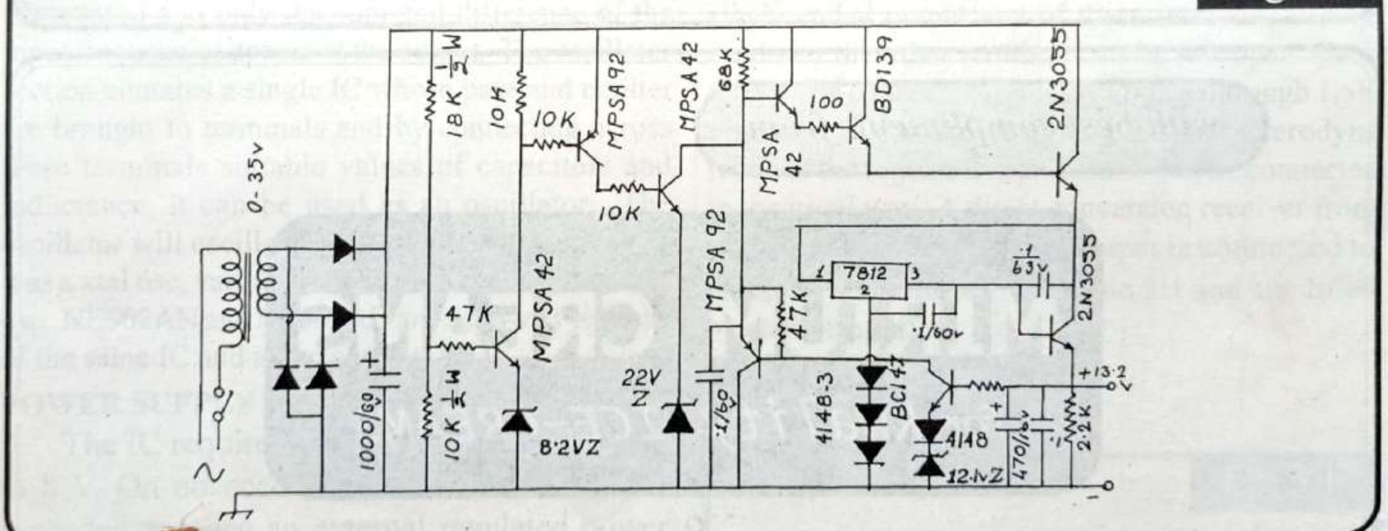
Scanned with CamScanner

REGULATED POWER SUPPLY FOR VHF

Ajay Kumar VU2 AJF

This regulated power supply will give you regulated 13.2V at 3A for working handy rigs. A 35V 4A transformer is used for power supply. The rectified voltage will be about 40V. For regulation of power supply I have used MPS series of transistors since they are able to withstand higher voltage. However BC548 can be used. The IC7812 will give an output of 12V. There will be a voltage drop of 1.8V across the three diodes connected from the pin no. 2 of this IC to earth. Hence the output voltage of the IC will be higher by 1.8V. The voltage at the base of the 2N3055 will be 13.8V from the base to emitter of this transistor. Hence the output voltage will be 13.2V. If the supply voltage increases the output voltage will be kept at 13.2V. Provision is made for crowbar protection also. If a short circuit is present in the circuit to which the power supply is connected, the output curreent is reduced to zero. The 12.1V zener should be carefully selected to operate at exactly 12.1V. The current capacity can be increased to 6A by connecting one more 2N3055 across each output transistor.

Fig 2.1



Ham Expo 2001

Phone to Phone Contest Results

First Prize	:	**Vijaya Pradeep**	**VU2 PEB**	**Kottarakkara**
Second Prize	:	**P.M. Mathews**	**VU2 PHD**	**Kattappana.**
Third Prize	:	**S. Sudheesh**	**VU3 SUI**	**Vaikom**

REGULATED POWER SUPPLY FOR VHF

Ajay Kumar VU2 AJF

This regulated power supply will give you regulated 13.2V at 3A for working handy rigs. A 35V 4A transformer is used for power supply. The rectified voltage will be about 40V. For regulation of power supply I have used MPS series of transistors since they are able to withstand higher voltage. However BC548 can be used. The IC7812 will give an output of 12V. There will be a voltage drop of 1.8V across the three diodes connected from the pin no. 2 of this IC to earth. Hence the output voltage of the IC will be higher by 1.8V. The voltage at the base of the 2N3055 will be 13.8V from the base to emitter of this transistor. Hence the output voltage will be 13.2V. If the supply voltage increases the output voltage will be kept at 13.2V. Provision is made for crowbar protection also. If a short circuit is present in the circuit to which the power supply is connected, the output currecnt is reduced to zero. The 12.1V zener should be carefully selected to operate at exactly 12.1V. The current capacity can be increased to 6A by connecting one more 2N3055 across each output transistor.

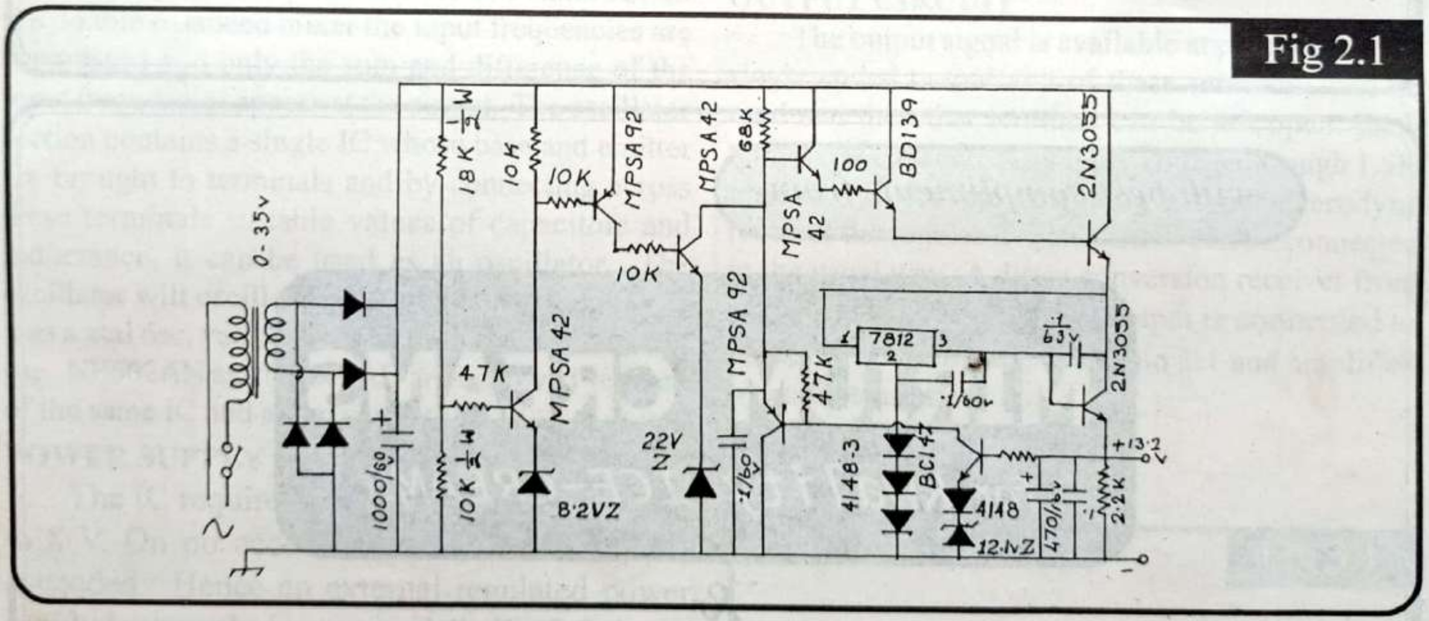


Fig 2.1

Ham Expo 2001

Phone to Phone Contest Results

First Prize	:	**Vijaya Pradeep**	**VU2 PEB**	**Kottarakkara**
Second Prize	:	**P.M. Mathews**	**VU2 PHD**	**Kattappana.**
Third Prize	:	**S. Sudheesh**	**VU3 SUI**	**Vaikom**

KNOW YOUR CHIP

Signetics NE 602

L.V.Sharma VU2 LV

One of the most useful chips for the average home brewer is the SIGNETICS NE 602 but unfortunately the VU ham has not started using it in a big way. This article is intended to familiarise you with the various circuit configurations in which it can be used. Not only will you be saving a lot of space but also components.

INTERNAL CIRCUIT

The internal circuit is shown in fig.3.1. Essentially it contains a voltage regulator, oscillator and a double balanced mixer with RF input. The different pin connections are also shown. It is housed in an eight pin DIP socket like the 555 timer IC. In the double balanced mixer the input frequencies are suppressed and only the sum and difference of the input frequencies appear at the output. The oscillator section contains a single IC whose base and emitter are brought to terminals and by connecting across these terminals suitable values of capacitors and inductance, it can be used as an oscillator. The oscillator will oscillate up to 200 MHz. We can use it as a xtal osc, variable tuned osc and varactor diode osc. NE602AN and NE602AD are improved versions of the same IC and are exchangeable.

POWER SUPPLY

The IC requires a regulated supply of 4.5V to 8 V. On no account should the voltage be exceeded. Hence an external regulated power supply is strongly recommended. Fig.3.2 shows a regulated circuit using three pin IC. A zener diode may be used in the place of this IC. Current taken by IC is about 2.5 mA.

RF INPUT

Pins 1 and 2 form a balanced input for RF. The input impedance is about 1.5K which drops to 1K at VHF. Since the impedance of a dipole antenna, which hams use, is about 50 Ohms, impedance matching circuit is needed. Circuit for RF input is shown in fig.3.4.

OSCILLATOR CIRCUIT

The circuit of a xtal oscillator using NE602 is given in fig.3.6. The frequency can be varied by varying the capacitance of 50 pf capacitor which can be a trimmer or variable capacitor. Colpitt circuit is shown in fig.3.5. Oscillator circuit using a varactor diode is shown in fig.3.8. The capacitance can be varied by changing the voltage to the diode. The full variation of the diode can be obtained only by applying 18 volts to the anode. The oscillator is internally connected to the double balanced modulator, hence no external connection is necessary.

OUTPUT CIRCUIT

The output signal is available at pins 4 and 5. In single ended output any of these terminals can be used and the other terminal can be left open. Each terminal is connected to supply voltage through 1.5K resistor. If you are designing a superheterodyne receiver the regular IF transformer can be connected in the usual way. A direct conversion receiver front end is shown in fig.3.7. The output is connected to an audio transformer with ratio 1:1 and amplified by audio amplifier.

