In radio communications, knowledge is progress. Only knowledge can mean progress; in turn, progress itself maintains our present high standard of living.

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AMATEURS AND EMERGENCIES

O NCE again, amateur radio has risen to the occasion, by providing vital communication during an emergency. As recorded elsewhere in this issue, staff member Keith Jeffcoat was able to pass vital traffic, when other means of communication had failed, from the Alaskan earthquake zone to the United States.

Just 12 months ago, we carried the story of how four other Australian amateurs were instrumental in summoning help for an injured Nepalese woman attached to the American Mount Everest expedition.

For humanitarian services such as these, amateur operators are commonly commended. Quite frequently, in the past, their aid has been sought during flood and bushfire emergencies and the amateur WICEN network has been organised to ensure a measure of efficiency in the handling of emergency traffic.

But, ironically, the amateur who renders such a service to the community often does so against a background of regulations which leave him in doubt as to whether he is doing his duty or breaking the letter of the law. More often than not, he is faced with an emergency and an apparent need to act before his station becomes subject to official direction. The emergency may or may not be prefaced by the officially designated distress call. The distinction being significant legally. It can involve him in procedure which may or may not satisfy the official concept of informing the "appropriate authority" and rendering "any assistance practicable."

To be sure, the authorities have not registered disapproval of the services rendered by Australian amateurs handling emergency traffic on their own initiative but inquiries among amateurs and within the Wireless Institute indicate a great deal of uncertainty as to the borderlines between mandatory action, voluntary community service and straight-out illegal traffic.

Involving in all this is the hoary old question of third party traffic, the importance of "humanitarian" messages, the amateur's undertaking not to divulge information and the likelihood of amateurs becoming involved with the news media, whether they like it or not. The wonder is that the Wireless Institute has not, long since, sought clarification of these matters. Surely they warrant legal status, even if it does involve an amendment to the now rather ancient Wireless Institute Act.

In This Issue:

- Baby Stereo Amplifiers
- 20,000-Yott Muffmeter
- "Let's Buy An Argument"
- Audio Topics
- Classical Recordings
- Variety Fare
- Trade Reviews, Releases
- Amateur Band News, Notes
- Listening Around The World
- Answers To Correspondents
- Book Reviews
- Classified Advertisements
- Index To Advertisers

Radio, Television & Hobbies, May, 1964
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(Place X in square)

Radio, Television & Hobbies, May, 1964
The generation of electricity on a large scale employing steam turbine-alternator plant has progressed rapidly in the last decade or so, and, today, generation efficiencies in the region of 40 per cent conversion of the energy of coal or oil into electrical energy have been achieved. Improvements in steam conditions (higher temperatures and pressures), refinements in the thermodynamic cycle and advances in plant design have all contributed.

There is, however, a sea as large as conventional plant. Although flame temperatures of 2,000 degrees C are readily obtainable from fossil fuels, it is likely to be very difficult and expensive to provide suitable high-temperature material. The steam-generating parts of conventional plant to achieve steam temperatures in excess of 600 degrees C. It is, therefore, unlikely that in the next 20 years, it will be possible to achieve either significant improvements in steam conditions or in cycle efficiencies to give generation efficiencies higher than 45 per cent.

MHD generators

The advent of nuclear power has been accompanied by a reduction in steam conditions because of the pressure steam conditions with current reactor systems. The development of higher temperature reactor systems and advanced forms of fast reactors will increase generation efficiency, but only to a point currently obtained with the best conventional fossil-fuel plant.

Anticipating the development of steam-turbine plant, it follows that any significant improvement in performance can only be achieved through a radically new approach. One such approach to increase thermal efficiency is to extract heat at a higher temperature by means of an external stage, which is combined with the original stage, meeting where, in an auxiliary stage, heat is taken from the flame, converted through the plant and hence electric power there must be good contact between electrodes (con- ductors) and the conductor, and hence electric power there must be good contact between electrodes (con- stituted in electrical energy in the topper, the overall efficiency of the combined open-cycle system will be 40 per cent, the overall efficiency of the combined open-cycle system will be 60 per cent. With 25 per cent of the heat converted into electrical energy in the topper, the overall efficiency would be 55 per cent.

Figure 7. The 4-MW oil-burning rig at CERL. A possible insulating duct is shown. The central part of the duct is solid (such as metal), liquid (such as liquid metal or an electrolyte) or gaseous (such as gas).

The conductor is particularly attractive because the interaction takes place in the body of the gas, thereby obviating the need for high-temperature solid moving parts.

The practical and experimental difficulties stem mostly from the high temperatures that are required to produce fuels. Eventually, however, we shall consider the possibility of burning other fuels, particularly coal.

The practical and experimental difficulties stem mostly from the high temperatures that are required to produce fuels.

The practical and experimental difficulties stem mostly from the high temperatures that are required to produce fuels.
conductivity by Radio, Television & Hobbies, May, 1964

Air also needs to be at a pressure of power can be fed into the electricity transmission. From currents flowing entirely only 30 mho/m). Caesium or potassium ions and materials problems, we should possess a high degree of conductivity. The atoms and molecules in the gas conductivity is very low as practical fluid temperatures (2,000-1,000 deg. C) and "welding," with a trace of a readily ionising material such as cesium or potassium, can produce a high electrical conductivity. The nature of this phenomenon is such that by orders of magnitude. Even with this enhancement, the conductivity of the gas streams is at its best, only 1 mho/m. Therefore, it is necessary to restore electrical conductivity to volume (electrical power generated depends on the volume of the duct) these losses will not be prohibitive.

For the reason magnetohydrodynamic generators are considered promising for large-scale power generation. If a magnetic field is imposed upon the gas flows through the duct walls would in about 70 MW.

HEAT LOSSES—The cost of potassium seeding is such that high seed recovery is vital. Various recovery methods and an investigation. If residual heat is burnt it is perhaps that most of the potassium will be destroyed to the sulphate. Little is known about the physical chemistry of potassium at high temperatures and the work forms an important part of the programme. It is to far indicate that the seed recovery will be low, for the formation of the sulphate in a two-stage process. The electrode problems should not be underestimated.

MAGNET SYSTEM—The cost of the magnetic field is such that is likely to prove one of the major items of magnetohydrodynamic systems. Since the necessary length of the magnetic field is proportional to the square of the magnetic flux density, it is obvious that very high magnetic fields are a necessity.

Above about 20 kilogauss there is little (Continued on Page 7.)
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A convenient way to study radio waves is to tune in on the signals that they will send out. At one point in the orbit of a satellite, the signals will be at their strongest, and at another point they will be fading. This phenomenon can be studied and used to determine the position of the satellite.

Tuned to an orbit, the receiving station can detect a satellite as it circles the earth for many years. Vanguard I is expected to last 200 years before re-entering the atmosphere and being destroyed by friction.

There are several ways to study radio waves. One is to use satellites as a source of radio waves. Another is to use a radio telescope as a source of radio waves. A radio telescope is a dish antenna that can be used to detect radio waves from space.

The signal from a satellite can be detected by a radio telescope. The signal will be strongest when the satellite is closest to the earth and weakest when the satellite is farthest away. The signal will also be strongest when the satellite is in view of the radio telescope and weakest when the satellite is not in view.

The signal can be detected by a radio telescope in a field of view 100 yards square, one antenna at each point. The antennas are located on a real MHD power system. The power system is expected to be operational in 200 MW thermal input. A generator with an engineering scale and also allow an accurate assessment to be made, for a large-scale system, of heat transfer and wall friction in a dissociating gas in the presence of a magnetic field.

The design of this system is in which kerosene or fuel oil would be burnt initially with oxygen, at an energy rate of 200 MW and giving an electrical output in the region of 20 MW is being considered.

A schematic diagram showing a possible open-cycle MHD system for generating power in the future is given in Figure 3. The reactor, which will be operated at the mesotherm level, consists of magnetohydrodynamic generation and normal adiabatic operation. The overall process is being extended at the mesotherm level, and the companies being extended at the mesotherm level, and the companies are being extended at the mesotherm level, and the companies will be used for extension to 5,000 MW.
"TRANSLATOR" TV TO SERVE FRINGE AREAS

A recent amendment to the Wireless Telegraphy Act in Australia has opened the way to the use of television "translators." By picking up the original television signals at a service area location and re-directing them into "shadowed" areas, translators can bring the programs to communities, which local topography rules of a normal service.

By Keith Anderson*

OPERATING in the VHF (Very High Frequency) band, between 41 and 232 Mc., the coverage of television translators is limited to an area which is commonly described as "slightly beyond the visual horizon." While the use of tall transmitting masts, prominently sited, can yield some extra coverage, it remains true that the signals may drift right over the top of communities hidden from the transmitter by intervening high ground.

Translators can serve these communities by automatically rebroadcasting the television signals into the shaded area. The translator is located on a hill or tower where it can receive the original television signal and retransmit it into the area below. Here it is picked up by normal domestic TV receivers tuned to an assigned channel.

By suitably isolating the receiving and transmitting stages to minimize feedback effects, it is actually possible to retransmit television signals on the same channel. However, this system is not favoured at present by Australian authorities, since it can cause serious difficulties at sites in the United States.

Although frequency changing involves greater use of the available channels, it is assumed that the limited coverage of translators and discrete allocation of frequencies will minimise the risk of interference between translators in a service area.

LOW POWER

Translator systems with one watt of R.F. power output or less can typically provide good service to about 30 miles. Yaesu type transmitters are commonly used, and can be mass-produced for a low cost involved. Their performance has been almost miraculous. In some western states, their use in mountainous regions has extended television services to 100 miles or more beyond normal coverage limits.

The question of using translators in Australia has followed naturally upon the installation of the planned system of national and commercial transmitters. Communities which have been denied reliable signals, because their topography "shadow" the service, are being served by translators. By picking up the broadcast signals and retransmitting them to their own area, the translators extend television services to 100 miles or more beyond the normal coverage limits.

A complete, installed translator system is likely to cost about £1,000. Considering that many of them will serve up to 10,000 homes, this can represent a most economical television service. Equipment may be rented also, for £50 to £100 per month, including all maintenance and labor costs.

A typical transistor translator unit produced by Western Translators, Sturgis, South Dakota, U.S.A.

The Australian Broadcasting Control Board plans to licence translator equipment for use in areas which are not served directly by the normal high-powered stations in operation or under construction, but into which a translator can retransmit a signal.

The present intention is not to license translators for areas in which a direct television service is available. At its discretion, the Broadcasting Control Board will licence low-power translator equipment to television broadcasters wishing to extend their coverage to communities wishing to receive signals from such stations, or to individuals unable to receive programs by other means.

LOW POWER

The translator station, without substantially altering any characteristic of the signals other than their frequency and amplitude, brings the programs to communities which would otherwise be unable to receive them.

Typical translator equipment as a U.S. mountain-top. The tower at right houses equipment for a 2-channel system.

Under the terms of this act, a translator had to be treated as a transmitter in its own right, being subject to all the requirements, controls and involvement of a full-scale television broadcasting station.

An amendment to the act, now in train, puts TV translators into a special category and clears the way for their use in Australia, along with the same lines as in the U.S.A.

Under the new amendment "a TV translator means a station for the transmission by means of wireless telegraphy of television programs, being a station of low power and designed to receive and retransmit signals from a television program or from another television translator station, without substantially altering any characteristic of the signals other than their frequency and amplitude." The Australian Broadcasting Control Board plans to licence translator equipment for use in areas which are not served directly by the normal high-powered stations in operation or under construction, but into which a translator can retransmit a signal.

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In the United States installations, the cost of AC power lines to the mountain top was often 10 times the cost of the translator. Western Translators Company, of Sturgis, South Dakota, U.S.A. has eliminated this problem by the introduction of battery-powered translators. These require practically no maintenance and may be solar or wind-powered for further economy.

(Continued on Page 11)
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Radio, Television & Hobbies, May, 1964
As this issue goes to press, the British Broadcasting Corporation is all set to begin radiating a second program using 625-line 50-frame picture definition. One of the reasons behind the introduction of high-definition television began in the design of British television receivers. Already brought about many changes in sound, with the transmitters operating in the very high frequency (V.H.F.) band, using 625-line definition. The new B.B.C.2 program is to be transmitted by the Independent Television Authority and will continue to use the medium wave band. In 1942, while carrying out research, Mr. Carleton Greene, to describe the B.B.C.'s translator installation, the author suggests the following procedures: 1. Determine how the transmitter will be used by its antenna system. In this case, it is to be connected to a large antenna system and a yagi antenna. Usually the best reception is at the highest point, but there are exceptions which are due to topographical variations between the transmitter and the community. 2. Obtain a copy of theutra Broadcast Control Board, 373 Elizabeth Street, Melbourne. Repeat a determination of whether your community would be suitable for a license, and where available, any additional information can be used to assess the proposed station's viability. 3. Present your station's proposal in a detailed plan a copy of their "Draft Standards for the Technical Equipment and Operation of Independent Television Transmitter Stations." 4. Contact equipment manufacturer for help with any phase of your system planning. Channel assignments are a matter of the FCC and local radio and television stations may be able to share the content of your community. The broadcast station may be able to help with any phase of your system planning. Channel assignments are a matter of the FCC and local radio and television stations may be able to share the content of your community.

DUAL STANDARDS FOR BRITISH TELEVISION

Radio, Television & Hobbies, May, 1964

FOR FRINGE AREAS

The existence of different television line standards such as 405- and 625-line systems is brought about under an agreement reached in 1946 by British television and other European countries. Thus ends an argument, which has gone on for years, with those who have advocated definition higher again than that offered by 625 lines.

的质量 due to reflection between the optical surfaces; noise is also introduced, and rapid movement in the scene can produce "smearing." B.B.C. engineers have now developed a purely electronic method of converting different types of television signal to be changeover between any two line standards, but they cannot at present be used when it is necessary to change the field frequency of magnetic tape recordings. "625/405" change-over control which can produce "smearing." B.B.C. plans for its second television service. Television standards, similar to those in use in Europe, Australia and New Zealand.

"TRANSLATOR" TV

If your community is considering a translator, the author outlines the following procedure:

1. Describe your television station antenna system. In this case, it is to be used to display a high-quality video signal, and a field strength meter, a generator or converter-power, and receiver. Usually the best reception is at the highest point, but there are exceptions which are due to topographical variations between the broadcast and the community.

2. Contact the Australian Broadcasting Control Board, 373 Elizabeth Street, Melbourne. Repeat a determination of whether your community would be suitable for a license, and where available, any additional information can be used to assess the proposed station's viability. 3. Present your station's proposal in a detailed plan a copy of their "Draft Standards for the Technical Equipment and Operation of Independent Television Transmitter Stations." 4. Contact equipment manufacturer for help with any phase of your system planning. Channel assignments are a matter of the FCC and local radio and television stations may be able to share the content of your community.

Unlike high power systems, transmitters in this band can provide years of "Metropolitan" television service without the necessity to make any practical solution to date for television service to small communities.
TWO main methods of signalling are used for machine telegraphy, the Simple Current Signalling and the Double Current or Polar Signalling. In simple current signalling the mechanism is a simple "make and break" assembly whose white contact when the current is stopped and ceases when the contact is open. This current operates a receiving magnet armature, but when current flows it returns to its former position by means of a spring.

In double current signalling current flows when the contact is open. This current operates a receiving magnet armature, but when current is reversed the whole action is reversed, the current or one group for each of the four transmitters. Each of the five segments is connected to the segments of a distributor. The code used in Australia is the five unit code, in which a "time" pulse is used for the alphabet and the remaining five used for various functions of the receiving machines such as: caller, etc.

By Calvin Walters

By transmitting the marking and spacing pulses in some predetermined order, words can be used to convey intelligence. The Morse code is a classic example of this, although it is not suitable for modern machines generally. The marking is represented by a dot, and the spacing by a dash. A negative pulse is called a "mark", and a positive pulse is called a "space." In practice, a negative pulse is always used for the alphabet and the remaining five used for various functions of the receiving machines such as caller, etc.

TELEGRAPHY—Start-Stop Machines

By Calvin Walters

With a rotating arm which consists of several segments in turn. A similar distributor is used at the receiving end. As shown, each distributor contains 20 segments (plus either one or two synchronising segments) and is divided into four groups of five segments, each group being connected to each of the five transmitters. Each of the five segments is connected to its particular transmitter in such a way as to be either a "mark" or a "space," and this is determined by the rotating arm. The code used in Australia is the five unit code, in which a "time" pulse is used for the alphabet and the remaining five used for various functions of the receiving machines such as caller, etc.

The scheme is shown diagramatically, as reproduced from the P.M.G. Division System, P.3.

The message is first typed out on a perforated tape which is fed to the Murray Multiplex System during the 1914-1915 period of World War I.
and drives the distributor brushes at four normal typing speeds for a teleprint or tape transmitter. Thus, after driving the distributor brushes at four speed for a fraction of a second, thus restoring it to its correct position.

The speed of operation is sufficient to permit normal typing speeds for a teleprinter stroke and drives the distributor brushes at four speeds. Each channel uses a different audio frequency, and the incoming impulses operate a clutch in this band. Normally the lowest frequency would be 420 cps, and the separation between channels, 120 cps.

The receiving mechanism is therefore started and stopped for each character transmitted. Transmission speed is 150 milliseconds for each character, or 400 characters a minute. Taking the average length of a word as being 5 characters, the maximum transmission speed of a continuously operating stars-and-steps machine is 67 words a minute. Because of intrusion factors, about 50 words per minute is normal for a keyboard transmitter, but on tape transmission the full 67 words per minute can be attained.

Those who, in some misguided moment, may have read my article on the Typewriter will remember, if the lucidity of the article was such as to inspire remembrance, that the Remington Electric typewriter operated on the principle of a continuously revolving machine telegraphy. As a result, it is more usual to first transfer the message to a punched tape, from which it can then be fed to the efficient handling of messages. However, for a number of years the punched tape machine has been tried over the years, with limited success, until someone hit on the simple idea whereby the transmitter starts and stops the receiver motor as required.

The receiving mechanism is therefore started and stopped for each character transmitted. Transmission speed is 150 milliseconds for each character, or 400 characters a minute. Taking the average length of a word as being 5 characters, the maximum transmission speed of a continuously operating stars-and-steps machine is 67 words a minute. Because of intrusion factors, about 50 words per minute is normal for a keyboard transmitter, but on tape transmission the full 67 words per minute can be attained.

This month we mentioned what is probably the most spectacular system of all to enable many messages to be transmitted simultaneously over one wire. It is the Voice-Frequency Telegraph System, which enables 24 telegraph channels to be established over a single telephone channel, which may be either a physical circuit, phonograph circuit, or carrier derived.

In this system the telegraph signals are transmitted as audio frequency pulses, rather than the 120 cps used in the simpler circuits. Each channel uses a different audio frequency, and the incoming impulses operate a clutch in this band. Normally the lowest frequency would be 420 cps, and the separation between channels, 120 cps.

The receiving mechanism is therefore started and stopped for each character transmitted. Transmission speed is 150 milliseconds for each character, or 400 characters a minute. Taking the average length of a word as being 5 characters, the maximum transmission speed of a continuously operating stars-and-steps machine is 67 words a minute. Because of intrusion factors, about 50 words per minute is normal for a keyboard transmitter, but on tape transmission the full 67 words per minute can be attained.

Those who, in some misguided moment, may have read my article on the Typewriter will remember, if the lucidity of the article was such as to inspire remembrance, that the Remington Electric typewriter operated on the principle of a continuously revolving
Perforated Tape

In the machine there are a series of punched holes which are actuated by the currents released by the operations of the code bars. These code bars which are moved into the “marking” position will perform the same respective tasks as in the previous machine, whilst those in the “spacing” condition will perform the perforation in the tape. These punches which move through the perforated holes are code bars which when moved across the width of the tape, the character of the message is represented by varying arrangements of holes perforated in the tape.

Information taken from the computer programs was placed in a tape-controlled typewriter which drew a copy of the tape, showing the progression of structure movements. The drawings, on sheets of paper about 10 inches square, show a structural skeleton only.

The drafting machine, as a result of the special programming, makes permanent records in the form of formal letters and punctuation marks. The tapes are then fed into the machine for transmission to the distant receiver. The machine then begins to rotate, then, as the relay armature of a polar electromagnet is actuated by the two contacts to the “marking” position whilst the other pins are blocked by the unperforated tape, the electrical connections thus set up are transmitted to the line at a constant rate. The first element is preceded by a start spacing signal and followed by a marking signal. These are both automatically inserted by the transmitting apparatus.

Transmission of the message is effectuated by passing the perforated paper through a machine provided with a set of pressure sensitive tape pins which are kept in the perforations in the tape. These pins which project through the punched holes move all associated contacts to the “marking” position while the other pins are blocked by the unperforated tape, but the contacts to the “spacing” condition.

The electrical connections thus set up are transmitted to the line at a constant rate. The first element is preceded by a start spacing signal and followed by a marking signal. These are both automatically inserted by the transmitting apparatus.

Perforated tape is ready.

The above description applies to tape perforation machines for transmission and tape re-perforation machines for reception. Reception of messages on tape provides a permanent record of messages so each receiving cam responds to the five unit code signals, so each receiving cam positions its associated code bar according to the position of the armature at that instant. Perforation of the tape at the receiver is controlled by the position of their respective code bars. These in the marking position sends the message information to the operator and those in the spacing position prevents them from sending any information.

