THE PROPAGATOR

MONTHLY NEWSLETTER OF THE ILLAWARRA AMATEUR RADIO SOCIETY.

P.O. Box 1838. WOLLONGONG. N.S.W. 2500.

IARS is a Member Club of the Wireless Institute of Australia.

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MONTHLY MEETING Held on the Second Monday of each Month, at 7.30pm, at the Wollongong Town Hall Meeting Room.

CLUB STATION - VK2AMW. CLUB REPEATER - VK2RAW, 2m, Channel 5.
VK2RUW, 70cm, Channel 1.

IARS MONTHLY BROADCAST

The Monthly Broadcast takes place on the Sunday preceeding the Meeting Night each month, at 1900 Hours EAST.

Frequency used by VK2AMW for the broadcast is -
Repeater Channel 5, or Simplex Channel 40.
Relay on 28.460 MHz, 20 cm Channel 1.

IARS CLUB NETS

6 Metre.	8.30am Sunday,	52.525 MHz	FM.
10 Metre.	3.00pm Sunday,	28.460 MHz	USB.

SEPTEMBER
SEPTEMBER
SEPTEMBER

1979

Members are advised that the Monthly Meeting of the Illawarra Amateur Radio Society will be held at the Wollongong Town Hall Meeting Room at 7.30 pm on

MONDAY, September-10th.

VISITORS ARE MOST WELCOME TO ATTEND.

KENWOOD

* * NEW PRODUCTS * * - * * NEW LOW PRICES * *

KENWOOD TS520S - H.F. Transceiver.....$ 650.00

KENWOOD TS820S - H.F. Transceiver.....$ TBA.

KENWOOD TS120V - H.F. Mobile 10watt output.....$ 530.00

KENWOOD TS120S - H.F. Mobile 100watt output.....$ 760.00

KENWOOD SM220 - Station Monitor.....$ 375.00

KENWOOD AT200 - Antenna Tuning unit/SWR.....$ 185.00

KENWOOD AT120 - Antenna Tuning unit/SWR.....$ 120.00

KENWOOD R599 - H.F. Receiver.....$ 235.00

KENWOOD TR7200G 2M 10watt Mobile c/w ch 2,4,6,8,40,50..$ 175.00

* * * * * * * *

KYOKUTO 2M Mobile 15 Watts - 4 memories - Auto Scan - Digital P.L.L. -RIT.....$ 360.00

* * * * * * * *

DRAKE "Century-21" Communications Receiver 0.5 to 30MHZ -AC/DC AM CW SSB.....$ 325.00

DRAKE UV3 VHF-UHF FM Fully Synthesized System. 5KHZ Steps - Double Conversion 10.7MHZ - 455 KHZ 6 pole Crystal Filter @ 10.7MHZ and 8 Pole Ceramic Filter @ 455 KHZ.
25 Watts Output VHF 10 Watts UHF.
Model 1340 144-148 MHZ.....$ 760.00
Model 1345 144 and 432 MHZ.....$1070.00

* * * * * * * *

NAGARA V5JR 80-10M Trapped Vertical.....$ 150.00

CUSHCRAFT 2 Metre Ringo Ranger.....$ 49.00

We Also Stock A Wide Range Of Test Equipment. Power Supplies, Technical Books etc.
We are now South Coast Distributors for SKYBAND Antennas.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

DRAKE

THE ULTIMATE HANDHELD ?

Seen advertised in a recent edition of " 73 MAGAZINE " was a YAESU FT207 R. This new product from the YAESU stable is only the second,fully synthesized, handheld transceiver (to my knowledge,) to hit the ham market.
Unfortunately no detailed specs. were included in the advert.
A brief description is as follows;-
144 MHz - 148 MHz Range.
3 Watts output.
Separate condensor mike.
Audio / Squelch controls
B.N.C. Connector for rubber flex antenna
etc. etc.
"SO WHAT !" Sounds like the usual run-of-the-mill two metre toy. Maybe so, but the word "SYNTHESIZED" raises the question "How do you control the frequency synthesizer?" Well, in this respect, the FT 207 R distinguishes itself. Read on for more specs.:-
(1) The synthesizer is Microprocessor controlled.
(2) Keyboard encoded frequency entry.
(3) 10 KHz steps.
(4) 5 KHz up switch.
(5) Keyboard lock switch (for obvious reasons.)
(6) 4 Programmable memories.
(7) Odd repeater splits programmed from keyboard.
(8) 5 Digit readout (with display on/off switch.)
(9)Priority channel.
(10) Memory and band Auto-scan. (scans for free or busy channel.)
(11) 2 Tone (TOUCHTONE regd.) input from keyboard.
(12) "Idiot lights"for transmit and busy channel.
OPTIONAL EQUIPT. :-
nicads / battery charger,
tone activated squelch,
separate plug-in speaker/mike.
The price ? Not set as yet , as the transceiver has not been released in Australia . But you can be sure that the price-tag will be heavier than the product.
(anyone want to buy a well used KEN ??????)