Fig 3.1

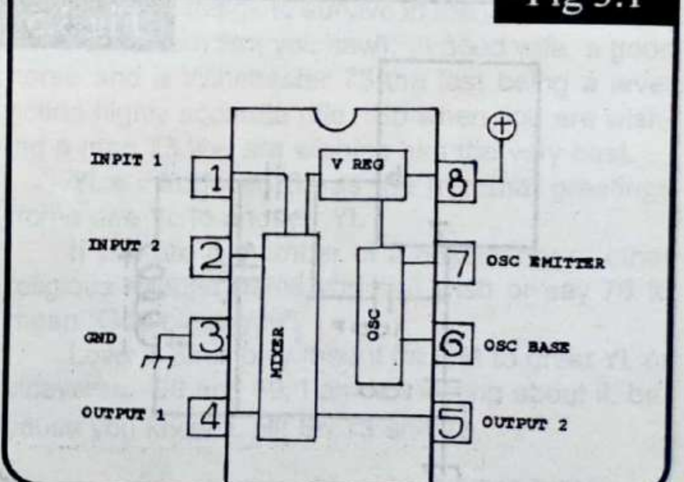


Fig 3.2

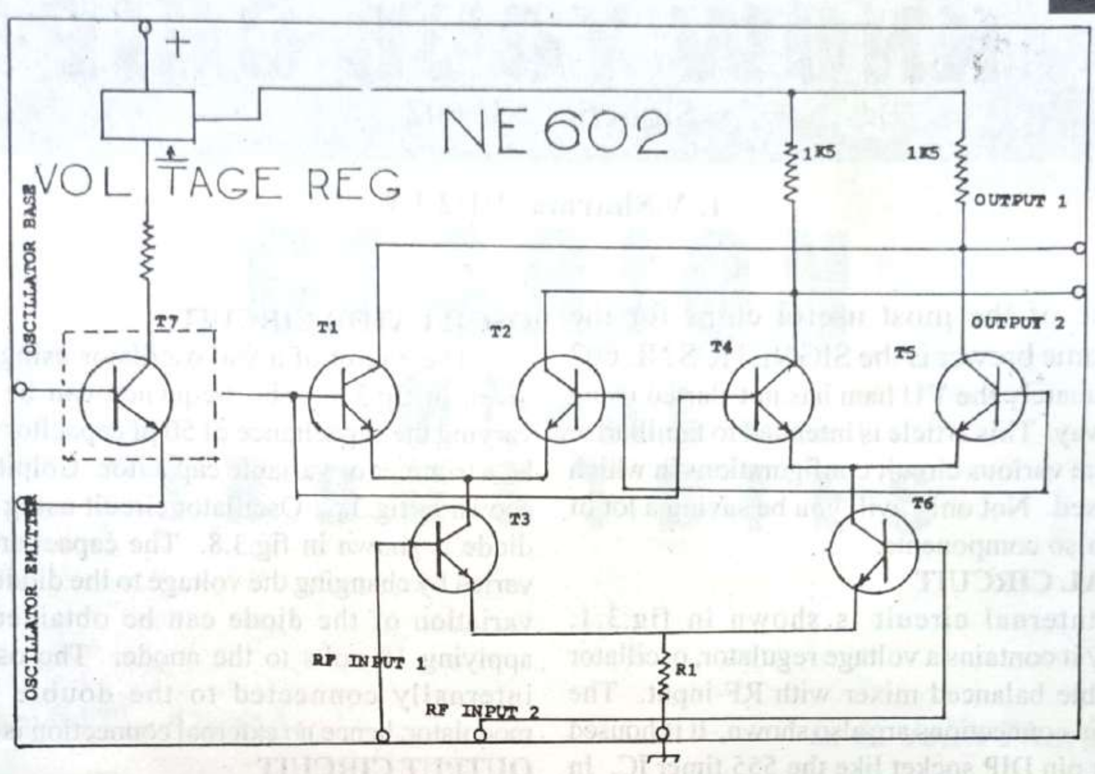


Fig 3.3

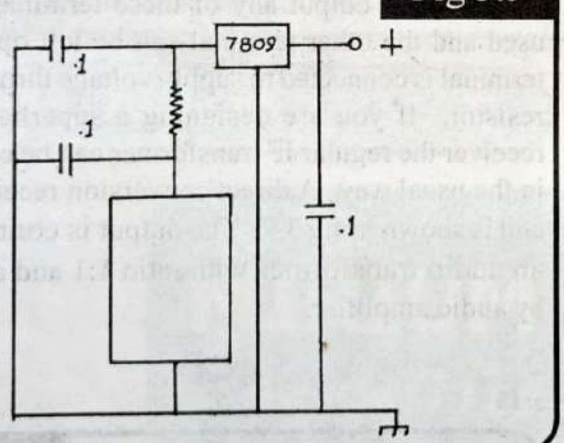


Fig 3.4

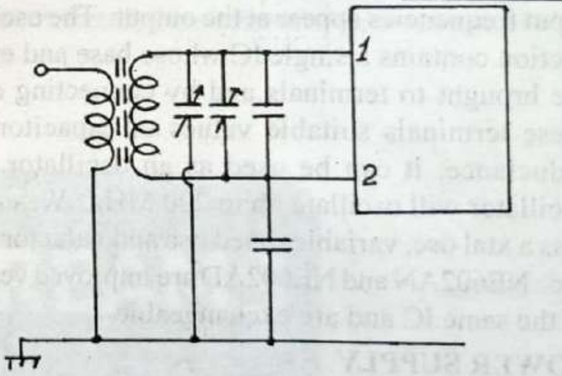


Fig 3.5

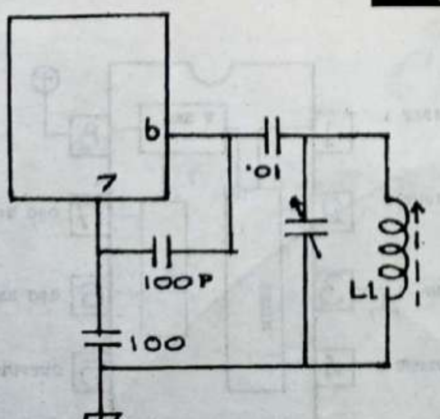
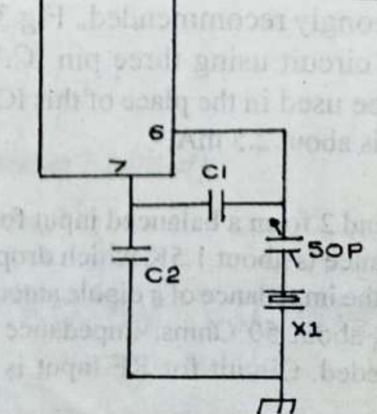


Fig 3.6



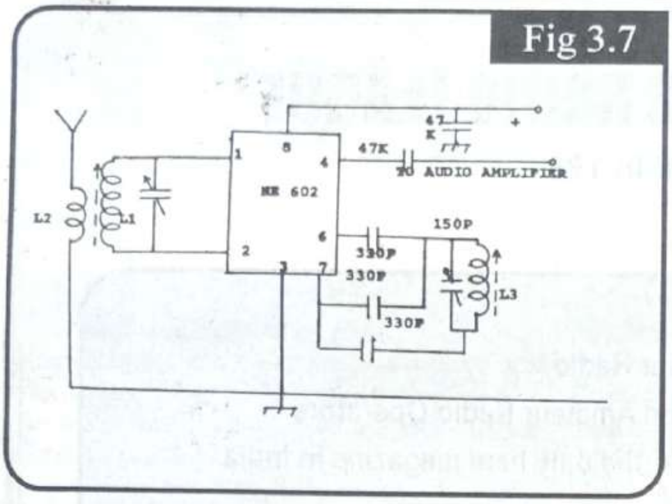


Fig 3.7

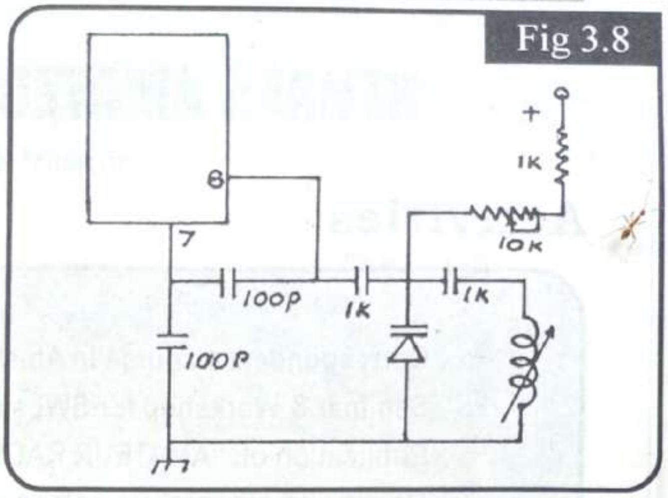


Fig 3.8

A Butterfly

A man found a cocoon for a butterfly. One day a small opening appeared. He sat and watched the butterfly for several hours as it struggled to force its body through the little hole. Then it seemed to stop making any progress. It appeared as if it had gotten as far as it could and could go no farther. Then the man decided to help the butterfly. He took a pair of scissors and snipped the remaining bit of the cocoon. The butterfly then emerged easily. Something was strange. The butterfly had a swollen body and shriveled wings. The man continued to watch the butterfly because he expected at any moment, the wings would enlarge and expand to be able to support the body, which would contract in time. Neither happened. In fact, the butterfly spent the rest of its life crawling around with a swollen body and deformed wings. It was never able to fly.

What the man in his kindness and haste did not understand, was that the restricting cocoon and the struggle required for the butterfly to get through the small opening of the cocoon are God's way of forcing fluid from the body of the butterfly into its wings so that it would be ready for flight once it achieved its freedom from the cocoon. **Sometimes struggles are exactly what we need in our life. If God allowed us to go through all our life without any obstacles, that would cripple us. We would not be as strong as what we could have been. fly.**

Dr.K.Raju. VU2GOK

Hobby Lovely

Amateur ham activity
A scientific and lovely hobby
Contacting YL's becomes a reality
From radio shack which is cozy
Did you become a member recently
You need not be a licensee
Any one can get one without difficulty
Work hard and prove your ability
Many radio hams have disability
In no way they lack in sincerity
Ham radio team offers loyalty

HOW COME 73 AND NOT 72 OR 74

Yes, Every ham knows **'73.** That is **"BEST WISHES"**. But how did it come about? In the early days in America there was a saying that a man needed three things to survive in the west (Remember the western film you saw). A good wife, a good horse and a Winchester 73-the last being a lever action highly accurate rifle. So when you are wishing a man 73 you are wishing him the very best.

YL's introduced 33 as the fraternal greetings frome one YL to another YL.

If you are a member of a missionary or other religious minded hams you can wish or say 76 to mean "God bless you".

Love in 88 is only meant for OM to greet YL or viceversa. 99 and 69, I am not writing about it, because you know it, Hi! So 73 and 76.

Naushad VU2 YNS

RADIO FREQUENCY GENERATOR

Harishanker VU2 NSH

Radio Frequency Generator is very useful for Homebrewers as well as communication equipment service/design labs. This circuit is simple and economical. For accurate frequency read out, one can use Frequency Counter which is capable of counting upto 30 MHz or above. The first stage is based on FET - (T_1) BFW10 or BFW11. This stage is configured as Trickler-feedback Oscillator. OSC coils T_1 to T_5 and Trimmer capacitors VC_1 to VC_5 provide selective bands (frequencies) output. Trimming T_1 to T_5 and VC_1 &VC_2; one can pull-up or pull-down frequency (Band) level for continuous frequency output in each band at RF OSC. T_1 to T_5 are OSC coil, T_1 is IFT - white, T_2 MW OSC, T_3 SW1 OSC, T_4 SW2 OSC AND VC_1 to VC_5 are trimmers 22PF - 40PF type. This RF Oscillator section is a common circuit. C20, a 500PF gang is used for tuning. Use multi turn knob (geared knob) for main turning or use tuning dial-spindle method.

Transistor T_2 and T_5 act as buffer amplifiers, which are providing sufficient RF output to modulator stage and for frequency readout. This two buffer stages employ 2SC2570 transistors. Modulator section is formed by a 1:1 transformer - TR1 and one 2SC2570, T_3. The transformer primary and secondary contain 80T - 36SWG on a small core; like driver transformer. IC NE555 provides 1 KHz audio frequency. The modulated output is taken from transistor 2SC2570. T_3 is then fed to output multiplier. Output multiplier section is formed by R_6, R_7, R_8 and R_{11} resistors. The output is amplified by transistor T_5. Output from T_5 is fed to a 1K VC to select sufficient RF output. The resistor RL* at T_5 is 10K to 1K5. High sensitive frequency counter will read harmonics also so select, RL for sufficient level to show exact frequency on display.

