HAM EXPO 2014

14th DECEMBER

Souvenir

Adoor
Amateur
Radio
Club

www.adoorarc.org

ADOOR AMATEUR RADIO CLUB

HAM EXPO 2014 — **14 DECEMBER 2014**

Souvenir

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A Few Words

The Adoor Amateur Radio Club is twenty one years old now. Now our club is the most popular in South India. We started as a small venture to bring all the hams in the state together for an eye-ball, has now become a popular ham meet in the country. This was not small achievement for a club working in remote relatively under developed place like Adoor. We have more than 100 active members atpresent. We continued to conduct HAM EXPO every year since 1996.

We extended our thanks to our members and fellow hams who by their unselfish service have helped to the success of all our ventures and made the club a LANDMARK IN HAM RADIO. We specifically thanks our contributers for the high technical standard of the articles. We are also thankful to our advertisers without those help this venture wouldn't have been possible.

We Congratulate Ham Expo Contest Winners

Ist Prize	*IInd Prize*	*IIIrd Prize*
Shanmukham VU2PLL	**Sanal Deep VU3SIO**	**Vijay Kumar Yadav VU2YVK**

Special Prize

Celine Terasa VU3CJP

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MESAGE

I am glad to know that the Adoor Amateur Radio Club, a non profit NGO, is organizing Ham Expo '14 at Adoor on 14 Dec. 2014

It is heartening to note that the objectives of your organization is to identify the talent, foster the competitive spirit, and creating culture among the youngsters by supporting and preparing them for National integration, Solidarity and Disaster Management.

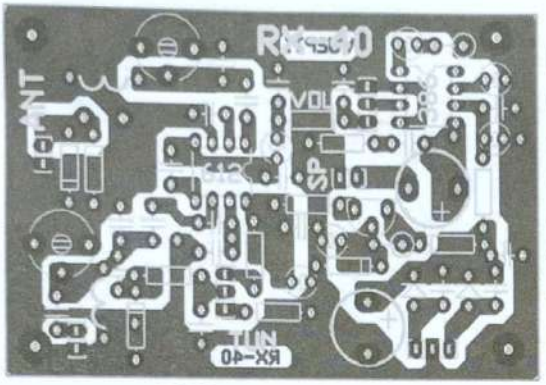
I am also happy to know that on the eve of Ham Expo '14, your Organization is bring out a Souvenir, which will be useful to all enthusiasts professionals, participants and newcomers. I am sure that your Organization will put in dedicated efforts in Promoting this Amateur Radio in our Country. My good wishes to the Adoor Amateur Radio Club and Ham Expo'14 as well as for the Souvenir '14 on this Occasion

CHITTAYAM GOPAKUMAR

'SHANGRILA', NEELESWARAM P.O., KOTTARAKARA

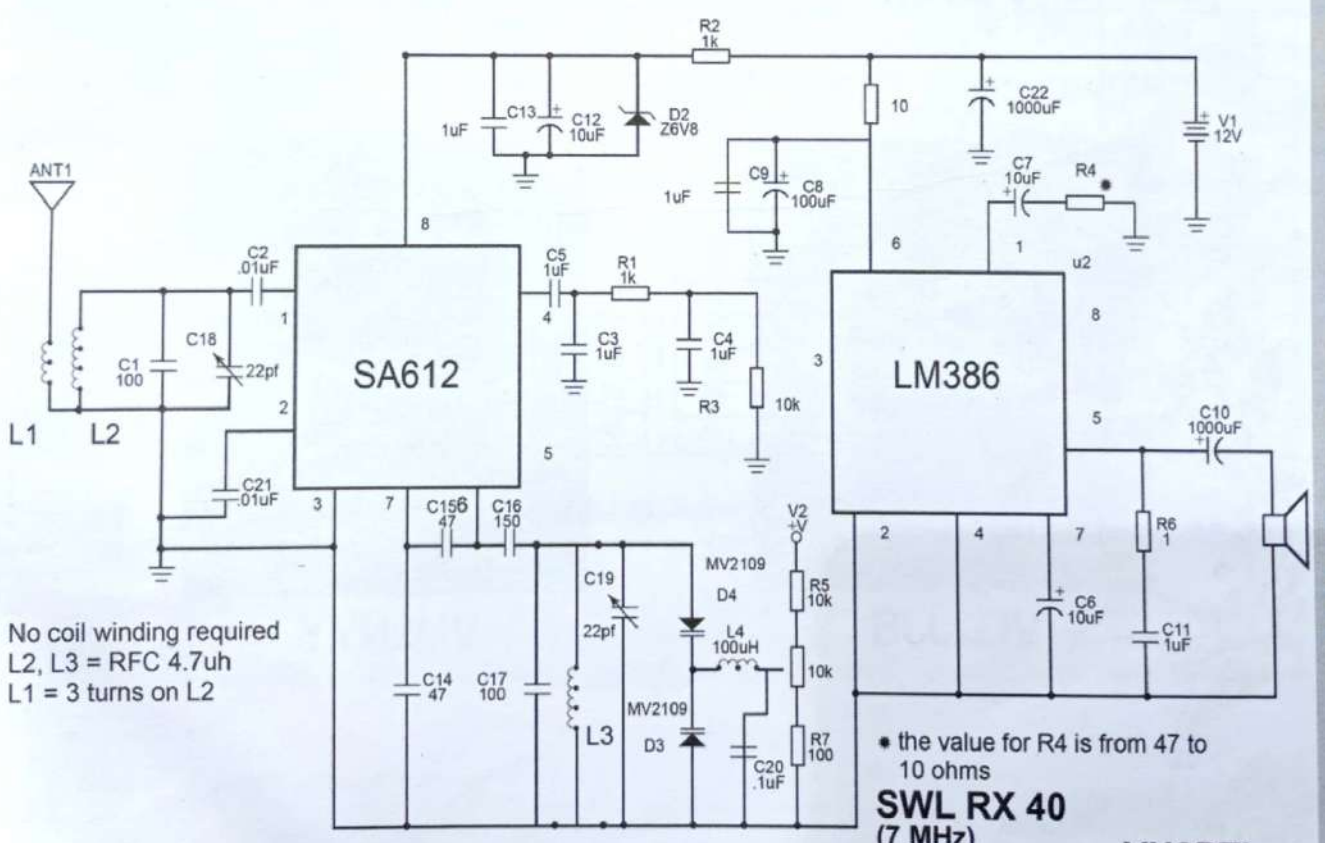
Simple DC Receiver for Biginers

PRADEEP KUMAR V, VU2PTI



PCB Layout for RX

This circuit built around a simple duel balanced mixer IC NE602. This is a low cost IC with best performance. Audio amplifier built around a general purpose audio IC LM 386. The circuit is self explenatory. The main feature of this circuit is there is no complicated coil windings. There is only two coils in this circuit. Both of them are 4.7 uH fixed coils, available readymade. Only thing is to wind three turns on L2. This will act as L1. And other simplicity is there is no tunning capacitor. A veractor diode with small capacitors and one potentiometer will do the tunning function. This receiver can operate on any 12V PS or on a battery.

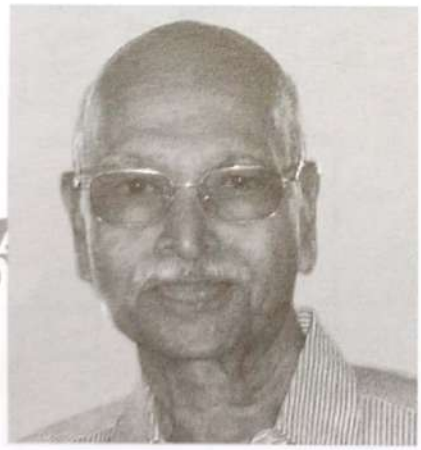


Circuit Diagram

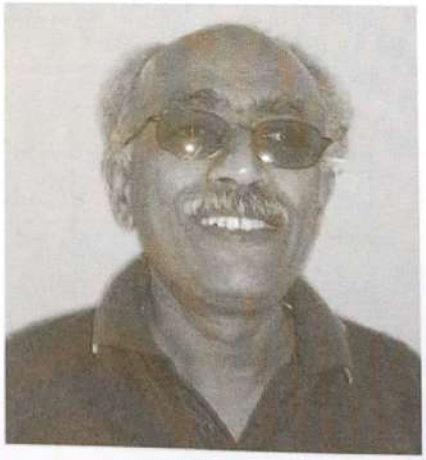
In Commemoration of Those Who went behind the Veil

VU2GIP

VU2XX



VU2JJS



VU2NYY

Toroid Inductance Chart
David Smith G4COE

To save a little time from calculating and experimenting when winding toroid cores here a chart of the most commonly used cores, simply pick the inductance required and read the required number of turns for the selected core. To keep things easy we'll stick to three most common cores, T37, T50 and T68 and we'll use the -2 and 6 mix, these figures are for single layer windings only, and the windings should cover the entire core evenly.

