FROM THE LIBRARY

The following are title and key points from articles published in other vintage radio magazines received by the NZVRS Library. Photocopies of these articles are available to members at $1 each from our Librarian, Ernie Hakanson, 17 Williamson Ave, Grey Lynn, Auckland. Ph 09-3766059

801 The Bendix Type CRR-74028 Frequency Meter. Part of LM-13 Radio Equipment. Photos, description, schematics, performance. Radio Bygones April/May 2004, p4

802 Restoring a KB BR420. Photos, schematic, refinishing cabinet. Faults encountered. Radio Bygones April/May 2004, p9

803 Auntie's (BBC) Love Affair with ET4336. Part 2. Photos, history. Radio Bygones April/May 2004, p30

804 Servicing a BRT 402 E. description, part schematic. Wellington Vintage Radio Notes, March 2004 p5

805 Greatest Radios of the Golden Era - RCA Victor 813K and 816K. photos, description. The Michigan Antique Radio Quarterly Oct 2003 p14

806 A solid state filter choke or field coil replacement. The Old Timers Bulletin May 2004, p14

807 The forgotten "Vibroplex" patent. Photos, description. History. The Old Timers Bulletin May 2004, p40

808 The Crosley Pup. Photo, description, history, circuit schematic. Bibliography. The Old Timers Bulletin May 2004,p57

809 Rockbank, Fiskville and the Beam Wireless. The beginnings. E T Fisk, Marconi, C S Franklin. 1927. Photos, history. HRSA Radio Waves. April 2004 p4

810 The HMV Rangemaster. 1961 transistor, photos, schematic description. HRSA Radio Waves. April 2004 p9

811 Restoration of an Astor mantel. Photos, schematic, description. 1930 set. HRSA Radio Waves. April 2004 p18

812 Sound Preservation Society Museum Bellerive, Tasmania - a model for all collectors. Photos, description. HRSA Radio Waves. April 2004 p25

813 Whither Radio Preservation and Restoration? Part 2. HRSA Radio Waves. April 2004 p28

814 Making Valve Shield Bases. Forming from thin walled copper tube. Photos, description. HRSA Radio Waves. April 2004 p37

815 Gilding the Lily: circuit evolution of the E H Scott Quaranta and Custom series from the full range high fidelity receiver. Photos, description, layout photos of up to the 50 tube design. HRSA Radio Waves. April 2004 p6

816 The history of the Wagner museum. The Phonographic Record. Feb//Apr. 2004

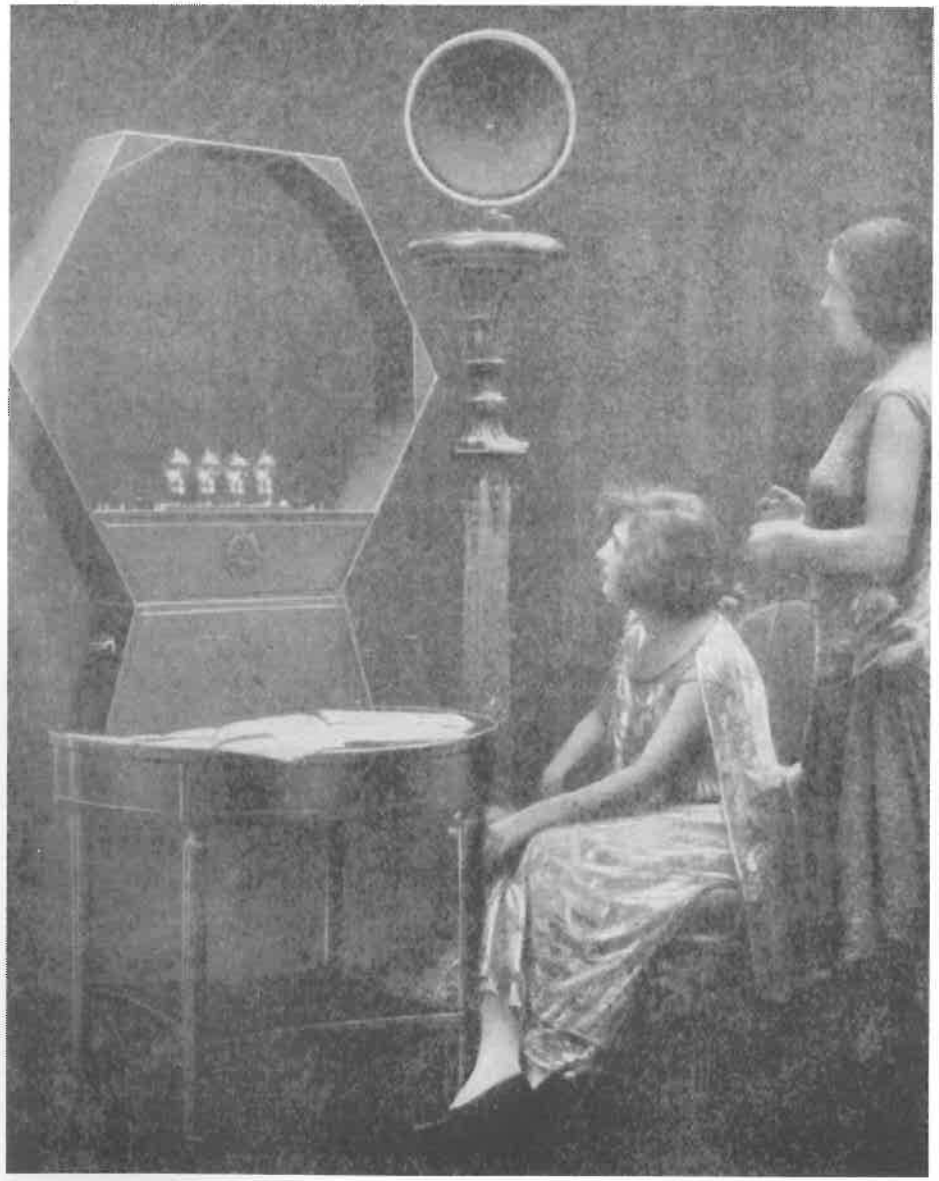
817 Gas Filled Tubes for Industrial Use. Technical description, photos, Ward Leonard, GEC, Thy-mo-trol.. Wellington Branch Newsletter. April 2004

818 The HMS Collingwood Museum of Communications and Radar. Description with photos of exhibits and staff at this famous museum. Radio Bygones June/July 2004, p4

819 The Sobell 439 "Sobelette Refurbishment. Photos, circuit diagram, description. Radio Bygones June/July 2004, p12

NZVRS BULLETIN

Vol 25 No. 4 Nov. 2004



NEW ZEALAND VINTAGE RADIO SOCIETY INC.

A non-profit organisation devoted to the preservation of early radio equipment and associated historical information.

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LIBRARIAN, Ernie Hakanson, 17 Williamson Ave, Grey Lynn, Auckland. Ph 09/376 6059. Requests for circuit diagrams, books and magazines (for personal use only) are handled by the Librarian at a small charge. Back numbers of most NZVRS bulletins are also available from the Librarian at $3.00 each for Vols 1 to 10 and $4.00 for issues from Vol 11 onwards. Cheques to be made out to NZVRS.

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Contributions should be sent to the
EDITOR,
Reg Motion, 2A Hazel Terrace, Tauranga. 07/576 8733, email: regmotion@xtra.co.nz

AUCKLAND MEETINGS will be held at the Horticultural Society Hall, 990 Great North Rd. (opposite Motion's Rd.).
Mon. 15th Nov. at 7.30pm- DVD of the interaction of "three giants in US Radio"
Mon. 20th Dec. at 7.30pm- Auction Night.
Mon. 17th Jan. at 7.30pm - Early NZ manufactured sets

BAY OF PLENTY AREA MEETING
Xmas weekend meeting will start with a giant sale of radios, boatanchors and other items at Gordon & Donella Bakers place, 101 Hinewa Rd., Tauranga on 27 November at 11am. Lunch will be provided there. There will be a dinner get-together at a local restaurant. Further visits on Saturday afternoon and Sunday will be advised. **All are welcome.**

TARANAKI AREA MEETING
Our meetings are held on the second Sunday of the months of February, April, June, August, October and December. Visitors are most welcome; contact either Bill Campbell, 06/7532475 or Graeme Lea, 06/7585344 for further details.

WELLINGTON MEETINGS
are held typically from 1pm on the second Sunday of every month at Tireti Hall, Te Pene Ave, Titahi Bay. For details contact Bob Hatton, 40 Rose St, Wadestown. 04/472 8788.

CHRISTCHURCH MEETINGS.
For details of meetings contact Jim Lovell, 41 Yardley St, Avonhead, Christchurch 8004. Ph 03/342 7760

FRONTISPIECE(supplied by Dick Stevenson)
This intriguing vintage photo is from a 1925 Spanish book on radio, originally translated from a German book by E Nesper.
Any idea of the model - The radio, not the ladies!

THE FOLLOWING BOOKS AND OTHER ITEMS ARE AVAILABLE TO NZ MEMBERS AT DISCOUNT PRICES

Please make out cheques to New Zealand Vintage Radio Society

From NZVRS Secretary, 2 Levy Road, Glen Eden, Auckland.
paul.woodcock@opus.co.nz

10m lengths of 3 core Power Cable
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or 12 for $20 - P&P inclusive.

Tight Woven Nylon Dial Cord, 0.7mm diameter - suitable for almost all radios
10 meter lengths at $5 including P&P

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FROM THE EDITOR

This issue has a modified cover page and list of contents (below) - your comments on these changes or any other matter concerning the bulletin will be welcomed.

My stock of publishable articles is rather low. This last winter has kept us inside out of the cold which must have produced some restoration and experiment. Let me have the details with photos if possible and don't worry about the grammar - that's my job..

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Peter Byam details the construction of a vintage Amateur Radio receiver.

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LETTERS TO THE EDITOR

The Fleming Valve

I was interested to see a mention of Sir Ambrose Fleming's diode in the Bulletin. As to who actually invented the device depends upon which side of the Atlantic one's sympathies lie. Americans rightly refer to the "Edison effect" as being an early discovery, although Edison himself, to his later chagrin, never applied it to radio. By careful experimentation, Fleming showed that a second electrode in a lamp would conduct electricity only one way, i.e. would act as a valve. This name endures in British-influenced countries and describes the true action rather than the alternative "vacuum tube".

Fleming called his diode an "Oscillation Valve" : a valve which detected high frequency oscillations but certainly could not produce them. This was left to the triode, the invention of Lee De Forest in 1906, which in American eyes is the true ancestor of the "tube".

Apparently Fleming was rather hard of hearing and trusted the evidence of his measuring instruments rather than that of an earphone. Nevertheless his diode became a respected detector in receivers and was reliable if not very sensitive. In recent years several enthusiasts have built replicas of early radio equipment but naturally the construction of a Fleming diode is beyond most people. Double filament car bulbs have been used instead. If one of the filaments is burnt out an isolated wire is left which may be used as an anode. The actual burning out has proved quite difficult as even twice the voltage may be withstood for some time before the filament succumbs!

Other replicas have been of coherers and magnetic detectors and one constructor tracked down a small firm in Bolton(UK) which manufactured permanent magnets. Apparently it had been an original supplier for this type of detector and could still make the magnets! Unfortunately such early detectors only picked up spark transmissions and these have been strictly forbidden for many years. Perhaps testing could be done during a thunderstorm as long as the aerial was not to extensive!