LM 7809 voltage regulator IC is used to get stabilised 9V DC for this circuit. A 9V battery will give very good & stable signal. At 9V DC, this circuit consumes only 20mA. RF OSC section FET-T_1 and its associated components work on 8.2V supply. It is provided by zener diodes D3, D4 and R4. If you are using a PSU for the circuit, use 12-0-12, 300 mA transformer with primary secondary sheilded type, and use proper capacitor, diode for the filter circuit. Keep this unit away from the main PCB. Rotary switch, S1A-S 1B, 2 pole 5 way type, which is used as frequency range selector. Output multiplier switch and mode selector is 1 pole 3 way type. After assembling, clean the PCB with isopropylene alcohol. Keep this PCB away from moisture and dust.

PARTS LIST

Resistors

$R_1, R_5, R_8, R_{11}, R_{15}$	-	1M
R_2	-	2K7
R_3, R_{10}	-	820K
R_4	-	47W½W
R_6, R_{14}, R_{12}	-	1K
R_7	-	100K
R_9	-	2K2
R_{13}	-	75K
RL*	-	10K to 1K5

Semi Conductors

IC1	-	LM7809
IC2	-	NE555
T_1	-	BFW10 or BFW11
T_2 to T_5	-	2SC2570
D_1, D_2, D_5	-	1N4007
D_3, D_4	-	4.1V 400mW

Coils , Trimmers & Transformer

T_1 to T_4	-	IF T-White, MW OSC, SW1 OSC, SW2 OSC...
VC_1 to VC_5	-	22 PF or 40 PF
TR1	-	1:1 - 80 T 36 SWG
L1	-	4.7 µH

Capacitors

C_1	-	1000µF 25V
C_2, C_4	-	0.1µF 60V Disc
C_3	-	100µF 25V
C_5, C_6, C_{10}, C_{11}	-	470µF 60V Disc
C_7, C_{19}	-	1KPF
$C_9, C_{17}, C_{13}, C_{14}, C_{21}, C_{22}$	-	0.01µF60V Disc
C_8, C_{16}	-	46µF 25V
C_{18}	-	100 PF Sty
C_{12}	-	10µF 25V
C_{20}	-	500PF Gang

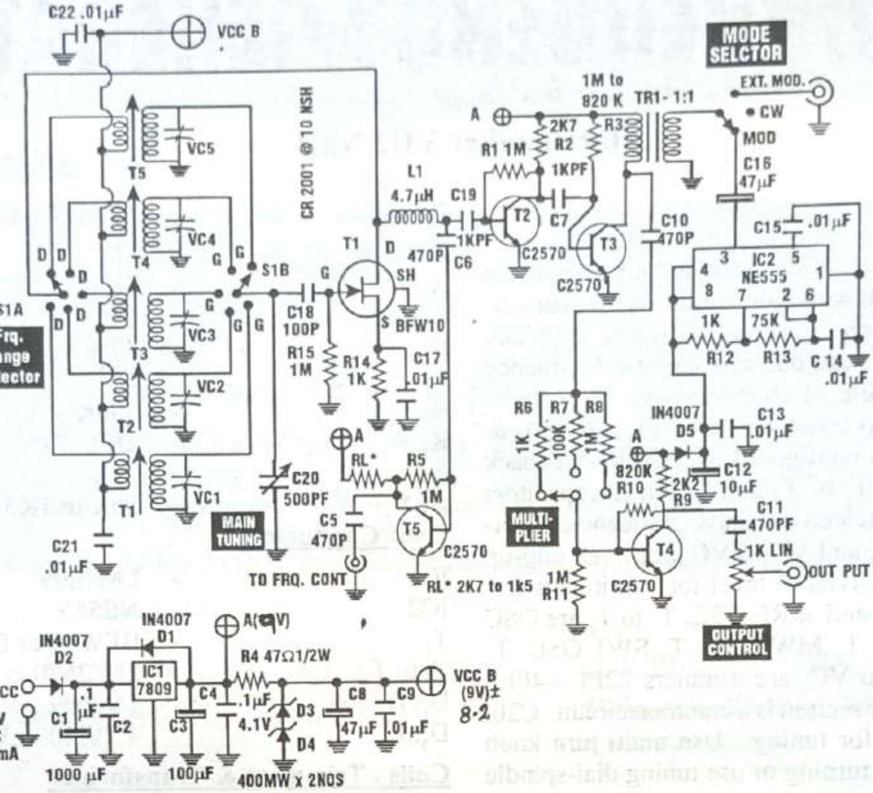
Miscellaneous

1P - 3W S witch	-	2N
2P - 5W Switch	-	1N
BNC female connector chases mount	-	2N
12-0-12 300mA Transformer	-	1N or 9V Bty.

Set T_1 to T_5 & VC_1 to VC_5 Like

1) 400KHz to 600KHz
2) 600KHz to 1600KHz
3) 1600KHz to 7MHz
4) 7MHz to 30MHz

Fig 4.1


C22 .01μF
VCC B
MODE SELECTOR
1M to 820 K
TR1 - 1:1
EXT. MOD.
CW
MOD
C16 47μF
A
2K7
R3
R1 1M
R2
1KPF
L1 4.7μH
C19
C7
C10 470P
C15 .01μF
VC5
T5
CR 2001 @ 10 NSH
T1
D
470P
C6
1KPF
T2
C2570
T3
4 3 IC2 5
NE555
8 7 2 6
VC4
T4
S1B
G
SH
S BFW10
C2570
1K
75K
R12
R13
C 14 .01μF
S1A
Frq. range selector
VC3
T3
C18 100P
R15 1M
R14 1K
C17 .01μF
R6 1K
R7 100K
R8 1M
IN4007
D5
C13 .01μF
VC2
T2
RL*
R5
1M
820K
R10
2K2
R9
C12 10μF
C11 470PF
T1
VC1
C20 500PF
MAIN TUNING
C5 470P
T5
C2570
MULTI-PLIER
1K LIN
OUT PUT
C21 .01μF
TO FRQ. CONT
RL* 2K7 to 1k5
1M R11
C2570
T4
OUTPUT CONTROL
IN4007 D1
IN4007 D2
A(9V)
R4 47Ω/2W
VCC
15V DC 200 mA
C1
.1 μF
C2
IC1 7809
C3
C4
.1μF
4.1V
D3
D4
C8
C9
47μF
.01μF
VCC B (9V)±
1000 μF
100μF
400MW x 2NOS

SWR METER & ANTENNA TUNER FOR QRP Tx

Prabhakaran VU2 PBT

The SWR meter cum antenna tuner can be assembled by and Amateur with minimum componets, all of which are easily available in electronic shops and may cost around Rs. 250/-. No critical components are required and adjustments are very simple.

Antenna Tuner

For the antenna tuner a P_1 network is used which as you know consist of an inductor and two variable capacitors. The inductor is made of winding 10 turns of No. 12 gauge bare copper wire on a 30mm diameter PVC tube. The PVC tube is removed and the two ends are straightened out and soldered to the SO-11 sockets. The coil is thus self-supporting. Variable capacitor C_1 has a capacity of 500pf max. and C2 about 300pf. Variable capacitors used in old valve radios should be used.

SWR Meter

Two hook-up wires from ribbon cable are wound seven turns on one of the straight wires connected to any one of the sockets. Usually the SWR meter is connected before the antenna tuner. The T_x is connected to the SWR meter and the SWR meter to the antenna tuner. But since the Icom rig, which I am using, has a built-in SWR meter, I assembled my SWR meter to the output end of the tuner. The hook-up wire should be of two colours, say red and blue for identification. One end of the red wire is earthed through a 47 Ohms resistor. One end of the blue wire is also earthed through a 47 Ohms resistor. Both the resistors should have equal value. The free end of the red and blue wires is then connected to two germanium diodes. If germanium diodes are not available, IN 4148, can be used. 100K potentiometer is used to adjust the sensitivity of the meter. M_1 and M_2 are the VU meters to show the forward and reflected current.

Adjustments

I will describe how to adjust the antenna tuner for 7MHz. Connect the antenna tuner to your receiver. If you have a transceiver, switch to the receiving mode. Tune the rig to receive a strong station. Adjust C_1 and C_2 and L until maximum signal is heard. Now connect the tuner to to the Tx or switch to Tx , in CW or AM mode. Adjust R_4 to show full deflection in M_1 (meter). M_2 will show the SWR. If there is any deflection in M_1 it means the SWR is high. Adjust C_1, C_2 and L_1 for nil deflection. For adjusting L_1 solder one end of a wire 7cms long to one end of L_1, and a crocodile clip to the other end. Vary the clipping point to get the minimum SWR. Once this point is determined, solder the wire at that point. If you are working 14MHz and 21MHz, find the correct setting for L_1 for the frequency. Use ceramic switch to short the required point on L_1.

Readers, who wish to calibrate M_2 to show the SWR, may refer to a similar article published in our HAMEXPO 2K souvenir. Those who don't have separate SWR meter can connect the circuit to the input terminal of the antenna tuner.

Advantage

Most Hams use a dipole or an inverted V for antenna. The dipole has impedance of 50 Ohms at its resonant frequency. The 7MHz band extends from 7.0 to 7.1 MHz. This antenna will have impedance of 50 Ohms 7.05MHz. The impedance at 7.0 and 7.1 will be high though not very significant. If the dipole is not designed properly, the impedance will be higher than 50 Ohms. The power generated by the T_x will be radiated completely if the impedance is 50 Ohms, otherwise it will be reflected back and the output circuit of the T_x will get heated up and damaged. The antenna tuner helps to match the impedance of the T_x output to the antenna and protect your T_x.

Legend

1) C_1	variable capacitor 500pf
2) C_2	variable capacitor 300pf
3) D_1 & D_2	IN4148 or Germanium diodes
4) C_3 & C_4	0.1 disc capacitors

Fig 5.1

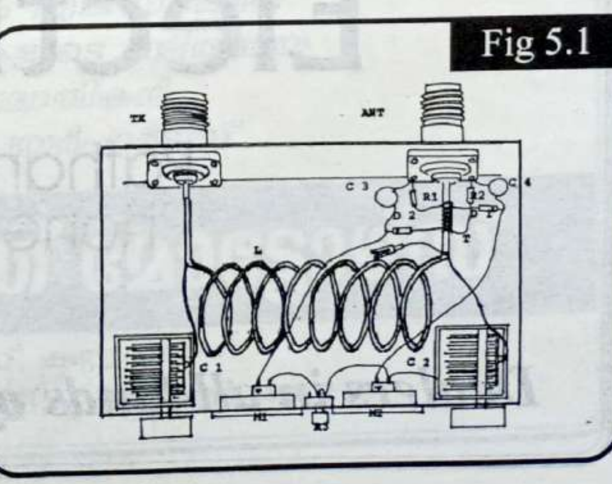
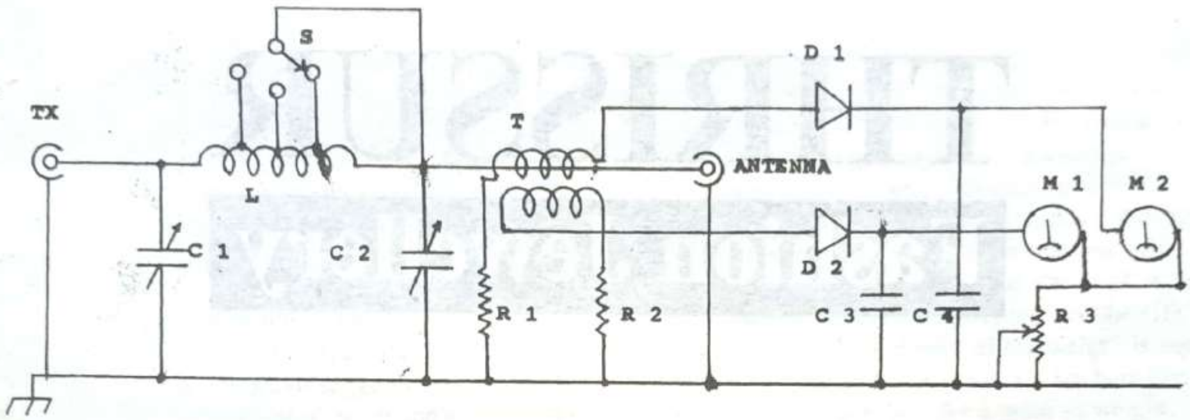


Fig 5.2



U-V MODE FOR THE VU SAT !