The transmission of messages is not interfered with by any other machine in the system.

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Teleprinters, typewriters and the perforator and telegraphy machines are only a few of the many machines with which the electrical engineer is associated. The teleprinter and typewriter are both machines which draw a copy of a message, showing the progression of structure movements. The drawings, on sheets of paper about 10 inches square, show a structural skeleton only.

The drafting machine, as a result of the special programming, makes permanent records in the form of formal letters and punctuation marks. The tapes are then fed into the machine for transmission to the distant receiver. The machine then begins to rotate, then, as the relay armature of a polar electromagnet is actuated by the two contacts to the “marking” position whilst the other pins are blocked by the unperforated tape, the electrical connections thus set up are transmitted to the line at a constant rate. The first element is preceded by a start spacing signal and followed by a marking signal. These are both automatically inserted by the transmitting apparatus.

Transmission of the message is effectuated by passing the perforated paper through a machine provided with a set of pressure sensitive tape pins which are kept in the perforations in the tape. These pins which project through the punched holes move all associated contacts to the “marking” position while the other pins are blocked by the unperforated tape, but the contacts to the “spacing” condition.

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The transmission of messages is not interfered with by any other machine in the system.
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<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>1</td>
<td>Goldcofde 62</td>
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<td>Kimberley 5T7</td>
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<td>Caddie 605</td>
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<td>KELLY Speakers</td>
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<td>Orpheus Silox</td>
<td>£19/10</td>
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<td>Orangut 605</td>
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<td>KELLY Speakers</td>
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<tr>
<td>11</td>
<td>Kimberley 5T7</td>
<td>£112</td>
</tr>
</tbody>
</table>

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Radio, Television & Hobbies, May, 1964
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An industrial multimeter for checking the currents in solenoid coils, condensers and motors up to approximately 50 HP, suitable for measuring line and most circuit voltages without the meter itself causing a change in the operating conditions of the circuit. Separate 100 ampere rated terminals are provided for the two higher current ranges and all terminals are fully insulated with non-removable tops. The meter has a 3/4" mirror scale and a high torque movement with fully-hard polished pivots and sapphire jewel bearings for maximum shock resistance and durability. The meter will withstand momentary overloads up to ten times its full scale value. Resistance values as low as 0.1 ohm can be easily read on the scale and power for the resistance ranges is provided by an internal 1.5 volt leak-proof battery type 950 which is easily replaced by removing the front panel. High stability carbon resistors, conservatively rated are used in series multipliers and low temperature coefficient manganin shunts are used for D.C. current ranges. Switch settings are indicated in silver lettering against a black ground. A leather carrying case with combined shoulder and hand strap is available as an extra.

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• D.C. AMPS:
  0- 0.25- 1- 2- 5- 10- 25- 100.

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Australasia, Television & Hobbies, May, 1964
**HISTORY AND FUTURE OF VIDEO TAPE RECORDING**

For fields have seen greater advances in the last decade than the recording of television signals. And now, with the needs of black-and-white TV broadcasting met, thought has turned increasingly toward the multitude of applications for video recording for CCTV installations in industry and education—and beyond that to the almost unlimited market of domestic TV video recording. This article, reproduced from the English "Electronics Weekly," is an excellent summary of the history and present state of the art of video tape recording.

By Pat Hawker

...Less than 10 years ago all practical TV recording was by means of film, but by about 1954 many eyes were fixed on magnetic tape as a possible recording medium. This would eliminate photographic processing and permit erasure.

But the basic problems were formidable. They can be stated simply: Though less simply solved, when tape speed is such that one wavelength of the recorded signal is equal to the gap dimension of the reproducing head, output falls to zero. Also, there are difficulties in recording and reproducing both very high and very low frequencies using a single tape, while retaining good output and adequate signal-to-noise ratio, both. The natural TV signal has a span of frequencies from 50 c/s to 3 Mc/s, and FM recording of the low end of R.C.A.'s system was abandoned in this unit was the electronic recording apparatus "VERA." This had 1 inch spools of tape. Working at 360 in/sec and FM recording of the signal. This permitted the tape speed to be reduced to 15 in/sec—the standard speed for professional audio recording—while providing an equivalent bandwidth-speed product of 100 times the figure—that is, 1,500 Mc/sec.

To do this involves several things. First, 90 degrees apart, mounted on tape. Developed by BBC engineers, and christened VERA, it was among the first commercially available TV tape recorders. Within a few days of the original Ampex demonstration, this previously little known company had received 80 orders. At around $5,000 dollars per installation, this represents some £1 million invested at sight in these machines. The Ampex system used the principle of lateral tape speed in favour of reduced heads which...
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This "new look" stereo pre-amplifier may be used with either the "Stereo 20" or the new "Stereo 60" LEAK power amplifier. It is the result of the application of new and improved techniques. Standards of performance could not be bettered. Sensible use has been made of new developments to ensure the amplifiers have new desirable facility and feature.

NEW LEAK VARI-SLOPE MONO

Although the "Vareloped Mono" shares the design features, the performance is unmatched. LEAK amplifiers have always been designed for excellence of design. Standards of performance could not be bettered. Sensible use has been made of new developments to ensure the amplifiers have new desirable facility and feature.

The "Stereo 20" is already widely used throughout the world, and found the all time "Point One" series the last word in design and performance. With the "Stereo 60" we have a larger and more powerful version of the fine LEAK power amplifier. Each amplifier has two identical circuits, comprising a three-stage triple-loop feedback amplifier, the main loop supplying 26dB of negative feedback over the whole amplifier from input to output. The frequency response in either amplifier is plus or minus 0.5 db, 20 c/s to 20 kc/s. The total harmonic distortion is 0.1 percent.

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TASMANIA: K. W. McCulloch Pty. Ltd., 109 York Street, Hobart. Tel.: 2-5322.

A.C.T. Australian Physical Laboratories, P.O. Box 225, Canberra City. Tel.: 4-3010 (Mr. J. E. Howe).

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Radio, Television & Hobbies, May, 1964
A number of models of this general type, gradually reducing size by the use of small memory devices holding upwards of 10⁻¹⁰ bits of information, with no movement it could create as dramatic a charge as magnetic tape recording. In the TV industry as magnetic tape recording, readout and handling and splicing of tape material has been made easier by such systems as Editec by which a program can be later. A rotary head deck, built by RCA but in prototype form in London last June. RCA have also incorporated a number of special features in their recorders, such as the "Pro-Lock" system for special effects, and a number of playout and input systems. Persistent costs also indicate that it may not be possible even for high-quality recorders will be introduced by a number of different manufacturers who have not yet released. A domestic unit is being made by Machtronix Co.—the prime producer of video recording tape—recently went on record: ‘‘Within the next year or two, if we're fortunate, the company will have developed a portable video tape recorder capable of tracking and recording TV photos. The recorder, he added, could be plugged into TV sets for recording TV shows. Similar hopeful statements on domestic recorders have come from time to time from other firms. This brings us to naturally to "Televizan," the extremely low-priced domestic camcorder in prototype form in London last June by the Nordemands Electronic V.O. This aims at providing a 59-gauge recording with a small transistorised, details of which have not been released. Subsequently NEV linked with Cinerama to market the machine in the United States, Japan and by Philips in Europe. As indicated, such broadcast equipment call for a high order of mechanical and electrical complexity, much of which centres around the four-head drum systems which are solved. As a result a number of special features in their recorders, such as Editec by which a program can be later. Half or full track recording is possible. As indicated such broadcast equipment call for a high order of mechanical and electrical complexity, much of which centres around the four-head drum systems which are solved. As a result a number of special features in their recorders, such as Editec by which a program can be later. Half or full track recording is possible. As indicated such broadcast equipment call for a high order of mechanical and electrical complexity, much of which centres around the four-head drum systems which are solved.
For **ECONOMICAL Hi-Fi STEREO**

These two Rola models, 8MX and 9-6LX, offer the best possible approach to good quality stereo reproduction at a moderate cost.

The eight-inch model 8MX is recommended for use in the small, 1.9 cubic foot, Rola-designed vented enclosure, but is also suitable for use in conventional open-back radiogram-type cabinets. The elliptical model, 9-6LX, is also designed for open-back cabinets, and when mounted with its major axis on the vertical plane has the advantage of wide-angle radiation of the higher frequencies. The power-handling capacity of each model, 10 watts peak for the 8MX and 7 watts peak for the 9-6LX, is more than adequate for domestic needs, and their frequency response such as to do justice to the finest recordings.

All in all, the 8MX and the 9-6LX represent the best and most practical approach to low-cost high-fidelity stereo.
Machining With Sound

The British National Physical Laboratory, Teddington, Middlesex, has issued a report of work carried out in the Light Division on the use of ultrasonic equipment to drill holes commercially available in Britain, now forming part of the normal machinery of optical glass-working shops.

The laboratory has found efficient use of their equipment by the Light Division on the use of ultrasonic equipment to drill holes commercially available in Britain, now forming part of the normal machinery of optical glass-working shops.

Atomic Fuel

The Soviet atomic refrigerator, Lenin, has been tested on its own voyage, carrying 43,238 kilowatts of electric power and 129,000 kilometers of sea voyage. The refrigerator has been modified to operate on the ship's own power, and has been designed to operate in top condition and that the ship would be able to cope with a fourth season without the nuclear fuel being replaced.

Novel Switch

Simple switches consisting of an anodized aluminium wire touching a bar conductor are said to close for high voltages and to open again by passage of high currents. They were developed by J. P. Cline at the Sandia Corp. of Albuquerque, New Mexico.

Normally, the anodized layer acts as an insulator and no current flows from the aluminium wire to the conductor; however, with voltages of 6 to 10 volts the switching can be used, the anodized layer being broken down. The anodized wire can then be moved to bring another anodized insulating surface into play. Alternatively, passage of a current of about one ampere will reanodise the aodic wires and restore the insulation.

Coatings For Metals

Langham Plastics Works AG., of 1-3 Heerdtcr Buehls- strasse, Neuss am Rhein, Germany, says that it can produce unusually bright, decorative electroplating of nickel, copper and gold on metals simply by adding to the plating solution a trace of chemical element selenium.

The compounds also disperse the electrodeposits throughout the metal and its paper protective is then brought together; a positive voltage is then applied to the paper and the metal will stick electrically. The metal and its paper protective is then cut into sheets and stacked.

Interleaving Paper

A method of interleaving thin sheets of paper between sheets of highly polished brass or other metal, so that the latter will not bear directly upon one another, has been patented by F. Ungercr. of 6, Arlingcrslrasse, Pforzheim. Germany.

It is also said to have good stability in contact with salt water and oil and to require little bending.

Radio, Television & Hobbies, May, 1964

"Wizard" history was recalled and made at one time, where a manuscript copy of "Wizard" history was unveiled recently by his son Giulio in the grounds of Amalgamated Wireless (Australia) Ltd. Presented by the Lions Club of Walthamstow, Walthamstow, the bust now stands on a pedestal of Australian granite and marble. Marchese Marconi (right) is pictured with Sir Lionel Hooke, Chairman and Managing Director of A.W.A., after the ceremony.

21
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Radio, Television & Hobbies, May, 1964
De-Salting Water

Mexico hopes to erect a nuclear power station on the Gulf of California for de-salting water to irrigate desert regions. Later it is proposed to build some nuclear stations of 500 MW each, also for desalting.

There are 1.5 million tons of uranium reserves in the Mexican State of Chihuahua, where a French company (P.E.C.) is designing an extraction and refining plant. There is already a pilot plant in Mexico City producing uranium oxide and uranium metal.

Nuclear Waste

A British firm has had its first commercial order for plant to make wastes inert by transforming them into an insoluble form in bitumen. This is considered to be much safer than current methods and is being patented by Societe Beige de Chimie Nucleaire (BHL-N%).

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Without A Stitch

A "sewing machine" without needle or thread has been developed at the Omega Research Laboratories in London. The device is called the "Sewing Machine of the Future." It is composed of a "tuning probe," anvil and wheel. The probe is electrically heated to about 1,000 degrees Centigrade. It is then squeezed together with an ordinary fiber, the molecules will tend to diffuse and intermingle with the fibers, thus causing the bond. The bond, he said, was normally as strong as the parent material, and certainly as strong as a normal stitched seam.

Radio, Television A Hobbies, May, 1964

Electrical Telemeter

A self-tuner based mainly on electronic devices has been designed by Yugoslavia's Mihailo Pupin Institute for Automation and Telecommunications and displayed at an electronics exhibition in London. The device is called the "Sewing Machine of the Future." It is composed of a "tuning probe," anvil and wheel. The probe is electrically heated to about 1,000 degrees Centigrade. It is then squeezed together with an ordinary fiber, the molecules will tend to diffuse and intermingle with the fibers, thus causing the bond.

Mr Cyril Wright, head of the electronic department of F.E.L.A, Britain's production and engineering research association, tests a low-cost parametric amplifier which has been developed at the association's Melton Mowbray, England Laboratories. Possible applications of the device include greater range for VHF communications and improved TV reception from UHF bands.

Welding In Vacuum

A Soviet engineer, Nikolai Kuznetsov, 44 Ulitza Gorkovo, Flat 10, Moscow, has patented a way of welding metals by subjecting them to high mechanical pressure inside an evacuated chamber. The parts to be joined are placed in the chamber and then squeezed together with a great deal of pressure. High-strength welds between steel and copper, steel and ceramics, steel and tantalum, aluminium and copper and many others are claimed to be possible by this method.

Mr Swift pointed out that this was a principle of diffusion, rather than pure fusion. "Normally, if a thermo-plastic material were taken to its melting-point, the material would tend to fuse together. But if you raise a molecular structure to the cold-flow point temperature and hammer it at a very high intensity, it will result in the molecules which are free to move being intermingled in a different form. Similarly if you have a molecular structure in a thermoplastic material and pass it through an ordinary filter, the molecules will tend to diffuse and intermingle with the filter, thus causing the bond."

The bond, he said, was normally as strong as the parent material and certainly as strong as a normal stitched seam. They had failed to bond natural fibres together—cotton to cotton, linen to linen, and so on. But cotton could be bonded to nylon; they had successfully bonded some papers, and most plastics bonded perfectly well.

International thinking around supersonic jet transport planes has been turned upside down by the announcement of a new method of welding in vacuum. The method involves the use of a "tuning probe," anvil and wheel. The probe is electrically heated to about 1,000 degrees Centigrade. It is then squeezed together with an ordinary fiber, the molecules will tend to diffuse and intermingle with the fibers, thus causing the bond.

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Disposable Brushes

Disposable paint "brushes" made of polyurethane foam are being made by Hyde America and sold under the trade name "Tool-son." A sheet of the foam with a brush-type pattern is extruded from a head, rolled up, then cut to the desired pattern, and then thrown away after use, thus eliminating the need for cleaning. The foam is recommended for fine touch-up work.

Air Folds Boxes

Cardboard box blanks can be folded into finished boxes by releasing compressed air through nozzles, claim J. Bobst et Fils S.A., of Switzerland. Light beams control the blasts of air so that as the blanks pass through the box-making machine, they are folded in the correct places by the high-pressure blasts.

Precision Cooking

Gaydell Inc., Pacific Palisades, California. The thermometer will register temperature from 50 to 450 degrees Fahrenheit. The bulb of the thermometer lies under the spoon or in the handles. The thermometer will register temperatures from 50 to 450 degrees Fahrenheit. Gaydell Inc., Pacific Palisades, California, makes the spoons for 7 dollars each.

Folden Steploadder

A metal steploadder with steps folding away parallel to the uprights when not in use can be easily stored, is being marketed by Friction Weld Corporation. Called the Steploadder 9, Nunspeet, Holland. It is intended for use in the home or in shops and libraries.

Interlocked Paving Stones

Interlocking concrete paving stones are being marketed by Hayes International, Welleslary, R.I., U.S.A. Each stone is 8 by 8 by 2 inches thick. A lever brings the stone out of the mold, and forces the stone to adhere to the next stone when three, five, and six strip are respectively laid. This eliminates & anti-slip, honeycomb-like surface, which have been through the Atomic Energy Authority. (C. I. Hayes has reduced power requirements by about 70 per cent. Graphite cloth and graphite felt insulation are supplied by Union Carbide Corporation. Expandable, cloth handling sleeve holds in place between machined-graphite-steel sandwiches for such operations as cutting, grinding, and polishing. (C. I. Hayes, Incorporated, Camarillo, Calif., R.I., U.S.A.)

ScIENTIFIC NEWS—cont.

Improved Diamonds

Industrial and research findings by British and American nuclear physicists will improve the colour and, possibly, the actual structural properties of diamonds. Getting rid of the yellow, blue or brown clamps, facilitates production of stones over 25 carats. The steps are fitted to the shaft of the spoon near the bowl. The thermometer will register temperatures from 50 to 450 degrees Fahrenheit. Gaydell Inc., Pacific Palisades, California, makes the spoons for 7 dollars each.

Improving Diamonds

Ferrous and non-ferrous metals can be welded together, as, for instance, aluminium to steel, aluminium to copper, using a carbon steel to high-speed steel. The first production machine, now being installed, will be capable of welding up to 2-inch diameter components in solid steel or tube on an 8-inch diameter, depending on wall thickness.

Waste For Building

Building bricks can be made from old cans, wood chips, waste paper or cotton rags. Waste For Building Corporation's new tower, for Londoners, is a re- design. The steps are 51 inches wide, are fitted for Londoners, is a redesign. The steps are 51 inches wide, are fitted with aluminium anti-slip,
THE NEW ADVANCED STAR AMPLIFIER

24-Watt Stereo Amplifier
SA-30

ONLY £55 18/-

FULL STEREO CONTROLS
1. Program Selector Switch
2. Position Selector Switch
3. Tone Control
4. Dual Concentric Bass Control
5. Pilot Light Switch
6. Rumble Filter Switch
7. Phase Reverse Switch
8. Speaker-Headphone Selector Switch
9. Headphone Jack

SPECIFICATIONS
Power Output: 12 watts per channel stereo. 24 watts monaural operation. Frequency Response: 25,000-100,000 CPS ± 1 db at 1 watt. 50,000-100,000 CPS ± 1 db at 12 watts. Hum and Noise: phone—50 db below rated output, Tuner—75 db below rated output. Distortion: less than 1%. Total Harmonic Distortion at 12 watts (1K), less than 25%. Total Harmonic Distortion at 1 watt (1K), less than 3%. Total Harmonic Distortion at 1/4 watt (1K), less than 5%. Seed Sensitivity: Low Level (Magneto Input) 5 mv at full output. High Level .6v at full output. Outputs: Dual 8 and 16 ohm impedance speaker outputs. Dual Tape outputs. Tube Complement: Total of 8, 3-12AX7, 4-6GWa, 1-5AR4.

Dual 12 Watt Stereo Amplifier
Coupled With a Versatile Stereo Preamplifier... Performance
The Equal of Units 2 & 3 Times Its Power & Price.

CHECK THESE QUALITY FEATURES
Stereo Headphone Jack
Independent Concentric Bass & Treble Controls For Each Channel
Concentric Volume Balance Control
Frequency Response: 20-100,000.CPS
± 1 db at 1 Watt.
Hum & Noise—75 db Below Rated Output
High Sensitivity Allows Use
With All Stereo Cartridges

BRILLIANT STEREO PERFORMER... An amplifier with the wide-range frequency response, low distortion, low hum and noise characteristics you'd expect of amplifiers 2, even 3 times its output rating and many times its price. A full range of control facilities have been included to ensure complete freedom of choice and flexibility. Two dual concentric Bass and Treble controls provide separate and individual tone controls for each channel, and allow precise channel balancing. Fast, easy operation between Stereo, Reverse Stereo, Monophonic Left channel and Monophonic Right channel is furnished by a Mode switch. A selector switch furnishes switching between AM, Tuner or Phono music sources. In addition switches are included for Rumble Filter (off-on) Phase Reverse and to take full advantage of the front panel Headphone jack a switch is provided for speaker or phone operation. Panel inputs located on the rear panel accommodate any of the ordinary stereo sound sources—inputs are included for magnetic, crystal or ceramic cartridges. Tuner, Tape and Auxiliary (high output) plus Tape Out jacks for recording through your tape recorder.

Beautifully styled in a low silhouette enclosure, color keyed to do justice to any decor. Ivory and gold front panel Is contrasted by gold metal knobs and enclosure. Complete with Cage and Legs. Size: 16½ x 13¾ x 8½. Shpg. wt., 20 lbs.

AUSTRALIAN DISTRIBUTORS
MAURICE CHAPMAN & CO. PTY., LTD.
Brisbane, Chandlers Pty. Ltd., Adelaide, Neil Muller Ltd.
Melbourne, V. Brull Pty. Ltd.

Radio, Television & Hobbies, May, 1964
Asbestos Substitute

Synthetic fibres which may substitute for asbestos have been produced economically by researchers of the United States Bureau of Mines, Internal Department Building, Washington 25 D.C., U.S.A. The silicon carbide fibres are produced from natural silicates to produce green and white threads up to 1.5 millimetres long. They will resist oxidation, it is stated, at up to 930 degrees Fahrenheit in air.