Dick Stevenson

Stability of the Columbus Model 75

I took some time to do a three hour stability check of the 75 chassis I have been working on. The measurements were taken on the 19 meter band. To prevent any undue loading effects a scope was used to sniff some RF and the amplified output of the scope was connected to a Global frequency counter. The ambient temperature was 12 degrees C for the duration of the test (winter in Feilding). Results were from a cold start:

1500hrs	15971.74	1600hrs	15967.93
1505	15968.73	1645	15971.72
1515	15967.93	1700	15972.37
1530	15964.96	1800	15975.95
1545	15966.35		

I should have monitored the mains voltage fluctuations as between 1500 and 1800 on a winters day there would be some variation.

Ian Greaves

Thanks Ian, This is slightly worse than I got on another model on this band but is still much better than a good quality unstabilised receiver of the time. -Ed.

The ZC8 Transceiver

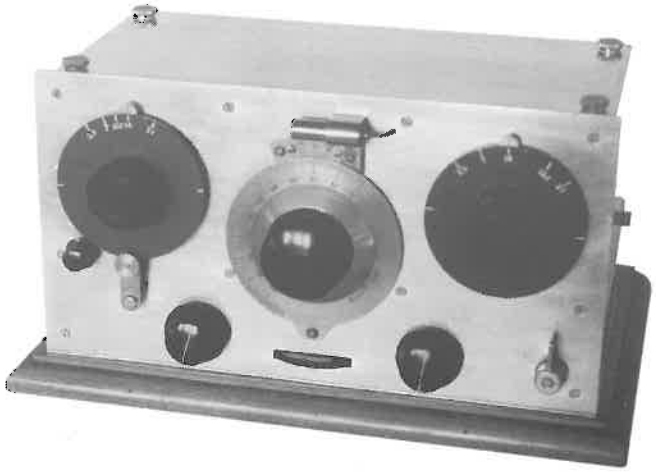
Regarding the ZC8 info, the SPAM library was sent a copy of the manual about two years ago and this was the first time I had heard of the set. There is at least one and possibly two of these sets in captivity that I now know of. Ross Jowitt has one he found in an old shed at Papakura and I have attached a couple of pics that came from Kelvin ZL3KB who obtained them from Paul Dixon ZL3VU. I do not know where or who owns the set.

John Nicholson (SPAM librarian)

Thanks John. Unfortunately the emailed pics were not of sufficient quality to reproduce here.-Ed.

Five Tube TRF Receiver by Peter Byam, ZL2JJ

There is a considerable amount of satisfaction in constructing one's own receiver. The key to success is simplicity without compromising performance. The venerable regenerative detector may still be the best starting point for such a receiver, and it is the heart of this design. Imagine a single pentode tube, a detector with feedback, at or near the point of oscillation, that can resolve AM, CW and SSB signals and offer excellent sensitivity and weak signal selectivity as well.

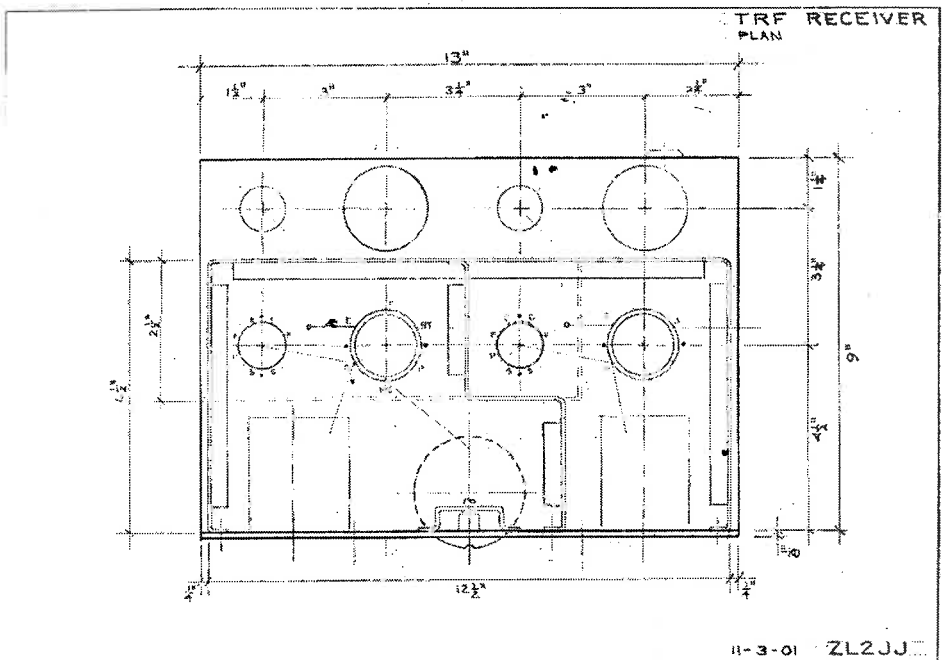


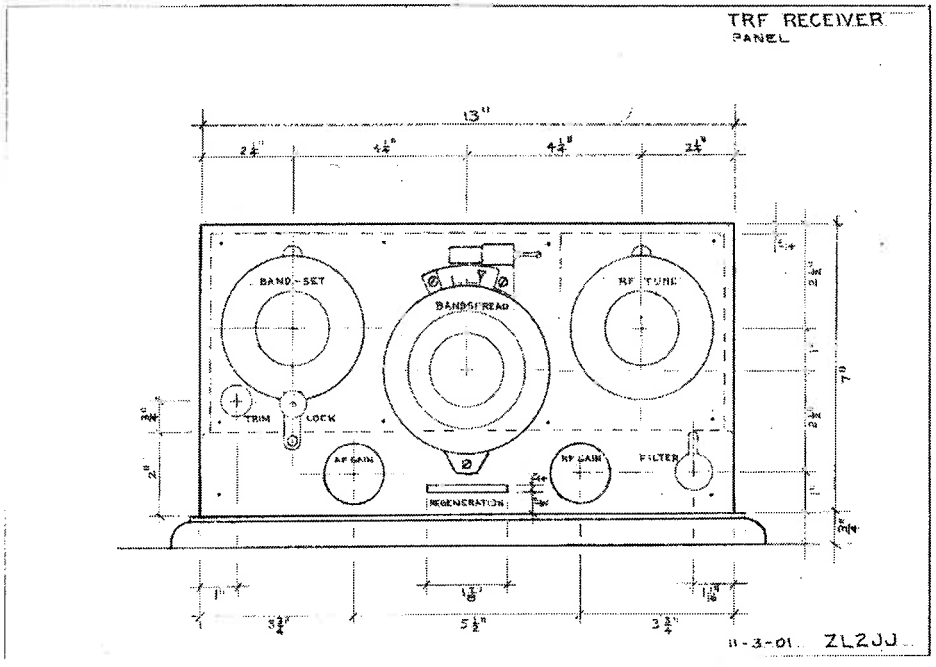
The following is a construction project for an all-band, high performance, regenerative, TRF receiver with an audio filter for CW.

The receiver is constructed in two sections: the RF/detector and a separate power supply/amplifier unit as shown.

Front View of the Receiver unit

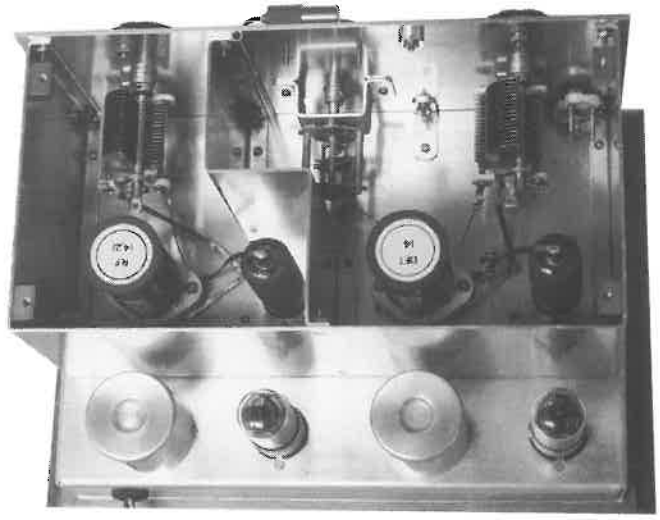
Front View of the Power Supply/Amplifier Unit





Before starting, it is best to have on hand:

1. A matched pair of receiver tuning capacitors, straight-line frequency, maximum capacity between 140 and 260pF.
2. A good quality bandspread variable capacitor of about 15pF.
3. Two ceramic 6 prong sockets to be mounted on pillars above the chassis for plug-in coils.
4. Six feedthrough capacitors, Five .0015uF, one l00pF
5. Two wirewound potentiometers, 47k and l0k.
6. A National velvet-vernier dial, type N, 0-100 scale.



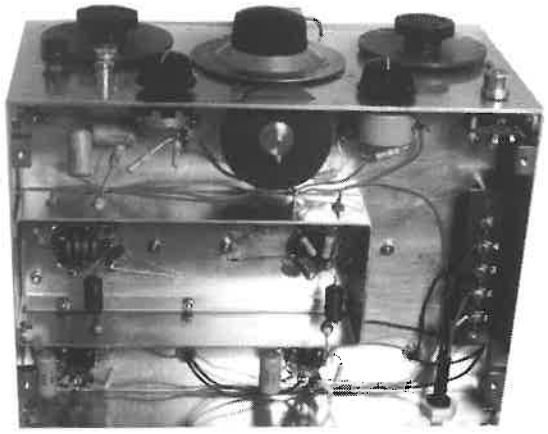
The chassis, panel and base are the same size for both the receiver and the power supply/ amplifier. Start by cutting out and folding the two chassis. All metal is 2 mm aluminium except the panels which are 3 mm aluminium. Dimensional accuracy is required for a good assembly.

Fit the panels to the chassis using the shields and preferred, 5-40 s/s screws and nuts with 3mm s/s spring washers.