Nagesh Upadhyay VU2 NUD
(Co-ordinator, AMSAT-INDIA)

By this time you are all aware that we are making an Indian Amateur Satellite called VUSAT. We have been propagating this idea through Sunday morning net (Sat-chat on 7070 KHz; 7:30 to 8:00am IST),internet forum (vusatsubscribe@yahoogroups.com) etc. You might also be aware that this is the first project taken under AMSAT-INDIA - a voluntary group for the realisation of Indian Amateur satellites.

When our group met at the beginning of the project, the hard decision was regarding the bands and the modes of operation. There were various suggestions. They ranged from all possible combinations of bands and modes to sky-repeaters, "store-and-forward", "parrot" modes and many more. We considered all the options.

We had to decide and start somewhere. We know that many VU-hams would be happy to have a 2m repeater up in the sky. That would be the ideal situation. No Morse code for passing the tests, no need to invest in higher-end tabletops, have mobile fun with the satellite! But Ham radio is something more than that!! And the ground (rather "space" realities, in this case) are different.

Let me explain. First thing, as you all know, repeaters are on single frequency (rather they are on "two single" frequencies). They operate on FM. Repeaters would require what are called as "duplexers" and other gadgetry for single-band operation. Within the 2MHz of 144 to 146MHz, a repeater has to receive and transmit signals within this bandwidth. There is the question of isolating the antenna while transmitting its receive portion should be isolated, because the antenna is common. These arrangements are easy on ground because on does not bother about power, space and volumes. However on the satellite all these things are at a premium. Hence it would be very difficult to accommodate repeater on a satellite.

Added to these things, if you think of a low-earth orbiting (LEO) satellite, it is circling at about 600-800km above the earth. The satellite can be used for radio communication for a short duration of about 10 mts. Then what happens is that, on FM a pair of Hams occupying the satellite frequency would engage it for the duration of the pass making it impossible for the others to commmunicate. Take the other case of the Geostationary Earth Orbit (GEO) satellite. It will hover at about 36,000km above the Earth and would be visible (for radio communication) to us all the time - 24 hours, 365 days. Fantastic, isn't it?! This satellite, when it is visible to us, would also be visible to other countries, like China, Russia, South-East Asia, etc. This is called as the "satellite footprint". Think of large number of operators in the same time zone trying to access this repeater. There may not be enough power onboard to support such unlimited operations.

Another thing to note with respect to GEO is that the repeater systems become quite complex. Weight, volume, power of the repeater and the antenna systems required to transmit and receive at a distance of 36,000km would be huge. Apart from these, most of the GEOs are used for commercial purposes where weight is equal to money. Even in other satellites it is so, but here it is more so. Several hundred dollars for a gram of weight.

Choosing amonst LEO and GEO, one would say that a GEO would be an excellent choice for fixed frequency, repeater-type operation for mobile usage. This would include areas like disaster communications. But given the constraints of satellite, one cannot think of an exclusive Hamsat in a GEO. There is also this question of developing such complex system by vu-hams. Also note that, GEO operation will entail only a maximum of one third of the global operation and curtails operation to other Hams in different parts of the world. LEO gives a world-wide usage, but the intervals are shorter. However it will be in the true spirit of global fraternity for use by Hams all over the world. The cost of making and launching such a satellite would also be manageable. The power, weight and volume would be affordable, and the complexities would be well within the capabilities of vu-hams.

Hence we were forced to rule out a repeater on sky. Next let us consider a digipeater--a store and forward system, a version of it known as "parrot repeater". You call 'cq' here over India, somewhere someone else answers you after sometime. Nice idea!! But to make such a thing on-board, one would need to incorporate digital circuitry, microprocessors (or DSPs), memory (RAM/ROM) etc. That would require digital engineers working with rf engineers. Not only that at the beginning of the project, it was decided that Hams outside ISRO will do this project under the umbrella of AMSAT-INDIA. When we looked around we could find couple of them who could do the rf part and not many to take up the digital works. So we went for the KISS (Keep It Simple Stupid) strategy and said we'll do only a linear analog transponder. No more complications for the first project VUSAT. That's how we decided on a simple analog frequency translator dispensing with more com plicated digital circuitry on-board.

There was a debate on the h-f operations for the satellite.Many of you would like to have h-f satellites because you are very much used to terrestrial communications. Long distance communication is so much attractive with terrestrial h-f operations that one would be forced to think of an all hf satellite. However, here the limitations come from two facts; one is the ionosphere vagaries and second is the satellite antenna consideration. You are all well-versed with communication problems with ionosphereic conditions changing. It varies with sun-spot cycles and is unreliable and unpredictable. Atmospheric absorption at 10m, for example, may amount to as much as 20dB during peak of sun-spot cycles.

The same conditions that provide 10m h-f operation with excellent worldwide skip can make the ionosphere nearly opaque to the satellite downlink. Many strange effects are also noted. When spacecraft is in the radio visibility one may not hear signals, whereas when it is far out of normal range one might hear strong signals. Such operations make h-f satellite operation highly difficult and are avoided.

More than that, from the satellite point of view, there is a severe constraint in putting up an antenna. For example, a 10m antenna at even half-wave length would be 5m length and is really an unmanageable issue on the satellite. First of all it has to be accommodated on a satellite of almost equal height. Secondly, it has to be in a folded condition to fit into the launch vehicle nose-cone. Thirdly it would need mechanism to deploy it in free space. A stuck antenna would jeopardize the mission. Based on these considerations it was decided to go for the higher frequency bands and avoid h-f.

With the VHF repeater and h-f operations ruled out, we would be higher bands like UHF or S-band (1.2GHz). Considering the state of amateur radio in India, any microwave frequencies rule themselves out. The next best choice could be UHF. Hence we decided on this band for uplinking. The antenna for the UHF is small and manageable.

Now how did we decide UHF for uplink and VHF for downlink? For those who donor know this jargon, uplink is the frequency on which one transmits to the satellite. Downlink is that frequency of reception from the satellite. Though there are many amateur satellites with VHF uplink and UHF downlink we preferred it the other way round. This is for the reason that experience has shown us the problems of transmitting on VHF. As you all know, there are lot of pirate stations and sea vessels operating clandestinely on our frequencies. More so on VHF. Apart from this, cable cordless, cell phones, police wireless and all kinds of other communications cause lot of interference on this band. These qrms are so much in the urban areas that it is very difficult to operate the terrestrial VHF and repeaters. Many times our repeaters are jammed by these qrms. If we choose VHF as the link frequency to transmit to the satellite, then all these will get onto the satellite transponder as the input. They will also come down as down linked signal on the other side. Till the time, these undesirable operators come on to UHF, it is best to get on with this frequency band. With these thoughts in mind, we have chosen UHF as the uplink frequency and VHF as the down kink frequency for VUSAT. This mode is also called as Mode-B on earlier satellites.

There are of course other issues like modes of operation (whether SSB/CW/FM), the ground station and on-board powers, gains of antennas etc. However, for the time being we hope that frequency issue for VUSAT is sorted out and finalised. That is, we are one step forward!! For the time that is good enough.

Incidentally do you remember, it was OM Subi from Bangalore who heralded Amateur Satellite era in India, being the first vu-ham to work through amateur satellite. His callsign was 2UV!

Next time you think of investing in a rig go in for UHF/VHF dual-bander and not just a monobander VHF. We would welcome you to the fantastic world of amateur satellites and a red carpet welcome to VUSAT.

Satellite Modes Of Operation

Mode	Uplink (to satellite)	Downlink (from satellite)
A	145MHz	29MHz
B	435MHz	145MHz - also known as UV mode
J	145MHz	435MHz - here JA is analogue &JD is digital
JL	1.2GHz	29MHz 145MHz
K	21MHz	29MHz
KA	21MHz	29MHz 145MHz
KT	21MHz	29MHz / 145MHz
L	1.2GHz	435MHz
S	1.2GHz	2.4GHz
T	21MHz	145 MHz
UV	435MHz	145 MHz -same as -B
V	29MHz	145MHz - inverse of -A

7 MHz LSB TRANSCEIVER

R.Sudheer VU2 LVA

I designed this and 40 Mts. LSB transceiver using ladder filter and easily available 3.56MHz crystals to keep the cost down without sacrificing its performance. I am using this transceiver regularly on the band and reports are encouraging. The principle of single side band has not changed much over the years. Hence readers will have no difficulty in following the circuit.

SSB Transmission.

The oscillator signal from a crystal oscillarot is modulated by the audio in a special circuit, which generates the upper and lower sid-band and eliminates the carrier. In the next stage, the upper side-band is eliminated and the lower side band is changed to the correct Ham band frequency before amplification and transmission.

Block Diagram.

The block diagram will help you to understand the operation of the rig and the switching arrangement.

Rx-Front End.

The signal from the antenna is fed to the band-pass filter L_1. The input resonant circuit is tuned to 7MHz. The 1K linear potentiometer acts as a RF attenuator. The collector of the 2N2222A is connected to the first mixer. This section works only in the receiving mode.

Balanced Modulator (First Mixer).

In the balanced modulator I am using MC 1496, which is selected for its superior performance. the audio from the microphone amplifier is used to modulate the carrier from the crystal oscillator. The carrier is suppressed and the upper and lower side-bands appear at the output. The upper side-band is eliminated in the next stage.

Crystal Filter & IF Amplifier.

We are now on our way to isolating the LSB transmission. We have already eliminated the carrier and only the LSB and USB remain. The next step is to eliminate the USB. A series resonant frequency permits only signals at resonant frequency to pass through and blocks all other frequencies. Here we use 3.58MHz crystals for the purpose. These crystals are used in digital clocks and are easily available and cheap. Any crystal will behave like a resonant frequency and will permit only that frequency to pass through. In this case we tune the crystal to the lower side-band with the use of capacitors. This section perhaps is the most critical part and the time spent on it will be rewarding. You will have to get some more crystals and select those, which give best result. The correct bandwidth is obtained by the use of various capacitors. Some trial and error with various values of capacitors will have to be undertaken to get the correct bandwidth. The IF signal is then amplified in a two stage amplifier using 2 nos. of BF194B Coils are wound on radio IF cores.

Second Mixer & Audio Amplifier.

The next stage is the product detector in which the IF frequency of 3.58Hz is mixed with the VFO to generate the frequencies in the 7MHz band. In the receiving mode the 3.58MHz signal is mixed with the crystal oscillator of same frequency to generate the audio signal, which is amplified by the LM 386 and fed to the speaker.

Band-pass Filter & RF Amplifier.