KIERAN VK2DAN.

P.S.
As from 27-Aug-79 your editor will be having harmonic problems in the form of a 9lb. 9oz. baby boy! Ed.

FOR SALE

DENTRON 160 - 10 AT Super Tuner (antenna tuner)
accepts all feed lines/ 160 to 10 metres/ 1kw/ as new $110.00
Contact George Meldrum Ph. 843153 (club badge : George SWL)

STRIPLINE BANDPASS FILTER FOR 70 cm

by J. Reithofer, DL 6 MH

It is very advisable for a 70 cm bandpass filter to be placed after varactor triplers and previous to the driver or power output stage in SSB transmitters in order to suppress subharmonic, harmonic and spurious frequencies. The two-circuit bandpass filter described here is extremely easy to construct since printed stripline circuits on an epoxy printed circuit board are used. As can be seen in Figure 1, it is only necessary for two trimmers to be soldered onto the PC-board and for two coaxial sockets for input and output to be connected. The filter is accommodated in a small casing made from aluminum plate or PC-board material.

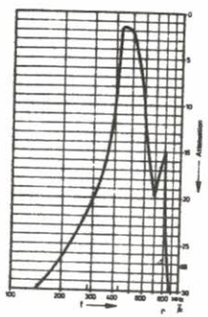

Fig. 2:
Passband curve of the
2-circuit bandpass filter

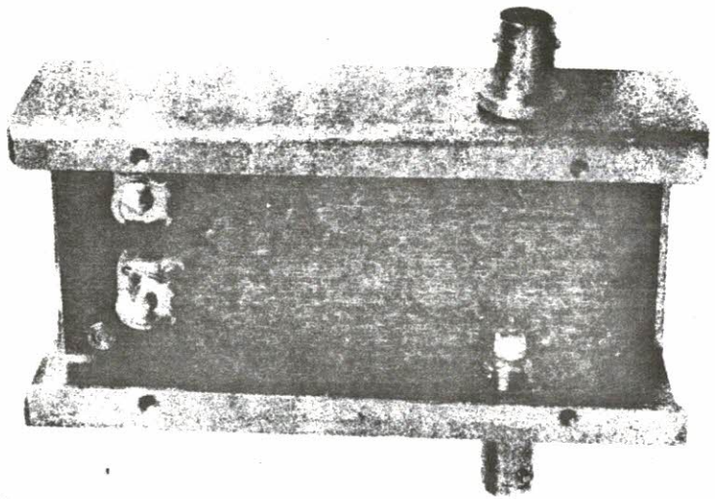

Fig. 1: Photograph of the stripline filter for 70 cm

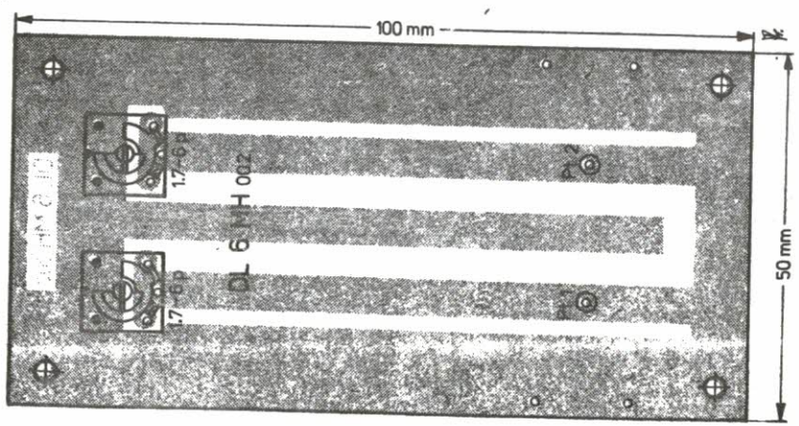

Fig. 3: Printed circuit board DL 6 MH 002 of the 432 MHz filter

The effectiveness of the filter can be seen by studying the passband curve in Figure 2. Two-meter signals are suppressed by more than 30 dB and their first harmonics at 288 MHz by approximately 20 dB. The first harmonic of the 70 cm band at 864 MHz will be suppressed by approximately 30 dB. The insertion loss amounts to approximately 2 dB which can easily be compensated for by the linear amplifier stages of a SSB transmitter.

The printed circuit board is designated DL 6 MH 002 and has the dimensions 100 mm long by 50 mm wide. The printed circuit board and component location are shown in Figure 3. The trimmers have a capacitance of 1.7 - 6 pF (or less). Air-spaced trimmers are used from which it may be necessary to remove one stator plate.