Turns - Inductance in µH

Turns	Red T37-2	Yellow T37-6	Red T50-2	Yellow T50-6	Red T68-2	Yellow T68-6
1	.004	.003	.005	.004	.006	.005
2	.016	.012	.020	.016	.023	.019
3	.036	.027	.044	.036	.051	.042
4	.064	.048	.078	.064	.091	.075
5	.100	.075	.120	.100	.140	0.12
6	.140	.110	.180	.140	.210	0.17
7	.196	.150	.240	.196	.280	0.23
8	.256	.190	.310	.256	.360	0.30
9	.324	.240	.400	.324	.460	0.38
10	.400	.300	.490	.400	.750	0.47
11	.484	.360	.590	.484	.690	0.57
12	.576	.430	.710	.576	.820	0.68
13	.676	.500	.830	.676	.960	0.79
14	.784	.590	.960	.784	1.10	0.92
15	.900	.680	1.10	.900	1.30	1.10
16	1.02	.770	1.30	1.02	1.50	1.20
17	1.16	.870	1.40	1.16	1.60	1.40
18	1.30	.970	1.60	1.30	1.80	1.50
19	1.40	1.10	1.80	1.40	2.10	1.70
20	1.60	1.20	2.00	1.60	2.30	1.90
21	1.80	1.30	2.20	1.80	2.50	2.10
22	1.90	1.50	2.40	1.90	2.80	2.30
23	2.10	1.60	2.60	2.10	3.00	2.50
24	2.30	1.70	3.10	2.30	3.30	2.70
25	2.50	1.90	3.10	2.50	3.60	3.40

Turns	Red T37-2	Yellow T37-6	Red T50-2	Yellow T50-6	Red T68-2	Yellow T68-6
26	2.70	2.00	3.30	2.70	3.90	3.20
27	2.90	2.20	3.60	2.90	4.20	3.40
28	3.10	2.40	3.80	3.10	4.50	3.70
29	3.40	2.50	4.10	3.40	4.80	4.00
30	3.60	2.70	4.40	3.60	5.10	4.20
31	3.80	2.90	4.70	3.80	5.50	4.50
32	4.10	3.10	5.00	4.10	5.80	4.80
33	4.40	3.30	5.30	4.40	6.20	5.10
34	4.60	3.50	5.70	4.60	6.60	5.40
35			6.00	4.90	7.00	5.80
36			6.40	5.20	7.40	6.10
37			6.70	5.50	7.80	6.40
38			7.10	5.80	8.20	6.80
39			7.50	6.10	8.70	7.10
40			7.80	6.40	9.10	7.50
41			8.20	6.70	9.60	7.90
42			8.60	7.10	10.0	8.30
43			9.10	7.40	11.0	8.70
44			9.50	7.70	11.0	9.10
45			9.90	7.90	12.0	9.50
46			10.0	8.50	12.0	9.90
47			11.0	8.80	13.0	10.0
48			11.0	9.20	13.0	11.0
49			12.0	9.60	14.0	11.0
50			12.0	10.0	14.0	12.0

For those interested in equations (√ L uH / AL value) x 100 will give us the turns required. To find the inductance of a pre-wound core, L uH = (turns/100)2 x AL value of the core.

This list could be expanded to cover many cores and greater winding ranges but would probably many pages of Sprat, this being pointless because many would not be used generally and any inductances greater than the range given above could be calculated with the above formula.

Title: Toroid Inductance Chart.

Author: David Smith G4COE
Pa

GQRP Club Datasheet

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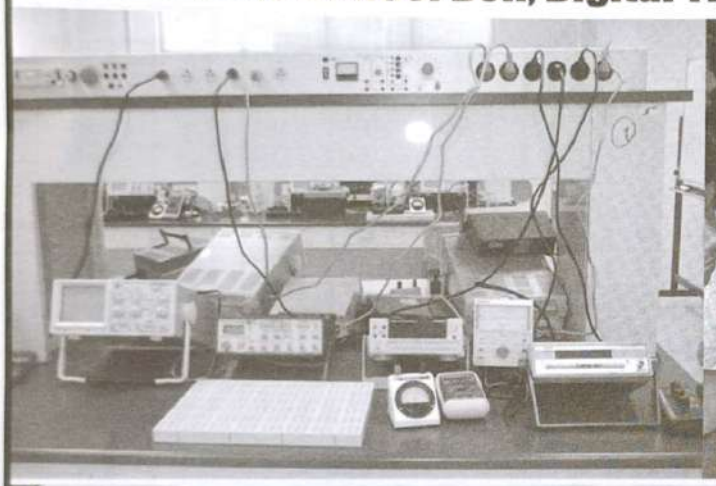

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Inductance in µH - Turns

µH	Red T37-2	Yellow T37-6	Red T50-2	Yellow T50-6	Red T68-2	Yellow T68-6
1	16	18	14	15	13	15
2	22	26	20	21	19	21
3	27	31	25	25	23	25
4	32	36	28	29	26	29
5	35	41	32	33	30	33
6	39	45	35	36	32	36
7	42	48	38	39	35	39
8	45	52	40	42	37	41
9	47	55	43	44	40	44
10	50	58	45	47	42	46
11	52	60	47	49	44	48
12	55	63	49	51	46	51
13	57	66	51	53	48	53
14	59	68	53	55	50	55
15	61	71	55	57	51	56
16	63	73	57	59	53	58
17	65	75	59	61	55	60
18	67	77	61	62	56	62
19	69	79	62	64	58	64
20	71	81	64	66	59	65
21			65	67	61	67
22			67	69	62	68
23			68	71	64	70
24			70	72	65	71
25			71	74	66	73

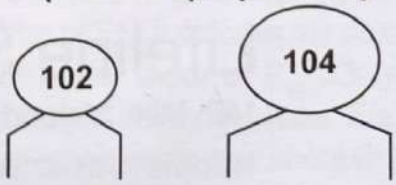
µH	Red T37-2	Yellow T37-6	Red T50-2	Yellow T50-6	Red T68-2	Yellow T68-6
26			73	75	68	74
27			74	77	69	76
28			76	78	70	77
29			77	79	71	79
30			78	80	73	80
31			79	82	74	81
32			80	83	75	83
33			82	85	76	84
34			83	86	77	85
35			84	87	78	86
36			86	88	79	88
37			87	89	80	89
38			88	91	82	90
39			89	92	83	91
40			90	93	84	92
41			91	94	85	93
42			92	96	86	95
43			94	97	87	96
44			95	98	88	97
45			96	99	89	98
46			97	100	90	99
47			98	101	91	100
48			99	102	92	101
49			100	103	93	102
50			101	104	94	103

CAPACITOR NUMERICAL CODING

VALUE		CODE	
100 pF	=	101	
1000 pF	=	102	
.001 uF	=	102	= 1 k
.01 uF	=	103	= 10 k
.1 uF	=	104	= 100 k

MULTILAYER (270 pF)

CERAMIC DISCS (.001 uF) (0.1 uF)



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POWER SUPPLY FOR QUAD - HT'S

BY N.S. HARISANKAR, VU3NSH. Tel : 808 985 3511

Concept of this circuit

Long back, handheld rigs were having 2mt (144 MHz) frequencies only; after that dual banders are introduced. Now handheld rigs are in **'four flavours'** (6m, 2m, 70cm and 23cm). These stuffs are consuming different levels of current at 13.8V DC. These erratic current consumption is due to different circuits and different circuit specifications. Generally its current consumptions are like 1.3A, 1.4A, 1.8A and 1.6A etc. (see table 1) at different RF output levels. For eliminating this problem, we need a regulated power supply, which will give good stream of current upto 2 to 2.5A and stabilized dc voltage of 13.8V. It should be regulated with very good line - load regulations, dc high voltage output protection, autocurrent limiting, remote sensing, high ripple rejection, simple design with economical and easily available components for 'Home Brewing'. This new gear fulfil all amenities like standard PSU.

Working

Unregulated dc voltage from rectifier stage (D_1 to D_4 & C_1, C_2) is fed to the collector of the super - alpha connected pair (Darlington Pair) T_1 & T_2 made of using TIP 3055 and BEL639. The output is taken from the emitter of T_1 through a low value current limiting resistor (Rsc). This Darlington transistor gets bias through resistors R_2 & R_3. When a voltage in the range of 18 to 25 volts (Vin) is given at the input, load current is drawn through T_1 - TIP3055. Output voltage is the difference between the input voltage and the drop across T_1. Transistor T_3 and T_4 - BC 548B and BC 549CP is an error amplifier. T_1 and this Darlington Transistor share current flow through the resistor R_2 and R_3. Emitter of T_3 is at a reference potential as 6.2 volts derived using the zener diode Z_2. The temperature coefficient of a zener diode changes from negative to positive between 5 and 6V. Because of this, zener diode with breakdown voltages in this area will have temperature coefficient of approximately 'Zero'. In critical applications, therefore, zener voltages near 6V are used because the zener voltage is constant when temperature changes over a large range. This highly stable zener voltage, sometimes called a ***"reference voltage"***, can be amplified with a negative-feed back amplifier to get a higher output voltage that has the same temperature stability as the reference voltage. A fraction of the output voltage is applied to the base of transistor T_4 - BC549CP through the potentiometer P_1 and associated resistors in the potentiometer circuit.

If the output voltage tends to increase, then the transistor T_4 base gets more voltage and hence its collector current increases. This in turn reduces the bias current to the series pass transistor T_1. This reduction in base drive causes more voltage to drop between collector and emitter of this transistor thereby reducing the output voltage to bring back to the set value. On the other hand if the output voltage is tending to reduce, then T_4 gets less bias and it's collector current reduces and hence an increase in base current for T_1. This reduces the voltage drop across T_1 and output voltage rises to the set value. So under normal operating condition. The output tends to stabilize to a voltage equal to zener voltage + Vbe of T_4 + fraction of the output voltage available at the wiper of P_1. Output voltage can be adjusted by P_1 (see Eq.1) Capacitor C_4 is for suppressing over shoot when there is a change in operating condition.