The signal frequency coming out of the second mixer is passed through the band-pass band coil L4. This coil is tuned to 7.05MHz. The three transmitters in this section amplify this signal to produce an output of 3W. No tank tuning circuit is used in the final stage. The impedance of the output stage is designed to match the dipole. You can connect the dipole to the output and come on air. This will help you to find out how your Tx is performing and make necessary adjustments before connecting to the power amplifier.

VFO.

A VFO is the most critical part of the circuit and any defect in its performance will be reflected in the output. If it is not designed properly, there will be severe wobbling in the output signal, a stable 5V stabilized voltage is given to the VFO with the help of a regulator IC. The 2J PVC tuning capacitor will enable fine-tuning of VFO. Use high quality preferably styroflex capacitors only. The tuning range is 3.411 to 3.511 MHz. This should be checked with a frequency counter or commercial transceiver.

Crystal Oscillator.

Crystal oscillator is the heart of the transceiver. The crystal oscillator of 3.58MHz generates the carrier for transmitting and also it acts as beat frequency oscillator for detecting the SSB/CW signals. The 3.3pf trimmer is adjusted to shift the carrier frequency for best audio.

Microphone Amplifier.

I have selected the IC741, since this is a very good IC which delivers good output power and audio quality. The IC is easily available. No audio distortion is noticed in the circuit. The 470pf capacitors and RF choke in the Mic Amplifier circuit helps to filter out any RF from en

Fig 6.1

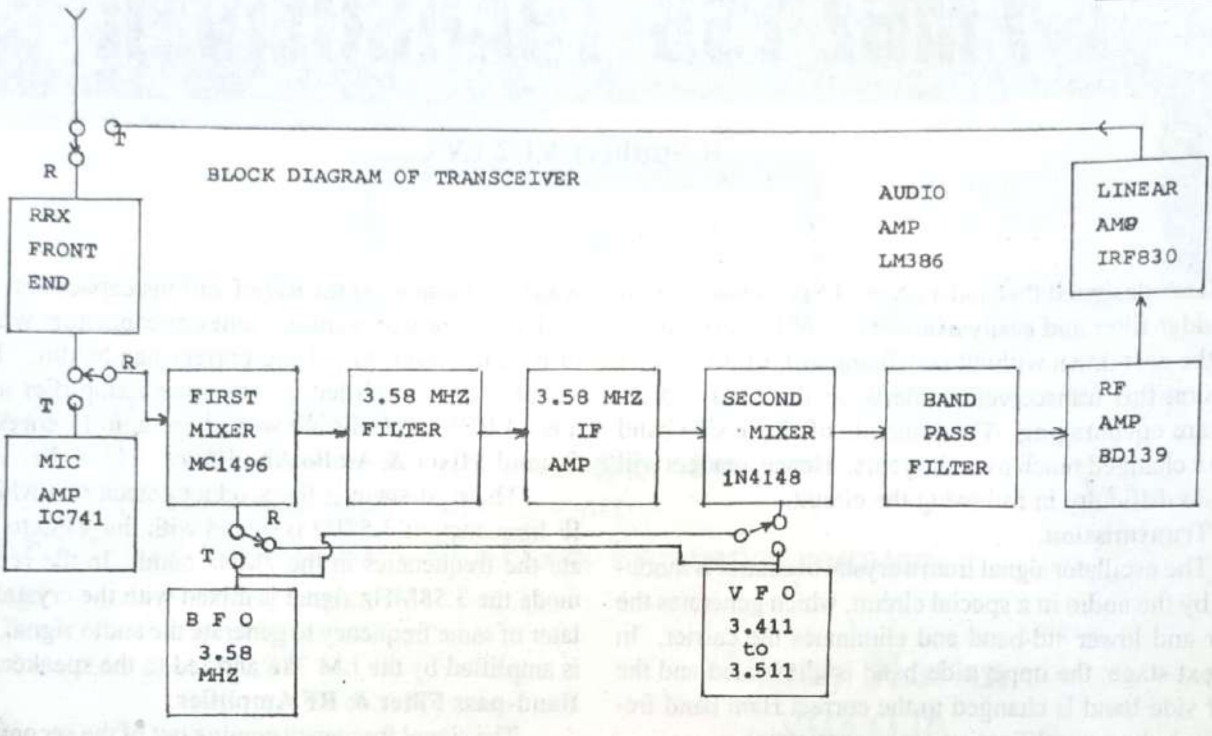
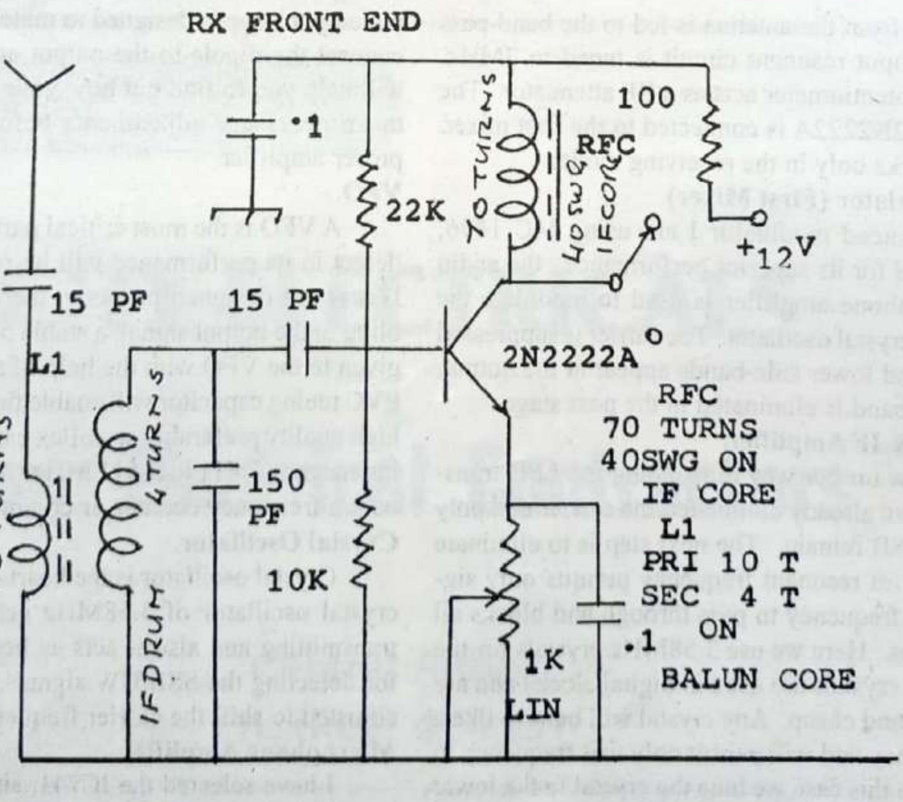

BLOCK DIAGRAM OF TRANSCEIVER
R
T
RRX
FRONT
END
AUDIO
AMP
LM386
LINEAR
AMP
IRF830
MIC
AMP
IC741
FIRST
MIXER
MC1496
3.58 MHZ
FILTER
3.58 MHZ
IF
AMP
SECOND
MIXER
1N4148
BAND
PASS
FILTER
RF
AMP
BD139
B F O
3.58
MHZ
V F O
3.411
to
3.511

Fig 6.2


RX FRONT END
·1
22K
100
10 TURNS
40 SWG IF CORE
RFC
+12 V
15 PF
15 PF
L1
2N2222A
10 TURNS
4 TURNS
IF DRUM
150 PF
10K
RFC
70 TURNS
40SWG ON
IF CORE
L1
PRI 10 T
SEC 4 T
ON
BALUN CORE
·1
1K
LIN

tering the audio section.

Linear Amplifier.

We use one IRF830. Use a hafty heatsink for the transistor. The idle current should be adjusted using 10K preset.

Testing & Alignment.

Complete the receiver section and test it thoroughly before proceeding to the Tx. You will require a RF probe and a commericial trnasceiver in addition to a digital multimeter. The crystal oscillator and VFO are assembled first and checked for oscillation using RF probe. The IF section can be calibrated giving a very low amplitude signal (through a low value capacitor). The RF probe is again used to peak the coil by noting the meter reading. In the receiving mode, the 22pf trimmer in the crystal oscillator is adjusted for the best audio from the SSB station being received. The band-pass filter is tuned for maximum signal in 7MHz using RF probe.