Development in Endoscopy

Surgeons in Edinburgh recently obtained a colour film of a dog's heart in action by using an endoscope invented by a London doctor. Reporting in the B.M.C. News, Allan Murray said that the silicon carbide fibres used in the endoscope contained a telescope and a quartz-crystal rod which lighted up an area of anything up to several feet beyond the end of the telescope. The operator could either look directly at the object he wanted to see, or photograph it through the eyepiece. "In Washington, D.C., U.S.A. The silicon carbide fibres are made by decomposing natural silicates to produce green and white threads up to 1.5 millimetres long. They will resist oxidation, it is stated, at up to 930 degrees Fahrenheit in air.

Endoscopic views of the human body are now possible. In Manchester, for instance, a colour film of a dog's heart in action was obtained by using an endoscope invented by a London doctor. Reporting in the British Medical Journal, Allan Murray said that the silicon carbide fibres used in the endoscope contained a telescope and a quartz-crystal rod which lighted up an area of anything up to several feet beyond the end of the telescope. The operator could either look directly at the object he wanted to see, or photograph it through the eyepiece. "In Washington, D.C., U.S.A. The silicon carbide fibres are made by decomposing natural silicates to produce green and white threads up to 1.5 millimetres long. They will resist oxidation, it is stated, at up to 930 degrees Fahrenheit in air.

Animated Video

Electronic animation of colour television tape was demonstrated for the first time recently at the National Broadcasting Company's Burbank, California, television audiovisual systems using the Ampex Editec time element control system. In addition to the special demonstration, the Electronic Edition of the NTSC technical journal, and exclusively with monochrome tape. Designed for use with colour and monochrome tapes, the system passed its first colour trials with flying colours, according to Ampex and NBC. As a result of the tests, a special demonstration tape was prepared by Ampex and NBC for viewing at a joint meeting of the Society of Motion Pictures and Television Engineers and the Audio Engineering Society at the University of California, Los Angeles. The test system is also designed to be compatible with the NTSC system in the United States, and the SECAM and PAL systems, and it couples with broadcast television services in the European broadcasting area. The test system is also designed to be compatible with the NTSC system in the United States, and the SECAM and PAL systems, and it couples with broadcast television services in the European broadcasting area. The test system is also designed to be compatible with the NTSC system in the United States, and the SECAM and PAL systems, and it couples with broadcast television services in the European broadcasting area. The test system is also designed to be compatible with the NTSC system in the United States, and the SECAM and PAL systems, and it couples with broadcast television services in the European broadcasting area. The test system is also designed to be compatible with the NTSC system in the United States, and the SECAM and PAL systems, and it couples with broadcast television services in the European broadcasting area. The test system is also designed to be compatible with the NTSC system in the United States, and the SECAM and PAL systems, and it couples with broadcast television services in the European broadcasting area.
THE VHF BANDS
What to do about TVI problems

Although the above subject has been extensively covered in overseas magazines, very little has been published in this country. We have endeavoured to set out here, not only the theory of TVI prevention but, we hope, sufficient information to allow the average amateur to operate on 52 megacycles with complete immunity from television interference.

By Keith Woodward

The first question which requires classification is that of "audio detection." It is this article.

sense of adjacent channel filters in the signals may he poor for several reasons, transmitter discussed is amplitude modulated. It is assumed that the difference usually gives both picture and TVI. The viewer, in some cases, may hear troubles.

The second major cause of TVI is what is known as "fundamental overtones." This stems from the inability what is known as "cross-modulation effects, abnormal coupling to the output link."

What are the common causes of TVI?

The second major cause of TVI is the radiation of harmonics or spurious frequencies generated in the transmitter. This type of interference cannot be cured, being directly attributable to the transmitter. Elimination of spurious output has to be undertaken before further checks can be made.

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What to do about TVI problems

THE first question which requires classification is that of "audio detection." It is this article.
### Chart 1: Harmonics of 9.0 Mcs. Crystal or V.F.O.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>9.0 Mcs.</th>
<th>18.0 Mcs.</th>
<th>27.0 Mcs.</th>
<th>36.0 Mcs.</th>
<th>45.0 Mcs.</th>
<th>54.0 Mcs.</th>
<th>63.0 Mcs.</th>
<th>72.0 Mcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscillator</td>
<td>9.0 Mcs.</td>
<td>18.0 Mcs.</td>
<td>27.0 Mcs.</td>
<td>36.0 Mcs.</td>
<td>45.0 Mcs.</td>
<td>54.0 Mcs.</td>
<td>63.0 Mcs.</td>
<td>72.0 Mcs.</td>
</tr>
<tr>
<td>Driver</td>
<td>9.0 Mcs.</td>
<td>18.0 Mcs.</td>
<td>27.0 Mcs.</td>
<td>36.0 Mcs.</td>
<td>45.0 Mcs.</td>
<td>54.0 Mcs.</td>
<td>63.0 Mcs.</td>
<td>72.0 Mcs.</td>
</tr>
</tbody>
</table>

### Chart 2: Harmonics of Transmitter Frequency

<table>
<thead>
<tr>
<th>Frequency</th>
<th>25.0 Mcs.</th>
<th>35.0 Mcs.</th>
<th>45.0 Mcs.</th>
<th>55.0 Mcs.</th>
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</thead>
<tbody>
<tr>
<td>Channel 5</td>
<td>TV</td>
<td>Commercial Radio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel 10</td>
<td>TV</td>
<td>Commercial Radio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>3.0-3.5 Mcs.</td>
<td>5.0-5.5 Mcs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Chart 3: Harmonics of 13.5 Mcs. Crystal or V.F.O.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>13.5 Mcs.</th>
<th>27.0 Mcs.</th>
<th>40.5 Mcs.</th>
<th>54.0 Mcs.</th>
<th>67.5 Mcs.</th>
<th>81.0 Mcs.</th>
<th>94.5 Mcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscillator</td>
<td>13.5 Mcs.</td>
<td>27.0 Mcs.</td>
<td>40.5 Mcs.</td>
<td>54.0 Mcs.</td>
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</tr>
<tr>
<td>Driver</td>
<td>13.5 Mcs.</td>
<td>27.0 Mcs.</td>
<td>40.5 Mcs.</td>
<td>54.0 Mcs.</td>
<td>67.5 Mcs.</td>
<td>81.0 Mcs.</td>
<td>94.5 Mcs.</td>
</tr>
</tbody>
</table>

### Chart 4: Harmonics of 13.3 Mcs. Overtone Crystal

<table>
<thead>
<tr>
<th>Frequency</th>
<th>13.3 Mcs.</th>
<th>26.6 Mcs.</th>
<th>39.9 Mcs.</th>
<th>53.2 Mcs.</th>
<th>66.5 Mcs.</th>
<th>79.8 Mcs.</th>
<th>93.1 Mcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 10</td>
<td>TV</td>
<td>Commercial Radio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel 5</td>
<td>TV</td>
<td>Commercial Radio</td>
<td></td>
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<tr>
<td>Services</td>
<td>9.0-9.5 Mcs.</td>
<td>12.0-12.5 Mcs.</td>
<td></td>
<td></td>
<td></td>
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</table>

### Chart 5: Location of Sound and Picture Carriers in TV Channel

- Location of sound and picture carriers in TV channel. Graph shows relative interference or signal, held to a constant level, as swept across a TV channel.

---

Radio, Television & Hobbies, May, 1964
There must be a good reason why

MODEL IM-11

VACUUM TUBE VOLTOMETER

is the WORLD'S

LARGEST SELLING

VTVM!

There certainly is! World-famous Heathkit VTVM's professional quality and low cost has made it the leader in the field for years and now with improved styling, better low-frequency response, and single test-probe convenience it is even greater value still!

Heathkit IM-11 features the same basic trouble-free circuit of the time-proven Heathkit VTA, plus many design improvements.

- AC volts (RMS), AC volts (peak to peak),
- DC volts, resistance and db measurements,
- Improved low-frequency response ± 1 db, 25 cps to 1 mc.
- ± 1% precision resistors for high accuracy.
- 11 megohm input resistance assures high accuracy in every application by minimizing circuit loading of unit under test.
- Front panel controls include rotary function switch with DC polarity reversing position to eliminate lead switching when alternately measuring pos. and neg. voltages.

PLUS many other valuable features too numerous to mention here.

PRICE: £27/12-6

Mail orders delivered free in metropolitan areas.

HEATHKIT ETCHED CIRCUIT RF PROBE KIT

May be used with any 11 megohm VTVM for RF measurements up to 250 megacycles. A convenient and useful accessory for those occasions when measurements are necessary in RF work. Printed circuit.

PRICE £3/11/

SINGLE PROBE

Slim, all-purpose probe with switch for all functions and unique clip-action for hands-free connections.

CIRCUIT BOARD ASSEMBLY

For uniformity and stability, as well as easy construction, the Heathkit IM-11 uses a printed circuit board for minimum component wiring.

PRECISION RESISTORS

The IM-11 voltage divider networks use precision (1 p.c.) resistors to provide high instrument accuracy.

WARBURTON FRANKI

Radio, Television & Hobbies, May, 1964
The use of a properly designed pi network can reduce harmonics higher in frequency than the required signal frequency.

Internally there is only one step left which can reduce the harmonics shown in chart 2, from being directly coupled to the aerial. This is the application of a short circuit path for a chosen harmonic. This short circuit may be a series trap, for example, 3, which is the cause of your worry. It is possible to view a TV set, showing interference caused by the unwanted harmonics passing through the amplifier stages of a six meter transmitter. However, it will be seen that the entire tank coil is "live" at even frequencies higher than that to which it is tuned, it is less effective in attenuating lower frequencies. The independent wholesaler

Radio Despatch Service

ALWAYS RELY ON R.D.S.

The independent wholesaler

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Sansui’s

HI-FI STEREO AMPLIFIER Model SM-33

OUTSTANDING FEATURES

HIGH POWER OUTPUT:
For both channels, 32 watts maximum, 26 watts undistorted of unsurpassed stereo and monaural performances of all types, broadcast, and music tape and disc reproduction. Suitable for home use or commercial applications.

HIGH PERFORMANCE CIRCUITRY:
Solid is equipped with a scratch filter to eliminate noise on older records. All line output stages are filtered by a proper balance of reproduction to be maintained.

SILICON RECTIFIERS:
Long life and high efficiency silicon rectifiers are used in the power supply.

ONE-TOUCH SYSTEM FOR TAPE RECORDING AND REPRODUCING:
Operation is greatly simplified, tape recording and reproducing connections utilise Magic-eye tuning indicator.

AMPLIFIER, EACH CHANNEL:

Sensitivity and Gain:
PHONO: MAG. 2 mV. 77 db for 12 W. output
Crystal 50 mV, 49 db for 12 W. output
TAPE & MIC.: 1.1 mV, 82 db for 12 W. output
AUX.: 70 mV, 46 db for 12 W. output
Signal to Noise Ratio: more than 55 db (at TAPE input)

AM-(MEDIUM WAVE) TUNER, CHAN-1 & CHAN-2:
Frequency Range: 535 to 1,605 KC
Band Width (adjustable): 6 KC. -3 db
Sensitivity: 60/inV or better for 0.5 watt output

AM-(SHORT WAVE) TUNER, CHAN-1:
Frequency Range: 3.5 to 10 MC
Band Width (adjustable): 6 KC. -3 db
Sensitivity: 15/mV or better for 0.5 watt output

CONTROLS:
CHAN-1 and CHAN-2. changeable by Slide Switch. Loudness, Scratch Filter, Tape Monitor

CABINET DIMENSIONS:
17¾ x 13¼ x 6½ high
WEIGHT:
29 lb.

The TEAC 505R is a 2-speed, Semi-Professional, high-quality tape recorder which will record and reproduce 4-track stereo and 4-track monaural, as well as reproduce 2-track stereo and monaural. -It is fitted with extra heads to permit instant monitoring from the tape, or by the flick of switch to monitoring from the source. Like professional machines, it is fitted with three hysterisis synchronous motors, giving individual drives for capstan, take-up and rewind. A special feature, ‘Reverse Automatic,’ enables the previously recorded track to be played back automatically after the finish of one track without rewinding the tape. Twin V.U. meters permit individual monitoring of each channel on stereo signal from source or tape. A mixing circuit enables microphone and line inputs to be superimposed on each other. A tape footage counter and tape-break switch are fitted. The TEAC 505R is a machine with that little extra for the connoisseur or for those requiring a machine for professional use.

TEAC 505R Semi-Professional Tape Recorder

4-TRACK STEREO AND MOHURAL

Visit the A.W.A. Radio Centre, lower ground fl., "Clarence St., Melb. to Fri.

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED
72 CLARENCE STREET, SYDNEY.

Radio, Television & Hobbies, May, 1964

2 033–ext 386
mutter were to cause the direct coupling of harmonic radiation to the aerial system.

However, there is no virtue in closing off these harmonics from the aerial if they are going to be radiated directly from an unshielded chassis into your own aerial system and also directed to nearby TV sets. It is obvious that there must be taken to shield the transmitter and any leads attached to such.

As an indication of the problem, with a cheap modulated oscillator, working with a sensitive shortwave receiver, it will often be found impossible to attenuate the signal going to RF leakage through the attenuator, the power leads and the inadequately shielded case.

The subject of transmitter shielding has been covered very thoroughly in amateur handbooks and publications. If we were to repeat all this information here, there would be little room for other articles! However, the general rule is to run all filament and high tension leads to shielded tanks and effectively to bypass both ends of these leads. When we say "effectively" we mean that. Some capacitors, which may have the appearance of a perfect bypass, are anything but that. It is generally recognised that disc ceramic capacitors are readily acceptable in this service.

Too very good article covering these topics have been published by Ducon Condenser Ltd., "A Note on the Use of By-Pass Capacitors." An extract from the first of these appears in figure 4 and shows how effective a bypass capacitor can be at a certain frequency. The impedance of a ceramic unit used as a bypass capacitor in a resonant circuit will be capacitive. The usable bandwidth of a bypass capacitor will be in the range from 0.7 to 1.4 times the resonant frequency. Within this range the impedance will be capacitive, or better than, the resistance of the gaseous or semiconductor, without any associated inductance.

One practical method of obtaining the resonance varies somewhat from any other is to short circuit Q at the end of the leads transforming it into a resonance frequency which is, as previously mentioned, the frequency where the most effective bypass action will be achieved.

Figure 5 in this article shows the effectiveness of the different methods which may be used to bring out leads of a shielded transmitter. The figures to the right of the diagram show the relative output, for the same oscillator frequency, of a shielded transmitter. The figures above the diagram show the effectiveness of the different methods of bringing out these leads. The original experiments to establish these filtering were made by Phil Rand, W1DBM, in his book, "Television Interference."

Any large holes in the case and front panel of the transmitter must be effectively shielded. For instance, the meter should be covered by a metallic shield (empty baked bean tin) which makes good contact with the front panel. A good method of bringing the meter connections out to the chassis is through two ceramic feedthrough capacitors in the back of the shield.

The case will naturally require ventilation. This ventilation is best achieved by a series of very small holes which have minimum RF leakage for which allow a reasonable air flow for ventilation purposes. The worst type of ventilation, as far as RF leakage is concerned, is slots or louvres. If these are already present it will be necessary to cover them with a fine gauze to reduce RF leakage. As will be noticed in all good modulated oscillators, use is made of double shielding to reduce signal leakage. This same principle may be used in a transmitter. Double shielding may be achieved by individually shielding the tuned circuits wherever possible, and the crystal if crystal controlled.

The amount of shielding and filtering necessary depends on the power level of the transmitter and the amount of local output, for the same oscillator frequency. High power equipment operating in the VHF bands may need considerably more elaborate shielding and filtering than much lower powered gear may require. The frequency of the equipment to be used, the outer rig, the shielding and filtering requirements become.

Naturally the higher the power of the...
WHY

Has the TELEFUNKEN 504 Stereo record changer become the favourite of hundreds of thousands of music lovers in Europe and America?

BECAUSE

It has brought high quality entertainment within the reach of everybody. The TELEFUNKEN 504 STEREO RECORD CHANGER combines time-proof sound reproduction, easy operation and graceful appearance at an extremely low price!

SPECIFICATIONS:

- Speeds: 78, 45, 33-1/3, 16-2/3 r.p.m.
- Operation: monaural or stereo, switch as desired.
- Records: 7", 10", 12" can be mixed.
- Response: 30-15,000 c/s.

PRICES:

- Deluxe Model: £29.6.6
- Standard TW504 £23.12.6
- 2 sapphire styli extra.
- Loud-speaker £3.15.11 extra.

Added Features:

- Freely suspended motor.
- Belt Drive.
- Reinforced turntable with heavy rubber surface.
- Removable changer spindle and auxiliary player spindle.

THE ULTIMATE IN QUALITY

TELEFUNKEN KL85

If you strive for superb music recordings and if you attach great importance to outstanding reproduction features, then the Magnetophon 65 hits the mark of your desire. The D.C. heating of the input valves, the double screen around the motor, a Philberth transformer with extremely low stray and the built-in push-pull oscillator are just a few of the many reasons why the Magnetophon 65 is successful. The input valve has a separate screened input valve which is fed by a separate push-pull oscillator. Programme tape experiments will yield further valuable features, such as the built-in pitch corrector for automatic playback of acetate mixers which is controlled by a separate push-pull oscillator. Particularities: 7 tape speeds: 33 (9.5 cm/sec) with 20 to 3,000 cps frequency response and 75 (19 cm/sec) with 30 to 20,000 cps frequency response (-3 db); Cartridge: following MM and MC standard, for playback also switchable to CCIR standard; a Philberth transformer; a Philberth oscillator; separate controls for bass, treble and volume, effective also for monitoring; extra sensitive automatic brake mechanism for protection of heads and tapes; level indicators via spring eyes; a Connections for microphone, radio, phone set, earphone, built-in mixer, separate controls for modulation and playback volume; 2 built-in Allvox PM loud-speakers; Brilliant 3-D-effective sound radiation is achieved via 6-watts push-pull output stage and 2 built-in Allvox PM loud-speakers. The Magnetophon 65 is a completely new-dimensioned magnetic tape recorder with remarkable features, such as the built-in pitch corrector for any kind of double recording, or the built-in mixer which allows 2 sources to be mixed, every time. The TELEFUNKEN 504 STEREO RECORD CHANGER combines time-proof sound reproduction, easy operation and graceful appearance at an extremely low price!
There are several ways of achieving the normal external filtering between the signs of harmonic interference. If traces of reduction have been used of any harmonics which may reach the transmitter the higher will be the level of frequencies shown in chart 2, then additional low-pass filter, bandpass filter and coaxial filter.

The simplest method, which gives only the required reduction of harmonic content, is an aerial tuner. Better systems are a coaxial filter. The best will be the same as for the aerial alone. It may be necessary to make slight adjustments to the coils and trimmers. The filter is initially preset by lifting the leads to the 100 pf capacitor and shorting the free ends of the coils to earth. With the two trimmers at half capacity, the coils may now be adjusted to the operating frequency with a GDO. Kept to the circuit and close the case. Next measure the SWR of the SWR of the coaxial filter on the transmitting set and close the case. The receiver is fitted into the centre partition which need not be very large. Coconut filler of 50 or 72 ohms may be used with the filter. The filter is initially preset by shorting the free ends of the coils to earth. With the two trimmers at half capacity, the coils may now be adjusted for minimum SWR. With a GDO, the following procedure will be the same as for the aerial alone. It may be necessary to make slight adjustments to the trimmers and TRs.

The approximate attenuation claimed for this filter is 30 db per octave, the insertion loss being approximately 1 db at the operating frequency.

The finished 52 Mc/s coaxial filter tested and rated against harmonic radiation.

Note that the variable capacitors used in the complete filter were adjusted to the operating frequency. To do this, attach a two-turn loop to either pick-up loop of the filter. The filters were then adjusted so that it was possible to obtain a suitably small increase in the efficiency of the filter may be obtained by the use of a 5/8 inch diameter inductor. However, the small increase does not warrant any great trouble or expense that may be necessary to obtain a satisfactory section of material. The inner conductor may be made of many materials as long as the conductivity is good and the physical dimensions are retained. Before the top plate is soldered on to the filter, it is advisable to check that it is connected to the operating frequency. To do this, adjust a two-turn loop to either pick-up loop of the filter and check the tuning range of the filter.

All details are given above for construction of the 62 Mc/s coaxial filter. With care in cutting out only one sheet of tinplate 20" * 28" will be required.

The final filter was fashioned from a sheet of tinplate 20" * 28" in 3/64th of an inch thick. A circular plate of 17 in was used for the base plate of the filter and the side pieces. The outer wall circumference of 17 in, the inner wall circumference of 3 5/18 in wide, the filter using a square section of 2 3/34 in. Do not forget to drill the holes for the filter connection before soldering the strips to the base plate.

These side strips are tricky to shape. It may be necessary to obtain a suitably small increase in the efficiency of the filter may be obtained by the use of a 5/8 inch diameter inductor. However, the small increase does not warrant any great trouble or expense that may be necessary to obtain a satisfactory section of material. The inner conductor may be made of many materials as long as the conductivity is good and the physical dimensions are retained. Before the top plate is soldered on to the filter, it is advisable to check that it is connected to the operating frequency. To do this, adjust a two-turn loop to either pick-up loop of the filter and check the tuning range of the filter.
NOMBREX

**NOMBREX SIGNAL GENERATOR**

**MODEL 27**

The wide frequency range, robust construction and easy portability make it the real all-purpose instrument for radio and television service engineers, technical colleges, institutes and laboratories, and for the amateur radio technician.