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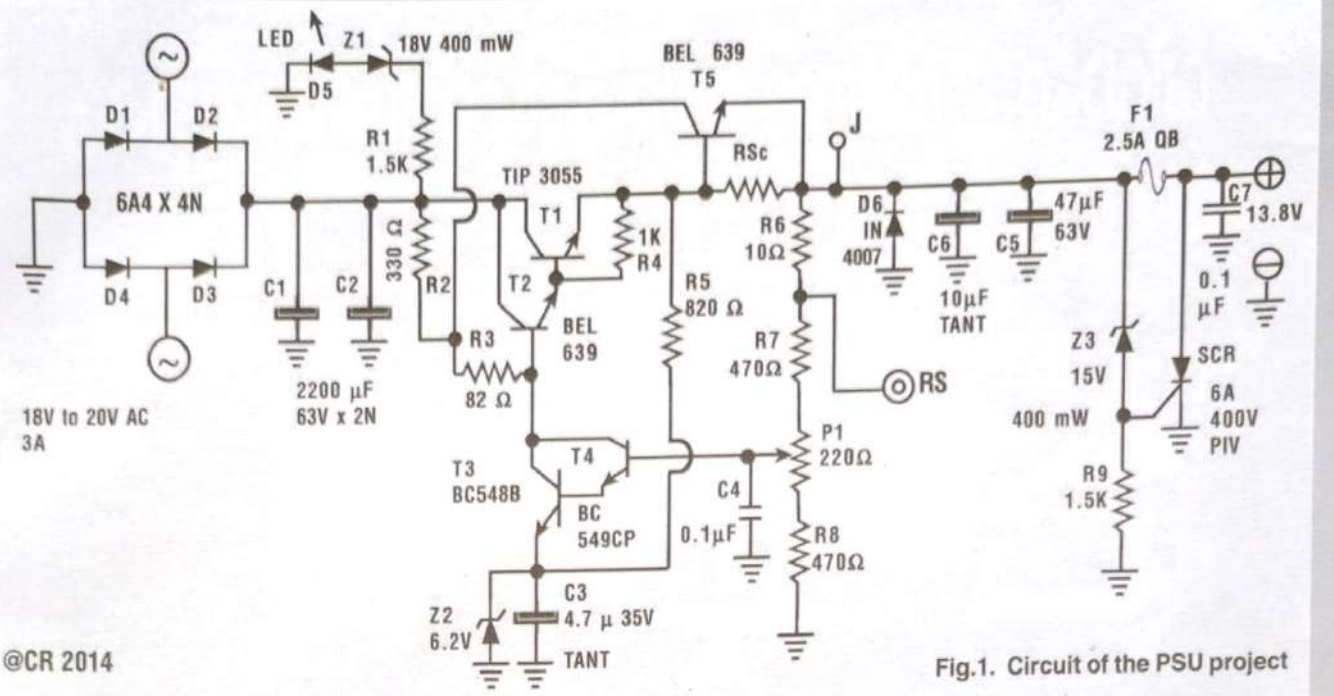


@CR 2014

Fig.1. Circuit of the PSU project

Table 1

Handheld rigs and current consuption at TX mode

Model	V	A	RF W
DJ - V5T	13.8	1.6	5
DJ - G1T	13.8	1.5	5
IC - 2GXAT	13.5	1.8	7
IC - W32A	13.5	1.6	5
DJ - 195T	13.8	1.2	5
FT51R/HP	-	1.9	5
TH - D7A	-	1.8	5

Regulation

Stability of the output voltage depends on several factors : The "***correction***" of the output takes place only if there is an "error" voltage that tends to drive T_1 to correct the output. This error will be minimum if the gain of the error amplifier transistor is high. High gain error amplifier causes a large change in base current of T_1 and as a result, even a very small change in output voltage can be compensated. In this circuit error amplifier is based on transistor T_3 and T_4 - BC548B and BC549CP. In this error amplifier, using BC549CP is a low noise transistor will give good results. T_3 and T_4 are configured as Darlington and it's total gain is more than it's multiplied HFE. Capacitor C3 - 4.7µF Tantalum, is for smoothing the voltage across zener voltage, free from any noise generated inside zener diode. Using resistor R_4 at emitter, base of T_1 will prevent any leakage from T_2.

Over current Limit

The max. current that can supply by the regulator is decides by "Rsc" Resistor. Voltage drop across this resistor is proportional to the load current. If this increases to the level of cut in voltage of the base emitter junction of T_5 BEL 639, then T_5 begins to conduct. When T_5 conduct, base current flowing through R_2-330Ω

Table.2 - Current Limit

(Ved / RSc) = (0.7V / Rsc) = I Limt.

Rsc wats = 0.7V x I Limt.

I Limit	Rsc	Rsc W
800 ma	0.87Ω	0.56W
1 A	0.7Ω	0.7W
1.4 A	0.5Ω	0.98W
2 A	0.35Ω	1.4W
2.5 A	0.28Ω	1.75W
3 A	0.23Ω	2.1W

is bypassed through T_5. This in turn reduces the base drive of T_1. This action maintains a voltage of 0.7V / Rsc amperes (ref. table 2). Resistor R_2 and R_3 are selected to maintain a voltage of about 2 volts across collector and emitter of T_5 during current limiting operation.

Remote Sensing - RS

If the power supply is connected to the load using long wires, the voltage available to the load is reduced, as there will be drop along the power supply leads. This drop depends on the load current and the resistance of wire. As a result, the lead regulation becomes poor. A method called ***'Remote - Sensing'*** can be employed to check the voltage available across the load terminals and to compensate or stabilize the output voltage at the end of the power supply lead. If remote sensing is not used, short circuit the jumper - "J" and 'RS'. For remote sensing; remove short and connect the sense input (RS) to +ve input of the load.

DC High Voltage Protection

SCR, Zener-Z_3 and Resistor R_9 is a crowbar circuit. Assume, when dc output voltage increases for any reason whatever. When output dc to load (13.8V) is too large, the Zener - Z_3 15V conducts and a voltage appears across R_9- 1k5, and it will trigger SCR. The SCR turns on and conducts ***heavily***. This action is similar to throwing a 'crowbar' across the load terminals and the fuse F1-2.4A blows off. Crowbarring, though a drastic form of protection, is necessary with many digital IC's; they cant take much overvoltage. Rather than destroy expensive IC's or other components in side the load (Rig).

Vin Normal Indicator

Resistor R_1 - Zener - Z_1 and D_5 - LED are employees as Vin "normal" indication. If the raw voltage dc is around 18V or above, the LED - D_5 will glow. If it is bellow 18V, then it will Turn off.

Reverse Polarity Protection

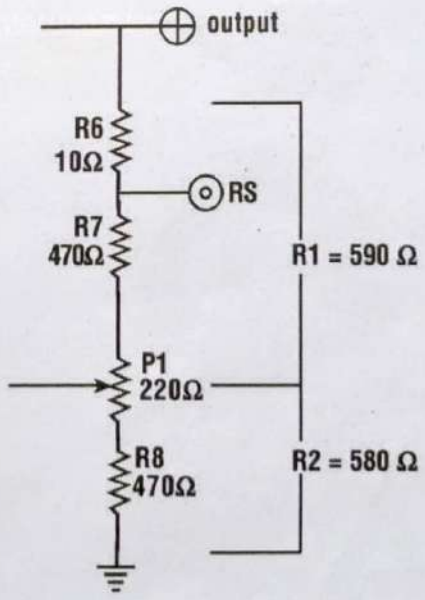
When a reverse dc voltage applied at the output terminals will damage this circuit. To protect this circuit, a diode is connected at output +ve to – ve of the output. Diode D_6 - IN4007, when an reverse supply occur at output this diode conducts heavily due to forward bias and it will faithfully destroy fuse F1.

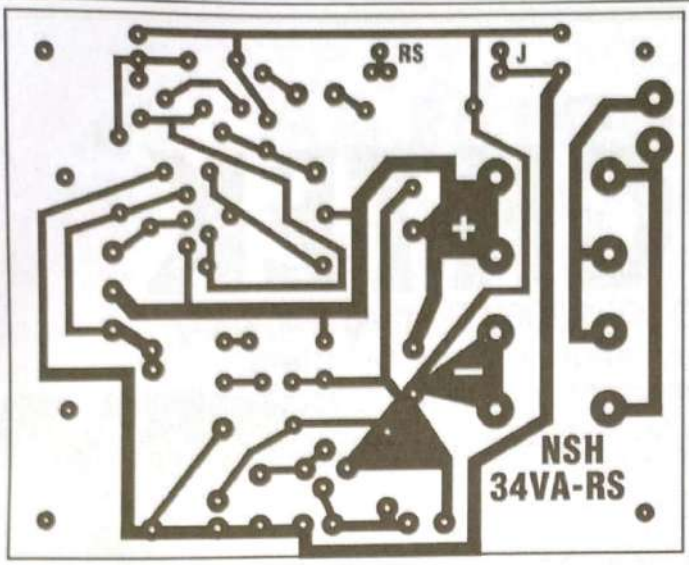
Equation 1

$$Acl = \frac{R1}{R2} + 1, \quad \frac{590\ \Omega}{580\ \Omega} + 1 = 2$$

Vout = Acl (Vz + Vbe), 2 (6.2 + 0.7) = 13.1

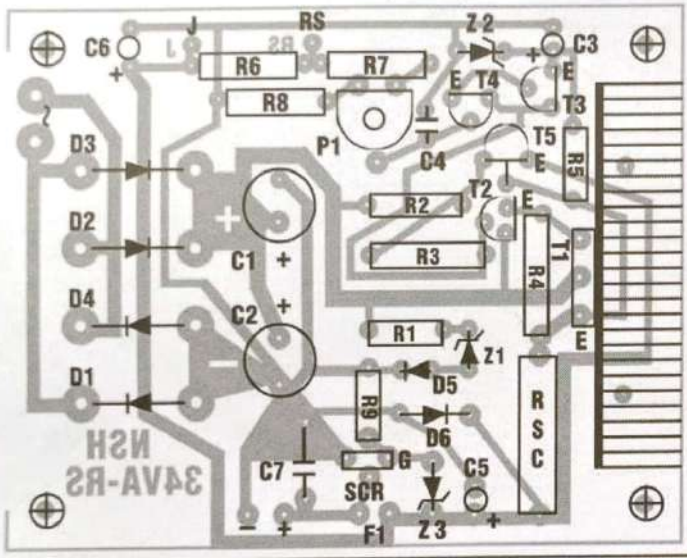
Acl - The closed - loop voltage gain





PCB Track Side

PCB Component Side



SPECIFICATIONS AND FEATURES

★ Output DC	13.8V
★ Output Current	2.5A Max
★ Lin Reg	2.86%
★ Load Reg	0.87%
★ PD	30W+

★ Wide AC input span
★ Remote Sensing
★ Auto Current Limit
★ Crowbar Protection
★ Economical Design
★ Vin-normal Indication