Fig 6.3

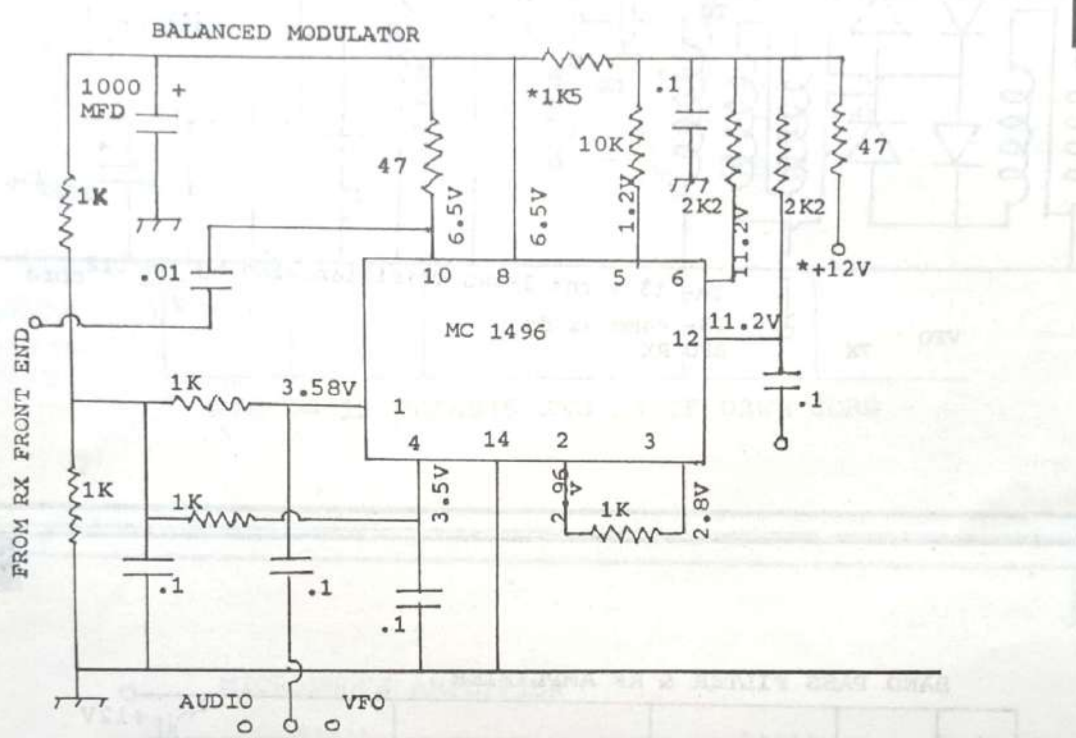


Fig 6.4

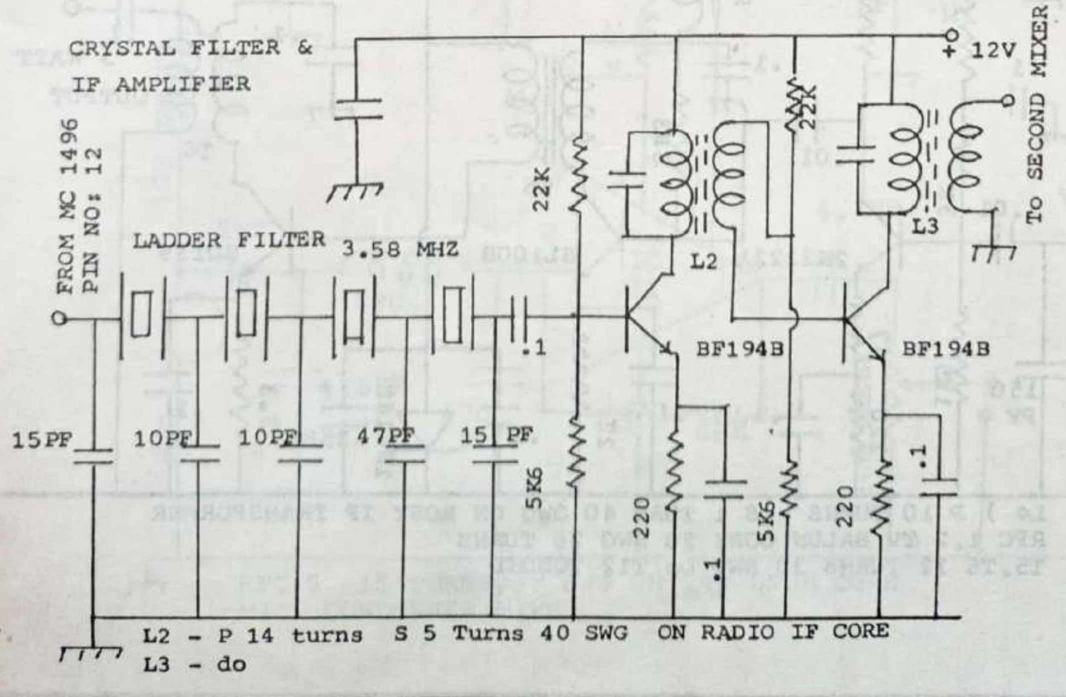


Fig 6.5

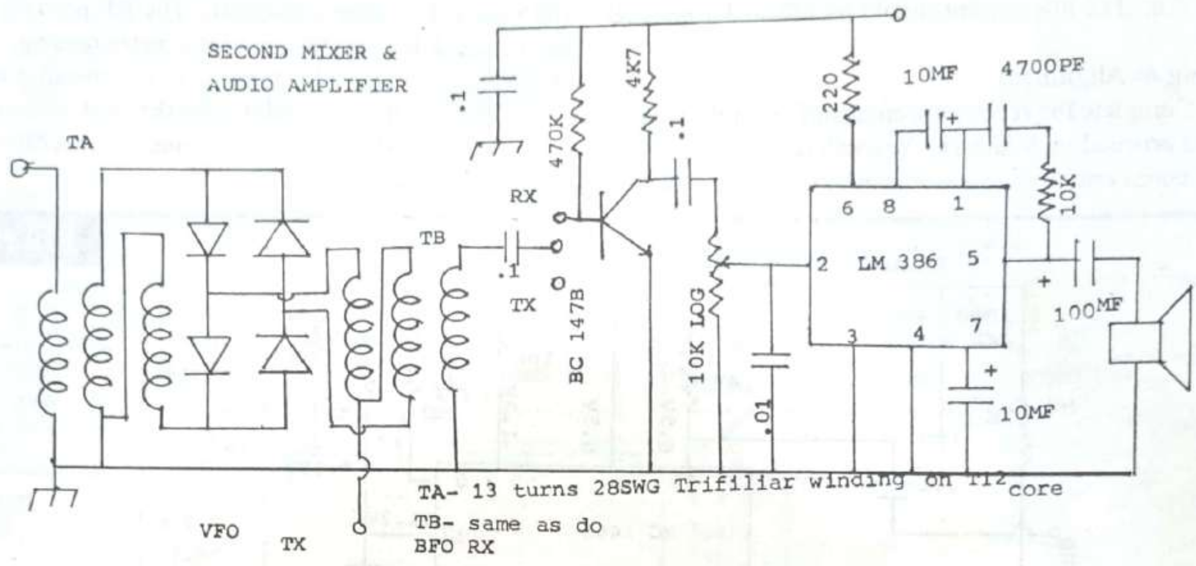

SECOND MIXER &
AUDIO AMPLIFIER
TA
TB
RX
TX
.1
470K
4K7
BC 147B
10K LOG
.01
220
10MF
4700PF
10K
6 8 1
2 LM 386 5
3 4 7
100MF
10MF
VFO
TX
TA- 13 turns 28SWG Trifiliar winding on T12 core
TB- same as do
BFO RX

Fig 6.6

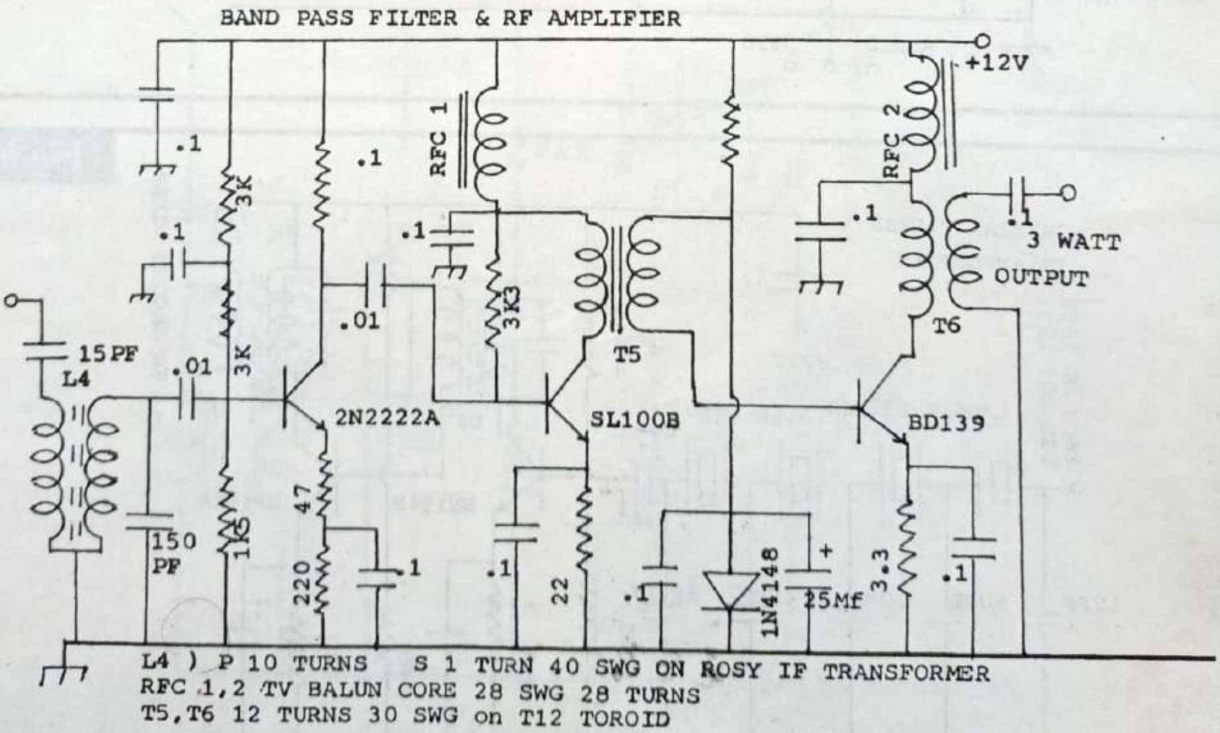
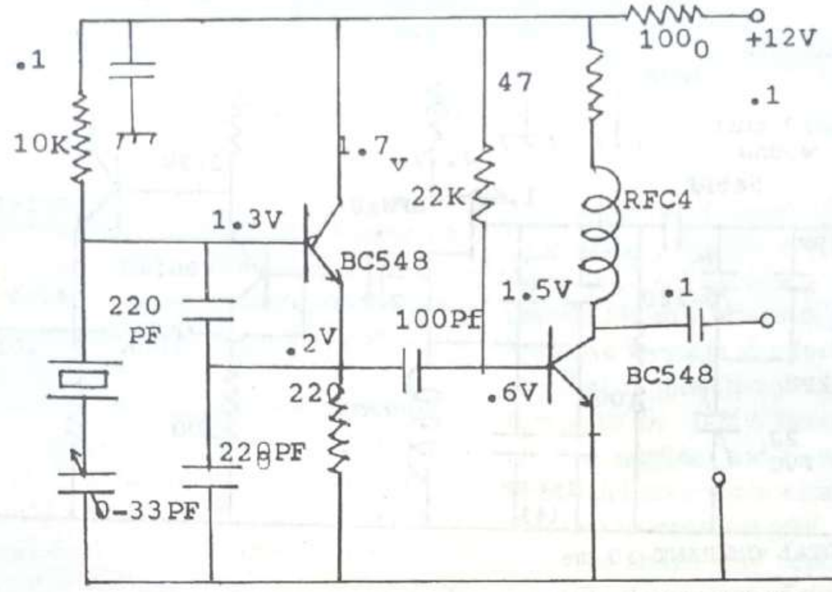
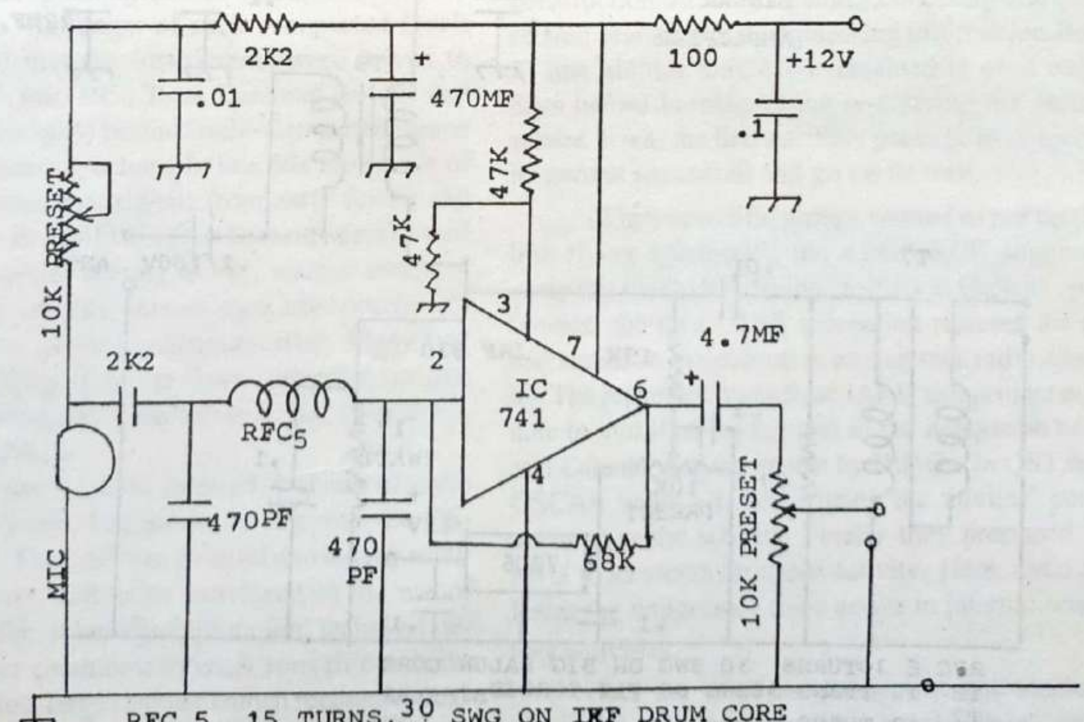