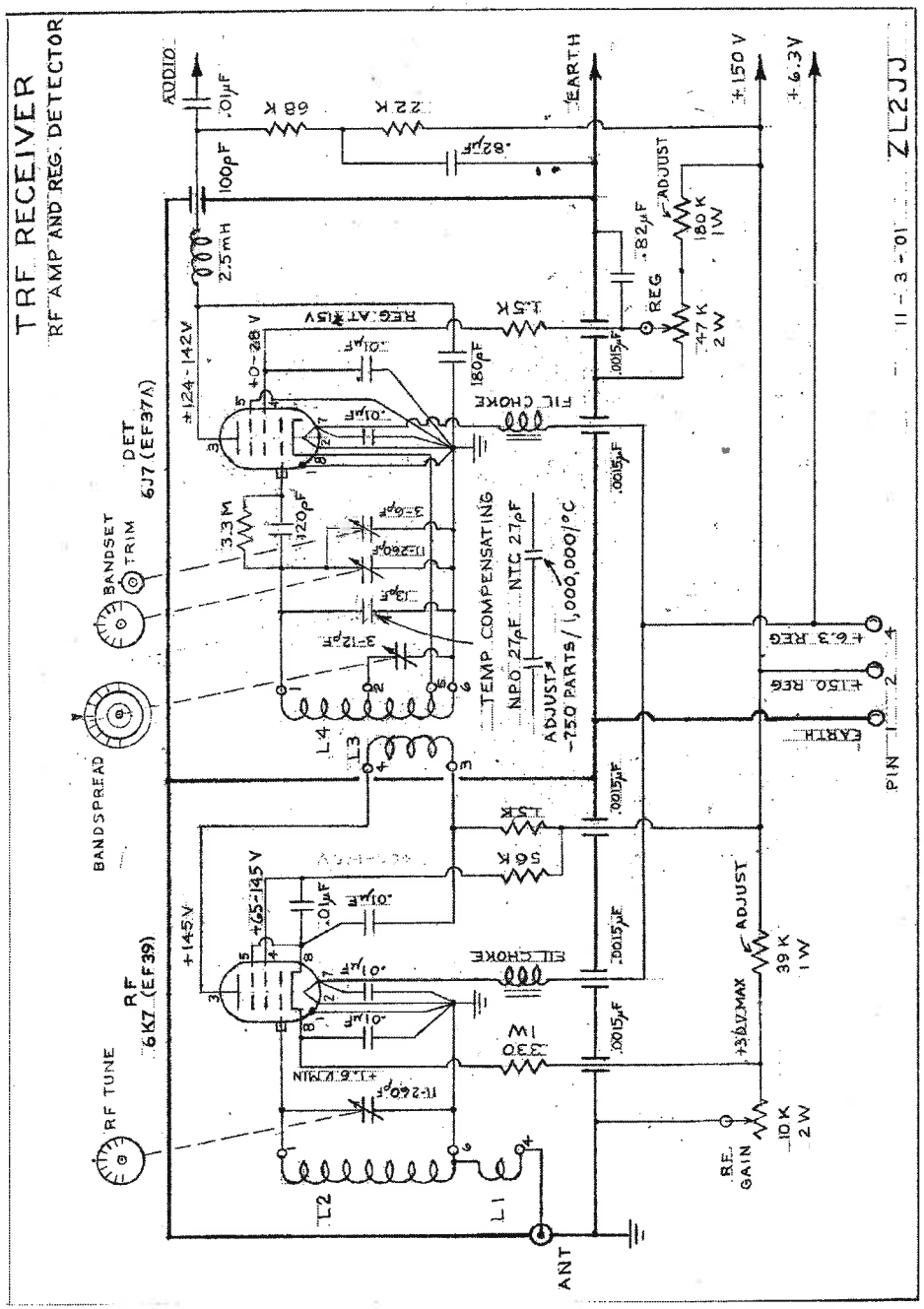
Receiver, top view with cover removed

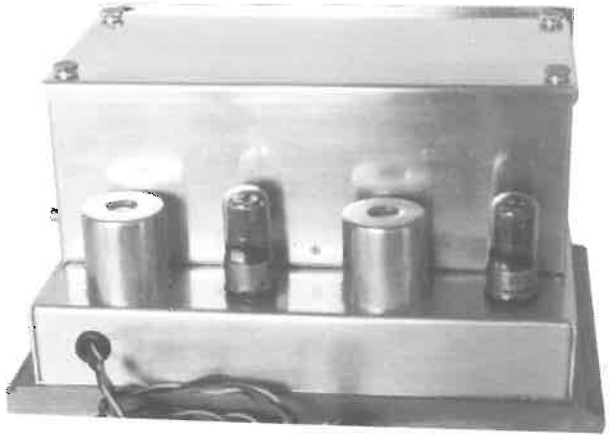
Follow the drawings and photos. When the sheet metal fabrication is finished and the bases mounted, disassemble, cut the socket holes, and drill and mount all the major parts.

The regeneration control potentiometer is mounted on a bracket vertically and fitted with a 2.75" diameter disc which protrudes through the panel 5/16". It is made from 3mm Formica, and the slot is cut with a fret saw. The same material is used to make the 3.5" diameter tuning dials.



Receiver, bottom view with base removed





Receiver, rear view

With all holes drilled, disassemble again, deburr and polish the aluminium with fine steel wool. After final assembly and with all parts mounted wiring can begin. Observe the single point earthing for the RF section as shown on the circuit diagram. All components and wiring including the coil sockets and coil windings must .be mechanically rigid around the detector to achieve good frequency stability. Use only NP0 disc ceramic bypass capacitors here. A thin sheet of aluminium is used to shield the bottom. The power supply/amplifier does not require a bottom shield and is simple to wire. Follow the drawings, circuits and photos.

If you have the Hammerlund coil forms, just follow the coil chart. A lathe is useful for marking off the small nicks on the ribs.

TRF RECEIVER
COILS

7 MHz COILS SHOWN

RF COIL

DET COIL

L_2

L_1

1½"

SANDSPREAD TAP

L_3

L_4

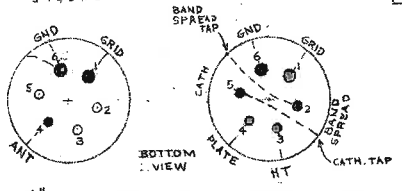
CATHODE TAP

546312

546312

COIL TABLE 1½" DIA. FORMS ENAMEL WIRE #SWG

MHz	L_1	L_2	L_3	L_4	CATH TAP	BAND SPREAD TAP
3.5	5.3T #24 CLOSE WOUND	20.1T #22 18T/IN	3.1T #24 INTERWOUND	20.1T #22 18T/IN	.5T	JUMP PIN 1 TO PIN 2
7	3.3T #22 CLOSEWOUND	11.1T #20 10T/IN	3.1T #22 INTERWOUND	11.1T #20 10T/IN	.4T	6.9T
10.1	"	"	2.1T #22 INTERWOUND	7.7T #20 7T/IN	.4T	3.7T
14	2.3T #20 CLOSEWOUND	5.1T #18 5T/IN	1.1T #20 INTERWOUND	5.1T #18 5T/IN	.4T	2.5T
21	"	"	1.1T #20 INTERWOUND	4.1T #18 4T/IN	.4T	1.1T

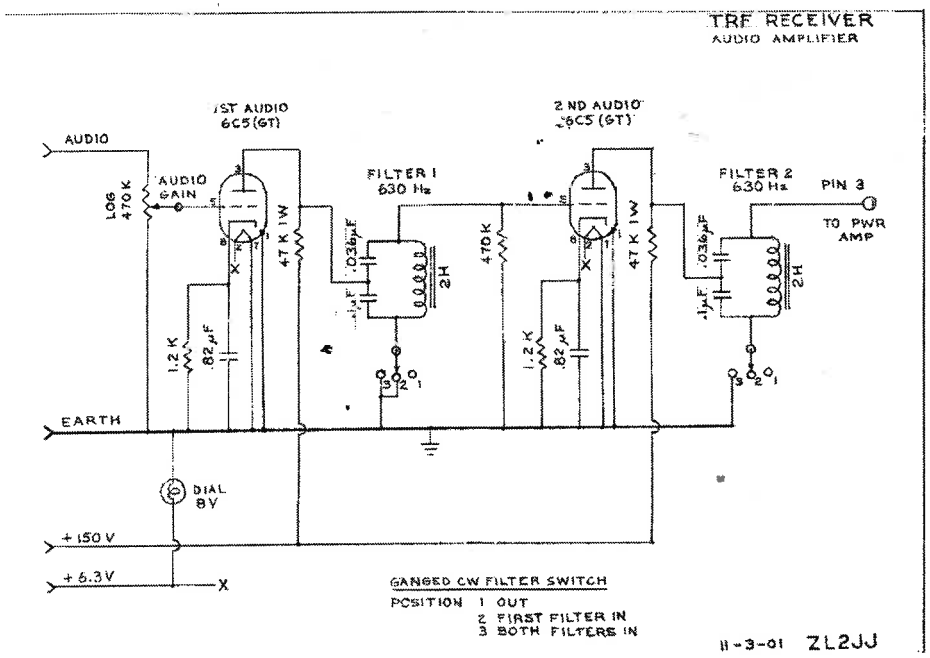


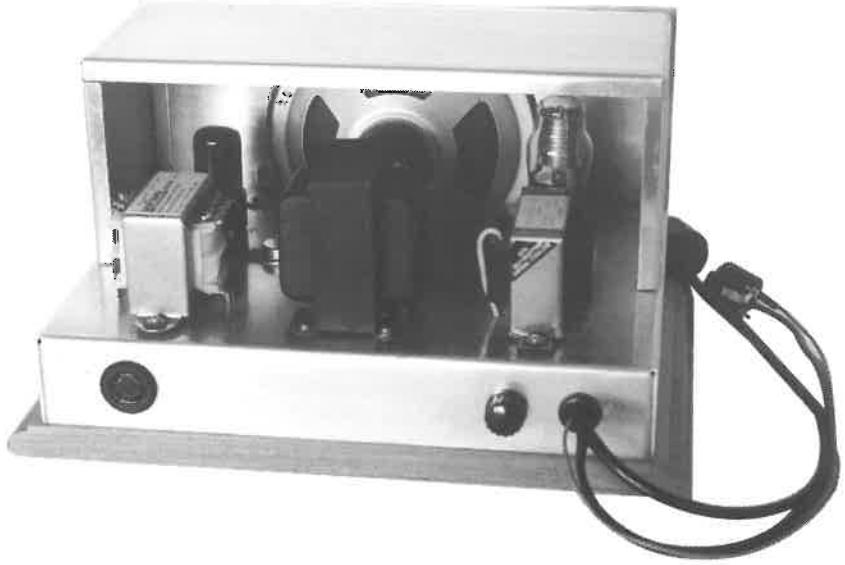
WIRE

SWG	INCHES	mm
18	.048	1.20
20	.037	.950
22	.028	.712
24	.022	.530

RIBBED 1½" DIA. COIL FORMS HAMMERLUND SWF-6

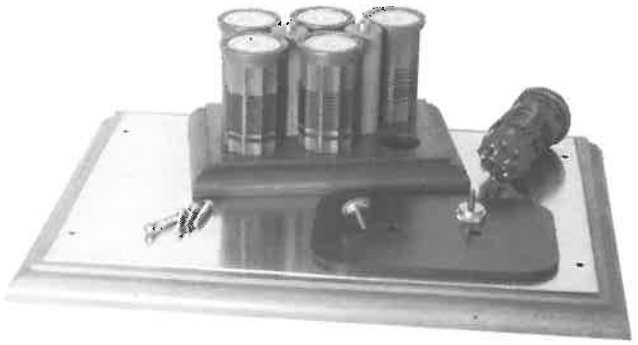
11-3-01 ZL2JJ





Power Supply and Amplifier - rear view

If you can't find Hammerlund forms, the coils can be made from 40mm PVC tubing and large 6 prong tube bases. A lathe will be required to groove the tubing. The coil table will no longer be accurate, so the number of turns w111 have to be adjusted by trial.



Set of coils

When winding coils and calibrating the receiver an accurate frequency standard must be used. The simplest and easiest to use is a crystal marker for 100 and 25KHz. Or, if you have lots of time, use the BC221 frequency meter. An advantage of the crystal marker is that it can also be used to set the receiver to the band edge accurately and quickly when operating. It can be small and battery powered.

The passive, CW, audio filter was designed by the late Don Sutherland ZL2AJL. This one is two stage and built around 2 Henry inductors. The two capacitors together resonate with the inductor at 630Hz. The capacitance is split at a ratio of about 4:1 as a means of matching between stages. A higher ratio will raise the Q and sharpness of the filter. Other inductors and capacitors can be arranged to give the resonating frequency you prefer. This receiver has the filters mounted above the chassis and protected with cut-down coil cans.