FEW COMMENTS

* Tin coated PCB should be used for this project.
* Use Large Heat Sink for T1
* Use MOV in parallel with Transformer Primary to prevent surge / spike protection (Philips 240V - 20).
* After soldering clean the PCB with Isopropyl Alcohol.
* The transistor BEL 639 is not available, use BC 639 (ref. pin configuration of BC 639). BC549CP is low noice high gain type, or use BC549C
* Data for BEL 639 is available from Bharath Electronics Ltd., (A Govt. of India Enterprise), Jalahalli P.O., Bangalore, Pin - 560 013, India. Phone : 91 080 3345382 Website :// www.bel-india.com

SHOPPING LIST

RESISTORS

5% carbon

1.5KΩ ¼W	2	R1, R9
330Ω ½W	1	R2
82Ω ½W	1	R3
1KΩ ¼W	1	R4
820 Ω ½W	1	R5
10Ω ½W	1	R6
470Ω ½W	2	R7, R8
Preset		
220Ω	1	P1
Rsc	1	See Text (Table 2)

CAPACITORS

Electrolyte 63V working

2200 µF	2	C1, C2
47 µF	1	C5
Tantalum 35V Working		
4.7µF	1	C3
10µF	1	C6
Polypropylene, Mini 100V working		
0.1 µF	2	C4, C7

SEMICONDUCTORS

6A-400 V PIV (6A4)	4	D1, 2,3,4
1N 4007	1	D6
LED	1	D5
TIP 3055	1	T1
BEL 639	2	T2, T5
BC548B	1	T3
BC 549 CP	1	T4
TYN604 or TIC126 B	1	SCR
18V 400mW	1	Z1
6.2V 400mW	1	Z2
15V 400mW	1	Z3

MISCELLANEOUS

DC output terminals, fuse holder, AC cable, LED holder, PCB, Heat sink for T1, on-off switch, fuse, transformer 0-18V-3A-230V Primary, metal box etc.

AN RF POWER METER

P. R. VAIDYANADHAN. VU2 PRV

RF power measurement is a must for any Radio Amateur.Though on-line power measurement is preferable as it shows the power output in a real-time, real antenna basis, home brewing an on-line meter is somewhat involved and will need some toroids of known parameters which are not accessible to a average Home-brewer in VU.

This wattmeter is simple to build and needs only components available in VU .This power meter measures the transmitter power by connecting the transmitter to a dummy load of 50 ohms and reading the peak RF voltage across it. The RF voltage is then converted Power in Watts using the Formula given below The first step is to build a 50 ohm resistive Dummy load capable of withstanding, say, a max of 100W for short time . A 20 watt dummy load will stand 100W for about 8 seconds without any problem.(tolerate the bad smell) If one is sceptical about this , higher wattage Dummy loads can be built using higher wattage resistors.

The dummy load described here makes use of 12 nos 150 ohm/2W resistors ,arranged in two sets to make 25 ohms each. Each bank have 6 nos resistors in parallel making the effective resistance to 25 ohms. Two such banks are connected in series to make the overall resistance to 50 ohms. Each resistor being rated for 2W the Dummy will have 24W rating. If one can find 3W or 5W rated 150 ohms resistors, the overall rating of the dummy will be 36W or 60W.

The RF voltage developed across the Dummy load when connected to the Transmitter output,is rectified with a pair of signal diodes and the resulting DC is filtered using a 0.1 uF capacitor.The DC voltage thus obtained is measured with a dedicated voltmeter or by using a good multimeter.

As we are using a filter capacitor, the DC voltage shown by the meter will be the peak value of the RF. The power output is then calculated with the following formula:

$$P = V2/2R.$$

Where P is the power ,V is the voltage and R is the resistance of the Dummy

For eg, if the Voltage reading is 50V, the Power is 502/ 2*50 = 25W.

Two signal diodes are connected in series to increase the peak reverse voltage of the rectifier. I used 1N5711 semi schottky diodes with PRV of about 50v; two of them in series will make the PRV to >.100v max .Diode 1N4148 can also be used but the forward voltage drop will be more.

To be on the safer side, when measuring more than 50W, the rectifier diodes are switched to across 25 ohms so as to limit the Peak reverse voltage . The voltage reading in the meter will be then one half of the actual value and hence the reading will have to be multiplied by 2 to use in the formula.

If a dedicated meter is used for Power indication, the Dial can be calibrated directly in Watts using the following table. A good quality moving coil meter with 100uA movement can be used with dropping resistors as shown in the diagram to get a full scale voltage reading of 50V. This can be checked with a reliable multi meter also.

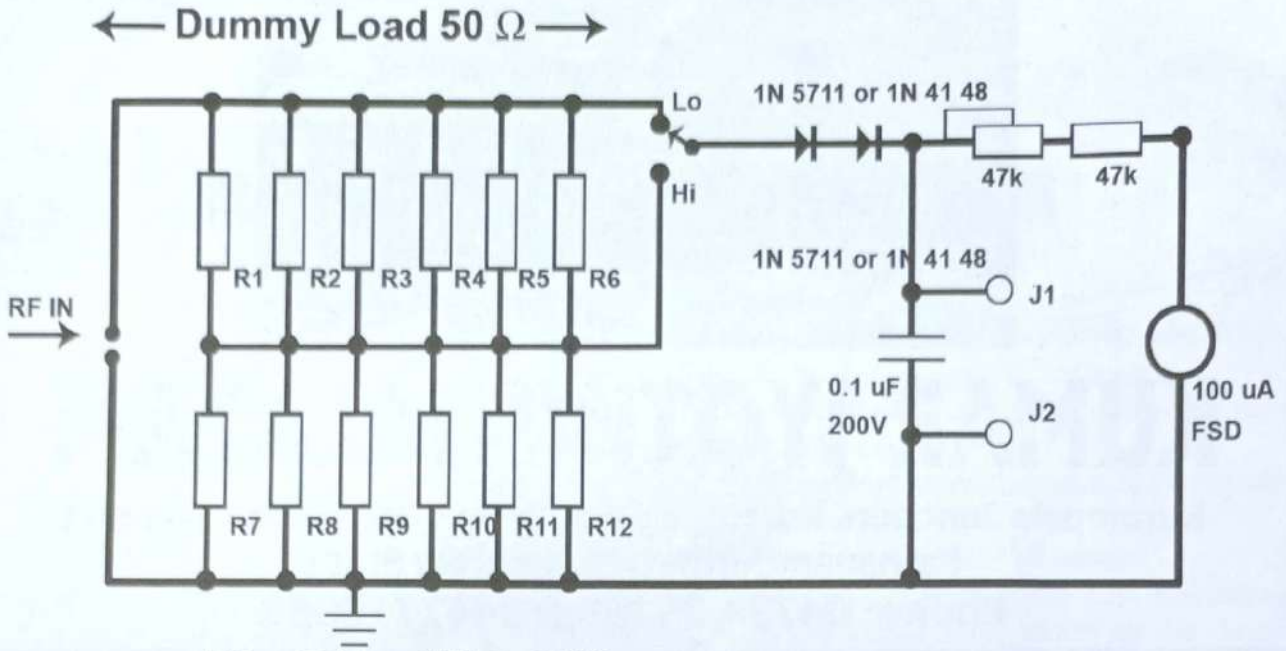
The accuracy of the meter is affected by two reasons:

1. The resistors used are carbon film or metal film variety instead of the carbon composition type needed ideally. The latter is not available now. The former type has invariably some inductance and therefore the Dummy will not be purely resistive. But , since 6 nos resistors are used in parallel, the effective inductance will be reduced proportionally.

2. Because of the small forward conduction voltage of the rectifier diodes the voltage readings obtained will be lower by the fwd voltage. Schottky diodes typically have fwd conduction voltages around 0.2V where as silicon signal diode have >0.6V. Therefore it is preferable to use Schottkys if they are available . In any case the error will be negligible for all practical purposes.

TABLE

Voltage	Power
22 V	5W
31 V	10W
38 V	15W
44 V	20W
50 V	25W
55 V	30W
63 V	40W
70 V	50W
86 V	75W
100 V	100 W



R1 - R12 - 150Ω /2W

If no self contained 100uA meter is not used connect multimeter to J1 & J2 - 0-50V range

RESISTANCE COLOUR CODE

Band Color	Digit	Multiplier	Tolerance
Black	0	1	---
Brown	1	10	±1%
Red	2	100	±2%
Orange	3	1,000	±3%
Yellow	4	10,000	±4%
Green	5	100,000	---
Blue	6	1,000,000	---
Violet	7	10,000,000	---
Gray	8	100,000,000	---
White	9	---	---
Gold	---	0.1	±5%
Silver	---	0.01	±10%
None	---	---	±20%

KUMAR JYOTHISHALAYAM

Kurampala Junction, Kurampala South P.O., Pandalam-689 501
Pathanamthitta (Dist.), Kerala State
Phone: 04734 252653, 9447718653

നക്ഷത്രം, പൊരുത്തം, മുഹൂർത്തം, ജാതകം ഇവ എഴുതി നൽകുന്നു
ഗ്രഹപ്പിഴ ശാന്തിക്കായി പരിഹാരങ്ങൾ നൽകുന്നു. രത്നങ്ങളും നൽകുന്നു

ഗൃഹൈശ്വര്യത്തിന് വാസ്തുശാസ്ത്രം അനുസരിച്ച്
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DCF (Non IFS) (Rtd)

ജ്യോതിഷഭൂഷണം, ജ്യോതിഷാചാര്യ, വാസ്തുഭൂഷണം

USB PIC MICROCONTROLLER PROGRAMMER

VIKAS, VU2VVA

When we decided to promote the use of microcontroller among hams, the biggest challenge that we faced is the programmer that has to be recommended. Since the microchip family adapts serial programming, we have option from the simplest programmer containing few components with RS232 or Centronics connector interface. But we found that most of the enthusiasts are now dependant on laptops which is not having these variety of interfaces and they will not function properly with windows XP or a later option. The search now extended to the new USB interface. Since at least some of the target people have some prior experience with MPLAB, the IDE provided by Microchip itself, It became a necessity to promote a programmer with MPLAB support. Till this point we are not sure how many of our targeted people will continue to stick with this family of microcontroller and to what extend they will acquire expertise in microcontroller programming, we decided this clone of PICKIT which works comfortably with MPLAB. For a newcomer who is not familiar with ICSP concepts, we modified the same with a ZIF socket and connectors so that at least the popular PIC IC s can be programmed with it as a standalone programmer. Later when they become comfortable with ICSP and In circuit debugging, they can still use the programmer without any modification. The additional cost of this design it worthwhile considering its functionality.