<table>
<thead>
<tr>
<th>RANGES</th>
<th>OUTPUT</th>
</tr>
</thead>
</table>
| 10 to 100,000 cycles, in four multiplier ranges. Directly calibrated scales. | Sine wave and square wave. Voltage: Maximum 1 volt peak, sine and square. |}

**£18.5.0 plus Sales Tax**

**NOMBREX SIGNAL GENERATOR**

**MODEL 32**

Printed circuit assembly is employed, the basic circuitry being a three-transistor Wien-Bridge controlled oscillator with thermal automatic control of output voltage, sine wave. A separate highly efficient two-transistor triggered circuit provides the square wave output, which is of excellent waveform throughout the entire range.

- Accuracy: Better than plus or minus 2 parts per cent overall.

**£30.0.0 plus Sales Tax**

**C. R. BRIDGE**

**MODEL 62**

The measurement facilities cover an unusually wide range of resistance and capacitance, together with provision for leakage test of capacitors, and measurement of Power Factor in the larger sizes of capacitors.

<table>
<thead>
<tr>
<th>RANGES</th>
<th>OUTPUT</th>
</tr>
</thead>
</table>
| 0.1 ohm to 100 megohms        | Sine wave and square wave. Voltage: Maximum 1 volt peak, sine and square. |}

**£16.15.0 plus Sales Tax**
The humble fuse is one of the simplest components in a TV set. Not only does it function as a kind of coffee-kettle, but it can also be a potential source of trouble. It is vital to understand how and why a fuse might blow, as well as its possible effects on a circuit. 

In many respects this story concerns quite routine service procedure, and in what circumstances might not even warrant telling. However, a combination of customer reaction and a particular type of fault produced a potentially tricky problem.

As far as I was concerned, the story started with a Monday morning call to replace a fuse in a TV set but, in fact, there was more to it than that. As I was to discover later, the set had failed on the previous Saturday evening and someone, either the owner or a well-meaning friend, had replaced a blown fuse. Anxious to see the set going for the evening's entertainment, and having no proper replacement fuse, they used the next test thing—an assistive fuse.

This is a tricky procedure, of course. Such fuses are normally far too heavy in function as such in TV circuits and beyond simply a lack to complete the cir-<n><n>South of a serious fault in the set, it is quite likely that additional damage will occur, particularly to the power transformer and associated components.

Unfortunately, there were no such complications on this occasion. The set came good at once as the new fuse was fitted, apparently exhibited no signs of distress, and the owner, who was very much short of time, went on without interruption. Simply put, the set was without incident on the previous night. It had finally warmed up with only the faintest blue glow on the small picture because, as he explained, it to be determined was why.

In fact, of course, the small picture was a visual clue. It left little doubt that the HT voltage had been well down when the set was first switched on after a period of idleness. The only point to be determined was why.

Fortunately, I was able to find a fuse suitable for this set. The owner had paid little attention to the transformer, more serious and routine but, as I said at the time, I had no way of knowing and, with the trail now quite cold, little chance of discovering anything immediately how the fuse failed. The correct fuse in the set and rear the correctness of this, although there were, nothing apparently wrong with the set as far as the moment, the trouble could recur and to call me if it did.

However, in the normal course of events, I more or less forgot all about it. That is, until about 10 days later, when I received another call from the customer, saying that the fuse had blown again. So I made another call. And again I found that the fuse had been replaced with an automotive type, again as an emergency measure to provide the previous night's entertainment. Convincing now that there was something more to the problem than simple fuse fatigue, I questioned the owner as to the exact circumstances in which it had failed.

That is, until about 10 days later, when I received another call from the customer, saying that the fuse had blown again. So I made another call. And again I found that the fuse had been replaced with an automotive type, again as an emergency measure to provide the previous night's entertainment. Convincing now that there was something more to the problem than simple fuse fatigue, I questioned the owner as to the exact circumstances in which it had failed.

First, I learned that both this and the first failure had occurred as similar circumstances; at the moment of switching on, rather than while the set was running. Additionally, this fault might have been caused by another thing. However, a fuse failure. By the HT voltage had been well drop in HT voltage, and the gradual recovery could all be accounted for by a gassy valve. Admittedly, a leaky electro-lytic might give similar symptoms, but I felt that, had it been as bad as the symptoms suggested, it would have been impossible to fix it.

The owner had paid little attention to the transformer, more serious and routine but, as I said at the time, I had no way of knowing and, with the trail now quite cold, little chance of discovering anything immediately how the fuse failed. The correct fuse in the set and rear the correctness of this, although there were, nothing apparently wrong with the set as far as
A wide range of reliable low-cost power transistors is offered by Mullard-Australia Pty. Ltd. With the addition of new germanium and double diffused silicon types, power coverage is now extended to 130W. The steady introduction of Mullard power transistors of proven performance has resulted in a range covering a wide variety of requirements and applications. The chart above is intended as a selection guide for the types required for a particular application. For more detailed information on price and performance contact Mullard-Australia Pty. Ltd.
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Radio, Television & Hobbies, May, 1964

The VHF Bands

(Continued from Page 31.)
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The initial question, this month, have to do with carbon microphones and their place in the scheme of things, in this modern age. Than follows a question with a slightly mathematical flavor, to do with transistors.

Why is it that carbon microphones are still so widely used? Surely a microphone better be available after all those years of development and research?

If "better" simply meant frequency response or distortion content, the answer to your last question would certainly be "yes." In fact, the word "better" must be taken, in the wider sense, to indicate the overall suitability of a carbon microphone to the jobs normally allocated to it.

In this sense, the answer might be just the reverse. Despite their rather primitive mode of operation, carbon microphones have certain important characteristics:

- They are cheap to manufacture.
- They are robust and reliable.
- They deliver very high output and therefore require a minimum of associated amplification.
- They have a relatively low natural impedance, which fits in well with the requirements of ordinary unshielded wiring and telephone line.

In terms of frequency response, distortion and background noise, carbon microphones are well down in the list, most other types showing a superiority in all these respects. You wouldn't even consider them where quality was of paramount importance. However, carbon microphones can be made good enough for ordinary speech resolution and, where this is the basic requirement, they are preferred because of the advantages listed above.

In some applications carbon microphones can—and have been—replaced by a small dynamic unit with in-built preamplifier. Another possibility is to indicate the overall suitability of a carbon microphone to the jobs normally allocated to it.

MECHANICAL WEAR: Physical strain can also deteriorate the surface of the granules, particularly in situations where the microphone is continuously subjected to vibration. Loss of output and rising noise result.

ELECTRICAL ARCING: The current which flows through a carbon microphone in normal operation causes minute arcing between granules, gradually and adversely affecting the surface. The higher the current and/or the longer the periods of operation, the more evident will the deterioration be. However, don't be too alarmed about these statements. An average carbon microphone is usually good for several years' service without the deterioration becoming at all serious—and that isn't far from the truth, either, since the carbon microphone has been the workhorse of the microphone industry for many years.

How is the current optimum through a carbon microphone determined? What happens if it is exceeded?

The output of a carbon microphone can be plotted against current, giving the output in miliwatts or some similar unit.

If the resulting curve is plotted, the knee of the curve is the value of current with a broad optimum can be struck representing the best all-round operating performance. As the collector current is related to the supply voltage and load resistor, the maximum possible collector current is limited by the voltage available.

Information is available covering optimum designs for ordinary speech requirements, for microphones used in very noisy situations, the variation in performance as a result of energizing circuits, and so on.

Whether this be the figure suggested by an individual manufacturer, or some other figure, it is generally accepted that the operating current should be held in the vicinity of the recommended value. Running the microphone at a higher current may yield some increase in output but with a disproportionate rate of deterioration.

In any research done these days, on carbon microphones, with a view to improving these characteristics? We wouldn't know the answer to this, but we doubt anyone would have the need to do urgent or intensive research. It is more likely that the results of ordinary manufacturing experience, combined with a better understanding of materials, will continue to produce gradual refinement.

Nevertheless, quite a deal of basic information has been published in the past decade relating performances to the nature and size of the granules, the size and shape of the space behind the diaphragm and the optimum degree of filling.

If "better" in the present context means something different from what it means in a vacuum tube, then we must agree that carbon microphones have nothing to fear from the advent of the transistor. In fact, all indications point in the opposite direction. Most other types of microphone today are showing a superiority in all respects to the carbon microphone, yet the latter is still in demand. However, in spite of the increased use of transistors, the carbon microphone is likely to continue in use for a considerable time. (An excellent paper was presented on the subject at the last convention of the Institution of Radio and Electrical Engineers of Australia.) It is due to be reprinted in the "IRE Proceedings."

Upon review of the article on transistor design in June, Radio, Television & Hobbies, I find there is one point I cannot understand. It states that an ability to see how distortion is defined by

\[ I_2 = \frac{E_s}{B} \]

Perhaps the simplest way of computing the "undistorted" state of a transistor is to say that, for the given supply conditions, the maximum possible collector current is limited by the base current. To approach this condition from a state of quiescent non-conduction, we can slowly increase the base current until the maximum output current is reached. Is the collector current related to the
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*Quirks, Television & Hobbies, May, 1964*
base current by the current gain factor Beta, this means that the collector current will increase at the rate of increase of lb.

Until bottoming is reached, lb will be approximately equal to Beta times ib. This is true only as long as the base resistance, Rb, stays constant, and will be approximately equal to Ic/β. Now when the voltage at the collector of the transistor falls to the "knee"—it slightly different and is not quite correct, the correct definition is the one that mentions only those things which are directly related by the transistor action.

β ≈ Ic/Beta

While this is intended to mean the same as the expression quoted from our article, it strictly means something slightly different and is not quite correct. This is because when practical transistors bottom they do not become a short-circuit. Rather, they have a small voltage drop which is almost constant independent of the current; something like a small battery of zero internal resistance, in fact. In other words, the maximum value of collector current reached is not quite Eccoli / β, but a slightly smaller value. Thus, a practical transistor can be arranged to produce a short-circuit, i.e. Ib is equal to or greater than Eccoli / β, though it is smaller than Eccoli / β times Kβ.

In many situations, therefore, the difference between the two definitions is negligible because the transistor is regarded as being "well and truly" bottomed or not at all. However, as the difference is important, it is a good idea to make sure that you know which is the correct definition for the circumstances involved. The correct definition is the one which mentions only those things which are directly related by the transistor action — the base current, base current and their load resistance.

If this is kept in mind there should be no difficulty.

Further to the description of the DeltaNet Front End, featured in the last article, it strictly means something which will reveal ways in which the performance can be improved or the construction simplified. Such is the nature of the improvements and the design, as published is capable of excellent results.

The 22k plate load of the VFO is now 10k and the 1k screen resistor is now 22k. Further to the description of the DeltaNet Front End, as published is capable of excellent results.
Two new informative leaflets have just been released by MSP. Be sure to obtain your copies from any of the leading radio parts distributors throughout Australia.

Here at last is a low-cost tweeter with the performance of expensive, elaborate designs.

The specification below speaks for itself.

- **Frequency Range**: 2-15 kc/s
- **Power Handling**: 5 watts
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- **Mounting holes**: 4 11/16" P.C.D.
- **Baffle opening**: 3¼" Dia.

This is what R.T. & H. (Oct. '63) said after testing this MSP 4" tweeter: "It has high sensitivity and is much cheaper than the imported tweeters. Its special curvilinear cone gives good response to 10 kc/s, tapering gradually above this. It represents outstanding value."

This is one of the latest additions to the comprehensive MSP range of high-quality sound reproducers.
CHAPTER 10: Limitations of a crystal set.

Amplified crystal sets and audio stages. Diode and triode detectors using valves and transistors. Grid-leak and base-leak detection. Reaction or regeneration.

Two-stage receivers with transformer or resistance-capacitance coupling. Three-stage receivers. Power output stages.

Having used the crystal receiver to learn some of the basic facts about radio reception, we are now in a position to discuss simple valve and transistor receivers. The emphasis in the discussion will be on the operating principles of the various types of receiver rather than on their construction, but circuits will be provided with component values for the benefit of those who would like to experiment.

As we saw in the last chapter, a crystal set is a useful and interesting device. It is unable to make, it costs nothing to operate and it demonstrates, in a practical way, many important radio principles.

For all that, however, a crystal set has very severe limitations. It can only operate to its full capacity if the radio-frequency energy picked up by the aerial and earth system from the desired transmitter is increased, the energy available to it is the radio-frequency energy picked up by the aerial and earth system from the desired transmitter. This is selected, demodulated and made available to the earphones as an audible signal.

As the distance between receiver and transmitter is increased, the energy available becomes less and less until, at a distance which may be as little as 25 miles, the signal becomes inaudible. Only in very exceptional circumstances are signals sufficient to operate a loudspeaker.

Yet another serious problem is that of selectivity, a crystal set being unable to separate the wanted signal from other, strong signals in the receiving area.

In the face of such limitations, it is not surprising that engineers, very early on, began to improve the performance of crystal receivers or, alternatively, to supplement them altogether. Nor is it surprising that they have been relegated, in this modem age, to the role of a "beginner's set." As we have probably guessed, the development of the triode valve brought with it the ability to amplify signals, and in very exceptional circumstances are signals audible in the phones by the "beginner's set." The very first valve was the thermionic valve. As we explained in the earlier article, this latter may be either a semiconductor or a thermionic type.

Against all of this, the triode valve needed a filament battery, which was something of a nuisance. Hence the argument of the day as to which was the better proposition.

The development of the triode valve settled such arguments, because it brought with it the ability to amplify the interesting signals. Instead of being unable to operate the phones directly, the signals were applied to the grid to deliver its output circuit what we describe as amplified audio. The amplified carrier and its sidebands were picked up by an aerial and earth system from the desired transmitter. This is selected, demodulated and made available to the earphones as an audible signal.

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Radio, Television & Hobbies, May, 1964
the grid circuit of a valve, making it
Radio, Television & Hobbies, May, 1964
valve version. As there is no filament
will not draw too much plate current
"detector" with only a moderate plate
operation of the detector depends
increasing as the carrier amplitude rises,
grid resistor (often called the "grid
outline. The second half involves the
ed RF input signal into a negative bias
circuit, the triode provides a complete
ponents and therefore at the grid, a
from Cb and Rb are similarly different from
necessary to tap the circuit connection
are the equivalents of Cg and Rg, and
bias. Because there is no initial grid
tell us that a large
input signal to the grid will cause
input signal varies in strength, with
produces a quite imposing article on the
amplifier.
produce a quite imposing article on the
many circuits which have been evolved
regenerative detectors.
The tuning, detection and amplifying
are basically the same as for figure 3. However, advantage is taken
of the fact that, over and above the
phones, plus an amplified RF signal.
That is not the end of the story,
- A-, B-, C +
Figure 7. Adding a further stage of audio amplification can increase the
gain of the regenerative one-valve set still further, giving louder reception
and making it less errteal in operation. Audio transformer coupling between
the stages is shown here.
- A-, B-, C +
Figure 8. The only difference between this circuit and that of Figure 7 is that
resistance-capacitance coupling is used between the first and second stages.
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Here are excerpts from a letter written by Mr. John Pimm, of Kedrnn, Brisbane. The original letter may be inspected at 28 Elizabeth Street, Melbourne.

"The TANDBERG Model 7 is sure to have no equal anywhere near the price. Live musical recordings at 31 i.p.s. sound so good, even on its own internal speakers, that it makes me wonder if 7½ i.p.s. is necessary, as the wow and flutter is impossible to detect on any type of music recorded at this speed. Because of this outstanding performance at 31 i.p.s. I naturally save an enormous amount of tape.

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Radio, Television & Hobbies, May, 1964
the chapter on radio transmitters. (See figure 7, Chapter 8.)

of RF energy, exactly as described in circuit, as figure 6 shows. The regenerative comb-wound coil, is inserted between the plate current than would the component, which is usually a honeycomb type. However, RF energy at the plate is not bypassed to earth by the capacitance of the phone cord. The RF is therefore retained for use by the reaction circuit.

At the same time, RF energy is underivable in the phone cords, because it can radiate into space and back into the aerial to assist oscillation. 

As the capacitor in series with the reaction adjustment to be upset by random movement of the phone cords or even by the person wearing the telephone.

The radio frequency choke (inductor) is intended to prevent this trouble, in effect being augmented by the 1000\(\mu\)H capacitor. Normally the telephone plug is fitted at the instrument location to earth. As the capacitor plates are opened, the impedance of the circuit concentration to follow them. The use of audio transformers has always been rather

Radio, Television & Hobbies, May, 1964

Figure 9. A transistor receiver which is the counterpart of the valve circuit shown in Fig. 8. Only one supply battery is required, whereas the valve circuit requires three different supplies. A biasing system is explained in the text.

The capacitor is always made large enough to suppress any RF energy to earth which may still be present but it does not bypass the audio components, which have a much lower impedance than the lower circuit impedances. With the potentiometer to earth ensures that all the RF energy appearing at the lower circuit impedances.

For a regenerative detector to operate correctly, it is most important that the sensitivity of the detector may still be somewhat improved.

For a regeneration detector to operate correctly, it is most important that the sensitivity of the detector may still be somewhat improved.

For example, the signals heard in the phone cords in figures 5 and 6 is set to that the detector is just below the point of active oscillation, the gain and selectivity is considerably increased. Used with an efficient aerial and earth, a one-valve or one-transistor reaction set can receive signals under favourable conditions from transmitters thousands of miles away.

From the foregoing description, it might possibly be assumed that a one-valve set is all that should ever be necessary to receive radio signals but this is not the case.

Compared with a crystal receiver, a one-valve set has an enormous advantage in terms of sensitivity and selectivity — terms which relate to its ability to pick up a wanted signal and separate it from other signals. For all that, however, its performance is still capable of substantial improvement.

For example, the signals heard in the phone from a distant station may be quite weak, requiring a good deal of concentration to follow them. The use of a greater receiver is not to be presumed at all. The signal voltage. This has the effect of increasing greatly by adding an audio amplifier stage after the tube detector, exactly as already described in figures 1 and 2 for a crystal set.

The following grid is returned to the operation of this circuit appear-


Comparison with the valve circuit is the same and the gain is more than that of the one-valve or one-transistor reaction set can receive signals under favourable conditions from transmitters thousands of miles away. The growing tendency through the years has been to provide means to develop and to develop radio valves which are able to give adequate stage gain without the assistance of a transformer.

Figure 8 is similar to figure 7 except that this resistance-capacitance coupling is used between the detector and audio am-

ifier stage. Some discussion relevant to the operation of this circuit appear-

ed in Chapter 6 of this series, to do with valves.

A resistor, normally referred to as the PLATE LOAD resistor, is connected be-

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plate and B-plus. With no input signal, a certain plate current flows through the biasing sources has always been rather

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Magnetic Sound Industries
387 GEORGE ST., SYDNEY (2 doors from Kodak). BX3371.

Radio, Television & Hobbies, May, 1964
enough in value in respect to the two

standing plate current. Therefore, if the

speaker is plus and minus 1 milliamp—

change it can effect through phones or

headphones. The convenience of a

speaker has to produce a lot more

current through their windings. There-

fore, it is necessary to use

an ordinary speaker. To operate a

receiver, so can

stage to a detector makes for a more

sensitive and versatile receiver, so can

further improvement.

Since the capacitor cannot alter its

charge at an audio rate, it simply trans-

mits the VARIATIONS in plate voltage to

the grid, but prevents the positive DC volt-

age on the plate from cancelling or up-

perating at the grid and across the grid

resistor as an alternating audio signal.

The signal is thus amplified by the second valve in the ordinary way.

In other words, the coupling capaci-

tor transfers the signal from plate to

grid, but prevents the positive DC volt-

age on the plate from cancelling or up-

perating at the grid.

Now, if a valve is to amplify without

being replaced in the collector circuit

of the first transistor by a 10K resistor, voltage with a rheostat, variation in plate

load resistor varies. As a result, more

or less of the signal for

in a receiver can introduce the problem

of OVERLOAD. The word is almost

self-explanatory.

On weak signals, the amplification

available in a receiver may be just enough to raise their level sufficiently

to operate the phones or loudspeaker. If the same amplification is applied to

signals which are already fairly strong, the potentiometer is wired in the re-

verse direction because this is found to

be more effective. On very weak signals, the amplifier remains constant,

for the second stage to handle. As a

result, the stage overloads and produces

a very distorted output signal—sounding

rather than from the base to the nega-

tive heater, to provide a more copious sup-

ply of electrons.

Throughout the discussion, also, we

have assumed the use of triode valves.

In actual fact, introduce or remove valves

always frequented as detectors or audio

amplifiers, often giving higher gain or

in comparable circuits than comparable triodes.

Just as the addition of one audio

stage can be thought of as requiring a large change

in a receiver can introduce the problem

of OVERLOAD. The word is almost

self-explanatory.

On weak signals, the amplification

available in a receiver may be just enough to raise their level sufficiently

To avoid this difficulty, it is often

necessary to include in a receiver some of the circuit, which is likely to be

happier in a reducing grid, ade-

quate signal level may be given enough strength to enable the undesired

dis- unabrated by the detector stage and the first audio stage.

Audio, Television & Hobbies, May, 1964

Figure 9 shows a two-transistor set

arrangement for amplifying or audifying

a signal. In Figure 10, the circuit is shown in detail. If we can cut a lot of corners to make

valve circuits the variational in flux with a rheostat. We could start from the

device, and the signal voltage being applied directly from

one point to the other. If the signal

so that the tapping is at the end connecting to

its base, we get a more copious sup-

ply of electrons.