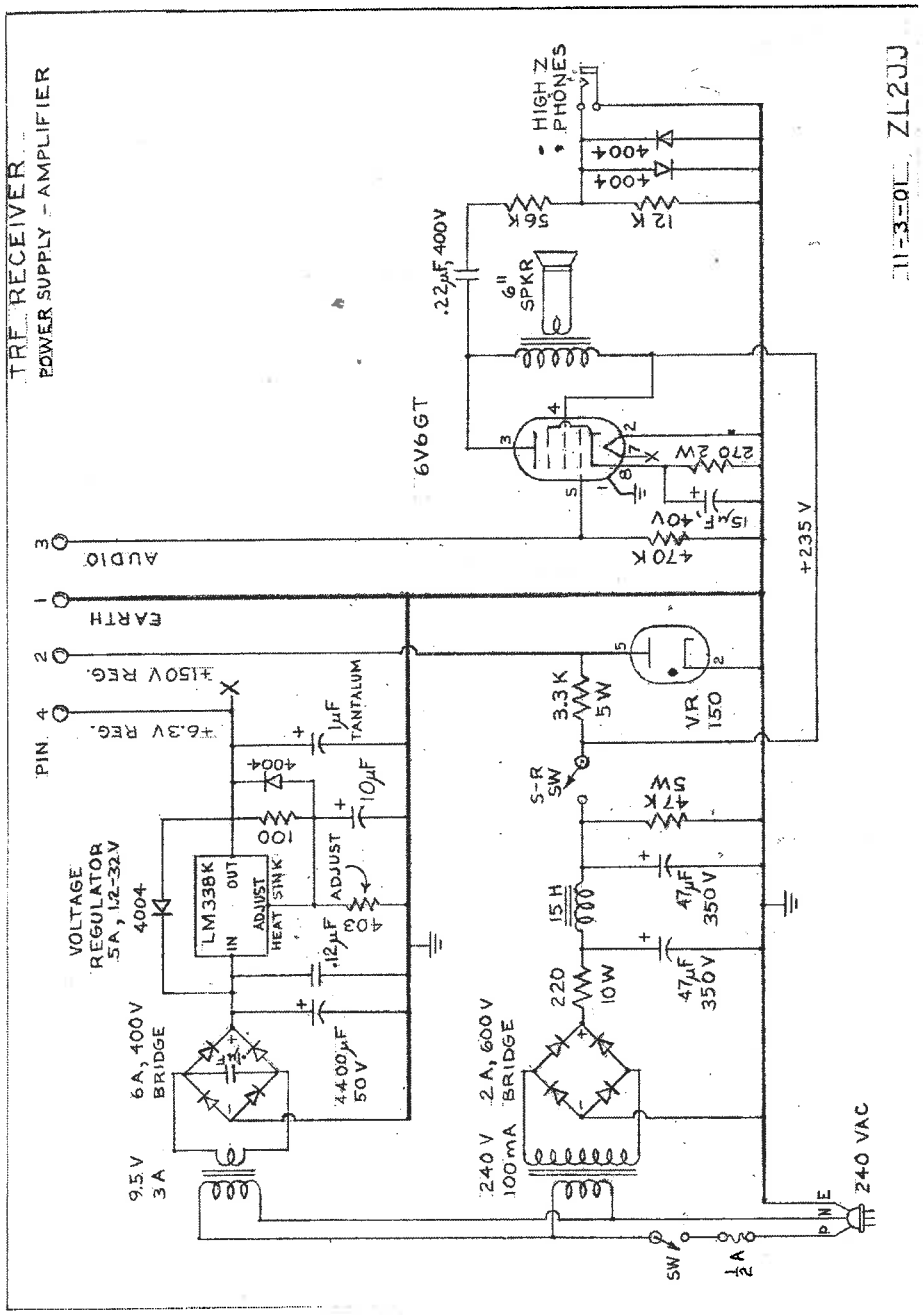
The power supply/amplifier circuit is shown overleaf and a rear view of the finished item is pictured at left. Construction details are evident from this diagram and photo -Ed

With the receiver completed, plug in the 80 meter coils, find 3.5MHz and trim the bandspread capacitor to track 0-100KHz. It w111 then track the same on all bands. Mark the bandset dial for each band, and also, peak and mark the RF dial.

Other tubes can be substituted. The ubiquitous 6U7G can be used for both RF amplifier and detector, but calibration will be slightly affected. The 6C5 can be replaced with the 6J5, but adjust the bias for best results. And the 6V6 can be replaced by the 6F6. Both glass and metal types are suitable for all tubes.

Anyone interested in this receiver is invited for a hands-on inspection at the writer's home.

I can assure anyone who takes up this invitation that they will not be disappointed. Peter is a meticulous craftsman and has many other examples of his craftsmanship including a 1920s style amateur radio transmitter in breadboard form and a fine small scale steam locomotive. Ed.



COLUMBUS MODEL 75

(Courtesy of Mark Smith an ex-employee of Radio Corporation)

You have to appreciate the general atmosphere prevailing at Radio Corporation, Wellington in 1937-38-39.

Here was a comprehensive manufacturing concern, with the grand title of Radio Corporation of New Zealand. Any association in the public mind with the American R.C.A. was not discouraged, although such connection did not in fact exist.

The Corp made many of it's own components; often necessary at that time, but an extravagance in today's light. Transformers, coils, IFs, wave change switches, bakelite knobs and escutchions, speakers - PM and EM - cabinets, some condensers, dial glasses (etched) were all made by RCNZ. Chassis and other components were all cadmium plated in house. An elite Laboratory and Special Equipment Division, made Public Address Amplifiers, intercall systems, test instruments and other non-production gear. Thus anyone working there, in any capacity, wore a general smugness in regard to their products Was there not some 20 retail/service branches devoted to these excellent products? Who could match that!!

Model 75 owes its existence to a prime factor. A young English immigrant in the factory had introduced a new feature - the slide rule dial. Prior to this, dials were of the clock type; their calibration and tuning was not of much interest to customers. Now there was a more visual means of bandwidth display - and a magic eye could be really featured. The young man was Fred Green, whose real talents were now on show, and in a short time, he was elevated to the created position of Production Engineer.

Short wave was a listening trend of the times - local stations, except the YA's, had only short range transmissions and ,with war imminent, listening to overseas short-wave broadcasts was popular. Thus the slide rule dial had huge possibilities. But how to fill the space available and stun the market? Answer - band spread short wave.

The Laboratory had played with this feature for some time but had no showcase for it until the slide rule dial was born. However, drift and stability was beyond current technology. The NTC idea was known, but units of the required capacity were not available or even made. There was little requirement for such a component world wide.

The answer to make them; Fred Green again. Radio Corp's in house Silver Mica Department was born.

The silver mica of the time is a story on its own. The plating material was a slate-grey slurry Fred concocted and was called tin oxide in the Department. It could be printed onto an insulating surface - dried somehow - contact made at each end and by mounting it in a variation of the Wheatstone bridge instrument, its capacity under various voltages could be read. By scraping off some of the dried "paint" or altering the contact points, you could get what you wanted. - broadly, much refinement was needed.

Mica was decided on for the condenser- a thin carrier for the paint and two pieces for covers. Mica sheet was split from saucer size blocks - gauged into required thickness by splitting layers

off till the wanted size was reached. Bone bladed splitting knives - some sheets only microns thick - a delicate business.

Dies were made for kick presses and hand presses. These machines already existed in the Mechanical Assembly Department where small components such as dial pointers, dial lamp holders. dial pulleys, wave change switch wafers etc were made, It was a delicate job punching mica, even in my day some 14 years later.

Trays of the thin mica pieces were then painted and baked dry in small Neeco bench ovens, ready for assembly. The pigtails, which made contact with the paint surface, were a special problem. Ever wonder why mica capacitor pigtails are flat? They are punched from thin tinplate with one round platform end in which there is a hole to carry an eyelet. No burrs that could cut through the dried paint were permitted.

The painted strip was mounted in a carrier, scraped to requirement, fitted with pigtails, mica cover plates and plated eyelets then gently squeezed to form a unit. The whole unit was then wax dipped and when cool measured again before sorting for accuracy. Though a fiddly process, think of the guy in the laboratory who could then get exactly the size he wanted by just going downstairs and resetting the Wheatstone bridge instrument knobs!

Thus eventually, with imagination and persistence, the stability problem was solved.

The model 75 entered production with all Radio Corp standard features. The drawn steel chassis - peculiar to each model was cadmium plated all over. Drawn aluminium IF cans and valve shields were used. Corp made octal sockets and so on.

It was recognized early on that checking the dial calibration in the field would be a challenge beyond some Service Departments. This was solved with a set of service instruments, designed in the Laboratory, built by the Special Equipment Division and installed in each of the 20 odd branches doing service work (some city branches were sales outlets only - e.g. in Wellington area all service work went to Courtenay Place).

The net effect of this field installation of test equipment was that factory standards became available in the field and any serviceman could go to any branch, walk into the workshop and just carry on. It was very far-sighted thinking.

The driving factor behind the special field gear was, of course, checking and, if necessary, resetting the calibration of band spread dials - especially now they were boldly presented to the customer. How to get an accurate bench generated signal into those band areas and identify it on the dial - by non-laboratory field staff? They came up with a simple answer. They built Radio New Zealand standard frequency generators. The main unit was a standard oscillator with calibrated dial, switched RF/AF as required. Another oscillator was included with crystal markers at 100 and 1000 kHz - just the thing for the broadcast band. It also had a short wave position marked 570. 2YA, with its immense power, was available right throughout the country (TEAL flying boats navigated with it well after that time). By tuning the radio to 2YA on 570 kHz you could zero beat the oscillator in the standard frequency generator to a dead accurate 570 kHz. The harmonics of that oscillator generally appeared in only one spot on each of the spread bands on the set dial, thus you had your reference point. Some clever dicks also checked with WWV or WWVH received signals.

The other main unit of the field gear was a standard multimeter with another meter beside it. This second meter read the plate current of the output tube and could be fed either from a harness lead from chassis to test speaker unit (part of the gear) or, in case of radios with no speaker plug, a harness of various tube bases which plugged into the output tube socket with the output tube replaced on top.

A dummy antenna box to provide correct RF source impedance was another feature of this set of test gear.

All this re-vamping and standardization in 1938 and all because of the model 75.

War overtook Model 75, and Radio Corp. as a manufacturing unit, came under the relevant Ministry of Supply.

Radio Corp. was allowed to complete domestic work already under way, and radio chassis with serial numbers could be finished. Ever looking for loopholes, Fred Green promptly bashed out bare chassis and put serial numbers on them - hundreds of them. The Ministry eventually woke up, and sealed "tin hat" dies into the presses.

The net effect of this was that Columbus models 75 & 53 were available in limited numbers during the war years. My elder sister was married in 1943, and got a model 75 as a wedding present from the family. Production of these wartime sets was in Newtown, where Radio Corp. had a cabinet factory upstairs, opposite the hospital. There were plenty of 6V tubes around, and many in stock. Other components were likewise made and hoarded. Neeco and Turnbull & Jones had plenty of wire - before it all came under the Post Office. Radio Corp. had money enough to acquire material and squirrel it away.

Bob Richards in the Laboratory during this era, did a huge amount of work on battery power packs for radios. Hash free units were the goal. If you look at the power pack, and other Corp. circuit diagrams of the time, you will see R.S.R initials on many of them. He sure made his contribution.

Stan Dallas once told me, that we "kids" educated within Radio Corporation had little real appreciation of the calibre of our organisation. When he was recruited to set up a recording studio nothing existed as equipment. He, with the staff of Special Equipment Laboratory and Fred Green, set about building unobtainable ribbon microphones, amplifiers and filter gear; control systems followed. He said the experience gained in winding coils for the microphone pole pieces, made possible the later Radio Corp gram unit magnetic pickups.