About the programmer

The programmer is designed in a single sided glass epoxy PCB. In order to avoid much complexity and to avoid the burden to make a few numbers of PCB of Double sided plated through hole, a few jumpers are included. For those who use this as an ICSP programmer, the ZIF socket part may be avoided and also that portion of the PCB may be cut off. This may help to reduce the footprint of the same.

Sequence of assembling

There is no strict rule for assembling the pcb. But inorder to avoid confusions we recommend the pcb to be assembled in this sequence.

1. the jumpers are to be placed and soldered first.
2. all the resistors are to be soldered
3. the diodes are to be soldered with enough care about the polarity
4. the electrolytic capacitors are to be placed with proper polarity
5. other capacitors are to be placed.
6. The IC sockets and connectors are to be placed
7. the usb socket, LEDs switch etc are to be placed.

Before applying power double check the layout for any error in placement, wrong polarity etc. since the pads are very close in certain places, be careful not to bridge during soldering. You can normally expect dry solders when IC and ZIF sockets are soldered depending on the quality of the same and the duration they are kept on shelf. So clean the leads thourougly before soldering and apply a good quality flux. It will be a better practice to solder the vacant pins of the IC sockets as well considering the mechanical strength.

Programming the chip

The HEX code of the programmer should be loaded on to the PIC before it is placed in the programmer. A working programmer should be used to programme the same or u can alternately but a chip with is preloaded with the hex code. Verify the code if you are doing the same by yourself.

Testing

If every thing is double checked, you can connect the programmer with a PC having Windows XP operating system or above through a USB cable. If everything is alright a new hardware found intimation will be displayed. If not check the cable, connector, USB port etc. in the worst case it won't get detected if the IC is faulty.

Now install the software and open the application. Once again connect the programmer. Proper jumpers are to be placed according to the controller you are targeting.

VU3NKK's Homebrewed HF Amplifiers

PA150	**- 200W**
NKK300-LA	**- 400W**
NKK600-LA	**- 600W**
NKK1100-LA	**- 1200W**

Frequency	- 1.8 - 28 MHz all amateur bands including WARC bands.
Mode	- SSB, CW, RTTY.
RF Drive	- 5W / 10W / 25W typ. for 200W / 400W / 600W / 1200W
Output Power	- PEP max, 150W / 300W / 500W / 1000W CW (typ), 200W / 400W / 600W / 1200W in SSB max.
Drain Voltage	- 13.8V for PA150 & NKK300LA. 50 VDC for NKK600/1200LA
Impedance	- 50 Ohms (unbalanced)
Circuit	- Class AB parallel push - pull.
Cooling method	- Forced Air cooling multi speed.

* Specifications subject to change without prior notice

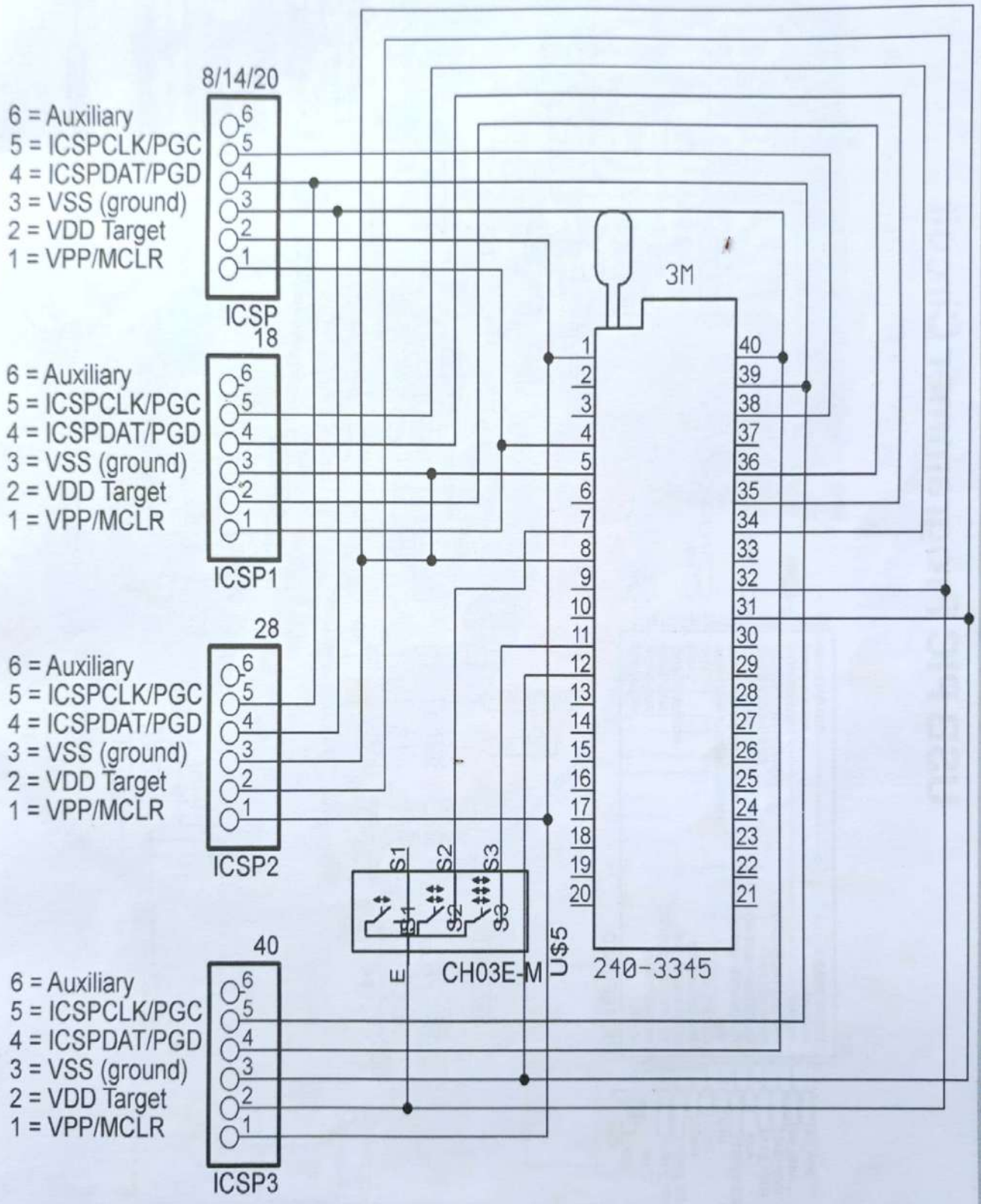
Full tested unit price:

PA150, 200W	**: ₹ 7,200/-**
NKK300LA, 400W	**: ₹ 24,000/-**
NKK600LA, 600W	**: ₹ 51,000/-**
NKK1100-LA, 1200W	**: ₹ 60,000/-**

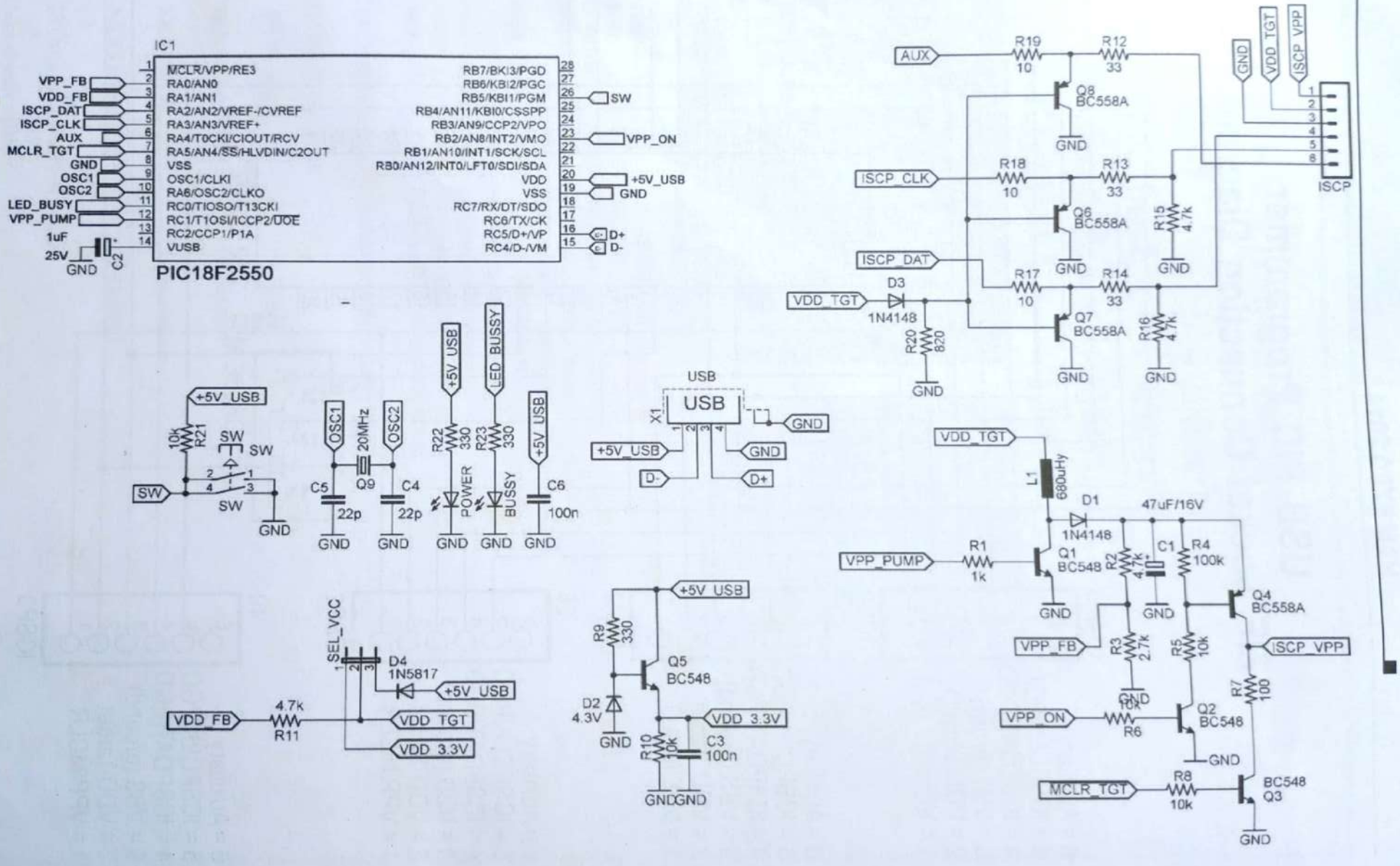
Add shipment charges extra.