The base bias of the transistor, to

be of such an order that the use of a

receivers in the early days of radio were

sensitive and versatile receiver, so can

further improvement.

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charge at an audio rate, it simply trans-

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the grid, but prevents the positive DC volt-

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## TRANSMITTER CB-106

**RANGE UP TO 12 MILES — VERY LIGHT WEIGHT: 21 OZS.**

**CITIZENS BAND — APPROVED BY P.M.G.**

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
</table>
| Circuit                  | Transmitter — Crystal controlled. Recei(-  
|                          | Krystal controlled. Super-nat with tuned RF stage. |
| Transistors, 2 diodes.   |                                              |
| Range                    | Depending on location—up to 12 miles.       |
| Frequency                | Citizens Band  (27.24 Mc/s)                  |
| Input Power              | 10mW to output stage.                       |
| Drift                    | Within 0.005 per cent.                     |
| Audio Output             | Sensitivity 1nV for 50mW out.               |
| Current Drain            | Transmitter unmodulated.                    |
| Transistors, 2 diodes.   |                                              |
| Microphone               | Speaker used for talking or headset unit (extra). |
| Speaker                  | 2" permag, 8 ohms.                          |
| PMG Approval             | Ref. NW64 208; 26/1/64.                     |
| Battery                  | 8 Penlight cells 1.5V ea.                   |
| Accessories              | Leather Case, Batteries.                    |
| Size                     | 6-5/8 x 2-9/16 x 1-13/16 in.                |
| Weight                   | 21 ounces.                                  |

Produced by the well-known SONY Corporation the CB106 is a truly portable and highly efficient transceiver with a range of up to 12 miles. It is small in size and weighs only 21 ozs. Crystal control of both transmitter and receiver ensures very high stability while the tuned RF stage in the receiver gives exceptional sensitivity and freedom from interference. For field use a combined headset/microphone unit is available (optional extra). This gives hands-free operation. Approved by the P.M.G. Dept. the CB106 is ideal for any application calling for a small highly efficient portable transceiver.

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Radio, Television & Hobbies, May, 1964
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• Output: 3 watts per channel.
• Level Controls: Individual controls on each channel for playback, microphone and auxiliary inputs. Full mixing facilities.
• Fluct/Wow: Less than 0.15% at 7 ips.
• Less than 0.2% at 1/2 ips.

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• Transisterised pre-amplifier.
• Individual level controls on each channel.
• 2 SONY F-96 dynamic microphones.
• Tape Speeds: 71 or 31 ips.
• Frequency Response: 50-14000 cps at 71 ips, ±2db 50-10000 cps at 71 ips.
• Signal/Noise Ratio: 46 db per channel.
• Fluct/Wow: Less than 0.19% at 71 ips.
• Less than 0.25% at 31 ips.
• Level Controls: Individual on each channel.
• Tone Control: 1 Control for treble boost or roll-off operates on both channels.
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Radio, Television & Hobbies, May, 1964
A VERSATILE, BABY STEREO AMPLIFIER

As a change from big, high fidelity systems, here is a stereo amplifier which is about as inexpensive and as simple as such an amplifier can be. It is compact, too, and end of a shape and size which will allow it to be mounted in odd corners or in small portable cabinets, as the situation may demand.

By John Davidson

THE decision to build a small amplifier stemmed partly from our recent encounters with portable record players and partly from a need which had become evident for something at the other end of the scale from our "Playmaster" designs: something as inexpensive, as compact and as versatile as possible.

One role for such an amplifier is in the home, feeding a couple of stereo loudspeakers, which can be unpretentious or otherwise and provided with whatever baffling system the circumstances may dictate. In such a role, it could give results at least comparable with a commercial stereogram.

Alternatively, a small amplifier might be incorporated in portable record playing equipment, with in-built or satellite speakers, according to the space available.

This latter possibility dictated that the amplifier be compact and with one dimension as "narrow" as possible, allowing it to fit under a motor board. Hence the shape and layout of the unit, as pictured.

As a further concession to versatility, we decided to attach the controls to shielded cables, rather than mount them permanently on the chassis. The arrangement isn’t quite as tidy but it greatly simplifies installation in a restricted space.

To emphasise the aspect of versatility, we mounted our own prototype in a portable player cabinet picked up from one of our advertisers. By using telephone type jacks for the amplifier output, as indicated in the circuit, a stereo cartridge, and breaking into the pickup leads with a 5-pin socket and a slide switch, we were able to achieve the following facilities:

1. Use of a turnover stereo cartridge allows any records to be played, the slide switch permitting the channels to be paralleled to produce a mono signal, if required.
2. Passing the pickup leads through a socket mounted underneath the arm, allows the unit to be used purely as a portable playing deck, with a mono or stereo signal from the pickup available directly to an external amplifier or tape recorder.
3. The unit can be used as a portable mono player using either mono or stereo channels, and if desired, the composite mono output can be fed into an external high-quality single speaker, by simply plugging a slide switch.
4. If desired, the composite mono output from the 3-pin socket can be fed into another amplifier.
5. Plugged into the alternative jack, the speaker will take over one channel only, making stereo available in conjunction with the in-built loudspeaker.

Two higher quality external speakers can be plugged in, one for each channel.

From the circuit it will be seen that each amplifier comprises a 6GW8 Iridium-pentode valve and a small output transformer. We used a Ferguson-type E7KEI but any equivalent type which will fit on the chassis will do.

Actually, the better the transformer can be, in terms of size or quality of the laminations, the better will be the frequency response and the higher the power available to the speakers. Thus, if size and a little extra expense are no problem, the chassis could be scaled up, without the control layout being changed, to accommodate bigger output transformers.

Pictured above and below is our new compact general-purpose stereo amplifier. It is equally at home feeding a domestic built-in loudspeaker system, or in the cabinet of a portable stereo player. The amplifier will operate successfully with almost any stereo crystal or ceramic pickup cartridge.
8-ohm speakers and the transformers are used, the power output per channel is limited to a little over 2 watts at the second harmonic. However, this power is more than enough for loud room volume when one speaker is being driven, and not to sacrifice too much effective load on the pickup as high as possible, whether individual constructors bother about this or not in a practical sense, it is essential that the valve sockets be orientated in the direction shown in the wiring diagram and underchassis photographs.

The parallel capacitors compensate for low-frequency response due to 150-ohm "Miller Effect" capacitance, and reduce the whole approach to this amplifier, in a physical sense, was to keep the size down, in accord with our fit-in-where-you-plant approach. This dictated the use of a small power transformer. small output transformers and a compact layout above and below chassis. The separate ganged volume and tone controls are a further aid to versatility; they can be mounted in necessary, to the side face of the cabinet or on a plate bolted to one face of the amplifier transistor.

Feedback applied to the circuit is about 10db, quite enough to give a safe reduction in distortion and to provide about 10db, quite enough to give a safe reduction in distortion and to provide some degree of negative feedback. The "balance" control has been mounted on the chassis as a preset control to load the other, with a consequent promise between a desire to keep the installation.

Whether individual constructors bother about this is a matter of personal choice, though we do suggest remembering the "Miller Effect" capacitance. The "balance" control has been mounted on the chassis as a preset control to load the other, with a consequent promise between a desire to keep the installation.

The resistors in series with the "hot" leads to the valves compensate for a compromise between a desire to keep the feedback applied to the circuit is about 10db, quite enough to give a safe reduction in distortion and to provide some degree of negative feedback. The "balance" control has been mounted on the chassis as a preset control to load the other, with a consequent promise between a desire to keep the installation.

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LAFAYETTE ELECTRONICS

Radio, Television & Hobbies May, 1964
Most of the amplifier stage wiring is concentrated around small boxes, as shown, back channels being symmetrical in terms of layout. It is most important to keep the output plate lead clear of the input grid wiring.

clear the trip mechanism attached to the base of the pick-up arm.

Last but not least, a small wedge had to be removed from the sloping panel behind the speaker compartment to allow the speaker to move by 4 holes, into which are fastened 12 small wedges, as shown, to the frame at the top and channel 2 at the bottom. The wiring diagram will assist in making the appropriate connections to both sides of this board.

The portal cut-out into which we fitted the prototype amplifier was the same as that used on page 67 of our February issue.

To mount it in a Collaro 4-speed player cabinet, obtained from the same unit as referred to on page 67, we had to remove the lower half of a plywood partition dividing the motor and to give access to the speaker jacks.

To mount the amplifier chassis of the speaker compartment, with the sloping panel, were mounted on the inside face of a plywood partition dividing the motor and to give access to the speaker jacks.

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Where there's action... you'll find the

FI-CORD 202

This dramatic picture was taken at the scene of a recent South Melbourne timber-yard fire. Here 3UZ cameraman, Gerard Fleming, takes the station's audience to the scene with an authentically on-the-spot recording... with a FI-Cord 202 Portable Battery/Mains Recorder. Complete fidelity and all the practical advantages of a full size recorder are incorporated in this completely portable, lightweight machine.

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Specifications
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Rubber grommets. Unfortunately, there player mounts on rails suspended on prototype, the main plate carrying the output—a nominal 4 watts from the can be so severe as to render it virtually useless. This arises from:

1. The use of a stereo cartridge, which is sensitive to vibration in both the vertical and horizontal plane.

2. The much greater available power output—a nominal 4 watts from the two channels.

3. Better bass response, due to more favourable loading presented to the crystal pickup.

While some good may result from bracing the cabinet this way or that, or from packing it here or there with foam plastic, far and away the most effective measure against acoustic feedback is provided with spring mounts and these proved a good deal of resilience between the motor plate and the metal baseboard, which itself was partially isolated from the Collaro motor plate is itself provided with spring mounts and these proved a good deal of resilience between the motor plate and the metal baseboard, which itself was partially isolated from the cabinet. Together, the resilient mountings provided enough isolation to allow the unit to be played at full room volume without acoustic feedback being evident.

While frequent reference has been made to a particular cabinet and a particular player, our observation should be taken in a general sense. The two golden rules might read:

1. Never try to mount a player and a loudspeaker in the one small cabinet, because they will not float together.

2. Make sure that the turntable and pickup base are attached rigidly to one another, so that they float together.

This photograph gives an excellent idea of how the amplifier and record player were fitted to a "disposals" cabinet. Mounted on its side, the amplifier is set back far enough to clear the speaker magnet assembly. Note also the position of the controls on the front grill of the cabinet.

Radio, Television & Hobbies, May, 1964
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Radio, Television & Hobbies, May, 1964
THE multimeter or "VOM" (volt-ohm-multimeter) is probably the most used of all test instruments. It is used to measure circuit operating voltages, to check output devices, to measure resistances, to check for shortcircuits, open-circuits and leakages, to measure power output, to check battery voltages, to check for shortcircuits and open-circuits, to measure resistors, to check for shortcircuits, to check current drains, to check for shorts, to measure circuit operating voltages, and for countless other tasks.

Small wonder, then, to date, Radio, Television and Hobbies has described quite a number of them —, and for countless other tasks.

The multimeter is an instrument of necessity. It is used to test circuit operating voltages, to check output devices, to measure resistances, to check for shortcircuits and open-circuits, to measure power output, to check battery voltages, to check for shorts, to measure circuit operating voltages, and for countless other tasks.

Bench-Style Multimeter With Overload Protection

Figure 1: The overload protection circuit given was, in fact, that of January, 1958, to which had been added silicon diode overload protection.

There is thus a definite need through-out the electronics world, and particu-larity in the servicing field for a robust, reliable meter constructed from readily-available locally-made components and priced for easy assembly and repair. And if it could be fitted with overload protection as well, so much the better.

One is that ever since the 1960 article appeared, we have heard a small but steady stream of letters saying if we would describe a new one. Most of the writers realized that "selling your own wasn't economical—only simply pre-forced doing so on the grounds that the experience and satisfaction gained far outweighed any financial loss.

Since 1960, we have not described further multimeters because we knew that readers could buy themselves a ready-made unit for considerably less than the price paid for a project instrument. We felt that very few readers would be interested in building a multimeter if doing so involved a definite financial loss.

Two factors have caused us to revise our views and describe the instrument shown here. One is that ever since the 1960 article appeared, we have heard a small but steady stream of letters saying if we would describe a new one. Most of the writers realized that "selling your own wasn't economical—only simply pre-forced doing so on the grounds that the experience and satisfaction gained far outweighed any financial loss.

The other factor is that talks with service personnel, engineers and experi-mentalists have shown that few applications imported meters prove unsat-isfactory. While they have a relatively sensitive should it be?

While brought changes, however, and in this case it brought large numbers of inexpensive, multimeters imported, from countries such as Japan.

Because of this, the price of commer-cial instruments generally fell while that of components remained relatively constant. As time passed, the financial incentive for constructing one's own multimeter slowly dwindled away.

In March, when the January, 1960, article was published, the incentive had "reversed its polarity" and had become a deterrent. One could buy quite an elaborate professional instrument for less than the cost of the parts needed for a modest amateur unit.

We were aware of this at the time, and we presented the article more as a FULLY PROTECTED 20,000 OHMS/VOLT MULTIMETER

A FULLY PROTECTED 20,000 OHMS/VOLT MULTIMETER

This article introduces a project which will be of special interest to laboratory workers and radio enthusiasts, high-performance 20,000 ohms-per-volt multimeter. Overload protected, the new instrument offers more than merely separate measuring ranges and is ideal for servicing, experimental and development work. Much of the usual wiring is replaced by a printed wiring board, which simplifies its construction.

By Jalemsen Rowe

A FULLY PROTECTED 20,000 OHMS/VOLT MULTIMETER

PART ONE

Figure 1: The overload protection circuit given was, in fact, that of January, 1958, to which had been added silicon diode overload protection.

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Hioki TH-J30 Multimeter

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Radio, Television & Hobbies, May, 1964
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Radio, Television & Hobbies, May, 1964
A long centimeter scale is required for this purpose. Consider, for example, that the 0-60 KV scale corresponding to the EHT probe. Considering the number of ranges provided on the instrument, the meter face is remarkably simple. The uppermost scale is the ohms scale, which is used for all six ohms ranges. Beneath it are the two voltage-current scales, a 0.3 and a 0.10, which are used for all twenty-five voltage and current ranges. The fourth scale is a single scale which may be used for comparative AC voltage measurements.

There are various things which must concern us here at the outset. One must usually have a separate scale for rectifier non-linearity. At low current the deflections follow a hyperbolic relation with voltage and current deflections. There are often additional oblique lines, coloured areas or numerical — the 0-3 scale. This has three additional figures in another colour for the 0-40 KV scale corresponding to the EHT probe. Considering the number of ranges provided on the instrument, the meter face is remarkably simple. The uppermost scale is the ohms scale, which is used for all six ohms ranges. Beneath it are the two voltage-current scales, a 0.3 and a 0.10, which are used for all twenty-five voltage and current ranges. The fourth scale is a single scale which may be used for comparative AC voltage measurements.

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431 Elizabeth St., Melbourne, C, Tel. Phone 34-6559.

Radio, Television & Hobbies, May, 1964

Through these things all considered, however, it is still possible to design the ranges and scales so that the meter face is considerably simpler and easier to use than the average. Figure 2 shows the meter face of our new instrument and indicates the results of our efforts in this regard. The next article will discuss in detail the ranges provided by our new instrument, in preparation for the constructional material in the third article.
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Now made in Australia!

This range of Insulated Power Resistors is intended to replace the smaller size of cement coated wirewound resistors. The remarkable reliability of Metox resistors has been confirmed by the use of some millions in radio and television receivers over the past years.

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>MAXIMUM LENGTH</th>
<th>POWER RATING</th>
<th>RANGE * OF VALUES</th>
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<tr>
<td>F32</td>
<td>2 inches</td>
<td>4 Watts</td>
<td>20 n to 35K</td>
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<tr>
<td>F33</td>
<td>1 1/2 inches</td>
<td>6 Watts</td>
<td>30 n to 39K</td>
</tr>
<tr>
<td>F34</td>
<td>1 inch</td>
<td>8 Watts</td>
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<tr>
<td>F35</td>
<td>2 1/2 inches</td>
<td>10 Watts</td>
<td>50 n to 66K</td>
</tr>
</tbody>
</table>

*Values down to 10 n, 20 n and 250 n can be supplied on types F32 to F35 respectively to special order.

TOLERANCE: ±2% one month after manufacture. The resistance value must be recalculated for any higher value.

STABILITY: Stability is low with 1% change in ohmic value after 500 hours operation at full rated load.

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VOLTAGE LIMITATION: The maximum voltage which may be applied to the resistor is limited to 600 volts r.m.s. between the resistor and a body in contact with the surface.

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500 Little Collins St., Melbourne. Telephone: 62 3191
Branches in Sydney and Adelaide

Radio, Television & Hobbies, May, 1964
"Crazy," you say.

Well, what say you knock on the man's door and suggest that such is the case?

But, before we take any such action, it may be fairer if we first looked at the evidence.

The writer of the letter who, I assure you, gives no hint of mental aberration, introduces himself as a 28-year-old TV servicer, employed by a large local company. He leads off with some old TV serviceman, employed by a large company in this country. The man half his age.

"Radio, Television and Hobbies." The fads I am about to relate to you were told to me by a non-technical man. Some time later the man decided to reach out to steady the picture, but it immediately returned to normal, the whole episode taking about 30 seconds. Nobody with any reputation back-ground saw it, so you can imagine how the camp was divided. There were those who told him to keep off the bottle, those who believed him and those who weren't sure what to believe.

"When he got over his surprise, he realized not to steady the picture, but that the picture had a slow roll first. When the set came on, to his amazement, the picture had a slow downward roll and was in FULL COLOUR!" Well, what's your reaction to such a letter?

Burn it or consider it? To my mind, three explanations suggest themselves as being possible, if not likely:

(1) HALLUCINATION. The man in question could simply haveimagined he saw the effect. The alleged correspondence of the colours "seen" with those seen in the studio, and the color of the set? A difficulty is that this explanation takes no account of others who allegedly saw the same effect.

(2) SUBJECTIVE COLOUR. From time to time there has been discussion and experiment around the idea of producing a sensation of colour, using purely black and white patterns, by exciting the rods and cones of the eyes in a specific manner. One of the most ambitious experiments, arranged in conjunction with B.B.C. television, produced quite vague results, some people apparently "seeing something"... but that's about all. If that represents the limit of what B.B.C. engineers could deliberately contrive, what are the chances of someone using a complete studio scene in full colour by accident and, apparently, in the absence of any colour mechanism, subjective or otherwise?

This theory I can't buy! A HOAX? From any correspondent's letter, which contains rather more back-ground than is necessary that people will reproduce, I formed a picture of the man who wrote the letter, mentally known, not devoid of humour and associated probably in some way with a group of wits-to be trusted to pull a good, old-fashioned leg-pull.

Who knows? It might even get into print! (J.B., Lower Hutt, N.Z.)
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MOVING SHORTLY TO 220 PARK ST., STH. MELBOURNE

Radio, Television & Hobbies, May, 1964

70
a letter from R.S., of Kogarah, N.S.W.. excessive speed." He begins thus: "Sir Robert then goes on to relate R.C.A.'s publicity sheets 'What is Dynagroove?' page 102, Nov- 50 cents, but the resultant publicity more little technical substance,' speaking of in verse as fellows:

"Distortion—Its Cause and Correction in its performance. It is entitled 'Tracing "electronic brain' referred to and, I think, more "popular" level. As I write, there has been a flare-up publication may allow other readers. Particularly those whose mission

"Roug JUSTICE

Pity Sir Robert Watson-Watt Strange ranges of his radar plot And thus, with others I could mention A victim of his own invention. His magical all-seeing eye was difficult enough as it was, without being com- bined with a love of scenic poetry. In fact, the overstatement in this par- ticular case was a saving grace of the article from a serviceman's viewpoint: If the writer (or shadow writer) showed any little regard for technical fact, what influence such a combination of sentiments may have on the arguments by listing certain basic facts:

"The hand that once created it. And as for you, arrogant buffoons Who may be nailing up your coffins: Particularly those whose mission deals in the realm of nuclear fission Deals in the realm of nuclear fission And thus, with others I could mention A victim of his own invention. His magical all-seeing eye was difficult enough as it was, without being com- bined with a love of scenic poetry. In fact, the overstatement in this par- ticular case was a saving grace of the article from a serviceman's viewpoint: If the writer (or shadow writer) showed any little regard for technical fact, what influence such a combination of sentiments may have on the arguments by listing certain basic facts:

"And bites, no doubt with legal wit. It spots the speeding motorist But now, by some ironic twist, Enabled cloud-bound planes to fly And bites, no doubt with legal wit. It spots the speeding motorist But now, by some ironic twist, Enabled cloud-bound planes to fly And thus, with others I could mention A victim of his own invention. His magical all-seeing eye was difficult enough as it was, without being com- bined with a love of scenic poetry. In fact, the overstatement in this par- ticular case was a saving grace of the article from a serviceman's viewpoint: If the writer (or shadow writer) showed any little regard for technical fact, what influence such a combination of sentiments may have on the arguments by listing certain basic facts:

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<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Movement</th>
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**HORIZONTAL READING METERS**

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<td>V.U. Meter</td>
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MELBOURNE ... VICTORIA 63 5973

Radio, Television & Hobbies, May, 1964 73
STEREO BALANCE IN DEBATE

The matter of stereo balance continues to be the subject of readers' comment, both related and unrelated to what has been said before this. In these and the "Argument" columns, some good purpose may be served, therefore, by acknowledging readers' opinions and adding relevant remarks.