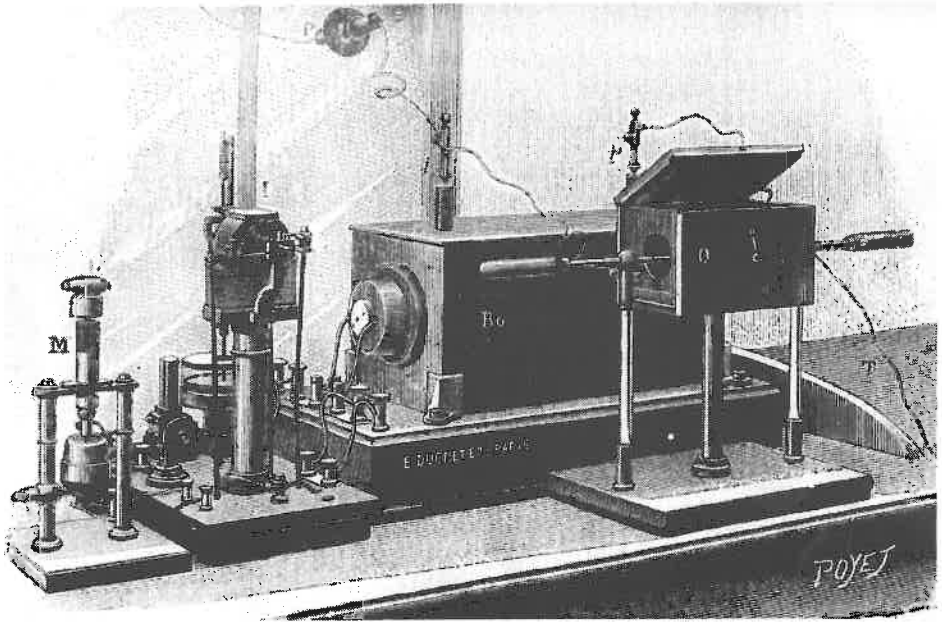
You should take a close look at this gram unit, should you find one. They were fitted to Model 19 table gram "Dover" sets and some Model 66 ".Pennant" gram sets. The .Black Budget had knocked the import of Garrard Player units. Fred set about making a local substitute. Motor lamination stacks were made, just like we later saw in Masterton at HMV Electronics. Coils were wound and shaded pole 230v motor thus produced. A turntable was made from two steel dish pressings, and Southwards provided a seamless rubber drive ring. (Len Southward was a mate of Fred's). The pickup was made with a small U magnet, a small coil, and a needle mounting. The mount for the needle was a special problem. The attraction of the pickup magnet to the Steel turntable was quite another matter, but on 78 rpm records your pickup didn't jump!

A dual speed unit to run at 33rpm was later devised, and the pickup arm took several forms. The 33rpm version had a separate plug in head for LP. I remember gram motors that "ran slow" were shipped off to Begley Industries and used in early fan heaters. These heaters. if you ever saw one, were two "tin hat" pressings (with much of the dome cut out) spot welded together around the rim. The motor/fan was mounted inside, with the element spaced on strips of asbestos building sheet. Metal mesh enclosed front and back and the whole thing sat in a conduit frame. The DeLuxe unit had a switch. All designed by Fred to use surplus items from the factory but built up the road by Begleys.

Model 80 was the battery version of Model 75. It had a switch to turn off dial lights and magic eye tube, to conserve battery.

The post-war Model 90 was the direct replacement of those sets. Check your circuit notes for interesting detail. Especially model 75.

The actual construction of the negative temperature coefficient capacitors is intriguing. Presumably the "tin oxide" mentioned in the above article is the titanium di-oxide mentioned in our previous article (May 2004 page 7). From the description above it appears to have been used as the plates of mica capacitors rather than the dielectric. Perhaps one of our readers has further knowledge. - Ed.



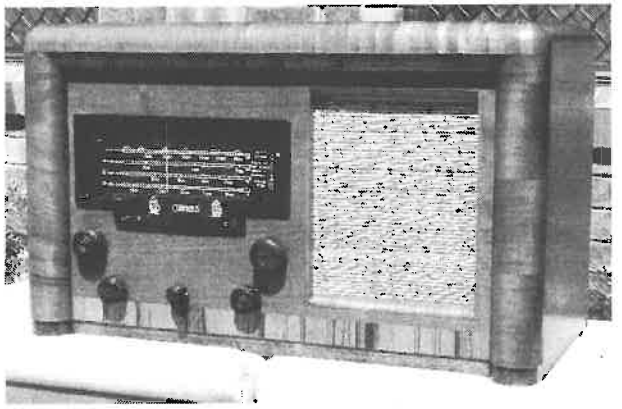
An early spark transmitter (c1900). To send some code it was necessary to press on handle M which made contact with a bath of mercury, sending current to the primary of the spark coil. Hardly conducive to a speedy transmission !

Illustration supplied byof Dick Stevenson

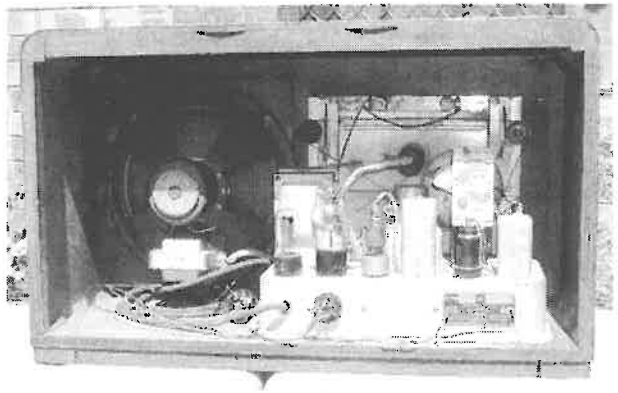
RESTORATION OF A COLUMBUS MODEL 90X

A few months ago our Treasurer was contacted by Graham Donaldson, Secretary of the South East Queensland group of the HRSA, for assistance with the restoration of a rather unusual find in Australia - a Columbus model 90X. Since some of the points raised in the subsequent correspondence could be of interest to our members, a précis covering those points follows including a yet unanswered question.

Some time ago Graham states, he was given a lovely old Columbus radio by a couple who came to Brisbane from NZ many years ago . It is a fairly large wooden table unit and is labelled model 90X on a plate at the rear of the chassis. The serial number is 87679.

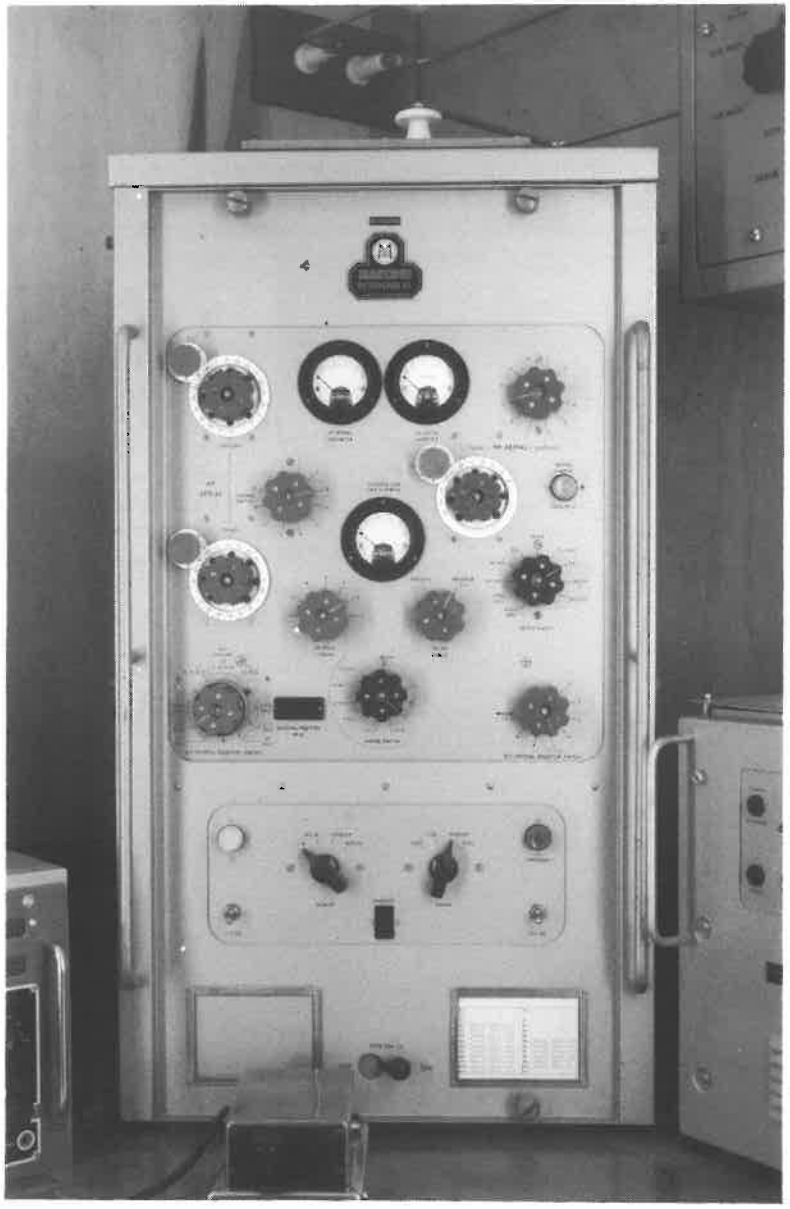


Superficially, it was in excellent order. However, on inspection, Graham found that the speaker field coil, one of the IF primaries and the RF coil primary were all open circuit and had to be rewound. He also suspected that one of the IF transformers has been replaced some time in the past as the two IF coils were totally different. The original "top of chassis" electrolytics were missing which he regretted as he usually refills these cans with new electros.



The circuit is very similar to that of a Columbus model 90 schematic which our treasurer sent him. The main differences so far noticed appear around the 6B8 detector valve.

A most intriguing point was - what did the "X" in the model number signify? Perhaps one of our members may be able to throw light on this matter



Front view of the "Oceanspan" Transmitter

Restoration of the Marconi International Marine Company "Oceanspan" Transmitter.

David Smith

The Oceanspan is possibly the most famous of all the British marine transmitters ever made. The Mark I was introduced in the early 1950's and the final model, the Mark VII was made in the mid sixties. All models covered the MF and HF marine band using radiotelegraphy (Morse code) and the Mark VII was also fitted with double-sideband radiotelephony.

This piece of equipment might appear to be an odd choice for one new to the hobby of radio restoration, but 40 years ago Oceanspan maintenance was part of my pre-sea training course, so I have fond memories of this transmitter.

The Oceanspan consists of two sub-assemblies. The upper assembly contains the RF stages and the lower unit contains the control section and modulators. These two sub assemblies are housed in a frame, with interconnection achieved by two rows of Z contacts wired to a loom.

Most ships of the period had 110V or 220V DC supplies. This was the era prior to the sophisticated AC motor control units that we know today and for shipboard use DC had many advantages. Most receiving equipment was designed with an HT of 110V; the valve heaters were wired in series. Thus the equipment was directly wired across the main supply. On 220V DC ships, large dropping resistors were wired in series with each piece of equipment.

On equipment such as transmitters, higher voltages were obtained by the use of rotary convertors. On DC ships, the Oceanspan was fitted with a rotary convertor in the lower sub-assembly and power was connected to it via the HT switch. Thus the operator would switch on the LT switch some time prior to transmitting, but only throw the HT switch down immediately prior to keying his message. The rotary convertor was very noisy and would be just an arm's length from the operator, so it was powered only when necessary.

However, I was in luck. The Oceanspan I have acquired was the more unusual AC model. The control chassis does not contain a rotaty convertor, its function has been replaced with an external power supply.

The RF sub-assembly basically consists of a MF (405KHz-525KHz MCW (A2) transmitter and an MF/HF transmitter, which covers all marine bands from 1.6MHz to 22MHz using CW (A1) or AM (A3A) modes. Several years ago, the previous owner of the transmitter had adapted the transmitter for use on the 80, 40, 20 and 15 metre amateur bands. This had involved the introduction of new crystals and possibly the retuning of the RF buffer amplifier stage.