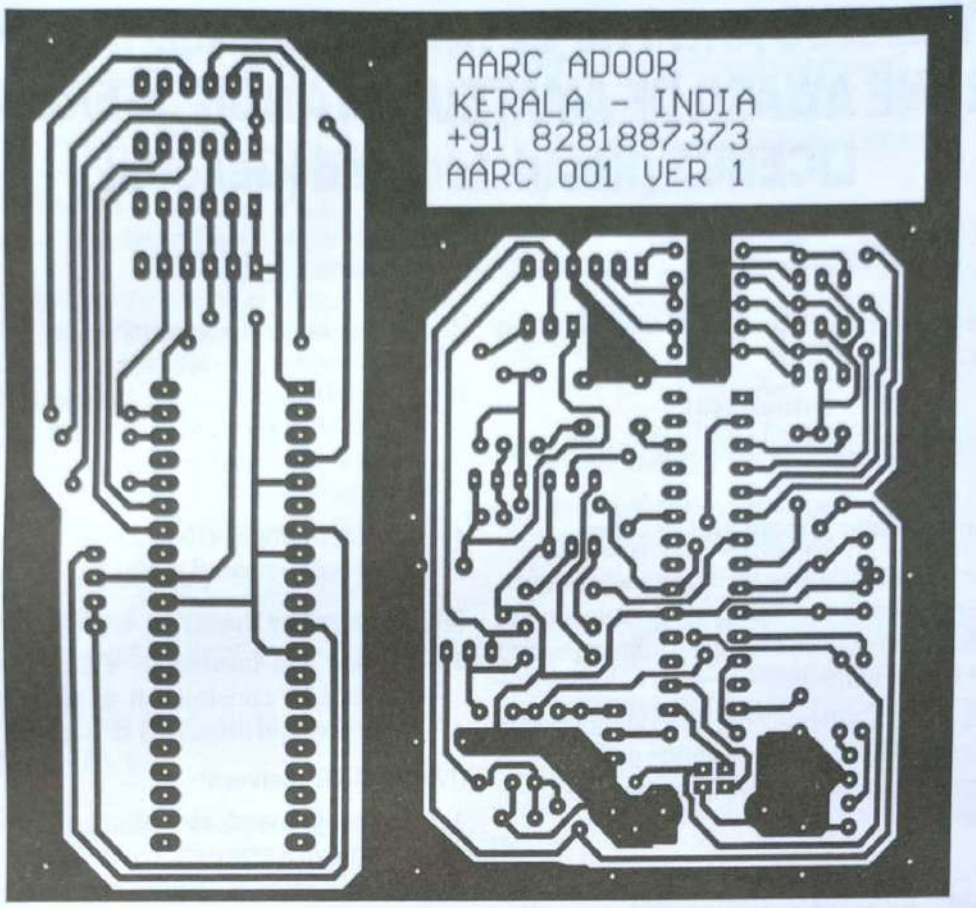
vu3nkk@yahoo.com,

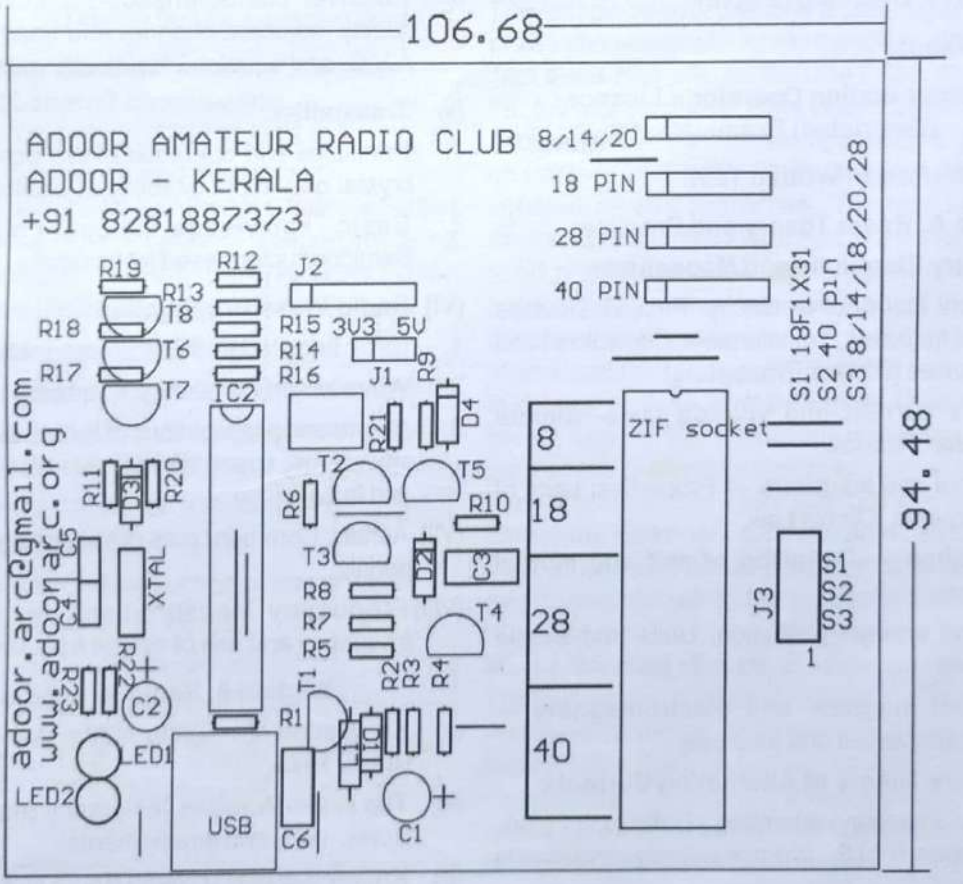
USB PIC Programmer
ZIF Socket Connection Diagram



USB PIC Programmer Circuit







SYLLABUS AND THE DETAILS OF EXAMINATIONS FOR THE AWARD OF AMATEUR STATION OPERATOR'S LICENCE (Restricted) and (General)

Demastan VU3DMT
demastan.blogspot.com

1. The examination shall consist of the following two parts:

PART 1 - Written Test

It shall comprise of one paper containing two sections as under:

Section A: Radio Theory and Practice

Note - Applicants holding degree in Engineering/Science or Diploma in Engineering and having studied electronics or telecommunications shall be exempted from appearing in Section A of Part-I of the test.

Section B: National and international Telecommunication Union (ITU) Radio Regulations applicable to the operation of amateur station and those relating to the working of station generally.

PART II - Morse
(Only for General Certificate)

Morse reception and sending (8 wpm)

2 Detailed syllabus:

2.1 Amateur Station Operator's Licence (Restricted) Examination

Part I - Written Test

Section A: Radio Theory and Practice:

(I) Elementary Electricity and Magnetism:

1. Elementary theory of electricity- Passive Devices (Resistors; Inductors, Transformers, Capacitors) and Active Devices (Diodes; Transistors).
2. Kirchoff's current and voltage laws- Simple applications of the law.
3. Conductors and Insulators — Properties; units of circuit elements, Ohm's Law.
4. Conductance — Definition of self and mutual inductance;
5. Power and energy- Definition, Units and simple applications.
6. Permanent magnets and electromagnets — Definition, properties and their use.

(ii) Elementary Theory of Alternating Currents:

1. Sinusoidal alternating quantities - Definition of peak, instantaneous, R.M.S., average values and its simple application.
2. Phase, reactance, impedance, power factor- Definition, units and simple • applications.
3. Parallel and Series Circuits series and parallel circuits containing resistance, inductance, capacitance; resonance in series and parallel circuits, coupled circuits.
4. Rectifiers, voltage regulation and smoothing circuits - Their basic knowledge and simple application.

(III) Elementary theory of Semiconductor Devices:

1. Diodes and transistors- Properties use of these devices for construction of amplifiers, oscillators, detectors and frequency changers.

(IV) Radio Receivers:

1. Principles and operation of T.R.F. and super heterodyne receivers.
2. CW reception.
3. Receiver characteristics-sensitivity, selectivity, fidelity, adjacent channel and image interference, A.V.C. and squelch/circuits signal to noise ratio.

(v) Transmitter:

1. Principles and operation of low power transmitter, crystal oscillators, stability of oscillators.
2. Basic knowledge about construction of Semiconductor based transmitters.

(VI) Radio Wave Propagation:

1. Basic knowledge of Electromagnetic Spectrum.
2. Wave length, frequency, frequency bands.
3. Nature and propagations of radio waves, ground and sky waves, space waves, skip distance, skip zone and fading.

(VII) Aerials: Common types of transmitting and receiving aerials.