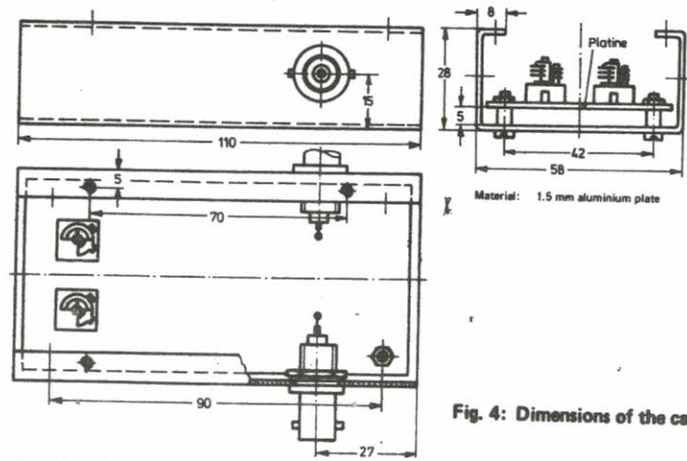

Fig. 4: Dimensions of the casing

After soldering the trimmers into place, the printed circuit board is built into a casing in which the coaxial sockets have already been mounted. Figure 4 shows the required dimensions. The printed circuit board should be spaced 5 mm from the floor of the case. Metal spacing bushings or nuts are used for this. Although the ground surface of the printed circuit board is grounded via the mounting screws, it is necessary for additional, low-inductive ground connections to be made between the coaxial sockets and the connection points marked on the printed circuit board. This is made by screwing a piece of silver-plated copper wire securely to the coaxial socket and soldering the ends to the ground surface of the PC-board. BNC sockets for single-hole mounting (UG 1094/U) are suitable. The filter is enclosed by adding a U-shaped cover.

For alignment of the filter, it is necessary for the output power of a 70 cm transmitter to be indicated between the filter and a terminating resistor (antenna). The reflectometer described in (1) can be used for this. The trimmers of the bandpass filter are aligned for maximum RF power. Finally, it should be pointed out that any impedance variation differing from those existing during the alignment will more or less load the filter circuit, or will detune it if the termination is not real. This can cause the insertion loss to increase considerably. The filter should be aligned in the circuit in which it is to be used.

REFERENCES

(1) R. Griek: Simple Stripline Reflectometers for 144 and 432 MHz
VHF COMMUNICATIONS 3 (1971), Edition 2, Pages 89-92

C 6 - C 10: ceramic disc capacitors, value uncritical, between 47 and 100 pF
C 11, C 12: Chip capacitors of approx. 1 nF

L 4, L 6, L 9: Ferrite wideband chokes (6-hole core)
L 7: 1.5 turns of 0.4 mm dia. (26 AWG) enamelled copper wire passed through a ferrite bead, 5 mm long
L 5: Approx. 17 cm enam. copper wire on 3 mm former, self-supporting
L 8: 20 to 25 mm length of 2 mm dia. (12 AWG) silver-plated copper wire, slightly bent to ensure that no short-circuit is made to the ground

Electrolytic capacitors: Tantalum drop-types for the required voltage.