There was a standing joke that the Oceanspan had fewer valves than "Mum's radio back home". This was a bit of an exaggeration, but not much. The heart of the transmitter is six 807's – three in parallel in the final RF stage, one in the RF driver stage and two in the modulator stage. By law, all transmissions on the international distress frequency of 500KHz had to be A2 – modulated carrier. Some medium wave broadcast receivers covered as far down as this frequency, so many readers may remember hearing these musical Morse code signals as they tuned below the National Program. The three 807's in parallel, with an HT of 600V produced a modest output of around 100 Watts, which was great for Trans-Tasman trips, but a bit weak for contacting U.K. on HF when conditions were poor.

I transported the Oceanspan to my business workshop with the intention of doing the restoration in the occasional evening during the winter months. The condition of the transmitter that I acquired was not brilliant. The MF aerial tuning variometer had been home for a family of starlings, whilst Mr and Mrs Mouse lived on the main chassis. Other places had been highly desirable residences for a variety of insects and all exposed unpainted metalwork had salt corrosion. I had never restored a radio before and had not touched any valve equipment since 1974, so I was unsure how to proceed. On the emailed advice of an NZVRS member I cleaned the exposed metalwork with a rag soaked in kerosene and used a toothbrush on corroded parts. After a few hours work, the unit started to look a lot better. The birds' nesting materials and rodent droppings were vacuumed out, a few rusty bolts were replaced and two rusty chromed handles on the PSU were sanded down and sprayed with chromium paint.

The only major part missing was the aerial insulator – a large ceramic unit, the size of a coffee mug. The previous owner had removed it so he could connect a coaxial feed directly to the aerial circuits. The owner had relocated and told me to collect the transmitter from his old home. He told me the insulator was on the kitchen table, but any amount of searching failed to locate it. I guess that in the tidy-up, a family member had mistaken it for crockery and discarded it. A local wood turner has made a replica insulator for me. The new insulator has been sanded and given a dozen coats of paint. One day I hope to use this wooden insulator as a model for a new ceramic insulator to be made.

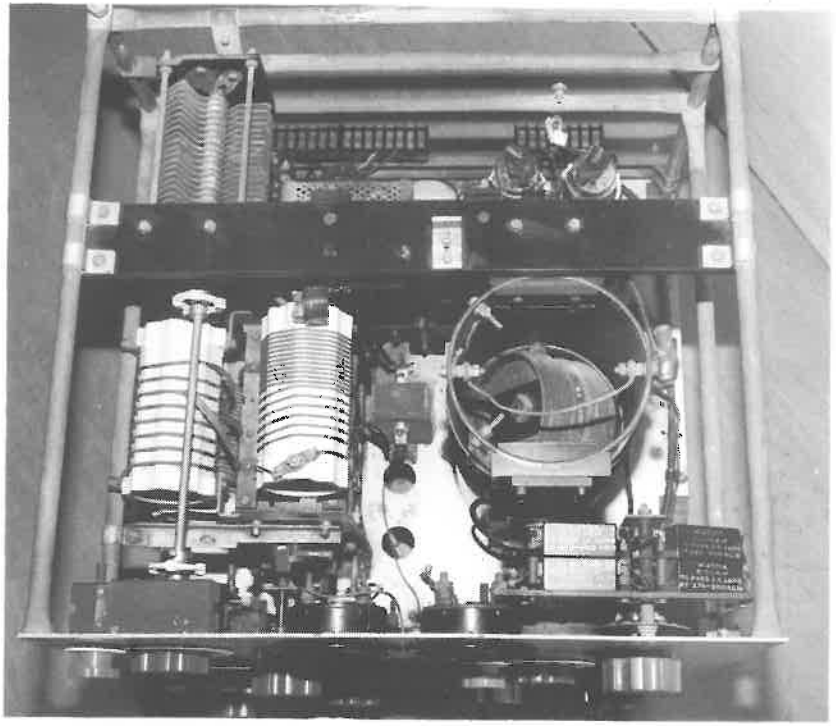
In the whole transmitter there were only three electrolytic capacitors; these were in a –12V microphone bias supply. They had already been replaced at one stage, however the packing around them was rotten, so they got replaced again.

I went systematically through the unit, checking the value of each resistor. Unlike modern digital circuits, I found it very easy to check each resistor whilst in circuit. I devised a procedure that involved 3 checks
Check #1. Does the resistor look good?
Check #2. If the resistor does not measure correctly, does the circuit diagram explain why?
Check #3. If unsure, unsolder one end and measure again.
At least a dozen resistors were found to be defective. The most interesting was a 1MΩ 5 Watt resistor. This had failed at some previous time and the Radio Officer had obviously not got the correct spare on board. So he had made a substitute with ten 10MΩ ½ Watt resistors in parallel. These were all faulty – obviously once one had failed the others went down like a row of dominoes.

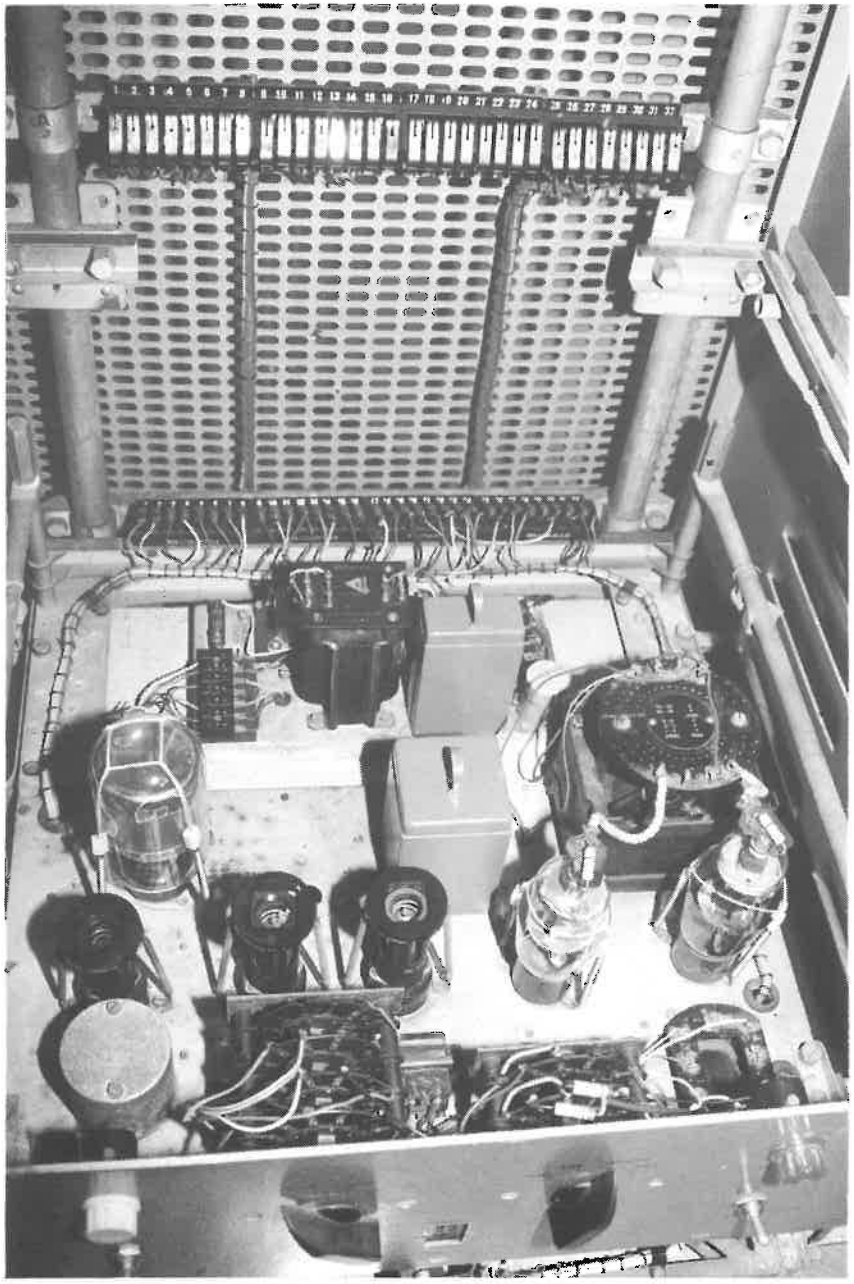
Once the PSU had been wired to the transmitter and repeated tests made with an ohmmeter, I came to the conclusion that there was nothing else to test unless I was prepared to apply power. The massive gate-switch was closed, the PSU and LT switches pressed down and I hid behind a bookcase as I remotely applied power to the workbench. The pilot lamps and valve heaters glowed reassuringly – no smells, no smoke – quite an anticlimax! After a while, I connected up a dummy load to the aerial connection, set the controls as per the manual and very gingerly pressed the HT switch. The meter switch was rotated – all the readings were normal, so I switched to the "tune" position (¼ power, key down). A slow rotation of the aerial tune control was rewarded by a dip in the RF amplifier anode current and a decent reading on the aerial meter.

It was now time to take the transmitter home and install it in a replica of a ship's radio room that I am constructing. The transmitter was connected via the usual three-eighth inch brass tube to a Marconi International Marine Company aerial switching box, which in turn was connected to a 40 metre long dipole aerial via a 50Ω coaxial feeder cable. This dipole aerial was a departure from what would have normally been found on a ship. An Oceanspan would have normally fed a "Marconi Aerial" which would have been an inverted "L" strung between the two masts. "Marconi Aerials" work best with very good earth connections and on a ship the "earth" is close to perfect as the transmitter is connected to the steel hull that is in contact with salt water. A few rods driven into the clay subsoil of my garden would not achieve similar results. I believe that anyone operating a radio transmitter from their home needs to ensure that there is absolutely no interference to his neighbours' TVs, radios and stereos and also that the visual impact of aerials are kept to an absolute minimum. The RF stage of the Oceanspan is driven in "Class C", which is a very efficient mode of operation, but does mean that the signal is rich in harmonics, and unless the harmonics are successfully suppressed by the aerial coupling circuitry they would create a source of radio interference. Thus I chose a dipole that is resonant on the frequency that I use the most – 3520KHz.

I've regularly used the transmitter on air. It performs well and is a joy to use. The warmth of the valve equipment makes the radio room a very cosy place to be on a frosty evening.



Upper RF chassis. On the left are the switched HF tuning coils and the HF coupling variable capacitor, On the right are the MF switched coupling capacitors and the MF tuning variometer. To the rear of the variometer are the three 807s in the power amplifier stage



Lower Control Chassis - The 5 valves at the front are used for modulation, the large valve on the left is the stabilivolt and the subchassis at the rear is the microphone bias power supply unit. The Z contacts for inter-chassis connection can be clearly seen.

SERVICING A BRT 402 E.

George Newlands

The communications receiver I am going to describe here was made by the General Electric Company of England and used at the B.C.N.Z. receiving station at Quartz Hill in the late 1960s. This particular one, serial no.111, was presented to one of the Superintendents on his retirement in December 1987. In February 2004 he donated it to the committee of the Wellington Amateur Radio Club and I volunteered for the job of overhauling it.