(VIII) Frequency Measurement: Measurement of frequency and use of simple frequency meters.

Section 8: Radio Regulations:

(a) Knowledge of :- (i) the Indian Wireless Telegraph Rules, 1973.

(ii) The Indian Wireless Telegraphs (Amateur Service) Rules, 1978 and amendments.

(b) Knowledge of ITU Radio Regulations as relating to

the operation of amateur stations with particular emphasis on the following:

Item	Provision of Radio Regulation (2008 edition)
Designation of Emission	Appendix-I
Phonetic alphabets and figure code	Appendix 14
Nomenclature of the Frequency & Wavelength	Article 2
Frequency allocation for Amateur Services.	Article 5
Interference, measures against interference & tests.	Article 15
Identification of Stations.	Article 19
Distress Signal, Call and Message. Transmissions	Article 30,31,32 & 33
Urgency Signal, Call and Message Transmissions.	Article 30, 31, 32 & 33
Amateur Station.	Article 25
Call Sign series allocated to India	Appendix 42

(c) Standard Frequency and Time Signals Services in the World.

d) The following 'Q' codes and abbreviations shall have the same meaning as assigned to them in the Convention.

QRA, QRG, QRH, QRI, QRK, QRL, QRM, QRN, QRO, QRS, QRT, QRU, QRV, QRW, QRX, QRZ, QSA, QSB, QSL,QSO, QSU, QSV, QSW, QSX, QSY, QSZ, QTC, QTH, QTR, and QUM.

Abbreviations: AA, AS, AR, AS, C, CFM, CL, CQ, DE, K, NIL, OK, R, TU, VA, WA, WB.

Note:-

1. The written test will be of one hour duration. The maximum marks will be 100 and candidate must secure at least 40 % in each section and 50% in aggregate for a pass.
2. There will be NO Morse test for restricted grade.

2.2. Amateur Station Operators' License (General) Examination

Part I - Written Test

Section A: Radio Theory and Practice

In addition to the syllabus prescribed for Amateur Station Operator's License (Restricted) examination, following items shall be included in the syllabus of Amateur Station Operators' license (General) examinations:

(1) Principles of Communications:

1. Elementary idea of analog and digital communication.
2. Need for modulation; Modulation- amplitude, frequency and pulse modulation.
3. Elementary idea about demodulation.

(ii) Alternating current:

1. Basic concepts on construction of transformers.
2. Definition of Transformer losses.
3. Transformer as a matching device

(iii) Semi Conductor devices and Transistors:

1. Elementary principles of conduction and construction;
2. Symbols and biasing methods.

(iv) Power Supplies:

1. Basic knowledge of half wave and full wave rectifiers.
2. Definition and application of Bridge rectifier, smoothing and regulating circuits.

(vii) Transmitters and Receivers:

1. Elementary principles of transmission and reception of Facsimile and Television signals,

(viii) Propagation:

1. Characteristics of ionosphere and troposphere.
2. .Properties of ionosphere layers.
3. Critical frequency and day / night frequencies.

(ix) Aerials:

1. Principles of radiation.
2. Aerials for different frequency bands including aerials for microwave,

(x) Space Communications

1. Elementary principles of communication via satellites.

Secon B: Radio Regulations:

Same syllabus as prescribed for Amateur Station Operators' License (Restricted) examination.

The above written test will be of two hour duration. The maximum marks will be 100. A candidate must secure at least 50 % in each section and 60% in aggregate for a pass.

Part II-Morse

Morse receiving: (Speed: 8 words per minute)

The test piece will consist of a plain language passage of 200 characters which may comprise of letters, figures. Test piece may also contain the following punctuations i.e. full stop; comma; semi colon; break-sign; hyphen and question mark. The average words shall contain five characters and each figure and punctuation will be counted as two characters. The test will be for five consecutive minutes at a speed of 8 words per minute. A short practice piece of one minute shall be sent at the prescribed speed before the start of the actual test. Candidates will not be allowed more than one attempt in Morse reception and sending test, the test may be written in ink or pencil but must be legible. Over-writing will be treated as error. If any correction is required the candidate may struck the wrong character and write the correct above the character. More than 5 errors will disqualify a candidate. However ii a candidate receives without any error in any part of the passage continuously for one minute duration will be declared successful in the Morse reception test.

Morse Sending (Speed: 8 words per minute)

The test piece will be similar to Morse Receiving test for Amateur Station Operators' License (General) examination. Candidates are required to send for five consecutive minutes at a speed not less than 8 words per minute. Other conditions are the same as applicable to Amateur Station Operators' License (General) examination.

Operating Procedure for Ham Radio

C. Demastan, VU3 DMT

Most of the experienced hams as well as new comers are coming now days on air without having clear understanding and knowledge about the amateur radio operating procedures. Amateur radio has developed its own operating procedures and ethics for making happy QSO on the air. Can u imagine being released on the roads, in heavy traffic, without knowing how to drive a car? The knowledge of the amateur radio code of conduct is an important for the hams as the knowledge of Indian Wireless Armature Rules and regulations.

Ham language

A good radio amateur is an active listener so that learn a lot by listening. During on the air contacts, use the Q codes and abbreviations correctly and can also use standard expressions that everybody understands. Use the one and only International spelling alphabet correctly. The most widely used language in ham radio is undoubtedly English, but u can use as well as Esperanto or regional language if the other side knowing that language.(I advise to read an article published in Ham fest 2014 souvenir about Esperanto for Ham radio by OM.Hari Rao,VU2GZ). Your language must be polite, courteous and gentle. It is clear that this hobby can be an excellent tool for learning and practicing English language.

How to make a QSO

Before starting QSO first check the band in use by listening for a while and if the frequency seems to be clear ask if it is in use. If still no one replies start CQ call by calling "CQ...CQ...CQ...de Victor Uniform three Delta Mike Tango calling and standing by..."in three times. If you want a specific station, your call may be " Victor Uniform Two Charlie Papa Alpha de Victor uniform 3 Delta mike Tango calling and standing by...".If u want to contact long distance stations call "CQ DX". Do not end a CQ with 'over" or "QRZ".Using the word "over" at the end of a QSO is recommended and a QSO consists of a number of transmissions or overs. "Over" stands for ' over to you". An ideal CQ call on CW is like this "CQ CQ CQ de vu3dmt vu3dmt vu3dmt k".

If a station answers CQ call, the first thing to do is to acknowledge his call, after which you can right away tell how you all receiving his transmission by give him your name and QTH.In phone contact, we exchange Readability and signal strength report. Of course it is simple to say "you are 59" in which 5 indicates the readability and 9 is signal strength. If the readability is not perfect you can say the name and QTH in phonetic alphabets. Do not say the phonetic alphabets twice like Delta Delta Mlc Mic Tango Tango" that may cause confusion. In most short QSOs, it is better to describe the details of equipment, antenna and other details about weather condition, temperature, humidity can be exchanged. As a manner it is the station that was first on the air (the station who called CQ) that should take the initiative to bring up subjects of conversations. Many hams are well expert and experiences to discuss many interesting technical subjects on the air while they making QSOs.It is better to remember that your QSOs are monitoring many people in their shacks eagerly so that you are always take care about what you are saying. Technical discussions being developed and results of experiments being exchanged because this hobby is intended for self-training.

At the end of the QSO, say 73 and thanks for the contact.73 is also commonly used in phone contact that means 'best wishes' .So never say or write 73s, best 73,or best 73s, all of these are incorrect.

CQ call in Phone contest

Contest is the name for a Radio communication competition between radio amateurs and it reflects the competitive side of Ham radio. In a contest a valid QSO is made when a call sign, signal report and often a serial number are exchanged. Contest operating is all about speed, efficiency and accuracy. "Thank you", "73", "see you later", etc. are just not said in a contest. It is all a waste of time. Make a CQ Contest call to invite other stations and make as many contacts as possible in a short time. Most contest operators use computer contest log book which is easily available in internet.

CQ Call in Repeater

Use repeater in simplex mode whenever possible and serve in the first place to extend the operating range for mobile stations. Do not interrupt a conversation without identification and if it is already in use, wait for a pause between transmissions to announce your call. Only use the term "break" or even better "break...break" in an emergency situation. Do not monopolize the repeater because others may want to use the repeater as well.

Nets

Local nets are those that cover small areas such as a city, country or metropolitan area that usually operate by VHF (typically 2-meter FM) and HF frequency at morning and evening regularly. Do not use net frequencies during the net time. Don't try to jump into net without knowing the call sign of the net controller. If you do not have any emergency situation, don't try to early check. Do not try to make QSOs between checking stations and only talk to the net controller and follow the net controller always. Give check back calls, only when the net controller asks for further checking. When you need to want specific station to contact, give a contact call and stand by in the quee.In VHF nets first preference goes to mobile stations and DX stations. DX station means in case of HF, the stations outside the continent or country and VHF -UHF, the stations located at more than 300 kilometers.

Log Book

Each and every contact must be recorded in the well bounded book called Log book. The details like date, time of starting QSO, call sign, report, frequency, emission type power output, time of ending QSO must be recorded in the Log Book.

QSL cards

A QSL card is a post card sized report confirming a QSO. If u wish to exchange QSL, mention it during the QSO.QSL cards may be mailed directly to the other station or via a QSL bureau. It is a good practice among the hams to exchange QSL cards by confirming QSOs.

As we know ham radio is a unique hobby for self-training and development, we have to follow good operating procedure all the time. Most of the bad practices are caused ignorance; many hams don't know the rules well enough. It is advisable to keep a copy of Amateur wireless telegraph rules on your table always and be cool for happy Haming...