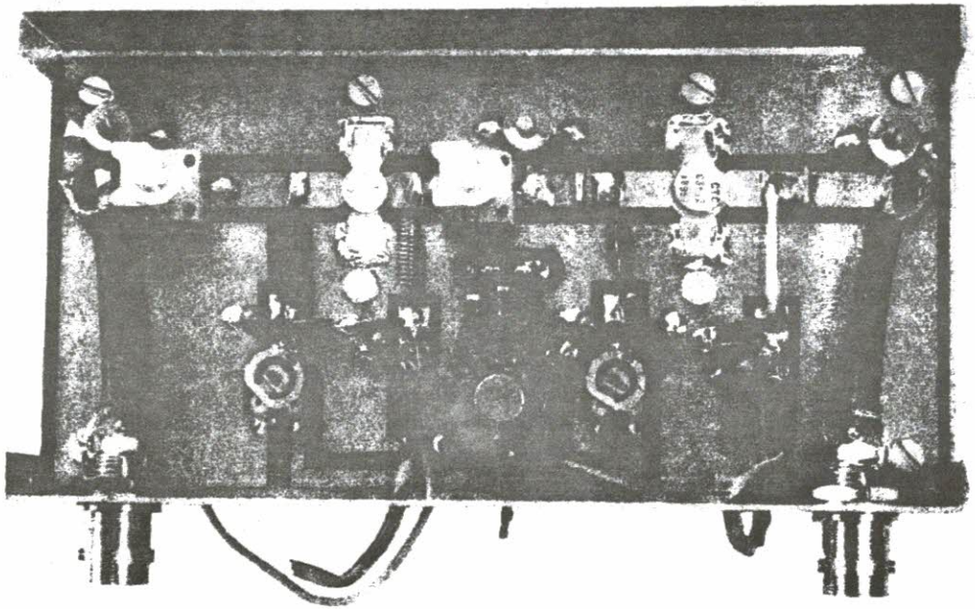

Fig. 2: Author's prototype

2. CONSTRUCTION

The photograph shown in **Figure 2** shows the author's prototype of the two-stage amplifier mounted in a TEKO box 4 A. The components locations and conductor lanes of the 135 mm x 65 mm PC-board DJ 4 LB 006 are shown in **Figure 3**. The PC-board is only single-coated and the components are mounted on the conductor side. The three temperature-probe diodes are mounted underneath the PC-board and are glued to the metal plate of the TEKO box. One diode is in the direct vicinity of T 1, another near T 2 and the third diode is located between T 1 and T 2 interconnecting the two other diodes. The cathode connection of the diode is screwed to the box near transistor T 2. A flexible wire connects the anode of the diode placed in the vicinity of T 1 and connects it to Pt 6 on the other side of the board.

An M 3 (3 mm) screw has been soldered to the lower side of the transistor T 1 so that it is possible for it to be directly screwed to the TEKO box in a similar manner to T 2 for heat dissipation. No heat sink is required in addition to the aluminium case (TEKO 4 A).

Two M 3 screws are required in addition to the four mounting screws at the corners of the board. These screws are provided in the vicinity of the emitter connections of the transistors and are required for a good mechanical and electrical stability. M 3 nuts are provided on each of the mounting screws between the lower side of the PC-board and the case, so that a spacing of approximately 2.5 mm results between the board and the box.

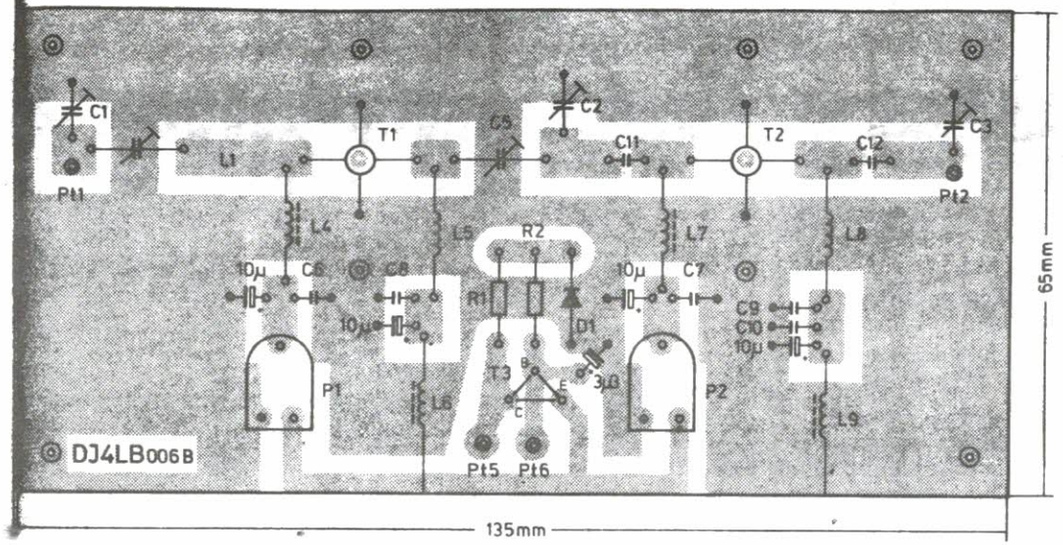

Fig. 3: PC-board for the ATV power amplifier DJ 4 LB 006

3. ALIGNMENT

The collector currents of the two RF transistors T 1 and T 2 are firstly aligned without RF drive by slowly and carefully adjusting potentiometers P 1 and P 2.

A TV video carrier, e.g. from DJ 4 LB 004, or another signal at the center of the band are suitable for alignment of the resonant circuits. All trimmers should be aligned for maximum output power, at the highest drive voltage. An exact alignment of the input circuit is possible with the aid of a sweep generator. It is possible using slight corrections on the adjustment of trimmers C 1 and C 4 to obtain the same passband curve at the output of the linear amplifier, as was present at the output of the exciter.

4. REFERENCES

(1) G. Freytag: A transistorized linear amplifier for 70 cm
VHF COMMUNICATIONS 6, Edition 1/1974, Pages 30 - 37

(2) G. Sattler: Transistorized Linear Amplifiers for ATV Operation
In this edition of VHF COMMUNICATIONS

TWO-STAGE ATV LINEAR AMPLIFIER FOR 435 MHz

by G. Sattler, DJ 4 LB

The described two-stage amplifier is similar to that described in (1). It provides an output power of 1.5 W with an operating voltage of 12 V over the whole of the 70 cm band without external tuning. The power gain is in the order of 50 to 60 times, corresponding to 17 - 18 dB; a drive power of approximately 25 mW is required.