BAND PASS FILTER & RF AMPLIFIER
+12V
RFC 1
RFC 2
.1
3K
.01
15 PF
L4
150 PF
1K5
2N2222A
47
220
3K3
T5
SL100B
22
1N4148
25Mf
T6
BD139
3.3
3 WATT
OUTPUT
L4) P 10 TURNS S 1 TURN 40 SWG ON ROSY IF TRANSFORMER
RFC 1,2 TV BALUN CORE 28 SWG 28 TURNS
T5,T6 12 TURNS 30 SWG on T12 TOROID

Fig 6.7



RFC 4- 15 TURNS35 SWG ON IF DRUM CORE

Fig 6.8



RFC 5 15 TURNS, 30 SWG ON IKF DRUM CORE
MIC CONDENSER MIKE

Fig 6.9

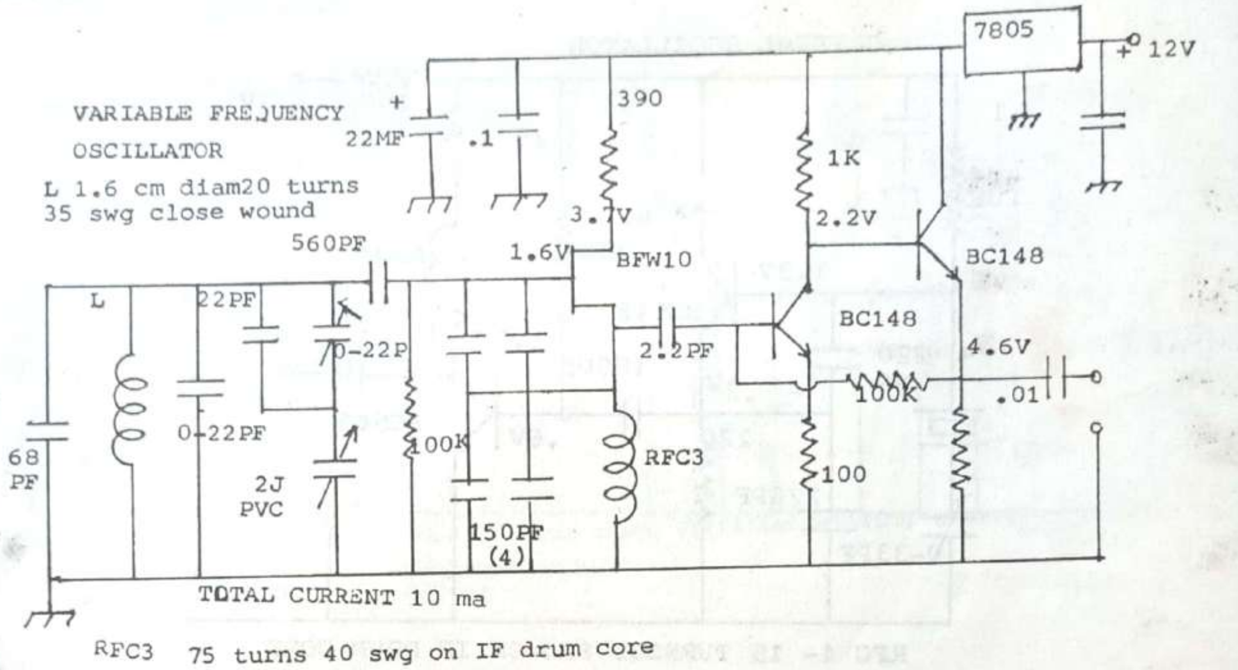
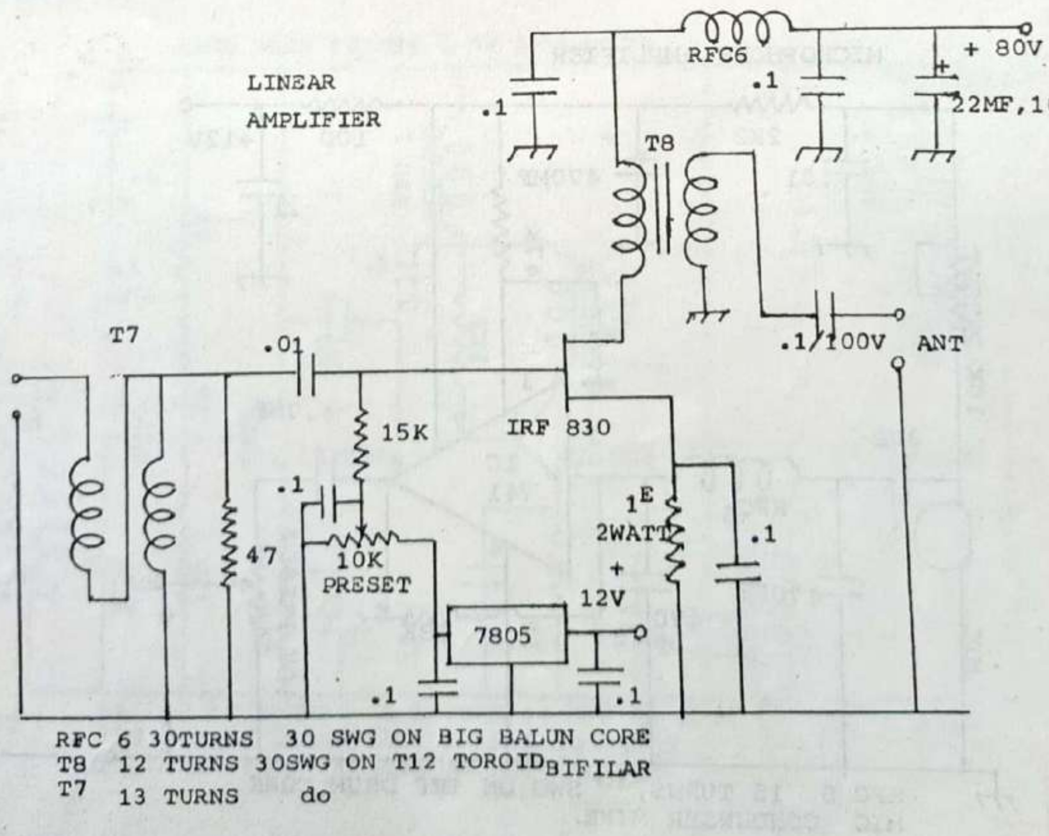


Fig 6.10



HISTORY OF SATELLITES FOR AMATEUR RADIO

Sundeep Shah VU3 SXE

In this age full of technology, we are using satellites in our day to day life.This article is dedicated to **AMSAT-INDIA** project. Since we, vu hams, are also gearing up in building satelites I am trying to bring up a few details of early satellite days.

On 4th October 1957, the Russians launched the first satellite in space with the transmitter freq 20.005 and 40.010 MHz. One of the transmitters operated just above the 20-MHz freq, which was used by the US and other countries to transmit standard time signals.Thousands of radio amateurs and swls who listen to these time signals will also be able to listen to the spacecraft.

The soviets' choice of freq.was not an accident.Their interest in radio amateur reports,and observation can give them extremely important data on the satellite's flight and state of ionosphere.

The US launched Explorer-1on 31 Jan. 1958. It contained scientific instruments to measure radiation level in space designed by group under Dr. James Van Alley.

When it began operating most of the instruments were reading off scale. Radiation of such unexpected levels was encountered that the instruments were driven to saturation.On 27th Jan. 1953 Ross Bateman (w4ao) and William L. Smith (w3gkp) beamed radio signal at the moon and succeded in hearing echoes.In late 50s thousands of radio amateurs monitored signals from early Soviet and American satellite.In April 1959 Don Stoner (w6tns) a well respected experimenter writing in CQ, wanted amateurs to construct relay satellite containing a transponder capable of supporting two-way communication. Many said Stoner was fantasizing. The first Govt. supported satellite to use the same techniques hadn't even begun, (Telestar-I, launched in July 1962).

In 1960, Stoner's article inspired, a group of radio amateurs in Sunnyvale, California, to organize the OSCAR association. The goal was to build and launch satellites. The US Govt. had to be convinced of the use of amateur satellite for scientific exploration, technical development, disaster communications,& scientific or technical education.Most large satellite launch rockets had excess lift capacity. It's simpler and cheaper to ballast a rocket with dead weight than to reduce the thrust. It was possible to add a secondary payload to many launches at very little extra cost.

After two years of efforts by members of the OSCAR association, the first radio satellite OSCAR-was ready for launch. Weighing 10 pounds, the spacecraft contained a 140-mW beacon at 145MHz transmitting a simple repetitive message at a speed controlled by a sensor responding to the internal satellite temperature. OSCAR-I beacon to the 10-mW beacon flown on Explorer-I (The US first satellite) and an early Vanguard mission. OSCAR-I did not contain a transponder. It was a significant first step towards that goal.

The classic QST Sept. 1962 article by Bill Orr has beautiful description of the emotions on the event surrounding the beginning of OSCAR-I launch for a 22-day sojourn in space (Don't miss this article).

OSCAR-I was an overwhelming success. More than 570 amateurs in 28 countries, forwarded observations to project OSCAR data reduction center. Important radio propagation through the ionosphere, spacecraft's orbit and thermal design were reported.This mission demonstrated that amateurs are capable of designing and construction,tracking satellites,collecting and processing related scientific and engineering information.Because of its low altitude OSCAR-I remained in orbit only for 22 days before burning up on re-entering the earths atmosphere. It was the first auxillary package to be ejected from its partent spacecraft and go on its own.

When scientific groups wanted to put up their own free flying spacecraft, the AIRFORCE suggested they study the OSCAR-I design.In 1963 at Geneva space conference, the then USSR delegation rejected the proposal and stated its opposition to any amteur radio space activity. The representatives from IARU and project oscar were able to mobilize the support of the delegation of US, UK and Canada, and the article by Bill Orr in QST,on project OSCAR helped in neutralizing the Soviets' position on amateur space activity. Finally they proposed 144-146 MHz to amateurs for space activity. Here, radio amateurs learnt the importance to be active in international regulatory activities.

Over the years many scientific and amateur satellites were launched into space as piggyback on primary missions. Later we had even a full fledged birds of our own, flown by radio amateurs themselves. We have learnt to fly.

RM 96-7 MHz TRANSCEIVER (Modified)

Harishankar VU3 NSH

I have presented here the modified version of RM-96-7 MHz transceiver after discussing with OM RAM.