Repeaters and Net timings

C. Demastan, VU3DMT

Location	Call Sign	Frequency (MHz)	
		Tx (out put)	Rx (in put)
Bangalore	VU2IU	145.200	145.800
	VU2RSB	145.700	145.100
	VU2TWO	145.650	145.050
	VU2ZO	145.250	144.650
Bombay (Mumbai)	VU2BBB	145.000	145.600
Cochin (Kochi)	VU2CHN	145.000	144.400
Coimbatore	VU2RPT	145.800	145.200
	VU2AOT	145.750	145.150
Hyderabad	VU2SDZ	144.720	145.320
Idukki	VU2HEN	145.100	145.700
Kilakarai	VU2ECS	145.550	144.950
Kodaikanal	VU2KOD	145.150	145.750
Calcutta (Kolkata)	VU2CVH	145.650	145.050
Madras (Chennai)	VU2MRR	145.775	145.175
	VU3MVR	145.675	145.075
	VU2SMA	145.600	145.000
	VU3VGC	145.575	144.975
Mysore	VU2TRE	145.725	145.125
New Delhi	VU2RRG	145.200	144.600
	VU2DLR	145.600	145.000
Palakkad	VU2BCM	145.650	145.050
Pathanamthitta	VU2DFD	144.475	145.075
Quilon (Kollam)	VU2CSD	145.350	144.750
Rajapalayam	VU2RYM	145.600	145.000
Tanjore	VU2TJR	145.850	145.250
Tiruchengodu	VU2TCD	145.125	145.725
Tirunelveli	**VU2LEU**	**145.850**	**145.250**
Tuticorin	VU2KJO	145.675	145.075
KERALA Calicut	VU2CSR	145.075	145.675
Kannur	VU2MWW	145.075	145.675
Cochin	VU2CHN	145.000	144.400
Thiroor	VU2MJJ	144.850	145.450
Kollam	VU2CSD	145.350	144.750
Thodupuzha		144.700	145.300
Palakkadu	VU2BCM	145.650	145.050
Pathananmthitta	VU2DFD	145.075	144.475
Trivandrum	VU2XT	145.600	145.000
Yercaud	VU2YCD	145.850	144.250

UHF Repeaters

Location	Call Sign	Frequency (MHz)	
		Tx (out put)	Rx (in put)
Madras (Chennai)	VU2MWG	435.800	434.100

Net Timings

HF

Time (IST) (UTC +5:30)	Frequency (KHz.)	Name of the Net
Daily Nets		
07:00 – 08:00	7080	Charminar
07:15 – 08:15	7045	Belgaum
07:30 – 08:00	7085	Garden City
07:45 – 08:45	7015	TRAC CW
08:15 – 08:30	7050	KARL AM
19:30 – 20:00	14150	AIR Net India
21:00 – 21:03	7085	Garden City
21:30 – 22:00	7095	Malabar
22:00 – 22:30	7080	Rajiv Gandhi / GEM
All Sundays		
07:30 – 08:00	7070	Satchat
08:00 – 08:30	7095	Chat
08:30 – 09:15	7085	SWL DX
First Sunday		
07:30 – 07:45	14292	ROAR

VHF Daily Nets

Place	Time (IST)	Frequency (MHz.)	Name of the Net
Bangalore	06:30 – 06:45	145.200 (+)	Kokarako (Daily)
	07:00 – 08:00	145.700 (-)(Main channel)	R5 (Daily)
		145.650 (-)(Standby channel)	
	07:00 – 08:00	145.650 (-)	News (Sunday)
	21:00 – 21:30	145.500 (S)	Chandamama (Daily)
Coimbatore	07:00 – 07:15	145.800 (-)	Happy Morning
	08:30 – 08:45	145.000 (S)	Evening
Kodaikanal	05:45 – 06:00	145.750 (-)	Kokara-ko
	06:45 – 07:00		Morning
	21:30 – 21:45		Kurinchi
Madras	07:00 – 07:15	145.775 (-)	Morning
	21:30 – 21:45	145.500 (S)	Night

Mysore	06:45 – 07:00 21:30 – 21:45	145.725 (-)	Brindavan Chamundi
New Delhi	22:00 – 22:15	145.600 (-)	New Delhi
Palakkad	07:15 – 07:30 21:45 – 22:00	145.650 (-)	
Rajapalayam	07:00 – 07:15	145.600 (-)	Sanjeevi
Tirunelveli	07:00 – 07:15 21:30 – 21:45	145.850 (-)	Agasthiya Pothigai
Trivandrum	21:30 – 21:45	145.600 (-)	Trivandrum
Visakapatanam	21:15 – 21:30	145.500 (S)	Dolphin

UHF Daily Nets

Place	Time (IST) (UTC +5:30)	Frequency (MHz.)	Name of the Net
Bangalore	06:45 – 07:00	436.000	Bangalore UHF
	20:00 – 20:15	435.500	
Madras	21:30 – 21:45	436.880	Madras UHF

International Nets

Time (UTC)	MHz	Net Name
01:00	21.407	Pacific Indian Ocean Net
02:00 - 03:25	14.313	Pacific Seafarers Net
04:00	14.310	Maritime Emergency Net
05:00	14.316	Tony's Net (Red Sea & Indian Ocean)
07:00	14.303	International Net
08:00	14.303	UK M/M Net
09:00	14.313	Mediterranean M/M Net
10:30	7.080	Caribbean Weather Net
10:30	14.265	Barbados Cruising Net
11:00	7.230-7.240	Caribbean M/M Net
11:30	14.320	South African M/M Net
12:00	14.340	Manana M/M Net (Hawaii, West Coast US)
12:30	7.237	Caribbean Net
12:45	14.121	Mississauga Net (Atlantic, Med, Caribbean)
13:00	21.400	Transatlantic Net
13:30	8.107	Panama Canal Connection Net
14:00	8.188	NW Caribbean Cruisers Net
14:00	7.292	Florida Coast Net
15:30	7.294	Chubasco Net
15:45	14.340	Marquesas Net
16:00	14.331	US Coast Guard Net
16:00	7.238	Baja California M/M Net
17:00	14.329	Skippers Net
17:00	14.340	California Hawaii Net
18:00	14.303	Maritime Emergency Net
18:00	14.303	UK M/M Net
18:00	14.282	South Pacific Net
18:00	7.076	South Pacific Cruising Net
19:00	14.305	Confusion Net (Pacific)
20:30	14.303	Swedish Maritime Net
21:00	14.315	Tonys Net (South Pacific & NZ, Australia)
21:30	14.290	East Coast Waterways Net
24:00	14.320	SE Asia M/M Net

LIST OF WIRELESS MONITORING STATIONS

[Correspondece for licencing examination is to be addressed to Officer-in-charge, Wireless Monitoring Station]

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Kotra, Pushkar Road,
Ajmer-305004
Tel# 2600641,2600593

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
18, Padmanabha Nagar,
Banashankari II Stage,
Bangalore-560 070
Tel# 26690102, Fax. 26790300

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
H.No.E-1/149, Arera Colony,
Bhopal-462003
Tel# 2564653, Fax. 2723930

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
International Monitoring Station
Village-Gopalpur, P.O. Sarkarpool
24-Parganas, **Kokata-734352**
Tel# 24012960, 24010151, Fax. 24589407

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Kandanchavadi,Perungudi,
Chennai-600096
Tel# 24960234, 24960811, Fax. 24960235

Officer-in-Charge,
Ministry of Communications, GOI
International Monitoring Station
Ghitorni, PO Mehrauli,
Delhi-110 030
Tel# 26802380, 26986226

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
7, Oak'S Bank,
Holding No-560, **Darjeeling-734001**
Tel# 252383

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Girdharilal Sardarmal Building,
Mancotta Road, **Dibrugarh-786001**
Tel# 221238

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Opposite Jagatpark Society,
Ahmedabad, GUJARAT
Ghatlodia-380061
Tel# 27484444, Fax. 27433011

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Sylvia Building, Chogm Road,
PO Alto Porvorim, **Goa-403521**
Tel# 2217245

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Gurauli Buzurg Chhapia,
Khajani Road,**Gorakhpur-273001**
Tel# 2333709

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
H.No.1-1-648/4, Gandhinagar,
Hyderabad-500080
Tel# 27613217, Fax# 27603368

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Main Garha Road,Hardyal Nagar,
Jalandhar-144022
Tel# 2225210

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
International Satellite Monitoring Earth Station
Indewadi Village,
Ambad Road,
Jalna-431203
Tel# 230201, Fax# 232200

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Fathima Mansion, Pintos Lane,
Bijai PO, **Mangalore - 575004**
Tel# 2493960, Fax# 2494249

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
International Monitoring Station, Gorai Road, Borivilli (West), **Mumbai-400 091**
Tel# 28677307, 28672351, Fax# 28672351

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Chindwara Road, PO Koradi T.P.S.,
Nagpur-441111
Tel# 262114, Fax. 2581807

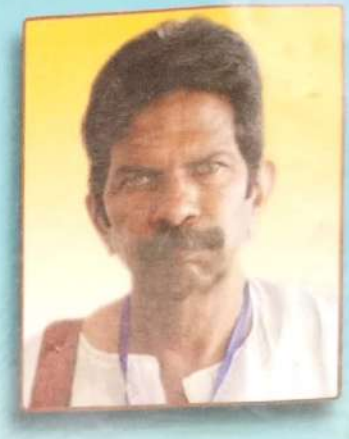
Officer-in-Charge,
Wireless Monitoring Statio
Harmu Housing Colony,
Ranchi - 834012
Tel# 2203823

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
PO Umpling, Lapalang, Rynjah
Shillong - 793006
Tel# 2230113, 2230893, Fax. 2233727

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
H.No. 41, Sector-I, Lane 2
Nanak Nagar-180004
Tel# 2430064, Fax. 2433557

Officer-in-Charge,
Wireless Monitoring Station,
Ministry of Communications, GOI
Kachani Post,Nettayam,
Trivandrum-695013
Tel# 2362202, Fax. 2364333

Officer-in-Charge,
Wireless Monitoring Station
39-27-41, Madhavadhara
VUDA Colony
Visakhapatnam 530018
Andhra Pradesh
Tel. 0891-2539365
Telefax: 0891-2542402



With Best Compliments from :

P.H. RAMAPRABHU

VU2DEV