If the mixer module DJ 4 LB 004 is used as exciter, a maximum of approximately 4 W of RF power output (FM) can be obtained with an operating voltage of 12 V. This means that sufficient power reserve is available for linear operation with an output power of 1.5 W (SSB, ATV). This module can easily be run from batteries, and closes the gap between exciters and higher power amplifiers (C 12-12 / C 25-12, 2 C 39, 4 CX 250 B).

1. CIRCUIT DESCRIPTION

The circuit diagram of the two-stage amplifier is given in **Figure 1**. It is formed from the two first stages of the DJ 3 SC amplifier. The modifications for ATV operation given in (2), have been taken into consideration. The output power is coupled out where the base of transistor T 3 is connected in the case of the three-stage DJ 3 SC amplifier. The original trimmer capacitor C 7 in series with L 3 can be deleted in our application without loss of output power, since the output impedance is 50 Ω.

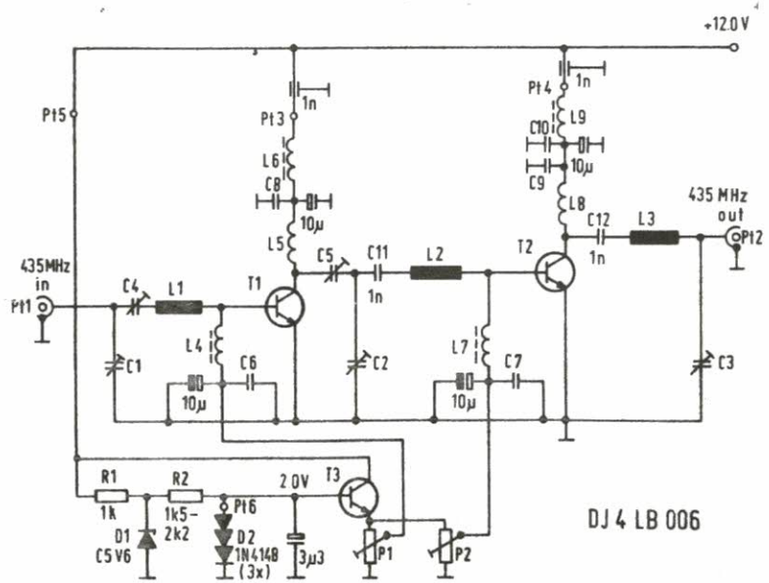

Fig. 1: 2-stage power amplifier for 70 cm ATV

1.1. Generation of the Base Bias Voltages and Temperature Compensation of the Collector Quiescent Currents

The base voltages of the two RF transistors are adjustable with the aid of potentiometers P 1, or P 2. Transistor T 3 is connected in an emitter follower circuit and its base bias voltage is formed as the sum of the forward voltages of three silicon diodes connected in series. The dropper resistor R 2 feeds these series-connected diodes with a stable, temperature independent voltage (R 1, C 5 V 6) at a low current (approx. 1 to 2 mA). Since the intrinsic heat is negligible, the diodes will be practically at the ambient temperature. They can be used as temperature probes when they are in direct heat-contact with the heat sink of the transistors.

The forward voltages of the diodes will be reduced when they are heated, and this will reduce the base bias voltages of the RF-transistors via the circuit comprising T 3. This means that the collector quiescent currents, which would increase considerably as a function of temperature if no compensation was made, will remain relatively stable.

Temperature	- 20°C	+ 20°C	+ 60°C
Quiescent current T 1	75 mA	70 mA	60 mA
Quiescent current T 2	95 mA	90 mA	75 mA

It will be seen that the temperature response of the quiescent currents is slightly overcompensated, which has a favorable effect: When the case is heated, the quiescent currents will slightly fall. The values given in the table at 20°C were found to be most favorable experimentally, using delta-wave test signals. Unwanted oscillation in the kHz-range does not appear uptil quiescent currents of over approx. 150 mA for T 1 and 300 mA for T 2.

On heating transistor T 3, the base-emitter voltage will decrease, which will cause the output voltage of the circuit to increase. Since this works in an opposite manner to the required temperature-voltage behaviour of the circuit, it is not possible for the transistor to be used as temperature probe. This transistor should therefore have the most constant operating temperature possible, and is therefore provided with cooling fins. The described circuit cannot avoid the collector currents increasing shortly after switching on. According to the thermal coupling, a certain time is required until the heat from the RF transistors is passed to the diode probe, and the compensation circuit can be effective.