Fig. 7.2

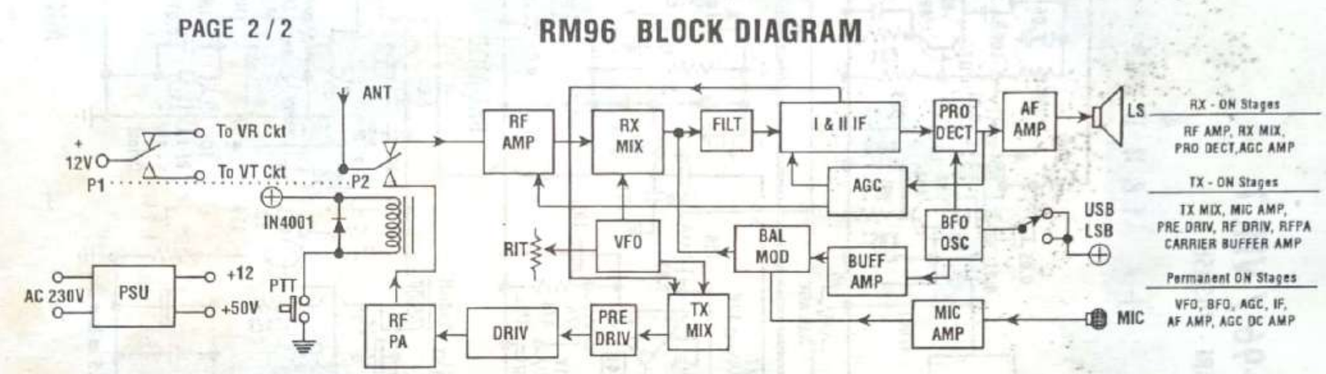


Fig. 7.3

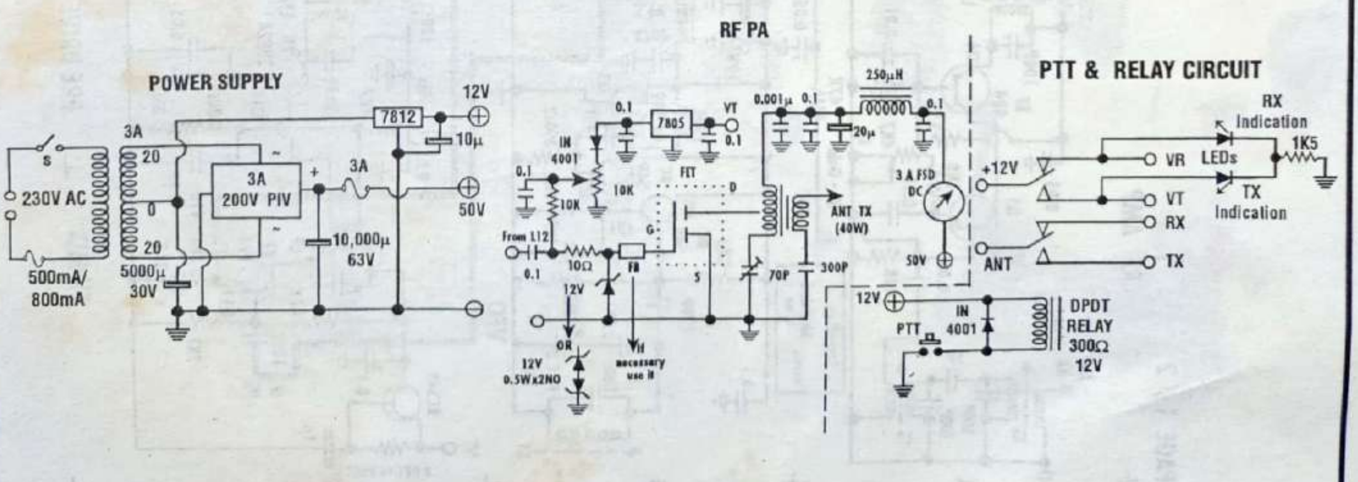
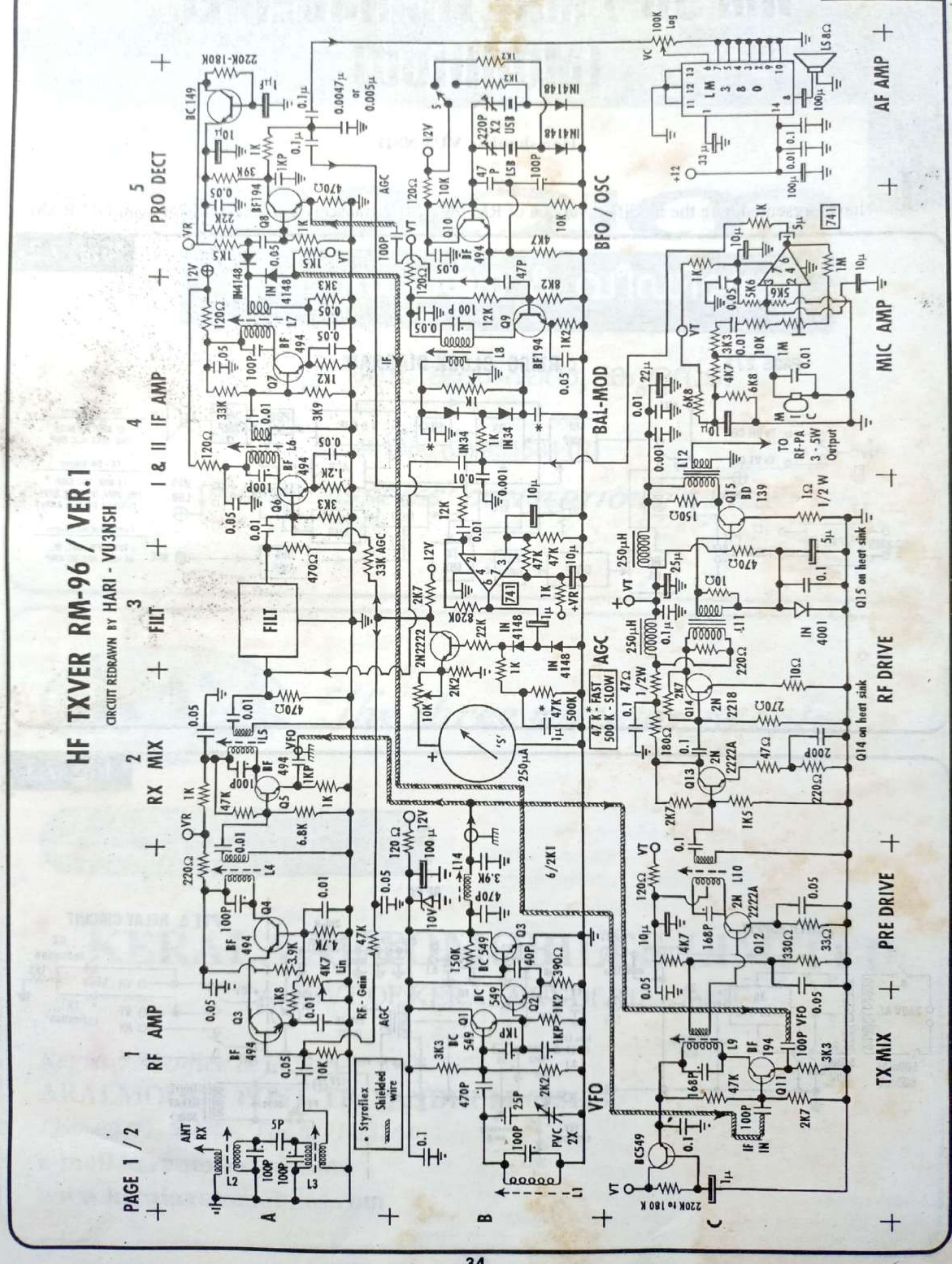


Fig. 7.1

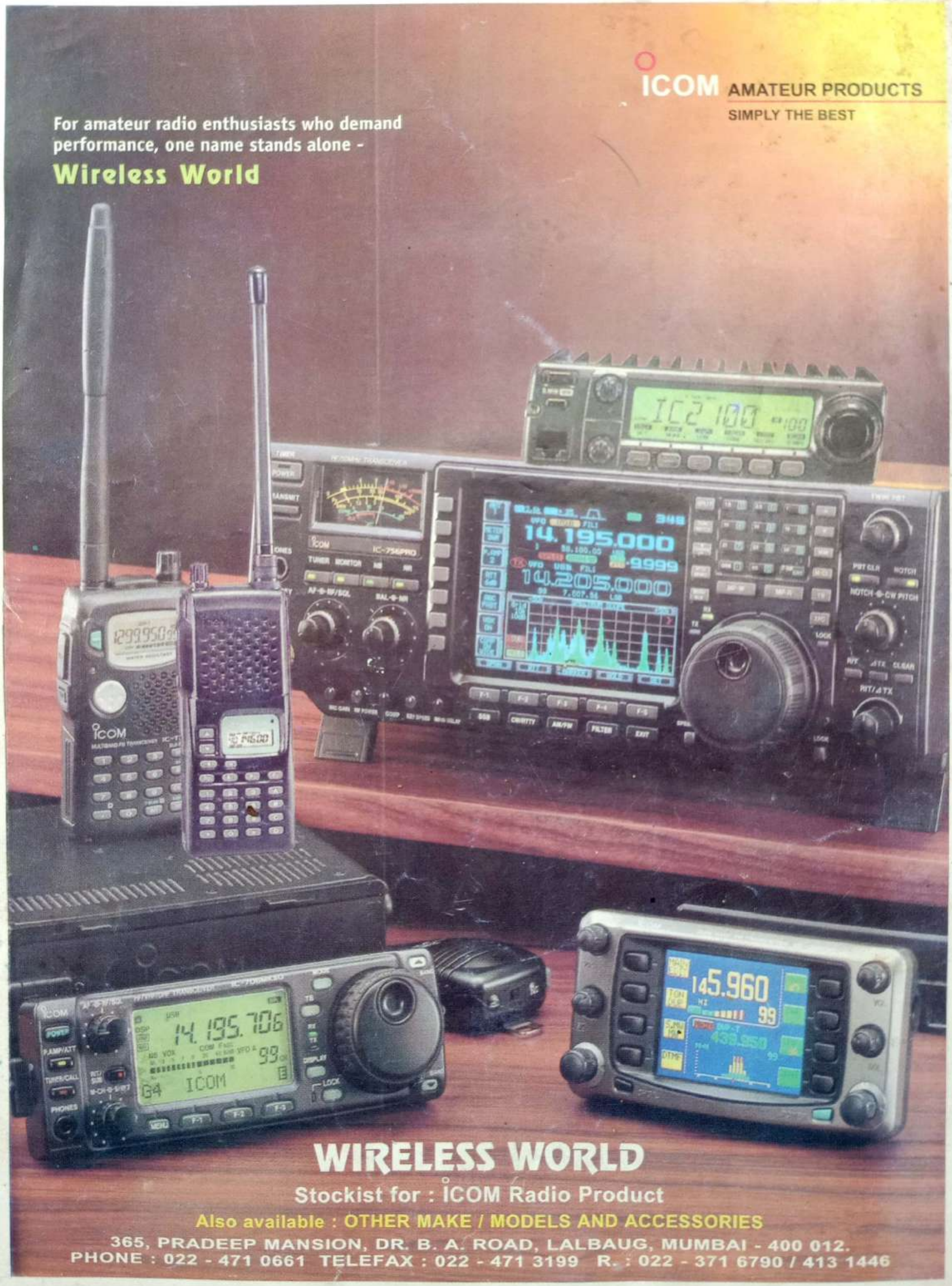

HF TXVER RM-96 / VER.1
CIRCUIT REDRAWN BY HARI - VU3NSH
PAGE 1 / 2
1 RF AMP
2 RX MIX
3 FILT
4 I & II IF AMP
5 PRO DECT
VFO
AGC
BAL-MOD
BFO / OSC
MIC AMP
AF AMP
TX MIX
PRE DRIVE
RF DRIVE
TO RF-PA 3 - 5W Output
Q14 on heat sink
Q15 on heat sink
47 K * FAST 500 K - SLOW
Styroflex
Shielded wire

451911


HAM'XPO 2000
3rd DEC. 2000


WELCOME
HAM EXPO 98
ADUR AMATEUR RADIO CLUB
COLLEGE of APPLIED
SCIENCE, ADOOR.


WELCOME
ADOOR


ICOM AMATEUR PRODUCTS
SIMPLY THE BEST
For amateur radio enthusiasts who demand performance, one name stands alone -
Wireless World
WIRELESS WORLD
Stockist for : ICOM Radio Product
Also available : OTHER MAKE / MODELS AND ACCESSORIES
365, PRADEEP MANSION, DR. B. A. ROAD, LALBAUG, MUMBAI - 400 012.
PHONE : 022 - 471 0661 TELEFAX : 022 - 471 3199 R. : 022 - 371 6790 / 413 1446