To start things off, a reader, A.M., coming from a point midway between phasing, can produce the effect of sound misplaced sources, properly balanced and purely single channel or mono situation, our readers and, while they involve a centre-line, the apparent sound source as the loudspeaker on that side is only present when the sound source is听ed separately. Forced sound appears, to a person in an auditorium, the apparent sound source is听ed separately, he can always obtain good balance, in one way or the other without creating a "hole in the middle" effect, or rather the lack of it, a phenomenon deliberately invoked. One can hardly deny the truth of this latter statement, A.M., goes on to say that he has always been greatly pleased by references to "the hole in the middle" since, with proper ('stationery' phasing, that is the very place from which ALL centrally voiced sound would appear to come.

In his own case, he says there are three positions in his room from which he conveniently listens, according to what he happens to be doing at the time. The interesting thing is that, although the positions are six to eight feet apart, he can always obtain good balance by properly adjusting the relative loudness from the two loudspeakers.

By Neville Williams

Basically, I go along with these observations in principle with what A.M. says. In the sound system to which I refer, stereo reinforcement is delivered into an auditorium from two symmetrically placed but completely camouflaged sound-channels. Using a good quality microphone and amplifier, and with the level set for comfortable listening, for much of the time the audience is conscious of having the speakers in phase — to a quite noticeable extent. I fully appreciated the effect, because it is fairly obvious and, in any case, will lend itself to the apparent source of sound one way or other without creating a "hole in the middle." I refer to the "hole in the middle" effect, or rather the lack of it, a reader R.F., from Brookvale, N.S.W., says that he has a stereo system in a 24ft x 12ft living room, with speakers apart, he can always obtain good balance, by properly adjusting the balance and occupy apparent centre, may be combined with bookshelves above and below from the point of view of the "little phile dream-homes, makes good sense. Reader H.F. also points out the necessity of having the speakers in phase — a matter which has been stressed many times in these pages and elsewhere. He makes the further point that volume control should be matched in terms of resistance per angle of rotation, that the effect will not change significantly with variations in volume control settings.

Reader R.L. from Brisbane takes up the same point in connection with stereo balance. He says that he has noticed that volume control settings alter the balance. In some cases, to a quite noticeable extent.

"A consider that the room sources of this trouble is, the proper 'tapping' of stereo and treble control potentiometers. It has made the trouble manifest one cannot have the advantage in terms of resistance per angle of rotation, that the effect will not change significantly with variations in volume control settings."

It was not until I heard stereo that I fully appreciated the effect, because it is fairly obvious and, in any case, will lend itself to the apparent source of sound one way or other without creating a "hole in the middle." I refer to the "hole in the middle" effect, or rather the lack of it, a reader R.F., from Brookvale, N.S.W., says that he has a stereo system in a 24ft x 12ft living room, with speakers apart, he can always obtain good balance, by properly adjusting the balance and occupy apparent centre, may be combined with bookshelves above and below from the point of view of the "little phile dream-homes, makes good sense. Reader H.F. also points out the necessity of having the speakers in phase — a matter which has been stressed many times in these pages and elsewhere. He makes the further point that volume control should be matched in terms of resistance per angle of rotation, that the effect will not change significantly with variations in volume control settings.

Reader R.L. from Brisbane takes up the same point in connection with stereo balance. He says that he has noticed that volume control settings alter the balance. In some cases, to a quite noticeable extent.
which the effect is evident in practice. The important matter is not any discrepancy in the treble response of the two channels, preferably from frequency disc to loudspeaker voice coil.

Considering the possibility of frequency imbalance in the pickup as well, this could add up to a good case for checking treble response of the two channels, separately from frequency disc to loudspeaker voice coil. Some have suggested that all such objections could be overcome by having a mono, disc coming from the left channel of a stereo system and the higher notes from the right speaker, or vice versa. This can be done when you have ganged bass and treble controls, as in most systems.

"I have noticed that you do not agree with separate bass and treble controls in each channel of a stereo system. I quite agree with you." However, the idea may not have been conceived with the same effect in mind as I think I have pointed out in the past, the average audiophile tends to play mono, discs through a stereo system, using separate bass and treble controls.

"It adds realism by the fact that you can get a different type of stereo effect, depending on whether the bass and treble controls are in or out. This is not to say that it is not possible to simulate a single sound source with two woofers and a tweeter, but in the average amplifier to correct this could add up to a good case for checking treble response of the two channels, preferably from frequency disc to loudspeaker voice coil.

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Radio, Television & Hobbies, May, 1964
FAURE REQUIEM—"a gentle beauty"

FAURE—Requiem, Op. 48. Victoria de los Angeles and, later director of music at one of Paris' greatest and fashionably fashionable churches—La Madeleine—and was thus saturated to this beautiful work that its composer, Faure, created during his adult life. True he was, during a period of great personal problems of balance between singers and acoustics helped solve the many tricky problems. Under Cluytens the orchestra plays in grand form here. He suits his style, as he always does, effortlessly to its loveliness remains unrevealed.

Ravel—Bolero; La Valse; Pavana; Bolero for a Devil Insulter, Boston Symphony Orchestra conducted by Charles Munch, RCA Stereo LSC 2664. Another Frenchman stay with an American orchestra in this highly enjoyable album because the orchestral balance is not always quite as satisfactory, as you will find in either of the two works reviewed above. There is throughout a slight, very slight, tendency to give the woodwind more than its rightful share of the balance almost to the point degenerates into sentimentality. Bernstein and the New York Philharmonic supply generous collaboration that much of their part is often so weakly

Vinyl—Bachianas Brasilieras No. 5 of Villa-Lobos. a composer of amazing rhythmic Brazilian Dance which is played brilliantly as it is recorded.

The next piece, Sensuemita by Mexican composer Silvestre Revueltas, is perhaps the best, the Bachianas Brasilieras No. 5 of Villa-Lobos, a composer of amazing rhythmic brilliance, is in some of the tultis, that is as it should be, but so seldom is heard in a concert hall.

Ravel—Bolero; La Valse; Pavana; Bolero for a Devil Insulter, Boston Symphony Orchestra conducted by Charles Munch, RCA Stereo LSC 2664. Another Frenchman stick with an American orchestra in this highly enjoyable album, because the orchestral balance is not always quite as satisfactory, as you will find in either of the two works reviewed above. There is throughout a slight, very slight, tendency to give the woodwind more than its rightful share of the balance, almost to the point degenerates into sentimentality. Bernstein and the New York Philharmonic supply generous collaboration that much of their part is often so weakly.

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Radio, Television & Hobbies, May, 1964

composed by musicians born in the western United States and with one exception, Latin American. The exception is Aaron Copland who comes from the western hemisphere and, with one exception—Leonard Bernstein, is Aaron Copland who comes from the western hemisphere and, with one exception, Latin American. To take the pieces in order, we must start with one of the best, the Rachmaninoff Rhapsody on a Theme of Paganini. The soloist, Nathanael Dettmar sings the vocal part in a fresh, graceful way of great assurance and charm, making a plastic contrast in the grave tone of the accompanying cells. These, for the most part, are admirably played but there are moments when the soloist wavers ever so slightly a little away from the dead centre of a note.

The French-trained Camille Guarnieri is represented by an easily flowing Brazilian Dance which is played

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Radio, Television & Hobbies, May, 1964
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G.R.D. INSTRUMENTS PTY. LTD.
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Radio, Television & Hobbies, May, 1964
Oscar Lorenzo Fernandez’ Batuque is a Brazilian Dance music more heartfelt than Courtois’. Its persistent stamping rhythms call to mind those of Borodin in his Polovtsian Dances from Prince Igor, though in no way imitates them. This, too, is splendidly play-
ed and recorded.

An American in Paris is no exception. The melodic line displays all the composer’s custo-
matic put together, and admirably.

It includes a scene between the two in a wedding chamber. Imagination boggles at the music of much of its significance.

The story is so universally known that one should have any difficulty in relat-
ing the music to the action. There might be some retouching, Ohana offers a

Of the two I prefer Rodrigo. He seems much more comfortable in his language than Gliosha, who despite furious efforts to emulate a serial style, still finds him-
sel immovably tethered to old-fash-
ded period; actually, the various pieces are splendidly played and the sound en-


Stereo Amplifier, 10 watts, are treble and bass, two nick-

as being a solo guitarist against a modern or-

★ ★ ★

** RECOMMENDED

Franck — Symphony in D Minor played by Munch and the Boston Symphony Orchestra, RCA S.T.V.C.1034.

Franck — Grande Pièce Symphonique. Played by Virgil Fox on the phonol-

Franck — Fantasia for a Courtier. Played by Rodrigo — Fantasia for Guitar and Or-

Rodrigo — Fantasia for c. Courtier. Olsen — Concerto for Guitar and Or-

Carlos Chavez, a Mexican, has been a heavy trinity to Stravinsky in his Sinfonia India-Maya. Of the phrases, and much of the other, seems to have been lifted straight from the Fair Scene in Pet-
ruchka. Then, quite surprisingly, the second strain has in it much of the quality of an English folk song. The text of these stanzas is terribly

tational music, despite its unquestionable vigor, is a little on the dry side and his Danzon

Rodrigo — Fantasia for Guitar and Orchestra.

Nicola Varese (pianist) with the National Orchestra of Spains conducted by Rafael Kubelik.

SXLAT510.

**

Much of it is reminiscent of the Ameri-

Is the test of time quite so successfully.

As with many of contemporary composers, despite the French influence, no-one should have any difficulty in relat-
ing the music to the action. There might be any some retouching, Ohana offers a

Given the above, the listener is left with the impres-

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If you want sound is first rate.

The piece that might find itself more of a fort-

and is content to confine his twentieth-
style they differ vastly. While Rodrigo

Kranichsteiner Festival program at Darmstadt.

H.M.V. Stereo ASD496.

Leipzig — Concerto for Guitar and Orchestra.
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---

*Seen the February, 1964 U.S. Consumer Report on pick-ups?*
In years of reviewing devotional records, I've come across few as enjoyable and interesting as this. The Billy Graham Crusade Choir has produced an LP titled "A Nation Sings: Five Thousand Voices Directed By Cliff Barrows." The record contains not one recognisable word of Welsh. This is one of the best devotional records I've heard recently, the stereo making a valuable contribution to the overall quality. Conducted by Terry James; Reader Emyr Jones. Stereo, HMV Mono OCLP 7601. (Also available in Mono OCLP 7601.) Technically, the sound isn't 100 per cent perfect, but for all the improvement, I still have no complaints in regard to the disc. I must equally agree that it has its reservations in regard to the disc. On Broadway, "St. Louis Woman" and "People Will Say We're In Love." On Broadway, "No Secret." (W.N.W.)
THE BI-RADIAL ELLIPTICAL stylus of 1963. The V-15 performance of the art" as recently as the late sum-
it unit incorporates highly disciplined re-
finements in design and manufacture that were considered "beyond the state
of the art" as recently as the last sum-
mer of 1963. The V-15 performance speci-
fications and design considerations are heady stuff—even among engineers.
They probably cannot be assimilated by
anyone who is not a knowledgeable
audiophile, with or without access to
the incredibly close tolerances and
routinely rigid inspection techniques
involved, it is not inexpensive. Per-
fection never is.
THE BI-RADIAL ELLIPTICAL STYLUS
The outstanding characteristic is that
the V-15 Stylus has two different radii
of contact, as shown in the figure above,
that were considered "beyond the state
of the art" as recently as the last sum-
mer of 1963. The V-15 Stylus vastly re-
solves the problem of tracking distortion
inherent in the record-groove material . . .
with a rating of 10 on the Marantz hardness scale. It's one thing to make a simple diamond cone, alto-
gether another to make a perfectly symmetrical Bi-Radial stylus with suffi-
ciently close tolerances, actually within
one tenth of an inch! Shure has developed unprecedented controls, in-
spections and manufacturing tech-
niques to assure precise positioning,
configuration, dimensions and tolerances of the diamond tip. It is a singular
and exacting procedure . . . unique in the high fidelity cartridge industry. And,
joints these acoustic technical safeguards are used, an imperfor-
tively formed elliptical configuration can result
and literally do more harm than good to both record and sound (as is the case with conventional elliptical stylus).
THE V-15 BI-RADIAL ELLIPTICAL STYLUS
The 15° effective tracking angle has recently been the subject of some
considerable debate. It conforms to the effective re-
cord cutting angle of 15° proposed by
the RIAA and EIA and now used by
the major record producing companies
and thereby minimizes tracking distor-
tion. The major features, then, of the V-15 are the Shure Bi-Radial Elliptical Stylus, the singular quality control tech-
niques and standards devised to provide
perfection of stylus symmetry, and the 15° tracking angle. They combine to reduce IM and harmonic
or distortion. In fact, the distortion (at normal record
playing velocities) is lower than the in-
herent noise level of the finest test
records and laboratory measurement in-
struments! In extensive listening tests,
the V-15 proved most impressive in its
hand-crafted and subject to quality con-
trol and inspection measures that re-
result in space-age reliability. Precision
machined aluminium and a special
ultra-stable plastic stylus grain. Exact
alignment is assured in every internal
vice—a connoisseur's cartridge in every
word, £47/15/6 retail.
In the illustration below how the points of
tangency (arrows) of the Bi-Radial ellip-
tical stylus remain relatively constant
because of the very small 5 micron (.0002 inch) side contact radius.
The Bi-Radial Stylus vastly reduces
the "pinch effect." As experienced audiophiles know, the record
trackability. It consistently proved
better than any other cartridge tested.
In true musical comedy tradition, an officer of the Viennese Hussars marries a princess but immediately regrets so doing. Flees from the situation, falls in love with the leader of a ladies' band. But the King and a rival court official, who pursues him, also find diversion with members of the band. In such complicated surroundings, the stage is set for a happy ending when the leader of the band visits the unfortunate prince to assist and teach him to appreciate music.

**Instrumemtal, Vocal and Humor**

**MY CONCERTO FOR YOU, Russ Conway**

and His Orchestra and the Williams Singers, Stereo, World Record Club, S-8797.

**Performance:** Excellent

**Quality:** Excellent.

**Stereo:** Normal spread.

The notes point out that Russ Conway, one-time turntable song writer, was the featured pianist, more or less by accident, even though he had never had the privilege of a music lesson. Whatever problems this may have posed in daily life, there is no hint of them here as Russ Conway fronts the orchestra and chorus in a series of numbers that are very easy on the ear. The songs are by a variety of composers, including Harry Warren, Fred Kern, and Max Steiner. Certainly, Marty Gold seems to think of it as "atmosphere" music. The quality is good, as also is the quality, except for some tracing distortion on the very last track. (W.N.W.)

**BLACK SATIN, The George Shearing Quintet And Orchestra. Stereo, World Record Club S-8051.**

Interest: Mildly restricted and there is just a trace of distortion on some inner tracks. (K.W.J.)

**RHYTHM ANTIQUES, Organ and Percussion. Stereo, Universal Record Club UP-546.**

**Recording:** Excellent

**Quality:** Good.

**Performance:** Very Good.

**Interest:** Melodic "atmosphere" music.

The album, which is described as "atmosphere music," plays for many of the major dancing championships in England. Local orchestras of old time and straight ballroom dancing should find much to please them on the disc.

The playing of this group is very definitely "stnet tempo" and although their orchestrations have sufficient embellishments to make them interesting they should not prove distracting to dancers. The quality of the disc is generally good, but not quite up to real "HI-FI" standards. The frequency response is mildly restricted and there is just a trace of distortion on some inner tracks. (K.W.J.)

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Radio, Television & Hobbies, May, 1964

**THE QUALITY OF THE RECORDING**

The title: "El Cumbanchero," "Bali,

"Bali, Love Of You," "Yesterday, More Than

You Know," "I Love You," "September

Song," "Love Is Here To Stay," "Mood

Ole." The quality is very fine and up to standard

and the surface noise is minimal.

**Stereo:** Normal.

**Quality:** Good.

**Performance:** Very Good.

As with all the King records which have come our way, the recording quality is excellent. From all viewpoints, this disc can be highly recommended. (E.R.)

**COME TO THE BALL, Harry Davidson**


**Quality:** Good.

**Performance:** Very Good.
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- Interlocked push buttons.
- Pause control.
- Hub locks to lock tape-reels.
- Automatic stop (optional extra).

Can be used as P.U. amplifier.

Price 92 gu.

Classic Radio
245 Parramatta Road, Haberfield N.S.W. PHONE UA 2145

84

Radio, Television & Hobbies, May, 1964
IN HI-FI STEREO EQUIPMENT BY CLASSIC

Based on Radio & Hobbies Playmaster No. 4 and Playmaster 101 Amplifiers also the Mullard 10-10. All units have built in dual wave tuners.

WRITE FOR FULL SPECIFICATIONS

SPECIFICATIONS COMMON TO ALL UNITS:
- Inbuilt high gain dual wave tuner with a frequency coverage of 350 to 1,600 K.C. on the broadcast band and 16 to 49 metres on short wave.
- EM84 tuning indicator giving accurate tuning with ease. Two channel tone control stage with separate bass and treble controls.
- Separate facilities for selecting external tuner—stereo pick-up—stereo or mono tape recorder for recording or play back.
- Stereo reverse switch.
- Calibrated dial scales available for all states showing main stations in large type with separate scales for short wave using two dial pointers.
- Chassis is mounted in attractive and durable metal case finished in black with embossed control panel in black and silver with matching knobs.

PLAYMASTER

PLAYMASTER 4 UNIT WITH TUNER
0 Output 8 watts per channel (16 watts).
0 Incorporating Ferguson grain oriented output transformer giving a frequency response of 20 to 25,000 cycles.
0 Valves 4 6GW8, 12AU7, 6N8, 6AN7, EM84 and two IN1763 rectifiers.
AMPLIFIER AND TUNER, £55/16/-. WITH GARRARD AUTOSLIM STEREO CHANGER AND TWO MAGNAVOX 8WR SPEAKERS, £69/10/-. ALL PRICES F.O.R. SYDNEY

PLAYMASTER 101 UNIT WITH TUNER
0 Output 12 Watts per channel (24 watts).
0 Incorporating Ferguson grain oriented output transformer giving a frequency response of 20 to 25,000 cycles.
0 Valves 4 6GW8, 12AU7, 6N8, 6AN7, EM84 and two IN1763 rectifiers.
AMPLIFIER AND TUNER, £55/16/-. WITH GARRARD AUTOSLIM STEREO CHANGER AND TWO MAGNAVOX 8WR SPEAKERS, £69/10/-. ALL PRICES F.O.R. SYDNEY

MULLARD

MULLARD 10-10 UNIT WITH TUNER
0 Output 10 watts per channel (20 watts).
0 Incorporating Ferguson grain oriented output transformer giving a frequency response of 20 to 25,000 cycles.
0 Valves 4 6GW8, 12AU7, 6N8, 6AN7, EM84 and two IN1763 rectifiers.
AMPLIFIER AND TUNER, £58/10/-. WITH GARRARD AUTOSLIM STEREO CHANGER AND TWO MAGNAVOX 8WR SPEAKERS, £82/10/-. ALL PRICES F.O.R. SYDNEY

A COMPLETE HI-FI STEREO SYSTEM FOR ONLY 59 GNS. F.O.R.

UNIT STEREO PLAYMASTER AMPLIFIER No. 106 WITH PLAYMASTER TUNER

NOW USING THE NEW 6GW8 OUTPUT VALVES

SPECIFICATIONS:
0 Output 8 watts per channel (16 watts).
0 Incorporating Ferguson grain oriented output transformer giving a frequency response of 20 to 25,000 cycles.
0 Valves 4 6GW8—12AU7—16AE8—1 fBAG 1 EM84—2 IN1763 Rectifiers.
0 Supplied in self-contained case finished in beige, hammer tone, with black and gold control panel with matching knobs.
0 Switching and Input facilities for pick-up—radio—F.M. Tuner and Tape Recorder.
0 FULLY GUARANTEED.

Classie Radio
245 PARRAMATTA ROAD, HABERFIELD, N.S.W. PHONE UA2145

Radio, Television & Hobbies, May, 1964
THE INDUCED
MAGNET TRANSUDER

Can a new cartridge be THAT different? THE ADC POINT FOUR CARTRIDGE is. It emphasises a concept sufficiently unique to establish a new type of playback head. It is, indeed, the most advanced cartridge available anywhere today.

1. **A FREEDOM FROM SATURATION AND HYSTERESIS**
   - By having all the permanent parts of the head in a remote position with respect to the main structure, thus reducing IM and harmonic distortion to a dramatic new low.

Performance of the ADC POINT FOUR can be summed up by a few words Percy Wilson, M.A., had to say about it in the December, 1963, issue of the "Gramophone" (U.K.):-

"LISTENING TO DIFFICULT RECORDS SHOWED AN dramatic new low.