1.2. Component Details

T 1:	C 1 - 12
T 2:	C 3 - 12
T 3:	2 N 2219, 2 N 1613 (NPN transistor with B min. 60 to 70) with cooling fins
D 1:	Zener diode 5.6 V (BZY 83 C5V6)
D 2:	Three silicon diodes, e.g. 1 N 4148 (1 N 914) connected in series
P 1, P 2:	220 Ω, trimmer potentiometer, for horizontal mounting, spacing 10/5 mm
C 1, C 2, C 3:	plastic foil trimmer 2 - 22 pF
C 4, C 5:	air-spaced trimmer 34 pF with two connection pins

AN 18 W POWER AMPLIFIER FOR 432 MHz WITH PRINTED STRIPLINES

by K. Hupfer, DJ 1 EE

A new generation of equipment has been developed for mobile services of public utilities and business communications at UHF. The semiconductor manufacturers have developed new power transistors for this equipment that offer output power levels of up to 20 W at 12 V to 14 V. This makes such transistors very suitable for mobile operation on the 70 cm amateur band where they can be used to build up an efficient power amplifier. A three-stage power amplifier with an output power of 18 W is to be described. All inductances are in the form of printed striplines etched on a double-coated epoxy board. The reproducibility is thus extremely good and the dimensions are very compact.

1. CHARACTERISTICS

The following values were measured when equipped with the given Philips transistors:

Output power:	16 W min., 20 W max. (50 Ω)
Drive power:	300 mW min., 500 mW max.
Current drain at 13.5 V:	2.9 A to 3.0 A
Suppression of first harmonic (864 MHz):	approx. 30 dB

This amplifier has also been constructed using RCA transistors: for T 1 and T 2: 2 N 5914 and for T 3: 2 N 5915. With this version, an output power of approximately 8 W was obtained.

2. CIRCUIT DETAILS

The circuit diagram of the three-stage amplifier is given in Figure 1. Input and output impedance are 50 Ω. All inductances required for transformation and selectivity are in the form of printed striplines (L 1 to L 9). They were dimensioned as described in (1). It is planned to explain how the matching elements can be calculated from the transistor data in a later article.

The drive power of approximately 350 mW is matched to the low and complex base-emitter impedance of transistor T 1 with the aid of matching link C 1, C 2, L 1. A power of approximately 2 W is available at the collector, which is fed via the matching network of C 4, C 5, L 3 to the base of transistor T 2. This stage also amplifies by approximately 4 times which means that about 8 W can be measured at the collector. The power is then fed to the output transistor T 3 via a similar matching network. A somewhat more extensive network transforms the load impedance of 50 Ω to the required working impedance for transistor T 3.

Chokes Ch 1 to Ch 3 for DC grounding of the base connections are not critical. Miniature ferrite chokes with an inductivity of approximately 100 nH are used. The collector DC-voltages are fed to the transistors via the low-inductive inductances L 2, L 4, L 6, which are also in the form of striplines.