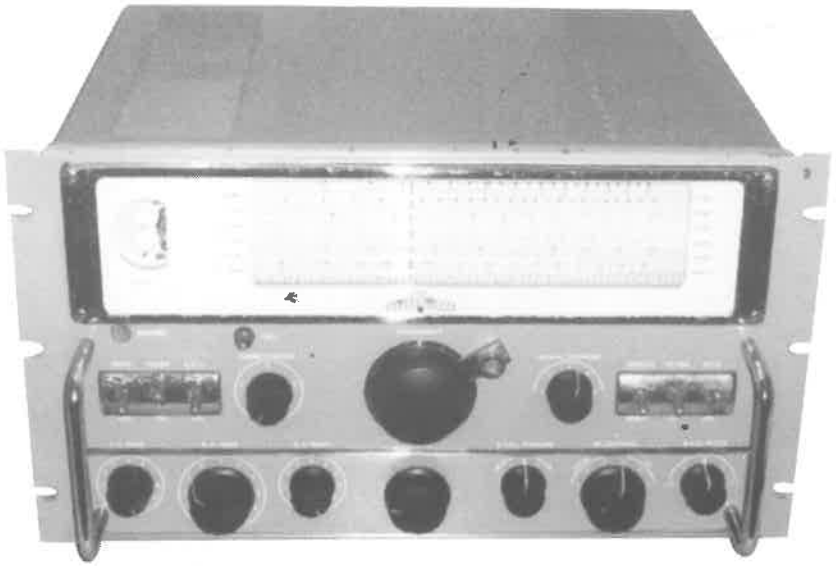
This set is a rack mounting device, single conversion with a 455 kHz IF. It covers 150-385 kHz and 0.5-30 MHz in six ranges and uses no fewer than 15 valves.

Contemplating the Problem

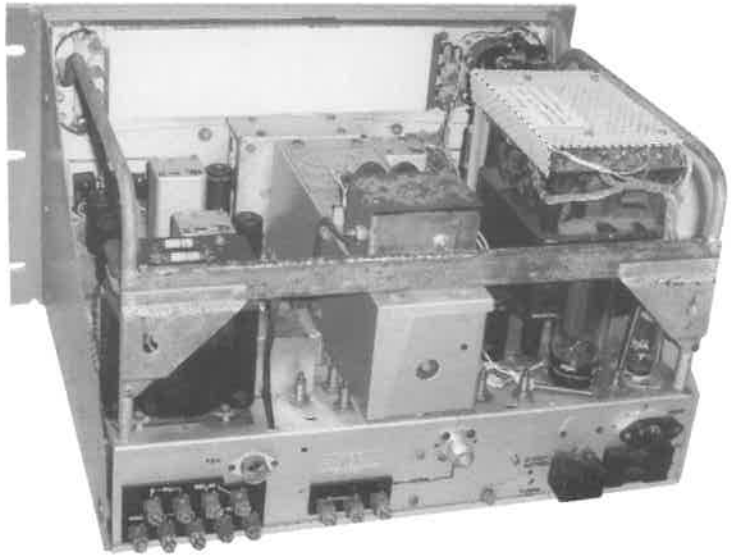
When I first received the set several things were immediately noticeable. Firstly the weight: no less than 36 kg! (That's about 80 lb. in proper measurement). Unfortunately it had the "30-odd-years-in-the-back-of-a-damp-garage" look that we are all familiar with and I was pleased to note that the handbook bore at least some resemblance to the set. The set is a model E and the handbook pertains to models K and N. A quick inspection showed everything complete but very dirty. There was also a notable lack of electrolytic capacitors - the only one is the decoupler on the output valve cathode. A quick study of the handbook showed the reason for this and I shall elaborate on it later. I also noted the use of an EL91, a power valve, in the local oscillator position, which seems rather unusual.

A good clean was the first priority and it looked much better for it. I didn't bother testing all the valves, considering that any that were faulty enough to cause trouble would show themselves in due time and this proved to be the case. The power safety check proved good so the rectifier valve was removed and mains power applied through a Variac and an ammeter. All this proved was that a couple of dial lights (there are ten of the things but they're not all on at once.) needed to be replaced. I then connected a bench power supply to the H.T. line and brought the voltage slowly up to 250. The set drew close to 100 mA, which is what I expected but apart from that nothing happened, untoward or otherwise. The thing just sat silent. It was now safe to plug the rectifier in and get serious with it.

All but one of the power supply voltages were there and replacement of an open circuit wire-wound resistor fixed that but I still had a silent set. The audio stage was lively so the next thing was the second detector and the I.F. section which proved to be dead and I wasn't exactly looking forward to it. Two stages of amplification, switchable crystal filter, variable bandwidth,



GEC type BRT-400E Communications Receiver



Rear View with Cover Removed

noise blanker, manual gain control, B.F.O., a complicated A.V.C. system, S meter, Uncle Tom Cobbley and all. Still, you can get lucky sometimes and I thought I had. All this section came to life with the replacement of one amplifier valve, a 6BA6 which had lost its vacuum. Surely, I thought, this would bring the set to life but no, it was still dead and I was confronted with a six band R.F. section consisting of two amplifier stages, the mixer and the local oscillator. Again, you can get lucky. Why waffle on- it was only another vacuum-less 6BA6, replacement of which brought the set to life.

I was grateful that the R.F. section did not require work because the construction is deep and very compact. Although professionally designed and built the construction is such that it is difficult to see the undersides of the valve sockets, let alone get at them. Having to replace any but a few of the passive components would be a servicing nightmare.

Reception with the set was inconsistent at first, due to the condition of the wavechange switch contacts. The switch sections were in remarkably good order, obviously having had very little use, but the lengthy sojourn in unsatisfactory storage had ensured an oxide build-up on the contact surfaces. Careful application of CRC and some vigorous use brought all that right. A random check of some of the tubular capacitors brought up no faulty ones; quite astonishing in something 40 years old and what proved to be an unnecessary calibration check brought the servicing of this quite remarkable receiver to an end. So there it was. Two valves, two dial lights and a resistor and the old set was back up and going. The further I went with it the more favorably impressed I became. The engineering, both mechanical and electrical, is absolutely first class and this; together with the quality of the components make this a really serious machine.

The cosmetic clean up was all quite simple. The outer case was rust spotted but it responded well to a light sanding and two coats of spray paint. The only other problem was the dial light diffuser panel. The set uses a slide rule style dial with the band in use being lit through contacts on the wave change switch. An opaque diffuser panel, white painted clear plastic, is mounted behind the dial scales and lit by a lamp mounted well to the back of the chassis. This effectively illuminates the inside of the cabinet and gives a most pleasing effect when the receiver is viewed in subdued light. The problem was that the paint had aged, shrunk and assumed a crazy paving effect, flakes of which fell off whenever the panel was touched. This meant that it had the appearance of having holes in it. A complete clean of the panel followed by a very light spray with matt white paint brought all this right.

And now to the power supply smoothing system which uses a 4 mfd oil paper capacitor in the reservoir position, a choke and what is called a "hum valve". I had heard of this system but this is the first time I have encountered it in practice. The circuit, as sketched here, shows the operation of it. Any hum appearing on the output side of the choke is applied to the valve grid via the .5 mfd capacitor. This means that a positive going hum spike will cause the valve to conduct and pull the spike down by virtue of the load provided by the 430 ohm resistor, thus causing the spike to flatten out. A negative going spike will cause the valve to cut off and thus push the spike up. The system is very effective, a distinct null in the hum level being noticeable as the cathode resistor is varied. The advantages of the system are that it takes less space than the equivalent capacitors and would certainly be easier to replace. The only disadvantage I can see is that it is rather wasteful of H.T. current, the valve bleeding off no less that 33 mA, but this does not worry a set of this kind. The power transformer is massive and has obviously been designed with much reserve capacity.

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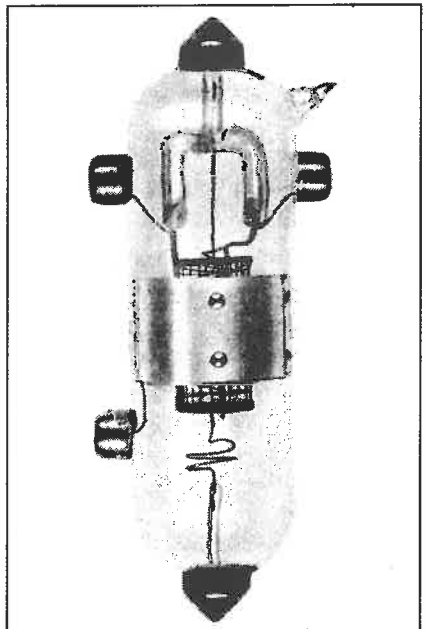
THE EARLY DOUBLE GRID VALVES.

R A. Stevenson

The tetrode, with a screen grid, is well known as the solution to the unwanted oscillations that plagued the early triode amplifiers at RF. Although this construction had been discovered in 1913 it was not used as such until the late 1920's. Yet, since about 1920, double grid (four electrode) valves had been in existence and used in a number of ways, mainly to increase the amplification factor. At the time this was an important consideration as it did away with the need for an extra valve. Valves were expensive and fragile and in some countries the tax on the receiver was based on the number of valves it contained.

An American, Irving Langmuir, found in 1913 that a positively charged grid near the filament accelerated the emitted electrons by cancelling out the negative "space charge" that otherwise required quite a high anode voltage to overcome. Such four electrode valves, using the space charge connection were popular for a time as they allowed the use of a low H.T, often only 10 volts. Yet there was a fatal flaw, the space grid drew quite a heavy current, often more than half the total current across the valve. Economical battery operation was not possible and soon improved valves and the use of pentodes made such circuits unnecessary.



FOUR-ELECTRODE VALVE

Fig. 1. Two grids, one filament, and one anode form the four electrodes of this Marconi-Osram valve, which can be used for the three purposes of high- and low-frequency amplifying and detecting, simultaneously

Courtesy Marconi's Wireless Telegraph Co., Ltd.

An early four electrode (or bi-grid) valve in Britain was the FE 1 (FE = four electrode) and resembled the tubular triode V24 but had an extra terminal on the side. Other types appeared and in Europe bi-grid valves were called Bigrille (French) and Bigrilla (Spanish). The bulky horizontal sockets needed by the V24 construction were given up in favour of the usual British-Continental kite-shaped arrangement with a fifth central pin or a screw terminal on the side of the valve-base catering for the extra grid.

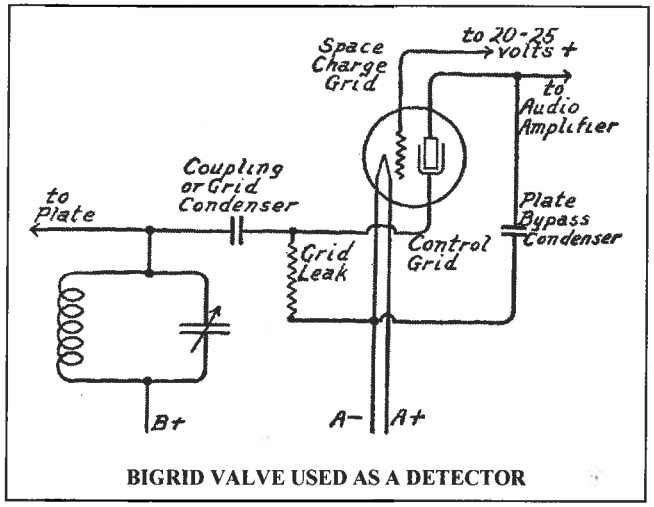
Interestingly the space charge principle was revived in America for car radios. During the 1950's, when automobiles changed from 6 volt to 12 volt electrics, a series of all-glass valves were produced, using 12 volts for both heaters and anodes. Pentodes for RF, IF and AF were quite successful but power amplification left much to be desired.

Several power tetrodes were issued, the large current needed for the space charge grid not being important as the car battery was being continually recharged. All this soon became academic as AF transistors, although at first rather noisy, took over. For a while, car radios had front ends using valves, feeding into transistors to drive the speaker.