Here, then, are the cold specifications. Proof of what they mean is up to your own ears:

<table>
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<tr>
<th>Specification</th>
<th>Point Four/E (Elliptical Stylus)</th>
<th>Point Four/D (Elliptical Stylus)</th>
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<tr>
<td>Compliance</td>
<td>30 * 10^-6.cms/dyne</td>
<td>30 * 10^-6.cms/dyne</td>
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<tr>
<td>Tracking force</td>
<td>30 - 60 lbs.</td>
<td>30 - 60 lbs.</td>
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<tr>
<td>Record to record velocity</td>
<td>100,000 rpm</td>
<td>100,000 rpm</td>
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<tr>
<td>Tracking force at 30 lbs</td>
<td>100,000 rpm</td>
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<tr>
<td>Tracking force at 60 lbs</td>
<td>100,000 rpm</td>
<td>100,000 rpm</td>
</tr>
<tr>
<td>Tracking force at 30 lbs in the cartridge</td>
<td>100,000 rpm</td>
<td>100,000 rpm</td>
</tr>
</tbody>
</table>

Find out more and ask for the complete product story.

J. H. REPRODUCERS

106 PINE AVE., ELWOOD, VIC.
PHONE 91-4583

VARIETY FARE

-listens, it will simply be a matter of reacting favourably or otherwise to key-features given.


If you're keen on the music or the artistry, you need not have any worries about the technical quality. (W.N.W.)

ELECTRODYNAMICS. Dick Hyman At The Lowrey Organ And His Orchestra, Stereo, Command SNKL-931221.

Interest: Organ plus orchestra.
Performance: Excellent.
Stereo: Excellent separation.

One can't help comparing and contrasting this disc to Ethel Smith's "Rhythm Antics." I'm afraid to the disadvantage of the latter. In all but price.

While Ethel Smith displays plenty of digital dexterity, Dick Hyman provides better arrangements and better amalgamation between the organ and orchestral sound. For much of the packet notes would give credit to the facilities available on Dick Hyman's Lowrey organ.

While some may argue that this disc gives the organ a new lease on life, I believe it is more a representation of the quality of Dick Hyman's performances. His playing is good enough to make the best of any orchestra he is playing with.

The tunes, some of which are recognizable from previous recordings by Ethel Smith, are: "Laura," "Memories Of You," "Hail The Conquering Hero," "I Love Paris," "That Sunday Afternoon," "Shadowland," "Big Ben Bossa," "It's All In A Night," "I'll Be Waiting Again." (W.N.W.)

HAIL THE CONQUERING HERO. Peter Nero With Orchestra Conducted by Marty Gold. RCA. LP. DSP-2638.

Interest: Popular piano.
Performance: Entertaining.
Quality: Good.
Sound: Good.
Overall appeal: Good.

Whatever reservations one might have had about Peter Nero, and the present extravagant tide, there can be no doubt about his current appeal and his current successes. In this new disc, the Peter Nero-Marty Gold combination does a musical tour of Europe per medium of titles that have some European association. Peter Nero also does a "tour" of piano styles.

Radio, Television & Movies, May, 1964
DANCE TO THE 7 THEMES, with Steve Race and His Orchestra (leader Charlie Katz) and the Steve Race Quintet, World Record Club, 12-inch stereo, £1.95. (Also available in mono.)

Interest: Dance music.
Perfection: Good.
Recoding: Recording standard.
Stereo Quality: Good.

Those who like to do their dancing to the music from popular TV series - or arrangements of the themes, to be more precise - will find this record to their taste. So too will those who would like to keep them as entertainment in their own right.


The quality is well up to modern standards and the stereo is used to give something of an old-world association, although I fear the recording acoustics seem to have been rather chilly by the standards of music and dancing by performance of Choral (Scottish) ever-

Interest; Liebeslieder.
Recording: Good.

& G. 12-inch Mono, WG-B-1793.

Brahms. The Methodist Ladies' Ensemble is a chorus, dance-troupe, and a民用流行音乐和舞蹈的表演团体。

The performance is disciplined, yet lively and aural pleasant throughout.

About the only query I have regard-

ing the performance is in connection with the tracks "Over The Fields" and "Song Of The Plains." I will readily admit that you could write your own music in the Russian manner, and I found it partic-

ularly enjoyable.

The performance is disciplined, yet not rigid. The band utilizes the arrangement of arrangements in a way that is simply lovely, and I found it partic-

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The performance is in connection with the tracks "Over The Fields," "Song Of The Plains," and "The Autumn Leaf." I will readily admit that you could write your own music in the Russian manner, and I found it partic-

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ularly enjoyable.
ON THE COUNTRY SIDE. The Norman Luboff Choir. Produced by Neity Plumb and Al Scmitt. Stereo, RCA Dynagroove, LSP-2819. (Also available in Mono.)

* * *

Stereo: Excellent spread.

To satisfy the apparently insatiable demand for songs by the late Al Jolson, and to add album 10 to those currently broadcast on medium of records and the CBS radio network.

Mall the coupon for full particulars of our Radio receiving apparatus.

The Norman Luboff Choir. Recorded in RCA's Hollywood studios, the sound has the fullsome, glossy quality that one associates with the film colony, yet it is not lacking in warm country-style spontaneously.

 pedido. If not, pardon my ignorance.

The recording is of a high standard, although the critical may find the noise level a little high. A small amount of overload distortion is in evidence on peaks.

If a mistake could have been made here? If not, pardon my ignorance.

It happens that the theme is music of the countryside:


For example: "The Music of America," "The Norman Luboff Choir," and "The Norman Luboff Sound." It just so happens that the term "country" is very much in vogue these days, and it is not surprising to find the Norman Luboff Choir recording, which was a tribute to one of America's best-loved popular singers.

All in all, a well-recorded selection of Runest, Soviet and "Western" music performed with precision and feeling. (J.R.)

The Norman Luboff Choir. Produced by Neity Plumb and Al Scmitt. Stereo, RCA Dynagroove, LSP-2819. (Also available in Mono.)

Stereo: Effective spread.

Whatever association the term "country and western" may have for you, there is nothing hill-billy about this presentation by the Norman Luboff Choir.

Perhaps one can best sum it up by suggesting that this is primarily a Norman Luboff Choir recording, which will appeal as ever to those who like the Norman Luboff sound. It just so happens that the sound is housed in a beautiful box, with the Lacraft 605L, All-balance arm ADC cartridge, diamond magnetic, including the best speakers and speaker boxes.

All those articles you can purchase from R.M.S., MELBOURNE, you see how much you can save buying world's best Hi-Fi Stereo Equipment.

Such as famous Pioneer SMB 161 Amplifier, 11-watt per channel, selection of built-in built-in Hi-Fi Stereo equipment.

If you spend a little more you can incorporate the Pioneer SMB 204 or the SMQ 300, with the Lacraft 605L, All-balance arm ADC cartridge, diamond magnetic, including the best speakers and speaker boxes.

Get your record and to add album 10 to those currently broadcast on medium of records and the CBS radio network.

To satisfy the apparently insatiable demand for songs by the late Al Jolson, and to add album 10 to those currently broadcast on medium of records and the CBS radio network.

RADIO IS the application of electronics to the design, qualified radio engineer, and the Course STOTT amateur radio students receive the latest advances in the field of electronics.

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Popular Jazz
KANSAS CITY JAZZ, featuring Pete Johnson, Joe Turner, Count Basie, Hot Lips Page, Mary Lou Williams, Eddie Durham and Benny Goodman, Universal Record Club, Mono, UJ-537; Performance: Excellent.

The full personnel of the various groups is too numerous to list, but they are made up of competent men and women who are well capable of producing good performances. The quality is generally good, particularly, when mentioned, Pete Johnson and Count Basie groups.

The title of this disc may be a little misleading, because Lionel Hampton and his group were both going strong in Kansas City at least, in 1937 and, as a consequence, the place became something of a mecca for musicians. Much good jazz was played at that time and the disc features many groups which were prominent then.

Most of the tracks were cut around 1940 and the numbers featured are: "Stardust," "One O'Clock Jump," "Who Am I Where," "Doggan Around," "Moton's Swing," "Elston's Rag," "Me and the Blues," "Dinah," "Why Don't You Do Right?" and "Little Girl." The title of this disc may be a little misleading, because Lionel Hampton and his group were both going strong in Kansas City at least, in 1937 and, as a consequence, the place became something of a mecca for musicians. Much good jazz was played at that time and the disc features many groups which were prominent then.

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The true stereo sound is THE sound of Music Lovers. Nothing else approaches its living realism because sound itself is an exacting science. To ensure satisfaction, the prospective purchaser MUST consult an expert. We at Mastersound are audio specialists, living for Stereophonic High Fidelity alone.

If you are new to true Hi Fi, we will be proud to initiate and if you are already an audiophile (one of us), please come and talk Hi Fi.

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NEW "ECCO" PRODUCTS FROM Wm. J. McLELLAN

Messes Wm. J. McUellan and Co., Pty. Ltd., announce the release of three interesting new products from Emerson and Cuming, Inc., of Canton, Massachusetts. The first of these products is known as Eccoshield ES and it is a highly conductive surface coating packed in an aerosol can.

Eccoshield ES has been successfully tested over the past few years in the U.S.A. and has been used in high RF Integrity of screen rooms and instrument housings by painting on joints and seams. Use of the product is claimed to improve the insertion loss value of a reasonably good metal structure by as high as 10 db.

This product is now offered in fast aerosol form for making full turns applicable in typical metal enclosures that have been in use for a few years, seams need to be opened, covered and thereby shifted effectiveness. Eccoshield ES offers a quick and simple solution, since the spray will drive conductive particles into minute cracks and make a quick, temporary RF seal. Conductive or high reflectiveness is as high as 30 db have been claimed.

The second of the new products, illustrated above, is a line of epoxy casting resins with filler consisting of either finely divided steel, powdered aluminium or magnesium coloured wood.

The new Stycasts are two-part systems that can be cured overnight at room temperature, or in one to two hours at 170 deg. F. When cured, each is readily machinable. Stycast wood, after curing, can be cut, drilled and conventional woodworking tools and equipment can be used to cut, shape, drill and machine Stycast. After curing, Stycast aluminium may be cut, shaped, drilled, filed and machine finished. Stycast lead and Stycast steel do not have the same usefulness. Stycast lead and Stycast steel may be carved with a knife, or shaped with conventional woodworking tools and also machinable. Stycast wood, after curing, is designed for use in foams, casting applications, coatings, etc. Stycast resins with fillers consisting of either finely divided steel, powdered aluminium or magnesium coloured wood.

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TRANSISTOR HEARING AID

RADIO HOUSE PTY. LTD.

Packed in a presentation case.
Separate tone and volume control.

306-308 Pitt Street, Sydney. Also at 760 George Street and 6 Royal Arcade.

Compact, smaller than a packet of cigarettes.

Outstanding features:
- Magnetic earphone.
- Precision printed circuit design.

First Phone Model FH-2

Model RH-5

Model RH-114

SPECIFICATIONS:

Price £9-17/- including Sales-Tax. Postage 5/- to 10/- extra.

£11/17/6 including Sales-Tax. Postage 5/- to 10/- extra.

£5/7/6 including Sales-Tax. Postage 5/- to 10/- extra.

10/- each or a packet of cigarettes.

Radio, Television & Hobkins, May, 1964
What is Amateur Radio? When did it start? What use is it? These questions and many others have been received, indicating that there is an increasing interest in the subject. For those who have asked themselves these questions and are still hoping that they will come across the answer, the following will be of interest.

By Pierce Healy, VE2RPG*

AMATEUR LINK TO ALASKA

The recent disaster in Alaska provided a further example of how radio amateurs can put to good use the very limited sectors of the short wave spectrum allotted to their use. On this occasion, as so often in the past, amateur nations provided a valuable link between the stricken area and the rest of the world.

WITH cables and land lines out of commission because of communication severed by the earthquake disaster, much of the early news on the event was conveyed by means of on-air activity. At the peak of the activity, Alaskan stations were known to be in communication with almost all parts of the world. The text of such messages was directed straight to Pierce Healy, VKZAPQ, the Amateur Band News editor, should be of interest.

AMATEUR BAND NEWS AND NOTES

By Pierce Healy, VKZAPQ

Radio, Television & Hobby, May 64
CLEARANCE SALE OF OUR BULK STORE
AT 16 SHERIDAN STREET, GRANVILLE

We must vacate premises by the end of May. New stock added. No reasonable offer refused. Individual or bulk buyers catered for. Ideal opportunity for somebody to start business in this field.

Open on Friday night, 8th May, from 7 p.m. to 9 p.m.
Saturday, 9th May, 9 a.m. to 4 p.m.

A.W.A. CRYSTAL CALIBRATORS
50-100 and 1,000 K.C. 6 Volt Supply
"A12-100" EACH

COSSOR DOUBBLE BEAM OSCILLOGRAPH £35-0-0

Pre-Reporter Radio Telephones Ex-Cabs. Complete with 12 Volt, Min Types 12 Volt Vibrator. Power Supply, Speaker, etc. Approx. 70 lbs., suit conversion, £15-10-0 each.

CLEARANCE OF ODDMENTS

CARTON OF OVER £2 WORTH OF PARTS, ONLY £2-0-0.

American Collins Chokes, 4 Henrys, 265 Ohms.
Hard surfacing 12 gauge. Bundle of Single Headphone with Headband, 560-9402.

Min Types 12V Vibrator. Power Supply, Speaker, etc. Approx. 9 pin Valve Cans 1/ each.
200 MA output, 2/-10/- each.
P.M.G. Phone plugs 2/- ea
Small Phone Jack, Suitable Standard 6H5 Valves. 2/-6 ea.
Range Hinders, £4-10/- ea.
Pots, 120K. 1/-6 each.
35 ohm, 5 watt, w/w. Resistors.
Hand Microphone with Press to
5 amp Fuses 2/- per doz.
12SK.7 Valves. 2/- ea.

COSSOR DOUBLE BEAM OSCILLOGRAPH

PARAGON RADIO

ALL ARTICLES PLUS FREIGHT

(50-100 and 1,000 K.C. 6 Volt Supply)

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(50-100 and 1,000 K.C. 6 Volt Supply)
**HUNTER BRANCH**

At the Annual General Meeting of the Hunter Branch which was held on March 6, the following officers were elected for the coming year:

- **President**—Llew Swank VK2KCS.
- **Secretary**—Les Hall VK2VL.
- **Treasurer**—Bill Hall VK2XT.
- **Social Secretary**—Max McLachlan.
- **Hon. Treasurer**—Bill Hall VK2XT.
- **Vice-Presidents**—Lionel Swain VK2CS, Arie Bles VK2AVA, Jim Muller VK2ZSG.

Several members are reported to be working phone and CW on 40 and 80 metres and it is hoped that the aerial for 160 metres will be completed in the near future. At the end of the evening, Ross Beckley and Mr. Williams gave details of the committee's activities in the State capital.

At the conclusion of the meeting, an item of considerable interest was the announcement that the Hunter Branch has been presented with 61 tons of Wurlitzer organ to be installed in his home. A cordial invitation is extended to the remaining members of the Branch, and it is hoped that the aerial for 160 metres will be completed in the near future. An item of considerable interest was the announcement that the Hunter Branch has been presented with 61 tons of Wurlitzer organ to be installed in his home. A cordial invitation is extended to the remaining members of the Branch, and it is hoped that the aerial for 160 metres will be completed in the near future.
DIAL GLOBES AND BEZELS  
- Sizes: 1 7/8" to 2 1/8" in steps of 1/16".
- For 5" to 14" diameters.
- Prices: 1/3 to 9/6 each.

MICROPHONE INSERTS  
- Models: 114, 124, 150, 170, 210, 211, 212, 214, 240.
- Prices: 2/6 to 3/6 each.

SPEAKERS, TRANSFORMERS, ETC.  
- Molded and metal type.
- Prices: 1/- to 10/- each.

WANTED TO BUY  
- Types: 12, 25, 30, 44, 50, 60, 90, 100, 150, 200.
- Prices: 1/- to 10/- each.

DIODES, TRANSISTORS  
- Prices: 1/- to 10/- each.

CRISTAL SETS  
- Eastern Germanium radio, complete with coil and capacitor.
- Prices: 5/- to 10/- each.

FERRVAC POCKET MULTIMETER  
- Model PT4.
- Prices: 10/- to 20/- each.

SOLDERROK  
- Diameters: 1/8" to 1/4".
- Prices: 1/- to 5/6 each.

BATTERY TERMINALS  
- Diameters: 1/8" to 1/4".
- Prices: 1/- to 5/6 each.

PLUGS AND SOCKETS  
- Types: 114, 124, 150, 170, 210, 211, 212, 214, 240.
- Prices: 1/- to 10/- each.

TRANSISTORISED AUDIO 
- Types: 114, 124, 150, 170, 210, 211, 212, 214, 240.
- Prices: 1/- to 10/- each.

VALVE SOCKETS  
- Types: 114, 124, 150, 170, 210, 211, 212, 214, 240.
- Prices: 1/- to 10/- each.

VARIABLE CONDENSERS  
-Types: 114, 124, 150, 170, 210, 211, 212, 214, 240.
- Prices: 1/- to 10/- each.

SERIALS, TRANSFORMERS  
- Types: 114, 124, 150, 170, 210, 211, 212, 214, 240.
- Prices: 1/- to 10/- each.

METERS  
- Types: 114, 124, 150, 170, 210, 211, 212, 214, 240.
- Prices: 1/- to 10/- each.

DIODES  
- Types: 114, 124, 150, 170, 210, 211, 212, 214, 240.
- Prices: 1/- to 10/- each.

DIODES, TRANSISTORS  
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- Prices: 1/- to 10/- each.
of the band for use by the amateur service in Australia.

This assumption has now proved to be true. This is on the other side of the continent activity commenced much earlier.

On a note from Rod Graham VK8ZS comes
certain details of a 432 Mc contact made at 0100 hours E.A.S.T. on January 1, 1964. The contact was between VK8ZS and VK6LK over a distance of three and one half miles and the signal reports exchanged were 5 X 30. The equipment used was crystal controlled transmitters giving an input of 50 watts to a G.W.O. 60 Final Amplifier. The receiver a crystal locked converter using two 1C02s and a 1KO 70 final but intensely interested group. So far no

locked converter using two EC88 fed into about 20 watts. The receiver a crystal

control with an input of 30 watts to a QQE06/40 Final Amplifier. The antenna was a five element Yagi about 30 feet high.

VK6LK used a QQE06 triplet giving about 20 watts. The receiver a crystal

control was a home constructed L.F. strip, the antenna a five element Yagi 13 feet high. Rod VK8ZS also reports that UHF activity around Perth is limited to a small group of operators using the latest low noise super-regenerative receivers or modulated oscillators.

DETECTION OF THE EARLY PART OF THE SUNSPOT CYCLE

The increasing use of S.B.O. is rapidly changing the elements of Amateur Radio. The emphasis being placed on the ability to handle communications under adverse conditions rather than what was commonly called "broadcast quality." This is also evident in the current interest being directed by the I.T.U. Aeronautical Radio Conference ended late in February with the report of the First Session having been submitted to the Registration Board.

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Special Purchase of Manufacturer's stock of Transistors and Transistor Components enables us to offer Transistors and Kit-sets at a fraction of original cost.

**Complete KIT for TRANSISTOR 6 PORTABLE £10/19/6**

The complete kit of parts for the transistor six includes six transistors, printed circuit board, coil kit, 4in speaker, Ferguson driver and output transformers, heavy duty battery and all necessary parts to complete the set with full instructions. Set is housed in attractive plastic case as illustrated.

Set can be supplied wired and tested at £2 extra.

Dials available for all States. Post and Packing extra N.S.W., 10/; Interstate, 13/.

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**NEW ENGLISH MAZDA TRANSISTORS**

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<thead>
<tr>
<th>MODEL</th>
<th>TYPE</th>
<th>POWER</th>
<th>CURRENT</th>
<th>SUPPLY</th>
<th>CASE</th>
<th>TEMP</th>
<th>PRICE</th>
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<tbody>
<tr>
<td>6N7</td>
<td>12V</td>
<td>1W</td>
<td>10mA</td>
<td>240V</td>
<td>TO</td>
<td>60°C</td>
<td>80/</td>
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<tr>
<td>6N8</td>
<td>12V</td>
<td>2W</td>
<td>20mA</td>
<td>240V</td>
<td>TO</td>
<td>60°C</td>
<td>100/</td>
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<tr>
<td>6N10</td>
<td>12V</td>
<td>5W</td>
<td>50mA</td>
<td>240V</td>
<td>TO</td>
<td>60°C</td>
<td>250/</td>
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</tbody>
</table>

**PE EQUIVALENT**

<table>
<thead>
<tr>
<th>Model</th>
<th>Equivalent</th>
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<tbody>
<tr>
<td>6N7</td>
<td>OC74</td>
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<tr>
<td>6N8</td>
<td>OC44</td>
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<tr>
<td>6N10</td>
<td>OC75</td>
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</table>

**NEW ENGLISH MIDGET POWER TRANS.**

- **40mA prim., 250v.** Sec. 225 x 225 with 6.3v. winding.
- **30mA** 240v Prim. 150 x 150v. Sec. with 6.3v. winding.

**NEW RESISTORS AND CONDENSERS**

- **New Resistors** (mainly L.R.C.) and Condensers include many popular values. The condensers are paper, mica and ceramic, some are older types and shop soiled.

**NEW MIDGET THREE-SP. TAPE DECKS £20**

These new tape decks are fitted with two-track high fidelity heads, three speeds 36, 76 and 78 rpm for third head, speed up to 75m, fitted with 3 digit counter, simplified controls.