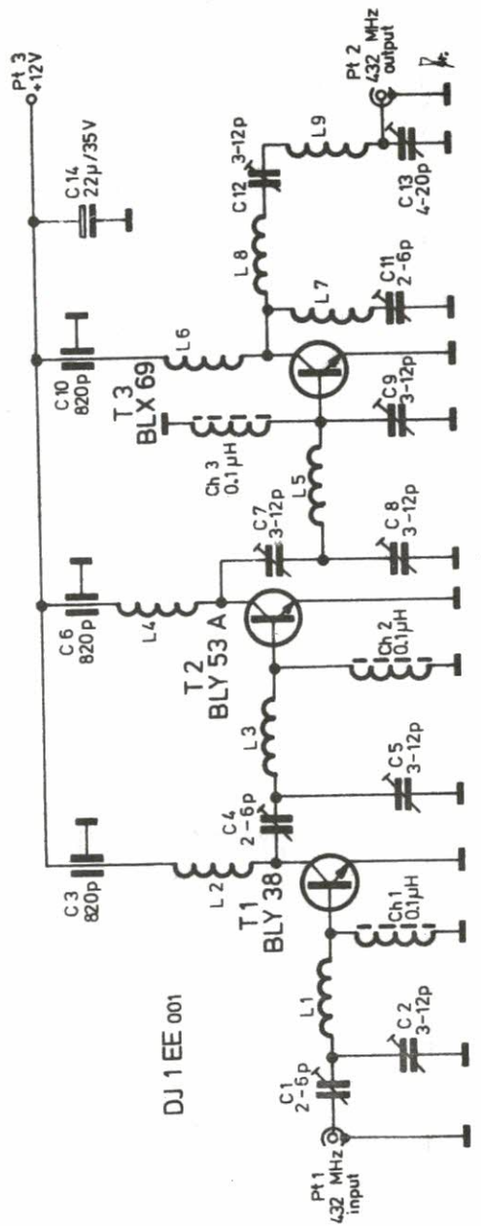

Fig. 1: Circuit diagram of the three-stage 432 MHz 18 W amplifier

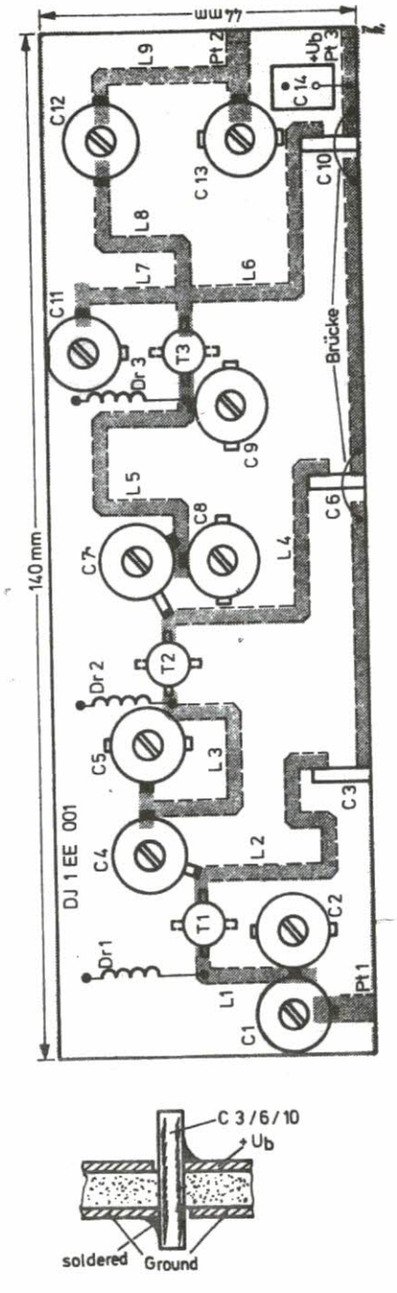

Fig. 2: Components and printed striplines of PC-board DJ 1 EE 001

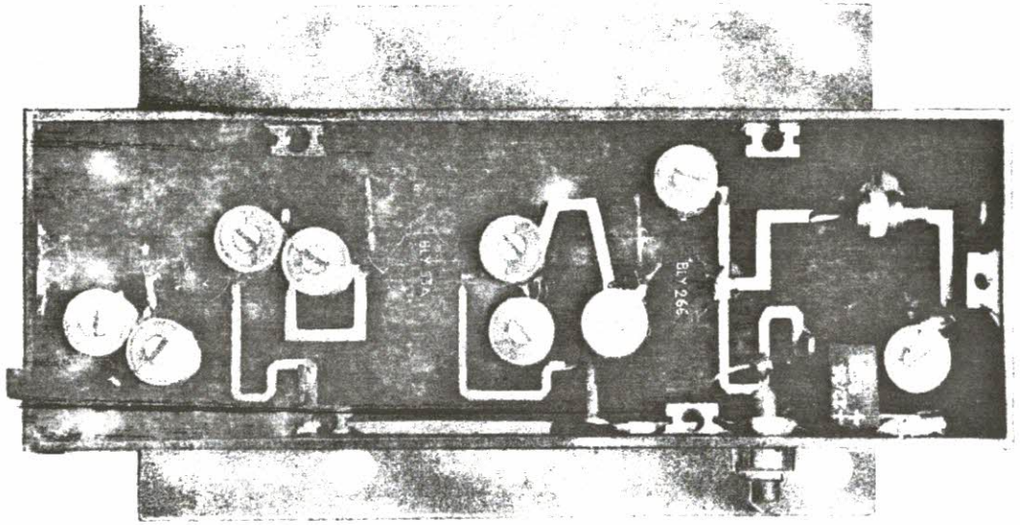

Fig. 3

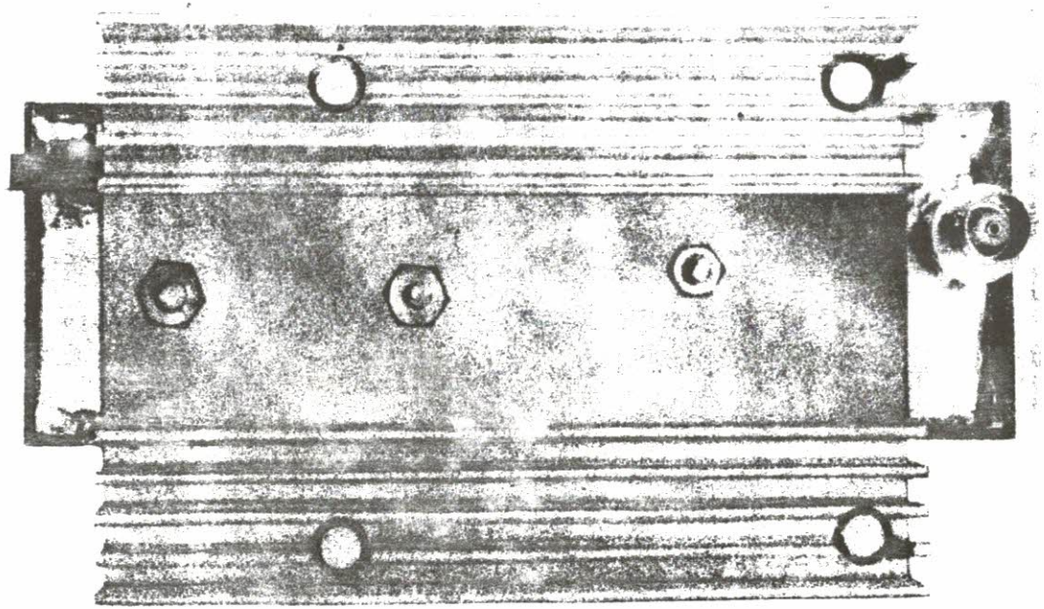

Fig. 4

The power transistor BLX 69 (formerly 266 BLY) has only been developed recently by Philips. The price of approximately DM 150,-- is of course very expensive for amateur equipment but will not doubt drop after production of professional communications equipment gets under way. However, the modification has shown that less expensive, lower power transistors such as the mentioned RCA types can be used. In the case in question, it was not necessary to carry out any modifications of the circuit or printed circuit board.

3. COMPONENTS

T 1: BLY 38 (Philips)
T 2: BLY 53 A (Philips)
T 3: BLX 69 (Philips)

C 1, C 4, C 11: 2-6 pF ceramic disc trimmer capacitors (10 mm diameter)
C 2, C 5, C 7, C 8, C 9: 3-12 ceramic disc trimmer capacitors (10 mm diameter)
C 3, C 6, C 10: 820 pF ceramic disc capacitors without wires
C 12: 3-12 pF ceramic tubular trimmer
C 13: 4-20 pF ceramic disc trimmer (10 mm diameter)
C 14: 22 μF tantalium electrolytic capacitor

Ch 1 to Ch 3: 100 nH ferrite choke (Delevan 1025-94)

4. CONSTRUCTION

All components are accommodated on the double-coated printed circuit board DJ 1 EE 001 whose dimensions are 140 mm x 44 mm. This PC-board is shown in Figure 2 together with the components and striplines. Holes must be drilled in the board for all ground connections and transistor supports. All "hot" connections are directly soldered to the conductor lanes. Slots should be sawn into the PC-board for the bypass capacitors which are mounted as shown in the drawing. The positive bar of the operating voltage is fed via bridges to the bypass capacitors so that a mA-meter can be connected instead of the bridge during the alignment procedure.

Further details regarding the construction can be seen in the photographs Figures 3 and 4. The printed circuit board is mounted on a somewhat shorter heatsink which cools all three transistors. Walls made from 15 mm high PC-board material are soldered to the edge of the PC-board, and a cover should also be provided.