Below is a selection of space charge valves with some details:

TYPE	USE	GRID (1)	ANODE
BIGR. AMP	AF Amplifier	10 volts	10 volts
12AL8	Car Radio AF	12.6V @ 75 mA	12.6V @ 40 mA
12DV8	Car Radio AF	12.6V @ 53 mA	12.6V @ 9 mA
12K5	Car Radio Output	12.6V @ 75 mA	12.6V @ 40mA

The BIGR.AMP exemplifies the early bigrids with a low HT. The details given for the car radio valves show the large current used by the space-charge grid, although fortunately not an issue in cars. Little output power was achieved, for example the 12K5 only managed 35 milliwatts!



BIGRID VALVE USED AS A DETECTOR

The same bigrid valves could be used in another popular configuration, the reflex receiver. Again, a valve could be saved as the bigrid was made to amplify or detect at RF followed by an AF stage fed back to the other grid by an AF transformer. Such an arrangement could be done with a single triode, but amplification at two different frequencies was thought to be more efficient if two different grids were used. Quite ingenious circuits were put forward. sometimes with even more functions loaded on to the unfortunate bigrid! The third, and probably most useful circuit was as a mixer in a superheterodyne. The superheterodyne principle was established as early as 1917 and its improvement in set selectivity noted but as long as there were relatively few broadcasting stations there was little need for this selectivity. However the meteoric increase of stations in the 1920's, especially in the USA, brought problems of separation and it was found that the bigrid could mix two radio frequencies to produce the intermediate frequency (then quite low at 50-100 kHz). This IF, once detected, could be greatly amplified by a modified A.F. circuit.

This use of the bigrid as a mixer was moderately successful but soon more efficient pentagrid converters appeared, like the 2A7 and 6A7, culminating in the triode-hexodes 6K8 and ECH35. A low frequency IF caused repetitions of the same station across the dial, so was changed at first to 175 kHz and later standardised at 465 kHz. An RF amplifier was now used rather than the previous AF one.

References:

"History of the British Valve to 1940" by K.. Thrower (1992).
"Harmsworth's Wireless Encyclopedia" (1924).
RC.A Receiving Tube Manual" (1965).
"V alvulas Europeas" by RJ. de Darkness (1954).
"Drake's Radio Cyclopedia" (1929).

Golden Knight - Before

Golden Knight - After

Radios Service at Home

My daddy fixes radios,
he's a service man you know.
The owners bring them in to him,
he has to make them go.

He tunes them up, he tests their tubes,
and checks their dial lights.
Then he settles down to work,
and stays up half the night.

He touches this and wiggles that,
and mutters neath his breath.
Then sometimes he'll swear so bad,
it scares ME half to death.

Then sometimes too he makes them scream,
and screech and squawk and roar.
I shove my fingers in my ears,
and scarper out the door.

I wish he'd give it up, I do -
it's driving him insane.
And if he doesn't stop I fear,
he'll become a rattle brain.

- similarities to "Radio Craft".
Submitted by David Crozier

Golden Knight Console circa 1930.

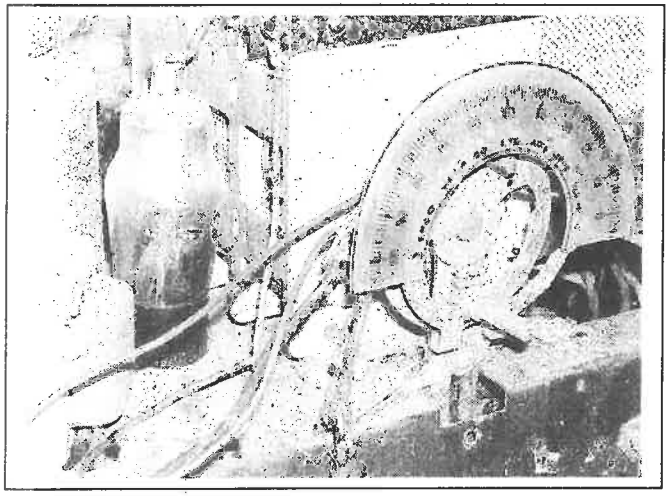
Ian Sangster

Some time ago I received a phone call from a fellow who said he had some old radio stuff that I could have if it was of any use.

Well, free is good, but from my experience of previous offers like this I didn't hold out much hope for anything decent. This time was no exception as I discovered when I saw the pile of rusty radio junk piled up in a broken down garage. I didn't have the heart to tell the man to throw it all in the rubbish bin so I loaded it all into the boot and back seat of the car thinking at least I could donate it to the club for our next auction night.

When I happened to mention that I was on the look out for real old radios I was told that there was an old one in another shed that I could have as well if I wanted it. So we had a look and there was this early Golden Knight console sitting lonely and neglected and just waiting for a new home. It was very dirty and at some time had been painted black with a yard broom however although it was rough and rusty it was all there.

Naturally it also came home with me.



I removed the chassis and speaker and gave everything a good clean then stripped the black paint off the cabinet. After a few minor repairs I shellacked and waxed the cabinet then replaced the old grill cloth and refitted the dial escutcheon.

Repairing the radio itself was a lot more time consuming. The arc dial mechanism was corroded tight and had to be dismantled, cleaned and oiled. The dial lamp holder had collapsed so I adapted another from the spares bin and fitted it. The power transformer was missing so a good one that I had saved from another set was fitted. The 2.5 volt valve lineup of a 2A7 mix/osc., 58 IF, 57 second detector/first audio and 2A5 output was as expected and fortunately I didn't need a circuit to get this one working.

Even after the alignment was checked over the sensitivity was poor however with a six foot aerial there was adequate volume.

Now for the next problem. Where am I going to display another console?

MARKETPLACE

Advertisements for the next issue must reach the editor by the 15th Jan. 2005. Ads must be either hand printed, typed on a separate page or emailed. No verbal or phone ads. Remember to include your name, address and phone number. There is no charge for ads but the NZVRS is not responsible for transactions between members. Address ads to Reg Motion, 2A Hazel Terrace, Tauranga, New Zealand or email regmotion@xtra.co.nz

AVAILABLE

Due to the consolidation of my collection I am offering 150 plus, nice old radios including the odd boat anchor and bits and pieces for sale. Most of the sets are popular types of the 1930s in unrestored original condition: there is a range of consoles, tombstones and mantels etc. I have too many sets to display at one time so I intend to sell them in batches thus the sale will be ongoing until all are sold. Any residue will be put in a garage sale or an auction. Please contact me for an idea of what I have got and arrange an inspection. I am interested in giving the genuine collectors amongst our members the first choice. Gordon Baker, 101 Hinewa Rd, Otumoetai, Tauranga 3001. Ph. 07-5767889. Leave a message so I can contact you back if no-one answers. Email baker@paradise.net.nz

Emmerson 6 valve 3 band circa 1934, small round dial, 110V ac/dc with tranny $170. Zenith H581T table radiogram, 4 speed changer, 3 band bakelite art deco cabinet, large brass front dial with manual and circuit, 110V 50/60 Hz with tranny: rare, may be the only one in NZ, $350. Vidor, Pye, Antone, Ariel valve portables in good condition, $20 each. AVO multiminor mk4, original leads and case, $50. Philips 597 glass dial scale, $10. Trevor McDonald, 09/8362023.

Yaesu FRG-7700 receiver with FRT-7700 antenna tuner and FRV-7700 VHF convertor, all with operating manuals. Receiver in clean working order and accessory parts seem not to have been used, $350 the lot. G Newlands, 14 Vasanta Ave, Ngaio 6004 Wellington. Ph 04/4791017.

Instruction book No. 1-56068R for AWA Distortion and Noise Meter Type 2A56068. Ex NZBC with extra pages showing circuit alterations and a report on mods. Postage only to anyone who may be able to use it. Graeme Lea, 116 Cutfield Rd, New Plymouth. Ph 06/7585344

Spring has sprung- time to box up all those loose valves lying around the shed, same old price, small $10 per 100; GT $10 per 100, medium $12 per100, large $18 per100. All plus postage (courier). Any amount supplied. Can't find that chassis You are looking for, give me a ring, you never know your luck, 6-8pm best time. Paul Burt, 44 Hastings St West, Christchurch 8002. Ph 03/3327157 Fax 03 3327059.

WANTED

Insignia for a Mullard model 540E. This insignia fits into a shallow recession in the centre front of the cabinet above the speaker grille. Bill Farmer; 43 Kay Drive, Blockhouse Bay, Auckland. Ph. 09/6270017

WANTED (Continued)

Circuit diagram for NZBC Equalising Amplifier type 2314.also instruction manual for a TMK Condenser Checker model TC-1. Graeme Lea, 116 Cutfield Rd, New Plymouth. Ph. 06/7585344 after 5.30pm.

Old EM loudspeakers with or without cones for restoration. Sam Lowe, 23 Hurdon St, New Plymouth. Ph 06/7536693

Chassis and speaker for Philco model 144, 6 valve 1934, any condition considered. Cone for Atwater Kent e speaker or one that will fit. Alastair Watson, 30 Newman Ave, Brightwater, Nelson 7151. Ph 03/5423733. Email alandmarg@xtra.co.nz

Old NZVRS bulletins as follows: Vol 1-1,2,3.Vol 2-1,3. Vol 3-1, Vol 5-1, vol 13-2. Vol 15-2,4. Vol 16-21 inclusive, all issues. Ray Robinson VK2ILV, 7 Roland Ave, Wahroonga 2076 NSW, Australia (West Island). Phone au 612-94898561. Email robinson@shlrc.mq.edu.au

Majestic turntable motor and pick-up; Ortofon pick-up arm and cartridges; valve amplifiers by Leak, Quad etc; 16" radio transcription records and old ribbon microphones. Andrew Griffiths, 26 Waratah Ave, Burwood, Victoria, Aust. Ph 03/98081067 or Email camfair@optusnet.com.au

Dial glass 295x139x5mm for Ultimate coc, looks same as cou (MGAR, p131), has band indicator above tuning indicator, broadcast, medium wave, short wave. Dial includes two smaller circle dials with pointers to show volume and fine tuning. Prepared to pay good dollars for an original or copy to restore radio with much sentimental value. Phone Rex 03/5239740 evenings.

2 white knobs for Clipper model 5M4 plastic mantel radio, also circuit diagram for Sony ICF2001. Dave Dawber, 5A Mules St, Stoke, Nelson. Ph 03/5472549, email ddawber@paradise.net.nz

Driver for Brown horn speaker (top left p 200 MGA). Handle for Gulbransen/Cromwell 518N portable (p47 GA). Green Philco Alabama model or just good case(p108 MGA). Green Bell Colt. Grey and blue push-on knobs for Bell Colt. One big knob for Columbus 565C (p119 MGA). One knob for Pacemaker Petit(p47 GA). One knob for Pilot Radio - brown bakelite with ships wheel motif. Brown bakelite knob for Ekco SW86(p194 MGA). Doug MacKenzie, 3 Landreth St, Portobello, Dunedin. Ph 03/4780910. Email doug.mackenzie@stonebow.otago.ac.nz

Circuit diagram or any literature for Trio AG-8 Audio Frequency Oscillator. Copy of "70 Years of Radio Tubes and Valves" by John Stokes, any edn considered, either hard or soft cover. Owen Young. Ph 09?3784594. Email oyoung@clear.net.nz

A Gordon A.C. electric phonograph motor or complete record player. Bob Kean, 5745 State Highway2, Paeroa. Ph 07/8676754.

Circuit diagrams for Tetronix type 321A Oscilloscope, Huang Chang type 5506 60 MHz oscilloscope. Reg Motion, 2A Hazel Terrace, Tauranga. Ph 07/5768733. regmotion@xtra.co.nz