Postage and packing extra: N.S.W. 15/; Interstate 20/.
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NEW 8" and 4" EXTENSION SPEAKERS

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Radio, Television & Hobbies, May, 1964
CSSB Transmission From Hilversum

Test transmissions on the new compatible single side band technique are at present being carried by Radio Netherlands in Hilversum in an attempt to reduce interference and increase signal strength.

The test on CSSB (compatible single side band) was begun on 17th April to determine if a more desirable signal to noise ratio and less interference can be obtained, if on a large scale, the normal carrier wave is eliminated and replaced by a carrier plus its sidebands. The tests on CSSB have already yielded some interesting results as far as interference is concerned but the effects on signal strength has not been determined.

The new technique, called CSSB (compatible single side band) is a method of radio transmission using a carrier wave and sidebands containing the modulated audio frequencies to about 4000 cps. The wanted carrier plus its sidebands represents about 4000 Kc for some months but, following a suggestion from the B.B.C. the carrier frequency will be temporarily increased to about 2500 Kc and extra energy is concentrated into the remaining sideband, the effect being that of providing a powerful signal concentrated into a narrower frequency band, the advantage being that it can interfere to a much lesser degree than the normal carrier transmission. The remaining sideband, the effect being that of concentrating the very decided advantage that it can be used for the transmission of signals received on ordinary receivers without the need to make frequency changes, the commercial stations 6KG Kalgoorlie from 860 to 980 Kc and 6AM Northam from 980 to 860 Kc. Though only 2500 Kc has been used on 6200 Kc as well as 2500 Kc, it is expected that 15240 Kc in the broadcast band will be used for the transmission of signals received on ordinary receivers.

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FLASHES FROM EVERYWHERE

TILANDS is a country which most listeners find difficult to tune but the station is heard from "parts unknown." It was on the air last year, and this year will be heard at 0500 GMT and 0600 on 6150 and 4945 Kc; also at 0430 GMT on 6150 and 4945 Kc; also 0300-0400 in English. It is on air from 0300 to 0600 daily, and on Monday, Wednesday and Friday from 0700 in English 6090, 9690 and 11780 Kc. Western North America 0400-0600 in Spanish and 0600-0800 in English.

ARGENTINA station Radio Nacional, operating from 1000 to 1700 hours GMT. The English period from 0500 to 0540 GMT. The station also has a program of English lessons.

CROATIE recently made a frequency change to 9770 as well as 6045 and the new 9525 Kc which was changed to CFCF in 1936; CFCF-CFCX.

In the same year the station increased its I 6005 Kc as again being active. This station is a relay of the oldest station in Central America and is heard in Los Angeles on 9525 Kc. ARNHEM in the Netherlands on 5095 Kc as again being active. This station is a relay of the oldest station in Central America. It was on the air in 1900 and is now on the air at 1900, German 2000, Italian 2100, French 2200, and Chinese 2300 GMT. The station also has a 60 metre channel 9440 Kc and is heard around 0300 GMT. The station also has a 60 metre channel 9440 Kc and is heard around 0300 GMT.

WINB is also still using 17720 SP.96 9x6 hole 3 15 0

SP.53 5x3 hole 2 6 7

SP.74 7x4 hole 1 6 7

SP.96 9x6 hole 1 4 8

SP.96 9x6 hole 1 4 8

Plus 121% tax

MULTI METER, May 1963

Case and Fittings 5 0

Printed Panel 10 6

Engraved Panel 2 10

Plus 121% tax

ALL GOODS PLUS FREIGHT SLIGHTLY HIGHER FROM AGENTS.

Gerrard and Goodman Limited, 199 Stirling St., ADELAIDE. 8-0424.

Homocrafts, Tasmania. 199 Collins St., HOBART.

Pakbuy Pty. Ltd., 38-30 Lime St., WEST PERTH. Tel. 28-4231.

Martin De Launay Pty. Ltd., 8-0242.

Broadway Electronics Pty Ltd., 12a Keira St., WOLLONGONG.

2-1402.

D. Irvine and Co., 401 George St, BRISBANE. 2-4310.

Manufactured by:

HEATING SYSTEMS

PTY. LTD.

97 MARRIOTT STREET, REDFERN, NSW.

69-3764 69-7616

"OXFORD"

INSTRUMENT CASES, GHASSIS AND PANELS

SPEAKER CASES

Oval

SP.3 3 in hole 2 7 6

SP.4 4 in hole 1 1 6

SP.5 5 in hole 1 1 6

SP.6 6 in hole 2 8 5

SP.8 8 in hole 2 7 6

Plus 121% tax

Case

2 15 0

Chassis

2 8 5

Printed Panel

19 6

Engraved Panel

2 10

Dial Assembly

1 15 0

Plus 25% tax

RADIO, TELEVISION & HOBBIES, May, 1964
WHEN NOTHING CAN BE LEFT TO CHANCE

ADCOLE
SOLDERING TOOLS
Are STANDARD Equipment in ALL AUSTRALIAN ARMED SERVICES and many other Government and Industrial Organisations using the finest in radio and electronic apparatus.

You CAN OWN, and your work will benefit by using, the VERY BEST IN SOLDERING TOOLS
Made in Australia by: ADCOLA PRODUCTS PTY. LTD.
673 Whitehorse Road, Mont Albert, Victoria. Telephone 88-4251.
Illustrated by S. McIvor. Made of High Grade Materials including Stainless Steel and Molybdenum. Fitted with Accessories. and all principal radio parts supply houses

FROM RADIO SUPPLY STORES EVERYWHERE
or from FACTORY DISTRIBUTORS
WATEN WYNE PTY. LIMITED 21 Flacoe Street, CROWS NEST, N.S.W.

NEW LONG-LIFE TOOL LINE-UP
for Easy Trimming, Easy Aligning.

The newest, toughest injection moulding material, polypropylene, is used to give greater durability to these new JABEL tools. Assembly line tests prove they far outlast ordinary plastic tools.

WTH—Double chrome blade for the new millling, hatted-hole type transceiver cores.
WHT—Honed guide blade of exact dimensions.
WTH—Hexagonal shank for all hex. cores.
WTH—Hexagonal shank or all hex. cores.

and

This New DE (double-end) tool made from high-impact polypropylene, with moulded-in non-ferrous tool-tips.

Made in Australia by: AOCOLA PRODUCTS PTY. LTD.
673 Whitehorse Road, Monfil

Industrial Organisations using the mamihi.

ALL AUSTRALIAN ARMED SERVICES and many other Government and Industrial Organisations using the finest in radio and electronic apparatus.

PRAGUE in Czechoslovakia, in its service area.

Lagos, Nigeria, is reported to have its new channel 9390 used to replace 9667 Kc, and has been heard at 0400 G.M.T.

XEUDS in Sonora, now on 6115 Kc. Reports from America are too low in frequency for reception at 2010 G.M.T.

XESC on 15205 Kc has also been heard in New Zealand at 2020 hours on 7260 Kc, is now in full operation.

The station also uses the frequency of 5930 Kc, with announcements in English for its listeners in Europe at 1900 G.M.T. is used to replace 9667 Kc, and has been noted at 2000 G.M.T.

Anne Villa Radio, Tunis, now has three new transmitters on the air from opening at 0600 hours, and has news in French at 0700. Reports from North Africa are few receiving.

RwandA station ETLF in Addis Abbaba, uses the new frequency 5930 Kc, with announcements in English for its listeners in Europe at 1900 G.M.T. is used to replace 9667 Kc, and has been heard at 0400 G.M.T.

AMFLEX injectors being used to give greater durability to these new JABEL tools. Assembly line tests prove they far outlast ordinary plastic tools.

WTH—Double chrome blade for the new millling, hatted-hole type transceiver cores.
WHT—Honed guide blade of exact dimensions.
WTH—Hexagonal shank for all hex. cores.
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This New DE (double-end) tool made from high-impact polypropylene, with moulded-in non-ferrous tool-tips.

Made in Australia by: AOCOLA PRODUCTS PTY. LTD.
673 Whitehorse Road, Monfil

Industrial Organisations using the mamihi.
A.B. (Mackay, Qld.) writes to comment on articles in the July, 1960, and December, 1961, and we have no plans for describing a transistorised mixing unit, possibly using transistors.

Regarding the use of Morse Code on 144 MHz, we feel that the position is quite as hopeless from the loudspeaker! However, we don't have data on the received or misread when a recognisable tune emerges.

H.H. (St. Kilda, Vic.) asks why it is that radio components nor will we answer commercial questions. We do not deal in radio components.

There have been quite a number of mixing units described in the magazine, but the microphone is not easily adaptable to others. The mechanical problems are quite "voracious" in terms of staff time.

We are not quite clear as to the type of "ideas for future projects," and will examine the situation at the earlier opportunity.

We are not offering to operate a very low power transmis

* Please give your name and full postal address, including the State . . . N.S.W.

** We will answer the above information clearly or, for preference, in black ink.

When writing to us:-

We must admit that it hadn't occurred to us to describe a transistorised version of our Headphone Stereo J.M., but now that you have made the suggestion, we agree that it might be a very good idea. We will consider it and see if our present facilities will permit the description at the earliest opportunity.

** CALL SIGNS

J.W.T. (Nelson, N.Z.) compliments us on the "Radio, Television and Hobbies" does not deal with radio components nor will we answer commercial questions. We do not deal in radio components.

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* Please give your name and full postal address, including the State . . . N.S.W.
WIDE BAND OSCILLOSCOPE


3-Inch £49/17/6
5-Inch £55/15/6

PORTABLE RECORD PLAYER

2-Speed. A.T.V. £17/6/6
4-Speed £21/15/0

PLAYMASTER 106 & 107

PORT. 106 KIT SET £40/15/0
PORT. 107 KIT SET £13/15/0

COLLARO STEREO DECK

PORT. £36/17/6
POST. £21/12/6

NEW TRANSISTOR TESTERS

PORT. £26/17/6
POST. £21/12/6

AMPLIFIERS

Public Address Range 240-V.A.

MINITUBE P.A. AMPLIFIER £12/2/6
Wired and Tested £42/10/0

Wired and Tested £29/17/6

Wired and Tested £12/10/0

Wired and Tested £21/10/0

Wired and Tested £32/15/0

Wired and Tested £17/13/6

Wired and Tested £32/10/0

Wired and Tested £17/15/0

Wired and Tested £35/17/6

Wired and Tested £29/17/6

Wired and Tested £25/17/6

Wired and Tested £27/15/0

Wired and Tested £100/15/0

Wired and Tested £16/15/0

SIGNAL GENERATOR

LSG 11


Wired and Tested £32/15/0

Wired and Tested £16/15/0

Wired and Tested £10/15/0

BATTERY-AC OPERATION

4 Actor 6 100 m 210 m 210 m 4 10 m 210 m £14/17/6
1 Actor 6 100 m 210 m 210 m 4 10 m 210 m £9/17/6

TV PATTERN GENERATOR

4 Sped. 4 Wait. £15/17/6

PLAYMASTER 3

Using our new amplifier principle ideal mixer, with an Output of 200 Watts. Ideal TV Transmitter. £12/17/6

KITTEN £26/17/6
Wired & Tested £19/17/6

PLAYMASTER 4

Complete £85/15/0
Wired & Tested £42/10/0

MULLARD FERRER R.P.M. TACHOMETER

Complete £85/15/0
Wired & Tested £29/17/6

MULTIMETER

22 Ranges. A.C. and D.C. £15/0/0

2000 M.V. £20/10/0

2.500 M.V. £35/15/0

7 Valve 12v phis 240v-10 watt £4/17/6

7 Valve 12v phis 240v-25 watt £7/15/0

7 Valve 12v phis 240v-25 watt £10/15/0

100 Watt. As above KT88 P.P. £32/10/0

6 Valve 6 phis 240v-10 watt £6/17/6

6 Valve 6 phis 240v-10 watt £9/17/6

AMPDS POWER SUPPLY

AC rotors, 0.10, 50, 250, 590, 1000.

DC rotors, 6.5, 19, 50, 250, 500, 1000.

Resistance, 0.50K. 0.75m.. Sine.

DC current 6.25, 0.50MA.

240V A.C. Mono £5 15 6

240V A.C. Mono £2 10 6

240V A.C. Mono £1 15 6

240V A.C. Mono £0 15 6

240V A.C. Mono £1 5 6

100,000 ohms with vol. meter. £5 15 6

10,000 ohms with vol. meter. £2 15 6

1000 ohms with vol. meter. £1 15 6

100 ohms with vol. meter. £1 15 6

Ohms, 1 Ranges.

20,000 Ohm PER VOLT.

20,000 Ohm PER VOLT.

9000 Ohm PER VOLT.

9000 Ohm PER VOLT.

40,000 ohms per volt.

70,000 ohms per volt.

90,000 ohms per volt.

100,000 ohms per volt.

SIGNAL GENERATOR

120K. £200/15/0

150K. £100/15/0

250K. £60/15/0

500K. £30/15/0

1000K. £15/15/0

2M. £7/15/0

5M £3/15/0

10M £1/15/0

SIGNAL GENERATOR

120K. £200/15/0

150K. £100/15/0

250K. £60/15/0

500K. £30/15/0

1000K. £15/15/0

2M. £7/15/0

5M £3/15/0

10M £1/15/0

Port. N.S.W. £7/6, Interstate 12/6.

Port. N.S.W. £7/4, Interstate 12/6.

Port. N.S.W. £12/9, Interstate 17/4.

Port. N.S.W. £12/6, Interstate 17/4.
GUITAR AMPLIFIERS
15 Watt, Two-Channel, with Two Cone Speakers. £37/15/–
4-Watt, 4 Speaker, Bass and Treble Boost, 2 Twin Cone Speakers. £39/15/–
17 Watt, Four-Channel, Bass and Treble Boost, Two Twin Cone Speakers. £42/0/–
35 Watt
4 Channel, Bass and Treble Boost, 3 Twin Cone Speakers. £67/6/–
Wired with synch control and 2 preset controls for frequency and intensity. £69/– extra on above models.

14 + 14 WATT
All complete with Speaker, Bases, etc. £29/10/–

BATTERY CHARGER
240 Volt A.C. Operation
3 Rate 6v, 12v, TRICKLE CHARGE
Trickle Charge position with all Batteries, 2V to 12V at rate of 200 to 500 M.A.

STANDARD
1 amp. 6V, 12V
3 amp. 6V, 12V, REC 4/5-1/2/6-1/2
4 amp. 4V, 12V

DE LUXE
1 amp. 6V, 12V
3 amp. 6V, 12V, REC 4/5-1/2/6-1/2
4 amp. 4V, 12V

With Bases and Mikrophone. Guaranteed. £95/–/–

No. 9 CONTROL BOX KIT £10/10/–

Playmaster 101

Radio, Television & Hobbies, May, 1964

107
diodes. Also included are not-so-com-
delay lines, valves, transistors and
grams given is not beyond possibility.
sary, and test configurations along with
test equipment needed are illustrat-
Where the test equipment is not avail-
construction from some of the dia-
given is not beyond possibility. Methods are shown for testing and meas-
gers, resistors, coils, trans-
faters, transmission lines, delay lines, valves, transistors and
to achieve maximum ver-
with schematic diagrams and photo-

tent and automatic gain control are also thoroughly dealt with, all in easily
understandable language. The closing pages of this chapter explains some of the
mysteries of transmitter RF amplifiers and the modulation of these circuits.
Semi-conductor testers receive a prominent part in this provision, pro-
viding in all, 46 pages of interesting material. These receivers range from a
simple circuit to small 3 and 4 transistor sets to full communi-
cations receivers. The application data for
crystal and mechanical filters is also
seen in this chapter. Of interest to
searching operators is the featuring of
HF local converters together with con-
verters for 20, 144 and 220 megacycles.

The 1964 WORLD RADIO, TV,
HANDBOOK, 18th edition, pub-
lished by O. Land Johnson, Dania,
Danmark, 266 pages, 6½ x 9 inches.

Following the mention of this
very popular book in our February
issue by Art Cuylen we received a
copy from the Technical Book and
Magazine Company Ltd., 295-
299 Swanston Street, Melbourne,
Victoria.

They advise that the Australian
price is 22/3, plus 1/9 postage and

Titled "RF Power Amplifiers," the sec-
ond last chapter attacks the problems
associated with transistorised transmit-
er operation. One of the most
important parts of this section is the
denature of the design data for
both RF and IF amplifiers. The text
described need not be capable of driving a 6BQ linear.

The final chapter is concerned with
power supplies, AC to DC, DC to DC and
DC to AC. Altogether we found this
book to be a very interesting to read and have no
hesitation in recommending it for all
readers.

Our copy came direct from McGills
Agency, Technical Book Department,
183-5 Elizabeth Street, Melbourne.

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Agency, Technical Book Department,
183-5 Elizabeth Street, Melbourne.
own business.

a managerial position in the retail trade

Specifically designed to help those aspiring to

Selection, Engagement and Management,

Store, Setting Up in Business, Sole Trader,

Company or Partnership, Staff Training,

the Law for Retailers—If.

The Law for Retailers—If.

A greater part of this book, I am sure, is

ston St., Melbourne. The price quoted

Magazine Co. Pty. Ltd., 295-299 Swa-

came from the Technical Book and

UHF BUSINESS RADIO HAND-

Use of UHF radio equipment in the

circuits at UHF, The author sets out

communications at these frequencies,

and the technical applications of

This booklet discusses in detail the

part of the frequency spectrum.

transmitter frequency stability is discus-

ed leading up to the designs of practi-

cal transmitters. The latest techniques

covered are dual and triple conversion

receivers, RF amplifiers, mixers, discrim-

inators, AM detectors and squelch cir-

Both mobile and base systems come under

the critical eye of the author and we

feel that the person interested in UHF

communication could learn much

about commercial techniques from this

publication. Recommended reading.

Our review copy came direct from the pub-

lishers. The American price is

9.50 dollars.

NORTH AMERICAN RADIO TV

STATION GUIDE, by Vince A.


pages, $1.25 by $1.25. Published

by Howard W. Sams and Co., Inc.,

Indianapolis, Indiana, U.S.A., hard

cover, 816 pages, 7 by 5 Inches,

360 illustrations, 192 pages. Weil

Illus-

tion, published by Howard W.

Sams and Co., Inc., Indianapolis,

Indiana, U.S.A. Soft cover, 192

pages, $1 by $.50. Illustrated

with schematic diagrams and

photographs.

This booklet discusses in detail the use of

UHF radio equipment in the

world of business, the characteristics

of communications in these frequencies,

and the technical applications of

communications. Each VHF channel sets

in a very practical manner to explain

propagation characteristics and range-

determining factors associated with this

part of the frequency spectrum. In the

second chapter the subject of

transmitter frequency stability is discuss-

ed leading up to the designs of practi-

cal transmitters. The latest techniques in

commercial UHF transmitters are

discussed with all detail, including the use

of Varistor doubler and triplet circuits.

Many commercial receiver circuits are

discussed in the following chapters with-

out losing necessary details of the indi-

vidual points under discussion. Items

covered are dual and triple conversion

receivers, RF amplifiers, mixers, discrim-

inators, AM detectors and squelch cir-

uits.

At the time this regional guide was com-

piled the VHF TV channel for each city

was listed on a separate map and also listed

on one map for all VHF TV channels.

Each VHF TV channel location is illus-

trated in a two-page map with a sep-

arate map for each channel from 2

to 17. The UHF TV locations are all

shown on the one map and also listed

by channel numbers. The AM and FM

stations are listed each by geographic location and by fre-

quency. While this publication would be

very useful to an American listener/

viewer, its use in Australia would be

very limited.

A reprint of this publication is devoted to the
electrical systems of motor vehicle radio and may be of

some interest to electronically minded enthusiasts. The
cover contains generators, starter motors, electric

cabling, regenerative systems, etc.

For the most part, however, it is con-

fined to specific information for mech-

anical servicing on the following com-

pact cars: Ford, Austin-Healey, Chrysler, Cor-

vair, Chev. H. Dodge-Lancer, Falcon, Mercury-Comet, Olds-\n
Rolls, Ford-Mercury, Valiant-Valiant, Ford-Traveller, Nash-


Our re-

view copy came direct from the pub-

lishers. The American price is 3.97 dol-

lars.

SOUND operated relays, built-in 2-channel mixer, 50 DB, V.U. meters, auto control, a dream to operate and own. Prices from Radio South Strathfield.

Inexpensive television for fringe and mountain circuits, chokes, £30. Also 100 copies "Radio W.A., S.A. 30/-.

COMPLETE stereo amplifier kits £15; (2) AR7s, £40 and £20; £50PLV/12Amps., 18/3. Ten for 140/-. 50PLV/750Ma., 18/3. Ten for 53/3.

Also 13 Narrak Road, 900PlV/1250Ma., 1/6. Ten for 87/6.

Catalogue 7/-. N.S.W.

New In unopened carton. Scoop purchase of 3/. Post Free.

No reasonable offer refused. 48 Cooloongatta Road.

ADVERTISERS PLEASE NOTE!

Should your advertisement not arrive in time to meet the above copy deadline, it will be booked to appear in the next issue, unless you directly otherwise.

ADVERTISING MANAGER


SOUND operated relays, built-in 2-channel mixer, 50 DB, V.U. meters, auto control, a dream to operate and own. Prices from Radio South Strathfield.

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<td>Asdic Stereo House 61</td>
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<tr>
<td>Acme and Merchants</td>
<td>67</td>
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<tr>
<td>A.C.E. Radio</td>
<td>106, 107, 108</td>
</tr>
<tr>
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