Due to the non-linear relationship between input and output RF-voltage, the amplifier is best suited for FM-transmissions. At lower drive levels with correct carrier adjustment, it can also be used for amplification of AM signals. In this case, however, an AF distortion of approximately 10% will result.

5. AVAILABLE PARTS

See material price list.

6. REFERENCES

(1) K. Hupfer: Striplines for VHF and UHF
VHF COMMUNICATIONS 3 (1971), Edition 4, Pages 207-216

MOONBOUNCE REPORT - SEPTEMBER 1979.

Evaluation tests of the dual band disc feed systems are encouraging so far. There is some interaction between the two feeds but modifications are in hand to reduce this.

Initial checks of linearity of radiation and lobe pattern show that it is "in the ballpark".

I was privilaged to meet Dick Turrin, W2IMU, on his recent arrival in Sydney for the IREE Conference. Dick has made tremendous contributions in the amateur EME field, particularly on 1296MHz and has been of great assistance to many groups trying to establish moonbounce stations. We at VK2AMW are indebted to him for his helpfull comments on some of our early problems.

MICROWAVE NEWS.

A 10GHz test was made by VK2ALU and VK2AHC on 25/8/79 over a 112KM path between Mt. Gibraltar near Bowral and Terrey Hills, north of Sydney. Very solid signals were received at both ends using FM voice communication. A 2 metre liason link was used, but signals on 3cm were as loud if not louder than on 2 metres.

A fixed attenuator had to be placed in the IF channel at 2ALU's end to bring the S meter pointer down "off the stop".

A pleasing feature was the accuracy of pointing at 2ALU's end, with the compass directed positioning being "spot on".

VK2AHC was able to reduce to his 15 inch diameter dish without much degradation of signal strength.

This test was the first over any distance for 2ALU's new portable transceiver.

More difficult paths are now under consideration.

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